PADI RESCUE DIVER COURSE

September 2022

SECTION ONE

THE PSYCHOLOGY OF RESCUE I

THE CAUSE OF DIVER EMERGENCIES

There's no denying that diving takes us into a potentially hazardous environment. We can't breathe water, so there's some risk from relying on a mechanical device to supply air. Potentially harmful organisms make their homes in some aquatic environments, creating risks. Currents and waves can overpower human beings, carrying them away from safety or into hazardous areas, creating risk.

Diving enjoys an enviable safety record, but one must accept that trouble can arise at any time due to myriad conditions, ranging from a diver's undiagnosed medical conditions to unforeseeable mechanical malfunction. Divers get into trouble because they either fail to foresee a potential hazard or variable, or they foresee it but fail to act accordingly.

The most common cause of diver emergencies is poor judgment. The majority of diver accidents are actually preventable; you can trace most of them back to a poor decision that begins a series of events that culminates in trouble. Remember

that planning a dive is partly a risk assessment – the divers considering the potential hazards and how to handle them. Failure to use good judgment in determining potential hazards or in response to identified hazards sets the stage for emergencies.

Poor judgment includes participating in an activity beyond a diver's training or experience, like entering a cave without cave diver certification. Poor decisions during a dive, such as disregarding a rising current or continuing a dive with what seems like a trivial equipment malfunction, can also lead to an emergency. Before a dive, it's poor judgment to skip equipment safety checks or basic dive planning, both of which help prevent accidents.

Learning to notice poor decisions others make gives you the opportunity to prevent accidents. While you can't be responsible for what other people do, you can tactfully raise questions about whether there might be a better choice. If you're part of the buddy team, you can always use good judgment and abort or adjust a dive, even if a dive partner is willing to, for example, continue the dive with a leaking low-pressure inflator. At the very least, being aware of a bad decision allows you to mentally prepare for the problem that may result.

In the aftermath of an accident or close call, there's wisdom in trying to determine what caused or almost caused it. Perhaps the most important reason is so that you don't make the same mistake, or repeat your own.

THREE CONSIDERATIONS BEFORE ATTEMPTING A RESCUE

When someone gets into trouble, the immediate urge for most people is to do something. Some people freeze, paralyzed by indecision and not knowing what to do, while others act instinctively based on the first thing that pops into their minds. Knowing how to help others is important because it eliminates the first reaction. But, you need to avoid jumping to help without forethought, because it's crucial that you protect yourself first. Realize that this is as much for the victim's benefit as your own.

Before you do anything, consider these three points in this order:

Assuming you're not already in the water near the victim, do you need to enter the water at all? It's always better to reach the person, extend something, throw flotation or go in a small boat or watercraft than to jump into the water to help.
Assuming inwater rescue is required, in the context of the situation do you have the equipment and training necessary for your safety and the victim's safety? Being a properly equipped PADI Rescue Diver doesn't mean you can always answer "yes." For example, if the emergency is someone lost in an underwater cave, unless you're a trained and certified cave diver, and have your cave equipment with you, the answer is "no."

Assuming inwater rescue is required, can you reasonably expect to accomplish the rescue without getting into trouble yourself? It's reasonable to accept some risk beyond what you might ordinarily, to give help (this is a personal decision you'll

have to make), but if you're not likely to be able to help by attempting a rescue, then don't. For example, suppose there's a panicked diver who's significantly stronger and larger than you – so much so that despite whatever technique you use, the most likely outcome would be that the victim would overpower you and put you in significant peril. In this instance, you should not attempt the rescue – at least not while the danger exists. It may be better to ask a large, strong qualified person to go instead, if willing, for example.

Note that when an emergency arises, the first things you should do are stop and think.

Exercise 1 – 1

Question 1

The most common cause of diver emergencies is

hazardous marine life.

poor judgement.
equipment failure.
bad dive planning.

Question 2

The first thing to consider before attempting an inwater rescue is how fast you should swim.

True
False

RECOGNIZING DIVER STRESS

In most emergencies, you'll find that stress is either a contributor or a direct cause. Stress is defined as physical or mental tension that results in physical, chemical and/or emotional (psychological) changes in the body.

It can cause both positive and negative reactions; a degree of stress causes biochemical changes that temporarily make you stronger, think faster and more pain tolerant. But excessive stress can cause you to flee when confronted by something frightening, or overwhelm you emotionally so that you cannot handle the situation rationally.

The ingredients and sequence for stress start with the initial cause, which can be an incident, a thought, an image, fear or perception. Next, the diver's disposition to the stressor affects the perception that it generates – does the diver see it as a major or minor concern? Is it a challenge or a problem? Finally, how stress will affect subsequent behavior depends on how the diver deals with it. If the diver handles the stressor in a healthy manner, then the stress will not likely affect subsequent behavior. Healthy responses include employing specific techniques

to eliminate the stressor, recognizing the stressor as trivial (if it really is), or canceling the dive if nothing else eliminates the threat.

Problematic responses include denial or rationalization and continuing the dive, magnifying a fear through worry, all the way to the worst case, panic, which is blind, instinctive reaction. A problematic response can be latent, such as fearing a specific potential event like seeing a shark. If the diver makes the dive without seeing a shark, the stressor may have little effect beyond distracting the diver. But, if a shark shows up, the occurrence of the diver's fear may overwhelm the individual and cause a panicked response, even if the shark does not act in a threatening or aggressive manner.

PHYSICAL STRESS

Physical stressors are those that affect the body, causing discomfort, loss of strength and other effects. Even minor annoyances can cause stress, and if left uncorrected lead to more serious problems.

Common physical stress causes include:
cold and heat
seasickness
gas narcosis
fatigue
illness or injury
alcohol or drugs
discomfort or impaired function caused by ill fitted or malfunctioning equipment

Whether any of these cause significant stress depends on the diver's condition, how extreme the stress is, and how long the diver must endure it. For instance, standing in the hot sun in a full dry suit, given enough time, will cause almost anyone to suffer heat exhaustion. A diver who's in good fitness can probably tolerate that amount of heat stress for quite awhile; an overweight individual with poor fitness probably much less, especially if dehydrated to start. What's stressful one day may not be the next, such as a long swim after a sleepless night versus one after adequate rest.

Physical stress can also be subtle. A leaky mask can be an annoying distraction that's not really a problem itself, but leads to a problem if it distracts the diver from safety tasks, such as adequately monitoring depth and air supply.

There's no way to eliminate many of the potential physical stress causes in a dive environment: cold, the walk to the beach, a rolling boat, a long surface swim to the dive site.

Preventing stress, therefore, lies with the diver, who, for example, wears proper exposure protection, maintains physical fitness, takes antiseasickness medications (if necessary), or makes a long surface swim at a relaxed pace.

If conditions exist beyond the diver's physical ability to cope, the diver should cancel the dive. Realize that divers, including you, may not perceive that they're pushing or exceeding their physical limits until excessive stress has already begun. The primary danger with physical stress, therefore, is failing to recognize its effects.

PSHYCHOLOGICAL STRESS

Psychological stress is stress due to the diver's reaction to perceived "threats" in the environment, including perceived causes of actual bodily harm, and "threats" to self esteem. The diver's beliefs and attitudes play a major role in psychological stress, so the stressor may be imagined or real.

Psychological stress often results from physical stress. For example, fatigue or being tired can trigger psychological stress if the diver fears being unable to make it safely to boat or shore. An overexerting diver can feel air starved and fear that the regulator can't deliver enough air.

A task loaded diver who's faced with more physical tasks to manage than the person is physically capable of may feel overwhelmed, unable to control the situation, including preserving personal safety.

HANDLING PEER PRESSURE

Logically speaking, few if any divers would rather have an accident than lose face or be embarrassed among their peers. Yet, on an emotional level, peer pressure can be powerful, sometimes leading people to do things that they otherwise wouldn't. Among divers, this can lead to accidents. You can help prevent this by setting a good example. If you don't feel comfortable making a dive, say so and don't make the dive. This shows others that there's no shame in being a smart, careful diver.

Some dive communities, especially cave divers, apply the following guideline: Any diver can end any dive at any time for any reason with no explanation. When you accept this, peer pressure goes the other way – it pressures divers to speak up when they don't feel good about a dive. Adopting this guideline turns peer pressure into a positive force that helps diver safety.

Finally, although a diver shouldn't let peer pressure be a factor, if the need to save face could overwhelm good judgment, an easy way to cancel or abort a dive without embarrassment is to signal or say, "I can't equalize." After all, who but the diver really knows?

However, threats don't have to be physical, logical or real. Any perception that something threatens a diver's well being will cause psychological stress. Psychological causes include an individual's beliefs and attitudes about a dive. Stress can arise if a diver believes, for example, that despite a risk the dive is too expensive (money or time taken to get there) to miss, creating internal pressures to dive despite misgivings about it.

Another psychological stressor is mental task loading – trying to pay attention to too many variables at once, leaving the diver fearing the inability to keep up and manage the situation. Peer pressure creates psychological pressure through a threat to self-image, so that a diver may fear looking like a coward, and thereby feel pressured to make the dive despite concerns about it.

Psychological stress can arise in any circumstance in which the diver perceives the risk to be greater than normal or expected, or more specifically, if the diver perceives that potential hazards are beyond the diver's ability to reasonably manage. As mentioned, psychological stress stimuli can be real or imagined, but either way the resulting stress is very real to the diver experiencing it. With the perception of a threat, the body responds with physiological and behavioral changes to deal with the threat.

As it prepares for emergency action, the adrenal gland releases epinephrine (a.k.a. adrenaline), which increases breathing and heart rate. While this is a useful response in normal circumstances, for the unaware diver underwater this can contribute to rapid, shallow breathing and the symptoms of overexertion and air starvation.

As stress rises, the diver may experience perceptual narrowing, which is a decrease in broad awareness through close focus on a perceived threat or the solution to that threat. To a degree this is a good thing, giving the individual intense concentration in dealing with a problem. However, beyond a point, perceptual narrowing becomes a negative. If the diver fixates on something that's not the true cause of the problem, or on a solution that doesn't work, perceptual narrowing may reduce the ability to look for the real problem or alternative solutions, or to perceive other problems arising. In the panicked diver, perceptual narrowing may be so extreme that the individual will not hear directions, will not recognize attempts to help and will put all energy into a single, ineffective solution.

Let's look at the effects stress can produce in a diver by looking at the stress response cycle. As you know, when a problem or perceived problem (threat) arises, the diver feels stress. The stress evokes both physical and psychological responses. At this point, the diver's disposition will affect the cycle. If the diver reacts with problem recognition and confidence that the problem can be managed, the individual engages in solution thinking and takes steps to remove the threat, or to be prepared if the threat manifests itself. Anxiety falls. If the diver fails to react with solution thinking, or the reaction fails to solve the problem, anxiety increases, and so does stress. What happens next often depends on the diver's training and experience.

If the diver's reaction doesn't remove the threat, and the diver feels unable to correct the problem (response unavailability), the result is likely to be sudden, unreasoned instinctive panic. Underwater, the diver's breathing rate may lead to a feeling of air starvation or suffocation.

At the surface, the diver may spit out the regulator, push off the mask and fail to establish buoyancy, resulting in a struggle to keep the face above water to breathe, leading to more stress and more physical responses to heightened anxiety.

The result is a vicious cycle of psychological and physical stress that continues to raise anxiety, perceptual narrowing and fear of lost control and the inability to escape the mounting threats. This will almost always lead to exhaustion and collapse unless a rescuer intervenes. Besides active panic, as just described, the diver may experience (though rarely) passive panic, becoming frozen, trancelike and unaware. Although the outward behavior differs, the internal psychological cycle is the same.

If the diver's reaction does not solve the problem, but the diver remains confident that the problem can be solved, panic will be avoided. If the diver stops, thinks, controls breathing and then takes alternative corrective action, panic is not immediately likely. If perceptual narrowing does not close the door on solution thinking, the diver continues to stop, breathe, think and search for alternatives. The diver may attempt more than one solution before finding one that works, yet not panic.

Whether an individual will panic depends upon how much threat and how much personal control to remedy the situation the diver perceives. The more threat perceived and the more helpless someone feels, the more likely the person will panic. Air supply disruption, for example, is highly threatening, sudden, and must be solved quickly, making panic more likely if there's no immediate perceived solution.

The less threat and the more control a diver perceives, the less likely panic and the more likely solution thinking. A broken fin strap, on the other hand, is much less likely to lead to panic, at least initially. Training, staying within experience limits and personal disposition are the major factors for avoiding panic. A common example is flooded masks – many beginners abruptly stand up when they flood their masks for the first time even though there is no real threat, only discomfort that they perceive as a threat. The same individuals, following training and practice, swim extended distances with no mask and without panic because they've learned the discomfort isn't threatening, and that they can clear their masks at will. They perceive minimal threat and high control.

Exercise 1 – 2

Question 1

Diver stress is

the physical and psychological responses to a perceived threat.
always negative and to be avoided.
the same thing as panic.

Question 2

Causes of physical stress include (choose all that apply)

cold and heat.
task loading.
peer pressure.
fatigue.

Question 3

Causes of psychological stress include (choose all that apply)

cold and heat.

task loading.
peer pressure.
fatigue.

Question 4

Perceptual narrowing is the tendency under stress to be less broadly aware and more focused on a perceived threat and/or solutions to that threat.

True
False

Question 5

The effects of stress on a diver can include (choose all that apply)

anxiety.
perceptual narrowing.
increased breathing.
panic.

BEING PREPARED FOR A DIVER EMERGENCY I

First-Aid Kits
The farther your diving takes you from access to emergency medical care, the more important it is to take a well-stocked first-aid kit. As a PADI Rescue Diver, you'll want to be sure there's a suitable first-aid kit on hand, whether you bring it yourself (as when shore diving) or whether someone else provides it (as when diving from a charter dive boat).

The easiest way to be sure there's a first-aid kit on site is to bring it yourself. If you already have a good first-aid kit, you only need a few more items to convert it into one especially suited to diving. If you don't have a first-aid kit, it doesn't cost much to put one together – as you'll see from the following list. You can also buy preassembled diver first-aid kits, though you may want to add some items, depending upon where you dive. A first-aid kit should last for years (with periodic replenishing, of course), and can come in handy for nondiving emergencies as well as diving emergencies.

Since you may need to store or deploy your first-aid kit in sand, sea spray and weather, pack it in a durable, noncorrosive, water-resistant case. Plastic tackle boxes and tool boxes work well; several manufacturers sell preassembled kits for divers in heavy-duty, water-resistant fabric cases. It's likely the kit will be dropped or knocked around from time to time, so avoid putting glass or anything fragile inside.

Label your first-aid kit and inform other divers where you store it. This ensures your companions can find it even if you're underwater or not immediately present. Keep your kit in full readiness by replacing used supplies and outdated medicines as soon as possible.

In setting up your kit, keep in mind that you'll use it for the most common diving and nondiving injuries you're likely to encounter. Its contents are meant to manage minor problems – like a small cut – or to stabilize a major one – like profuse bleeding – until reaching medical care.

The easiest way to set up your first-aid kit is to start with a premade one (you'll find many on the market), and then add to it as necessary. A first-aid kit will seldom have (or need) all of the following, but consider the appropriateness of each in your kit:

- Latex or vinyl gloves, rescue breathing mask with one-way valve for rescue breathing, ventilation barriers, eyeglasses/eye protection, face mask – you use these to reduce the risk of infectious diseases, and to reduce contact with blood, body fluids, mucus membranes, wounds or burns.
- The Emergency First Response Primary and Secondary Care Participant Manual for ready access to first-aid information for common injuries or conditions.
- The PADI Accident Management Workslate to provide dive accident-specific management flow instructions and emergency contact information.
- A pad of paper or blank slate for recording what you observe, and the steps you've taken to help an injured person that you provide to emergency medical personnel.
- Reference materials with first aid specific to aquatic life injuries.
- Cell phone with power adapter – so you're not limited by the phone's battery.
- Large absorbent dressings (various sizes) – used to help stop bleeding.
- Sterile gauze pads (various sizes) – used to help stop bleeding and dress wounds.
- Clinging rolled bandages (various sizes) – used to dress wounds.
- Adhesive bandages (various sizes) – used to dress wounds.
- Adhesive tape – used to dress wounds.
- Nonadherent, dry pads – used to dress burn wounds.
- Triangular bandages – used to immobilize dislocations and fractures.
- Sterile cotton – used to dress wounds.
- Cotton tipped swabs – used to clean wounds.
- Bandage scissors – used to cut bandages and dive apparel.

- Tongue depressors – used to check vital signs during illness assessment, and can be used as splinting material for finger dislocations and fractures.
- Tweezers – used to assist in removing material.
- Needle – used to assist in removing foreign material.
- Safety pins – used to attach and secure bandages.
- Penlight – for light and to use as an examination tool.
- Oral thermometer – used to measure temperature as a vital sign.
- Squeeze bottle of water – for hydration and divers with heat stroke, for burns, eye or wound wash.
- Splints – used to immobilize dislocations and fractures.
- Emergency blanket – for warmth and to cover divers with shock.
- Cold packs – for bruises, muscle injuries, strains, eye injuries, stings and dislocation and fractures.
- Hot packs – for venomous bites and stings.
- Vinegar – used to neutralize stinging cells of jellyfish.
- Plastic bags – used to dispose of gloves and medical waste and may also be used in lieu of actual gloves as a barrier.
- Small paper cups – for drinking and to cover eye injuries.
- Denatured alcohol – for disinfectant (not to be used on wounds).
- Antibacterial soap – used to clean wounds.
- Antiseptic solution or wipes – for wounds.
- Antibiotic ointment – for wounds.
- Hydrocortisone ointment – for stings/irritations.
- Aspirin and nonaspirin pain relievers – used to reduce swelling and diver discomfort.
- Antihistamine tablets – for allergic reactions.
- Sugar packs, candy or fruit juice – for low blood sugar.
- Activated charcoal – for poisoning.
- Anti nausea drugs – for reducing seasickness.
- Nasal decongestant spray (with physician's approval) – useful for divers with equalization difficulty.
- Sunscreens – to prevent sunburn.
- Rescue Breathing Mask

In your Emergency First Response – CPR course, you learned to use ventilation barriers to reduce disease transmission risk when providing rescue breaths. Although there are many types that work well, the PADI Rescue Diver course emphasizes the use of the rescue breathing mask, also called a resuscitator mask or CPR mask.

A rescue breathing mask is simply a mask specifically designed to facilitate rescue breathing. It has four advantages. First, it simplifies getting an effective seal and head positioning. Second, it reduces worries about disease transmission. Third, as you'll see during rescue training exercises later in the course, it is one of the most effective ways to provide inwater rescue breathing for a nonbreathing diver.

Fourth, you can connect a rescue breathing mask to emergency oxygen to provide oxygenated air with your rescue breaths. It is so effective a tool that you'll want to consider carrying one as a regular part of your dive kit. You can tether the mask case to the inside of a BCD pocket to reduce loss risk while having ready access in an emergency.

Exercise 1 – 3

Question 1

A well-stocked first-aid kit is intended to help manage small problems, and to stabilize major problems until reaching emergency medical care.

True
False

Question 2

A rescue breathing mask is something a rescuer wears to prevent disease transmission.

True
False

Question 3

Advantages of a rescue breathing mask include that (choose all that apply)

it simplifies making an effective seal.
it reduces disease transmission risk.
you can use it for inwater rescue breathing.
you can provide oxygenated rescue breaths with it.

EMERGENCY OXYGEN DELIVERY SYSTEMS

Mounting evidence in recent years points to administering emergency oxygen as one of the single most important first-aid steps for a diver suspected of suffering from decompression sickness, lung overexpansion injury or drowning. Medical case histories show repeatedly that prompt oxygen first aid can make a dramatic difference in the diver's immediate condition and in the effectiveness of subsequent treatment. Let's look at emergency oxygen equipment suitable for use by PADI Rescue Divers.

Emergency oxygen equipment falls into three primary categories: nonresuscitator demand valve units, continuous flow units, and positive pressure resuscitator units. Rescue divers may use the first two; the latter requires special paramedic level training because it can injure someone if used improperly. Nonresuscitator demand valve units and continuous flow units adequately meet the needs of a dive emergency.
Nonresuscitator demand valve units operate much like your scuba regulator. Oxygen flows only when the diver inhales, so these units reduce waste, and with

a proper mask it can deliver nearly 100 percent oxygen. In addition, a rescuer can inhale from a nonresuscitator demand valve unit and ventilate a nonbreathing patient with a high oxygen concentration (the body only consumes a small fraction of the oxygen in each breath).

Dive accident first aid calls for delivering the highest oxygen concentration possible for as long as possible, making the nonresuscitator demand valve the best choice for rescue divers.
Continuous flow units release oxygen continuously, so they're more wasteful than nonresuscitator demand valve units. Fixed continuous flow units usually deliver six or 10 litres per minute; adjustable units usually deliver up to 25 litres per minute. With the proper flow (15 litres per minute recommended) and a nonrebreather mask with reservoir bag, continuous flow units can deliver more than 90 percent oxygen, but with low flow rates and/or an improper mask, the concentration may remain below 60 percent.

By using a rescue breathing mask, you can ventilate a nonbreathing diver with partially oxygenated air using a continuous flow unit. Continuous flow is also used if the injured diver is very weak and unable to breathe with the nonresuscitator demand valve system. Most nonresuscitator demand valve systems have multifunction regulators that can be used for continuous flow so you don't sacrifice this benefit.

POSITIVE PRESSURE RESUSCITATOR OXYGEN SYSTEMS

Positive pressure resuscitator oxygen systems get their name because they use pressure from the oxygen cylinder to provide rescue breaths. While this supplies 100 percent oxygen and is far less tiring for the rescuer, oxygen cylinders have high pressure. Improper use could potentially injure a patient by overpressurizing the lungs. For this reason, until recently these units were used only by paramedics, EMTs and other trained medical professionals.

The manually triggered resuscitator valve is changing this. Equipped with a special safety valve that prevents accidental injury to a patient, these devices are suitable for lay rescuer use, and give you the ability to provide rescue breaths with positive pressure. They do, however, require some additional training for each specific model. In the PADI Emergency Oxygen Provider course, depending upon equipment availability, your instructor may introduce you to manually triggered resuscitator use, and you may have the option to qualify to use a specific model.
Emergency oxygen comes in differing cylinder sizes, and internationally you may encounter different valve configurations, so it's a good idea to check the local standards when traveling. Ideally, carry a big enough supply to keep an injured diver on pure oxygen until in the hands of emergency medical care. However, some very remote dive destinations may make this impractical or impossible; carry as much oxygen as you reasonably can. Some oxygen is better than none at all. For general purposes, 637 litres of oxygen (22.5 cubic feet; even imperial system countries usually measure medical oxygen in litres), can be expected to last approximately 40 to 50 minutes, depending upon whether used with a nonresuscitator demand valve or continuous flow.

Like your first-aid kit, your oxygen equipment needs a case that can withstand the rigors of diving, ideally one in which you can store your equipment set up and ready to go. Most commercially available oxygen systems for divers come equipped with a suitable case. Most airlines won't let you bring a pressurized oxygen tank aboard the plane when you travel.
If you frequent distant destinations that may not have oxygen on site (i.e., remote locations that lack dive resorts) you can also get systems that have everything except the oxygen tank. Instead, you rent the oxygen tank at your destination and bring it to the dive site.

The PADI Rescue Diver course teaches what you need to know and qualifies you to administer oxygen in a diving emergency. The focus in this course is effective community standard emergency oxygen first aid until emergency medical services personnel arrive, which you'll practice beginning in Rescue Training Exercise Nine. You can learn extra detail about emergency oxygen equipment use in the PADI Emergency Oxygen Provider Course. If your diving takes you into areas where you're several hours or more from emergency medical care, you'll want additional training in remote dive emergency management.

CAN I GIVE OXYGEN?

New PADI Rescue Divers often ask whether it is legal to give an injured diver oxygen in an emergency, and whether it might cause medical complications. These are valid concerns, but within the scope of diving, administering oxygen in an emergency isn't really an issue.
In most areas, there are no laws prohibiting buying medical oxygen for emergency use, or administering oxygen in an emergency. Some areas stipulate that the individual be trained in oxygen administration (PADI Rescue Diver, PADI Emergency Oxygen Provider and/or other emergency oxygen diver certifications qualify within the scope of dive emergencies). As long as the diver consents, in most countries there's nothing illegal about providing oxygen in a dive emergency (if the diver is unconscious, consent is implied). Only a few countries prohibit giving oxygen in an emergency.

It has been thought that giving oxygen can make a few medical conditions worse, but there's some doubt about this now.

Nonetheless, these conditions include emphysema and other lung diseases that impair individuals significantly. People suffering from these are not candidates for diving. Healthy individuals can suffer lung irritation if they breathe high oxygen concentrations too long, but this takes hours – more than likely, you'll have the diver in professional medical care, or run out of emergency oxygen first.

O_2 OPTIONS

In a DCI emergency, if you run out of emergency oxygen before you can get a breathing patient into emergency medical care, have the patient breathe any enriched air available. While not as beneficial as 100% oxygen, enriched air has

more oxygen than air and may help. It certainly won't hurt. For a nonbreathing patient, at least one manufacturer makes a system that allows you to provide EANx from a scuba tank, much as you provide oxygen from an emergency oxygen system.

Exercise 1 – 4

Question 1

It's important to have emergency oxygen available because prompt oxygen first aid can make a difference in the case of decompression sickness, lung overexpansion injury or drowning.

True
False

Question 2

The three primary types of emergency oxygen systems include (choose all that apply)

nonresuscitator demand valve systems.
continuous flow systems.
membrane extraction systems.
positive pressure resuscitator systems.

Question 3

_____ work much like a scuba regulator, supplying 100 percent oxygen when the diver inhales.

Nonresuscitator demand valve systems
Continuous flow systems
Membrane extraction systems
Positive pressure resuscitator systems

Question 4

The emergency oxygen systems suitable for use by PADI Rescue Divers include
(choose all that apply)

nonresuscitator demand valve systems.
continuous flow systems.
membrane extraction systems.
positive pressure resuscitator systems.

Question 5

For general purposes in areas with ready access to emergency medical services, an emergency oxygen supply of 40 to 50 minutes is normal.

True
False

AUTOMATED EXTERNAL DEFIBRILLATORS (AED)

Automated External Defibrillators (AEDs)
As you may recall from your Emergency First Response course, when someone's heart stops, the sooner a shock can be delivered to attempt to restart it – called defibrillation – the more likely the heartbeat will return to normal. The purpose of CPR is simply to extend the time between cardiac arrest and the start of defibrillation to increase the probability that a normal heartbeat can be restored.

Automated External Defibrillators (AEDs) were introduced to shorten the time to defibrillation by making it possible for laypersons with comparatively minimal training to provide it.

AEDs are electronic instruments that analyze an unresponsive diver's heart rhythm, then guide you through the steps of providing the shock, if necessary (sometimes called "semiautomatic" AEDs). Some versions deliver the shock automatically if analysis determines it's required (sometimes called "automatic" AEDs).

Due to training requirements, costs and the relative newness of the technology, as well as restrictions in use by laypeople in some areas, currently AEDs are not considered standard first-aid equipment nor a community standard.

However, if one is available, the clear benefit is the ability to attempt to restart the heart in a shorter interval than waiting for EMS personnel to arrive. As with CPR and any rescue technique, an AED cannot guarantee that a diver with cardiac arrest will survive; it may, in some instances, increase the chances of it. Depending upon availability, local restrictions and other factors, your instructor may include AED use as part of your rescue training.

Exercise 1 – 5

Question 1

An AED (choose all that apply)

is a device that delivers a shock in an attempt to restart the heart.
is part of the dive community standard first-aid equipment.
eliminates the need for CPR training.

Question 2

The primary benefit of an AED is that it shortens the interval between the loss of heartbeat and attempts to restart the heart.

True
False

ACCIDENT MANAGEMENT I

Managing an Emergency

When an emergency arises, your skills as a PADI Rescue Diver can contribute to a higher chance of a positive outcome. Your role in an emergency situation can vary depending upon the number and training of others available. Whether you're alone or one in a crowd ready to help, emergency management is the skill of using the human resources available as effectively as possible.

In discussing diver emergencies, it's important to distinguish between the concepts of "victim" and "patient."

A victim is a diver in an accident situation who either has yet to receive help, or who is receiving help but is not yet in a stable, safe environment. A patient is a diver in an accident situation who is receiving emergency medical care (such as your first aid) in a stable, relatively safe environment. This means that the affected diver's status changes as a rescue progresses. For example, an unresponsive diver floating face down is a victim. The diver remains a victim during your initial rescue and exit, and becomes a patient once aboard a boat receiving rescue breaths and oxygen.
Your role as a rescuer will likely be one of two in the event of an emergency. When there's a more qualified person present, such as an instructor or divemaster, you will most likely be a skilled rescue assistant under that person's direction and management.

On the other hand, if you are the most qualified diver present, then you will likely coordinate the rescue as the emergency manager, delegating tasks to others based on their abilities and qualifications. In this situation, take control in a firm but calm, direct manner. Since you know what you're doing there's a tendency to start giving orders, but a calm, reasoned approach more readily inspires confidence and cooperation. For example, saying, "This person needs oxygen immediately. Please get it from my car as quickly as you can," shows levelheadedness and thought.

READINESS

Since you may find yourself managing an emergency, you want to attend to and maintain two forms of readiness: personal readiness and equipment readiness. Personal readiness is your physical and mental preparedness for an emergency, while equipment readiness is being prepared with the tools that significantly benefit your efforts in an emergency.

There are several elements to personal readiness. The first is maintaining your physical fitness through regular, proper exercise, diet and rest. Adequate fitness gives you more strength and stamina to apply in an emergency, and also reduces the likelihood that you'll become a victim yourself.
Personal readiness also includes participating in regular training and practice to maintain your rescue and EFR skills. This allows you to apply them more confidently and quickly in an emergency. It's fun to take a day with other PADI Rescue Divers and higher level divers to run through some emergency drills and keep fresh, but another way is to refresh and reapply those skills through higher level training. This includes continuing on to the PADI Divemaster course.

Proper attitude is a third aspect of personal readiness that goes hand in hand with good judgment. As you learned earlier, poor judgment is the primary reason divers get into trouble. As a PADI Rescue Diver, you need to commit yourself to following safe diving practices. By diving safely yourself and paying attention to others, you're better prepared for emergencies that may arise. Get in the habit of mentally rehearsing what you would do by visualizing possible situations and your responses. This readies you to act quickly and confidently.

Equipment readiness is having special rescue equipment, either kept on hand in case it's needed (like your first-aid kit and oxygen system), or being able to improvise it on the spot (like using a table as a stretcher). Be resourceful!

Keeping a few of these items on hand, or knowing where to find them, can make it easier to help a diver in trouble:

- Binoculars – for spotting divers at surface and for coordinating missing diver search.
- Clipboard with pen and paper – for recording what happened to whom, where and when.
- Surf/rescue board/torpedo float, rescue float, etc. – for swimming assists.
- Rope – to throw to divers at the surface, to lift victims from water, to assist an underwater search and other uses.
- Circular sweep anchor – to easily mark the center of a circular search pattern.
- Diver compass – for navigating an expanding square or U-search pattern.
- Marker buoys – to mark location for missing diver search.
- Flares – to signal help from boat to boat.
- Whistle – to alert others at a distance.
- Bullhorn – to coordinate a rescue effort over a large area.
- Radio (CB/VHF) – for contacting emergency medical care.
- Cellular telephone/public telephone – for contacting emergency medical care.
- UW recall system – if boat is so equipped, for recalling all divers to the boat or shore in an emergency, or at the end of a missing diver search.

Besides having equipment, preparation includes knowing how to use it, ensuring that it's in working order, and stowing it where you can get it easily if needed. If you're unsure how to use something, get trained for it. Special circumstances prompt special equipment; for example, if you're planning an ice dive, it makes sense to pack blankets and warm liquids for treating slight hypothermia.

At the dive site, how you prepare your personal dive equipment affects your readiness. Keep your mask, fins and snorkel arranged together so you can pull them on quickly if necessary. Leaving them scattered about the boat and piled in with other divers' equipment slows you down if you have to enter the water in a hurry.

SIX STEPS FOR EMERGENCY MANAGEMENT

By being ready personally and maintaining equipment readiness, you're able to anticipate what, where and when the most likely problems will occur. This lets you plan, formally or informally, to handle those situations, and to identify and avoid hazards likely to cause an emergency or complicate a rescue.

1. Assess the Situation.
When any emergency arises, Stop. Breathe. Think. Act. Assess the situation – who is involved, where is it happening, what do you have available to assist you? Then, think about the best solution and get ready to act on your plan. There's no one "right" way to handle a situation – every emergency is unique, so anything that gets the job done without making things worse works. Be flexible. Assessing the situation and adapting the plan is an ongoing process that continues throughout the effort.

2. Act on Your Plan.
If no one takes charge, step up to the plate. Take charge and quickly implement a plan of action by directing others in a calm, considered manner. If you are assisting a more qualified diver, carry out tasks as appropriate. Keep that person updated on your efforts, but as a PADI Rescue Diver you will be able to carry out many tasks without burdening the manager with unnecessary details.

3. Delegate.
By definition, a manager is someone who gets things done through other people. Usually, you can make things happen more quickly if you assign responsibilities quickly, clearly and concisely. Even bystanders and inexperienced divers can help by contacting local emergency services, fetching emergency equipment or performing tasks under your direction. Given the resources, you may find a central location where you can coordinate and direct the rescue, or you may dive in and effect the rescue first hand. What you delegate to whom depends on how many people you have available, their qualifications and the nature of the rescue, but you'll want to consider several options.

If you have enough qualified rescue divers available, it's usually more effective for two rescuers to go to the victim's assistance. However, you don't want to endanger anyone by asking untrained divers to do things beyond their training.

In delegating tasks, assign someone to get emergency assistance, or to at least stand by for your signal to do so if you're still determining the victim's condition. As appropriate, tell this person who to call, where to find the contact information and what to say.

Have the person call the local emergency medical system or other similar local emergency personnel first. The person should clearly establish that the call is about a diving accident and give the exact location. If there's a radio or cellular telephone on the site, the person should give the call letters or telephone number so medical personnel can regain contact. The caller should answer all questions

and stay on the line until the EMS call taker hangs up. This assures that the EMS has all the information needed.
If necessary, assign the caller or others to meet emergency vehicles and guide them to the accident site.

After calling the local EMS, the caller should call the Divers Alert Network (DAN) or other diver emergency service if in an area served by them, and if you suspect decompression sickness or lung overexpansion injury. The physician on call may not be immediately available, so the caller will give contact information to the service to call back. If there's no way to contact you (such as if the call's made from a pay telephone far from the scene), the caller should leave contact information for the hospital or local emergency service. If you're outside a diver emergency service area, the caller should call the local recompression chamber to alert them and allow them to coordinate with the EMS.

Depending upon the people available, post observers to watch the victim and the rescuers. In the water the rescuers may have trouble seeing the victim, so the observers can help direct them.

Other duties to consider include noting what happens, accounting for all divers (especially those who may be underwater and not involved in the rescue), securing the victim's equipment and controlling bystanders.

4. Attend to Injuries.
Once the victim is out of the water (now a patient), follow the protocols you've already learned in your Emergency First Response training. Begin with primary assessment and continue into secondary assessment if you discover no life-threatening conditions. In more serious accidents, you may need to provide Basic Life Support (BLS – rescue breathing and CPR) and other primary care until relieved by emergency medical personnel.

If the patient is responsive, try to calm and reassure the diver by explaining what you're doing to help. If you suspect that decompression sickness or lung overexpansion injury may be involved, keep the patient lying down. If not done already, contact local emergency medical care and the local diver emergency service as appropriate. Remember that you can delegate attending to injuries to qualified individuals present, leaving you to handle other aspects of emergency management.

You may find it useful to ask a responsive patient about what happened. The PADI Diving Accident Management Workslate prompts you to ask questions that may tell you more about the patient's condition. Your questions may go something like this:

You: My name is _____. I'm trained in emergency procedures. I can help you. What's your name?
Patient: Pat Smith.
You: What's wrong, Pat? Do you hurt anywhere?

Patient: I think I'm bent. I can't feel anything from the waist down.
You: What happened?
Patient: I'm not sure. I ran low on air and came up pretty fast. Maybe that was it.
You: What were your depth and bottom time?
Patient: About 18 metres/60 feet for 35 minutes.
You: Did you make any other dives today?
Patient: Yeah, this morning. This was to about 30 metres/100 feet for 15 minutes.
You: When did you first notice….

Keep calm to reassure the patient. Cool, controlled and deliberate action on your part goes a long way to encourage the patient. Remember to tell the patient what you're doing to help as you proceed.

5. Control the Scene.
Your ability to do this will depend on the number of people assisting you and their qualifications. If you're the only one with EFR and rescue training, you may have to devote most of your attention to providing direct care for the patient. But, if there is sufficient help available, your best role may be to coordinate activities and administrate.

Coordination and administration may include providing emergency personnel with appropriate information regarding the injured diver and accident (the PADI Accident Management Workslate was designed for this purpose), getting contact information from those who witnessed the accident or helped with the rescue, arranging to contact the patient's family and, if appropriate (depending on the severity of the accident and local requirements), submitting a report to local authorities.

Avoid making any statements about causes, and avoid drawing conclusions or assigning blame at this time. You likely don't have all the facts, and this is not the time.

If the patient's equipment was recovered, turn it over to local authorities. Do not disassemble it, but do have someone check the air pressure and whether it seems to be functioning normally.

6. Arrange Evacuation to Medical Care.
In a serious dive accident, the patient must reach the nearest medical facility; and a pressure related injury will normally require recompression in a hyperbaric chamber. Even if the first available medical facility doesn't have a hyperbaric chamber, the community standard is to get the patient there for medical stabilization and support prior to and during chamber treatment.

Depending upon where you are, local emergency services may or may not be familiar with treating diving injuries. If necessary, provide information about dive accident care so that medical personnel understand the nature of the injury/illness and requirements for care, and give them contact information for DAN or another diver emergency service, emphasizing that these services have

specialized medical doctors on call for consultation and arranging specialized treatment. Have the contact information listed on the Accident Management Workslate you send with the patient, but also find out where they're taking the patient, then give that information to DAN or other appropriate diver emergency service for direct contact.

Helicopter evacuations from boats impose special procedures you must follow for the safety of the patient, the helicopter and everyone aboard the boat.

The boat and helicopter must communicate. Usually, they talk directly by marine radio, but sometimes a third party relays messages.
Normally, the helicopter pilot will prefer that the boat make way into the wind at a slight angle, usually at approximately five knots. The pilot directs the boat captain to the preferred course and speed.
You need to prepare the boat for a helicopter pick up. Lower all tall objects and secure loose objects so they don't get blown overboard, or worse, sucked into the helicopter engine. Surprisingly heavy objects qualify as "loose" when you deal with helicopters: helicopter blade wash can blow about dive gear bags, partially filled coolers, wet suits, clothes' bags and similar objects. Secure these as well as smaller objects. If in doubt about anything, stow it below or tie it down firmly.
Prepare the patient by putting a personal flotation device on him. The helicopter crew will tell you whether there's room for the oxygen system. Send it along if possible.
When you have the boat and patient ready, signal the helicopter by radio, or by hand signals or flashlight if you don't have direct communication. The helicopter will move in to lower a basket stretcher. Let the helicopter come to you. Keep the boat on a steady course; don't try to maneuver toward the helicopter unless directed by the pilot.
Usually you'll see a line dangling from the basket stretcher. Do not touch or grab this line. Allow the line to touch the boat first to discharge static electricity. If you touch the line first, you may receive a severe, possibly life-threatening static shock. If you don't see a line dangling from the basket stretcher, let the basket touch the deck before you touch it for the same reason.
Once you have the basket down, load the patient as quickly as possible. Do not tie the basket to the boat, or attach anything from the boat to the helicopter. Keep the helicopter free to move from the boat at any time. If you need to move the basket, advise the helicopter and disconnect it from the lifting cable. When you've readied the patient (and reattached the cable), signal the helicopter. Have everyone stand clear and use the basket trail line to steady it as the helicopter rises away from the boat.

If appropriate, ask the helicopter to fly as low as possible with the patient. Reduced pressure at altitude can worsen DCI by making bubbles expand.

Land-based helicopter evacuations also have considerations:
Mark off a landing area at least 18 metres by 18 metres/60 feet by 60 feet. It should be free of obstacles such as trees, power lines and poles, or antennas.

Clear the area of litter and other loose objects that could be blown about by blade wash.

Clear the area of all people, and station a guide on the windward corner of the landing zone to guide the pilot. As the helicopter lands, the guide should turn away so dirt and sand don't fly directly into his face.

Don't let anyone approach the helicopter until signaled by the pilot. Anyone approaching the helicopter should note the blade height (which lowers as they slow on landing), maintain a low, crouched position and keep eye contact with the pilot.
Keep everyone clear of the helicopter tail. It's nearly impossible to see the rear rotor in motion; people have been killed accidentally stepping into it. Never approach a helicopter from the rear.

EMERGENCY ASSISTANCE PLANS

In an emergency, you save a lot time if you already know who to call and where to go. It only takes a few minutes to jot down emergency contact information relevant to the dive sites you visit and store them in your first-aid kit. When you go someplace new, add the information to the list. You can note this on the Diving Accident Management Workslate for ready reference. Information readiness provides the basis for your local Emergency Assistance Plan. This plan includes:
Contact information for local emergency medical systems. For areas where Emergency Medical Services (EMS) are available, most people are familiar with emergency contact numbers – for example, 911. However, it's still a good idea to write this information down for easy access at the dive site.

Contact information for the Divers Alert Network (DAN) office serving the local area, or other diver emergency service providing consultation for your area.

Areas with well-established emergency medical systems and dive community may require only one or two contact telephone numbers. When you travel to remote dive destinations, however, you may need to have several telephone numbers as well as VHF radio frequencies and even multiple language considerations. To be as useful as possible, try to include in your plan any contact information you would need to get an injured diver to help.

Calling Divers Alert Network (DAN)		
DAN (incl. DAN Brasil and DAN World)	America	+1-919-684-9111 Available 24/7 for diving and nondiving emergencies (including DAN TravelAssist services); can be called collect www.dan.org (DAN America) www.danbrasil.org (DAN Brasil) www.travelerems.com (DAN World)
DAN Europe		+39-06 42 11-5685 www.daneurope.org

Calling Divers Alert Network (DAN)	
DAN America (incl. DAN Brasil and DAN World)	+1-919-684-9111 Available 24/7 for diving and nondiving emergencies (including DAN TravelAssist services); can be called collect www.dan.org (DAN America) www.danbrasil.org (DAN Brasil) www.travelerems.com (DAN World)
DAN Japan	+81-3-3812-4999 www.danjapan.gr.jp
DAN Southern Africa (within South Africa) (outside South Africa)	0800-020-111 +27-828-10-60-10 (accepts collect calls) www.dansa.org
DAN Asia Pacific region	www.danasiapacific.org
Diving Emergency Services (DES)	
DES Australia (within Australia)	1-800-088-200
DES Australia (from overseas)	+61-8-8212-9242
DES New Zealand	0800-4DES111
Singapore Naval Medicine & Hyperbaric Center	6758-1733
Philippines	(02) 632-1077
Malaysia	(05) 681-9485
Korea	(010) 4500-9113
China	+852-3611-7326
Japan	+81-3-3812-4999

Exercise 1 – 6

Question 1

A “patient” is someone likely to recover from an accident, whereas a “victim” is someone you help, but who is unlikely to recover.

True
False

Question 2

As a PADI Rescue Diver, your role at a dive accident (choose all that apply)

never changes.
may be to manage the emergency.
may be to assist a more qualified person.
is to immediately initiate an inwater rescue.

Question 3

Personal readiness for managing an emergency includes (choose all that apply)

staying physically fit.
participating in regular training and practice.
maintaining the proper attitude.
establishing your authority with other divers before it's needed.

Question 4

In the six steps for basic emergency management, what is the first thing you do when any emergency arises?

Stop, breathe, think and assess the situation.
Delegate someone to contact help.
Control the scene so the situation gets no worse.
Any of the above may be the appropriate first step.

Question 5

A local emergency assistance plan should have contact information for (choose all that apply)

the US Navy surgeon diver.
local emergency medical services.
the diver emergency service for the area (if any).
any information you may need to get an injured diver to help.

RESPONDING TO DIVER EMERGENCIES I

SELF-RESCUE – LOOK AFTER YOURSELF FIRST

In a way, your diver training to this point has already taken you into the rudimentary levels of rescue diver training. Your PADI Open Water Diver course and Advanced Open Water Diver or Adventure Diver course introduced and developed your self-rescue skills by teaching you how to prevent and handle problems you might come across while diving. At this point, you're ready to further develop these skills.

Self-rescue means that you're self-reliant, which every diver should be, of course, but your confidence in your self-reliance becomes crucial when dealing with an emergency. Before you can cope with another diver's problem, you must believe that you won't endanger yourself. If you don't believe that, you probably won't (and shouldn't) initiate a rescue. Furthermore, your ability to calm and assist a victim may be affected by whether the victim trusts your capabilities as a diver. For discussion, we can divide self-rescue into preparation, prevention and performance.
Physical preparation involves proper health, fitness and diet. You should maintain good physical fitness to be prepared to manage an emergency. Being fit physically also prepares you to better deal with any emergency situations you find yourself

in.

Mental preparation involves confidence and a feeling of well being about the dive. This includes diving within the limits of your training and experience. You need to have the right attitude to be prepared for accident management; again, this same attitude helps keep you out of trouble and helps you handle a problem if one comes up.

Equipment preparation involves familiarity with the use of your dive equipment and emergency equipment. It means keeping your gear in working order and maintaining it properly, and it includes having emergency accessories at hand in case you need them. These may include whistles, small emergency strobes, flares, dye markers and inflatable signal tubes. Inflatable tubes are especially helpful if you find yourself drifting away from a boat.

The height of the inflated tube above the water surface makes you much more visible. These items can fit into a BCD pocket for easy access. It includes knowing what equipment you have on hand that could help handle an emergency.
Prevention can be divided into three procedures as well. The first is to maintain your equipment properly and have it serviced regularly as recommended by the manufacturer. This, along with a predive inspection, will head off the vast majority of equipment related problems.

Second, anticipate problems as part of your dive plan and throughout the dive. Remember that dive planning involves risk assessment. Devise plans to avoid those problems you anticipate.

Third, don't ignore small problems. Most major accidents start as small problems that snowball into a full blown chain of events that leads to disaster. If you can recognize that a problem is occurring or is about to occur, you'll be able to take early action and break the event chain. This keeps a small problem from becoming a big one.

By not ignoring small problems and anticipating where they may lead, you can respond to things like overexertion, hypothermia, vertigo, etc., soon enough to head them off. For example, if you were swimming hard against surge, you may find yourself breathing hard and becoming overexerted.

By stopping immediately and resting, you prevent the problem from growing into a serious situation that might require your buddy to assist you. You may also realize you're using your air far faster than planned and modify your plan when you turn and head for the exit to avoid a long, difficult surface swim.
Performance is how you deal with a problem if, despite your preparation and prevention, you find yourself in one. You do what you've already learned when dealing with an emergency involving another diver: Stop. Breathe. Think. Act. Stop what you're doing. Breathe to maintain or reestablish normal breathing. Think

about the problem, its cause and possible appropriate actions. Act logically based on your plan, not based on a thoughtless reaction. Assess the situation to avoid hazards and consider resources available. Be prepared to reformulate a new solution if your first doesn't work.

When anticipating problems, you plan to avoid them, but you also visualize proper responses you would take if problems happen anyway. This helps you make the right choices quickly. And, the procedures you learn in this course, plus practice to keep your skills sharp, prepares you with proper responses to help you deal with a problem.

There are five dive skills that you want to focus on to be better prepared to deal with a problem. The *first is good buoyancy control*, which helps you avoid struggling to maintain your position either at the surface or underwater. It also helps you stay off the bottom, reducing the risk of aquatic life injuries, while protecting aquatic life from damage. Any problem is easier to deal with if you're not having to deal with poor buoyancy at the same time.
The *second skill is proper airway control*, which allows you to breathe past small amounts of water in your regulator or snorkel, thus avoiding choking. You probably do this somewhat instinctively already, using your teeth and tongue to block water as you let air gurgle past it. With practice, you can breathe effectively with a surprising amount of water in your snorkel or regulator.

The *third skill is cramp control* - You may not think of *cramp removal* as much of a skill – until you need it. Practicing it helps cramp pain from escalating into a bigger problem, like not being able to swim back to the boat! The most common cramps are in the quadriceps, calf or hamstrings, all of which you can help relieve by grasping your fin tip to give you something to pull against.
When you get a new pair of fins, be sure to practice this – you may find it easier or more difficult to get a hold of the tip like you're used to.

The *fourth skill, handling air depletion*, is something you learned and practiced as an Open Water Diver. More than likely, you practiced sharing air with an alternate air source supplied by your buddy. You'll refresh this skill during the Self Rescue Review. However, as a PADI Rescue Diver, you may want to consider an independent solution, such as a pony bottle or self-contained ascent bottle.

The *fifth skill is responding to vertigo*. Vertigo is losing your sense of balance and orientation, and can cause nausea as well as stress. Although it can happen on the bottom, you're most likely to experience vertigo in midwater, especially if you can't see the bottom and have no visual reference for orientation. The easiest way to reestablish your sense of orientation is to make contact with a fixed object.
If that's not possible, watch your bubbles and consult your depth gauge for up and down orientation and whether you're rising or descending. Hugging yourself may also help.

Exercise 1 – 7

Question 1

Three areas of self-rescue preparation include (choose all that apply)

physical preparation.
contact preparation.
mental preparation.
equipment preparation.

Question 2

Three procedures that help you anticipate and prevent problems include (choose all that apply)
equipment maintenance.
anticipating problems while planning the dive.
not worrying too much about small problems.
dive plans to avoid the problems you anticipate.

Question 3

If you encounter a problem while diving, you should first signal your buddy and then act immediately based on your gut instincts.

True
False

Question 4

Which of the following are skills that can help you self-rescue? (Choose all that apply.)

Good buoyancy control
Handling air depletion
Cramp removal
Responding to vertigo

RECOGNIZING RESCUE SITUATIONS

RESPONSIVE DIVERS AT THE SURFACE

The majority of rescue situations involve a responsive diver at the surface, and range from a diver who simply needs some assistance to those who've lost control and panicked. The signs of a diver who needs help may be obvious, but they can also be subtle. An exhausted diver at the surface may suddenly and quietly slip underwater for no apparent reason. A diver with a problem may fail to ask for help, express anxiety or mention symptoms of injury or illness due to ego threat. Scuba equipment can conceal facial expressions and other gestures that indicate stress or anxiety at the earliest stages, and it may reduce verbal communication.

General signs and behaviors that indicate a diver may have a problem on the surface include:

- Giving distress signals – raising one arm, whistling, yelling for help, and so on
- Struggling on or just below the surface, especially with vigorous arm swimming.
- High treading or finning with sufficient vigor to lift a portion of the body out of the water.
- Rejecting equipment by pushing off the mask and/or the regulator mouth piece, or both.
- Clinging and clambering (pulling the body toward the high point of any object on the surface).
- Not moving – apparent unresponsiveness.

During the first three Rescue Training Exercises, you'll practice rescuing responsive divers at the surface. You can classify the rescues as a tired diver assist or as a panicked diver rescue. It's important to recognize the difference in the victim's state of mind because it affects how you handle the situation and the risk the rescue poses for you.

Tired divers are divers with a problem, but are adequately managing stress. Frequently the problem is fatigue, but it may also be leg cramping or other difficulty. Generally, tired divers ask for help and respond to directions or questions. They don't reject their gear, keeping their masks in place. They can usually assist with your efforts to help, and often recover quickly, no longer needing assistance.

NON-RESPONSIVE DIVERS AT THE SURFACE

Panicked divers are divers with a problem who have become overwhelmed by stress and fear. They've abandoned rational responses and react entirely through instinct and fear. Panicked divers tend to reject their gear, pushing their masks off or onto their foreheads and spitting out their regulator or snorkel.

They fail to establish buoyancy, and swim vigorously with arms and legs until exhausted. Their eyes tend to be wide and unseeing due to extreme perceptual narrowing, and they do not respond to commands or questions.
Panicked divers may fixate on a single, ineffective solution to the problem, and may attempt with great strength to climb onto anyone or anything to get out of the water. They can do little to help themselves, and without a rescue will usually exhaust themselves and lose consciousness.

The panicked diver poses the most risk because the victim can overpower you if you don't use techniques to maintain physical control. You'll learn these techniques during your training. It's also important to realize that a tired diver may panic while you're moving in to help, making it important to constantly assess the victim as you assist.

More rarely, a panicked diver will panic passively – not splashing, climbing or otherwise showing overt signs of panic. However, the passive panicked diver will

also not respond to the emergency correctly, and may quietly slip below the surface and drown. Therefore, if a diver does not respond to you, assume the person needs help until you establish otherwise.

Exercise 1 – 8

Question 1

Signs and behaviors of a diver with a problem at the surface include (choose all that apply)

giving distress signals.
high treading or finning enough to lift a portion of the body out of water.
clinging and clambering.
apparent unresponsiveness.

Question 2

Characteristics of a tired diver include (choose all that apply)

asking for help.
rejecting equipment.
failing to establish buoyancy.
responding to questions or directions.

Question 3

Characteristics of a panicked diver include (choose all that apply)

asking for help.
rejecting equipment.
failing to establish buoyancy.
responding to questions or directions.

NONSWIMMING ASSISTS AND RESCUES

Emergency! You've just finished a dive, and while still in your exposure suit with mask, fins and snorkel in hand, you see a responsive diver in trouble at the surface about 10 metres/yards behind the boat. What should you do? Stop, breathe, think and act. Your first thoughts should be to see if you can provide assistance without getting into the water.

In any rescue situation, your first priority is to stay safe yourself. Rushing into the water to help another diver without any forethought may lead you to becoming a victim too, and in any case poses more risk. Realize that maintaining your own safety is for the victim's sake as much as your own. You can't help the victim if you're in trouble. If you become a victim, it divides the remaining rescue resources between you and the original victim instead of concentrating them on one. Yes, you may take on some more risk than you otherwise might, but if you're not reasonably confident you can stay safe, it is usually a better strategy to not attempt a rescue and instead summon additional help. Only after you reasonably ensure

your safety do you help the victim. That gives the victim the best chances for a positive outcome.

The best way to reduce your risk while helping someone is to do so without getting into the water. It is generally faster and safer to assist from a stable position on a boat or shore. These rescue techniques include reaching, extension, and throwing assists from the pool deck, pier, boat deck or shore, as well as wading assists in water no more than chest deep. Failing all these, your next option is a watercraft assist if you have a boat or other watercraft available. Only after exhausting these possibilities do you want to consider entering the water to help. You'll practice the following nonswimming assists in Rescue Training Exercise Three:

REACHING AND EXTENSION ASSISTS

Reaching assists are easy and effective ways to help someone within arm's length of a pool deck, dock or swim step. The primary concern is establishing a stable position that keeps the victim from pulling you in.

Lie on the deck, dock or platform. Spread your legs to increase stability and keep your mass centered on the deck over a wide area. Reach out with only one arm and grab the victim's arm or piece of gear.

If you're already in the water, you can also provide a reach assist if you have a firm grasp on a solid object, like a boat ladder, dock or poolside. Extend one arm or leg to the victim and then pull to safety.

If the victim's too far away, you can use an extension assist by reaching out with a pole, boat paddle or even a towel or piece of clothing. Use the same technique as with the reach to extend the object. One advantage of an extension is that if the victim starts to pull you in, you can let go easily.

THROWING ASSISTS

If you can't reach or extend to the diver, your next choice is a throwing assist.

The ideal is to throw a rescue bag, or a tethered life ring, buoy or personal flotation device. But, in a pinch, anything with reasonable buoyancy tied to a line will do. Throw the flotation past the victim and then pull it in with the line – this is faster than attempting to throw to the victim because a short throw will require you to retrieve the line and try again. If you don't have a line, throw flotation anyway. Establishing buoyancy may stabilize the situation, and it may come in handy if you have to use an inwater assist.

WADING ASSISTS

A wading assist is more dangerous than other nonswimming assists because you must enter the water. Use a wading assist when the victim is too far away for a reach or extension assist and you have nothing for a throwing assist, but the victim is reachable from water that allows you to go in no more than chest deep. Wade

in to water chest deep or shallower and get into a stable position with one foot forward and one back, weight on the foot away from the victim. Extend something to the victim and then slowly walk to safety, reassuring the person as you go. In cold water, remember your safety comes first, and you should not attempt a wading assist unless you're wearing adequate exposure protection.

WATERCRAFT ASSISTS

If you can't reach, extend, throw or wade, your final option before attempting an inwater rescue is to use a small boat or other watercraft if available. Use a stable craft that can't be capsized easily and approach from downwind so that the boat doesn't blow over the victim, then use a reach from the boat side, if necessary, to help the victim. When possible, two rescuers in the boat – one to drive and one to assist – simplifies the rescue.

Exercise 1 – 9

Question 1

Your safety takes priority over the victim's because it's for the victim's best interest as well as yours.

True

False

Question 2

Non-swimming assists include (choose all that apply)

reach and extension assists.

watercraft assists.

lifeguard tow assists.

wading assists.

ASSISTING THE RESPONSIVE DIVER AT THE SURFACE

As mentioned previously, you can broadly classify responsive diver at the surface rescues as tired diver or panicked diver rescues. A tired diver rescue is generally more of an assist, whereas the panicked diver is a true rescue because the victim will likely lose consciousness and drown if not helped. The panicked diver rescue is also the most hazardous situation for the rescuer because the victim isn't rational and may hang on or climb onto the rescuer in an attempt to remain afloat. Driven by fear, a panicked diver can be incredibly strong and overpower smaller divers. This is why reaches, extensions, throws, wading and watercraft assists are your preferred options over inwater rescues.

However, those options may not be available, or you may already be in the water near the diver when the problem arises. Your and the diver's equipment provide adequate resources to handle the emergency.

TIRED DIVER RESCUE

Let's begin with the tired diver, which is perhaps the simplest rescue situation. Recall that a tired diver can lapse into panic during a rescue (typically before you actually get close enough to help), and a panicked diver may come out of panic (typically after you make contact and establish buoyancy). You need to continually assess the victim's state of mind when assisting a responsive diver at the surface.

Approach – If you're already in the water, you'll be fully equipped normally. But, if you must perform a rescue starting from shore or aboard a boat, take your mask, fins and snorkel. Don them with your eyes on the victim, or have someone watch and point to the victim while you do so. Enter the water (if not already in) and swim with your head up, eye on the victim the entire time. Look for signs of panic and try to determine the victim's state of mind. Pace your swim so you arrive with sufficient energy to complete the rescue and tow the diver to safety, if necessary. You want to hurry, but have enough strength to do some good when you get there.
Evaluate – Stop your approach near, but out of reach of the victim. Assess whether the diver's rational or panicked. Try to spot the diver's BCD inflator location and type, and attempt to talk the person through the problem by giving strong verbal instruction to inflate the BCD or drop weights. If the victim complies or responds coherently, then panic has not set in.

Make Contact – If you're confident the diver has not panicked, establish ample positive buoyancy and continue your approach from the front. Try to reassure the diver by explaining what you're going to do or by giving further directions. Make contact and support the diver, assisting with establishing positive buoyancy, if necessary.

Reassure the Tired Diver – Make eye contact and talk directly to the victim, which shows the diver you've got the situation in control. Help the diver relax and rest before resuming activity. If surface conditions allow, the diver may remove the mask and regulator/snorkel for more comfort.

Assists and Transport – As you assist the tired diver to the boat or shore, allow the person to self-assist as much as possible. Ideally, use a tow that keeps the victim's face above the surface, with both of you positively buoyant, swimming horizontally for minimum drag and easy kicking. Obviously, you want to stay in control of the situation and maintain eye-to-eye contact. You'll learn and practice several tows in Rescue Training Exercise Three; for the first exercise, your instructor will teach you one or two to use.

A "tired" diver may be a diver suffering from a leg cramp. You can help the diver stretch the cramp out by bracing the fin on the affected leg, providing something to push and stretch against. After relieving the cramp, you may tow the diver a short way while giving the leg a chance to rest. Following some recovery, the diver can attempt to swim independently, though more slowly than before. Because mild activity stimulates blood circulation, lightly swimming after stretching and resting typically relieves cramping better than resting and not resuming activity.
Equipment Removal – A tired diver may not discard gear due to impaired thinking under stress, but in most tired diver situations, other than dropping weights, ditching gear is a low priority. In fact, it is typically unnecessary. You may want to

help a very tired diver remove the scuba unit (assuming adequate buoyancy with the exposure suit) to reduce drag, and/or to lie on top of it to rest. More likely, it may help to have the victim slip the scuba unit off before trying to climb a boat ladder or trudge up a steep shoreline. If you're unsure of the victim's mental condition as you approach, one technique is to remove your scuba unit (assuming you have adequate buoyancy without it), inflate the BCD and pass it to the diver.

PANICKED DIVER RESCUE

Approach and Evaluation – Your approach and evaluation are exactly the same for a panicked diver as with a tired diver: Keep your eye on the victim the entire time, and stop out of reach to determine the diver's state of mind. Note the BCD inflator location and type, and attempt to talk to the victim by giving instructions like "Inflate your BCD!" or "Drop your weights!" No matter what behavior you see, assume that any diver who does not respond rationally is panicked. Based on your size and strength relative to the diver's, determine whether you should make contact on the surface or underwater.

Make Contact – You want to establish buoyancy for the diver as quickly as possible. A surface approach is fastest, but presents more risk to you. A flotation aid greatly simplifies a surface approach (you'll practice using flotation aids later in the course), but if you're already in the water, that's not likely an option. An underwater approach takes a little longer, but presents less risk for you. It's a good choice if you're substantially smaller or weaker than the victim.

If you elect to make surface contact, begin by inflating your BCD and establishing ample buoyancy, so that if the victim climbs on you you're less likely to get pushed underwater. You want to establish buoyancy for the victim and yourself, and gain control as quickly as possible. You can use several methods.

The underarm lift method works well when you are larger than or about the same size as the victim. As you approach, the victim will usually reach toward you. With one hand, grab the victim's wrist so that you grasp the diver's right with your right, or left with left, and pull him toward you, spinning him around so he ends up facing away from you. Grasp the same, upper arm with your other hand and lift, then inflate the BCD. If necessary, you can easily go to the knee cradle position for more control. The underarm lift allows you to support and reassure the victim quickly.

Another method is to swim around behind the victim from beyond reach and approach from the rear. Grasp the tank valve and lock your legs onto the tank in the knee cradle position, which prevents a struggling victim from being able to reach you. Inflate the victim's BCD. If possible, release the diver's weights; this may be necessary anyway if the BCD inflator doesn't work, or if you're not sure the BCD will provide enough lift (overweighted victim). The cradle position gives you maximum control, though it takes time to swim behind the victim. In some rare instances, the victim may turn with you, making it hard to get behind.

For an underwater approach, descend quickly and approach the victim at knee level. If possible, release the victim's weights, then turn or swim around the victim. Ascend hand over hand behind the victim into the knee cradle position and inflate both of your BCDs.

If you get into a panicked diver's grasp, you'll need to use a release or escape to regain control of the situation. The surest release is to breathe from your regulator and descend. Underwater is the last place the victim wants to go, and you can continue your rescue with an underwater approach.

Alternatively, you can attempt to escape by inflating both of your BCDs, which tends to push you apart. Finally, you can push the victim up and away from you, kicking to open the distance between you. This tends to push you underwater, which is the last place the victim wants to go. The best technique may depend on your and the victim's relative sizes and the circumstances. You'll have a chance to practice different releases during Rescue Training Exercise Two
If you're unable to maintain control of a victim without unreasonable personal risk, your best option may be to stay clear. The victim will reach exhaustion, perhaps losing consciousness, after which you provide aid using the techniques for rescuing an unresponsive diver that you'll learn later in the course. Although this puts the victim in a more serious situation, it's preferable to having you in trouble, too, and unable to provide any rescue at all.

Reassure and Transport – After you've established the victim's buoyancy, the person will normally calm down and become more rational. From this point, finish as you would with the tired diver by reassuring the person, transporting to the boat or shore and encouraging rest. Equipment removal considerations are the same, being a low priority based on the victim's strength, surface conditions and exit requirements.

Exercise 1 – 10

Question 1

The two types of responsive diver at the surface rescues are assisted rescues and unassisted rescues.

True
False

Question 2

Rescuing a panicked diver is the most hazardous situation for the rescuer because

the rescuer is almost always injured.
the victim may climb on and overpower the rescuer.
panicked divers usually don't have proper gear on.

Question 3

A tired diver is not panicked, so it is not necessary to stop outside the victim's reach when going to provide assistance.

True
False

Question 4

When using surface contact to rescue a panicked diver (choose all that apply)

That's right! You answered correctly.
establish ample buoyancy.
one option is the chin lift.
one option is the underarm lift.
you may choose to swim around the victim to the knee cradle position.

Question 5

Escaping a panicked diver by descending is usually effective because underwater is the last place a panicked diver wants to go.

True
False

KNOWLEDGE REVIEW

Question 1 of 14

Equipment failure, gas supply issues, the environment and other factors can contribute to an emergency, but poor judgment is the most common underlying cause of most diver emergencies.

The most common cause of diver emergencies is

equipment failure.
running out of gas.
environmental conditions.
poor judgment.

Question 2 of 14

Your first concern is to take care of yourself because you can't help someone if you're in trouble, too. Don't get into the water if you don't have to. If you must, be confident that you have the training and resources needed to accomplish the rescue without unreasonable risk to yourself.
You're on a boat and see a diver who needs help at the surface a short distance away. Before entering the water to attempt a rescue, which of the following do you need to assess? (Choose all that apply.)

Can the diver manage without assistance?

Do you need to enter the water at all?
Do you have the equipment and training needed for your and the victim's safety?. undefined
Do you have the equipment and training needed for your and the victim's safety?
Can you reasonably accomplish the rescue without getting into trouble yourself?. undefined
Can you reasonably accomplish the rescue without getting into trouble yourself?
Do you have emergency oxygen and a first aid kit?

Question 3 of 14

Stress can cause all of these, depending upon the degree. Some stress improves emergency response, but extreme stress can decrease broad awareness and reduce the ability to look at the real problem or alternative solutions. Uncontrolled and unmanaged, stress can lead to panic.

Stress can cause (choose all that apply)

temporary strength increase.
faster thinking.
pain tolerance.. undefined
pain tolerance.
perceptual narrowing.. undefined
perceptual narrowing.
panic.. undefined
panic.
reduced thinking.. undefined
reduced thinking.

Question 4 of 14

The rescue breathing mask reduces disease transmission risk, but it also simplifies getting an effective seal and positioning the head for rescue breathing. It's one of the most effective tools for inwater rescue breathing, and you can connect it to emergency oxygen to provide oxygenated air with rescue breaths.

The only benefit of a rescue breathing mask is that it reduces disease transmission risk

True
False

Question 5 of 14

If you had difficulty with this, review the discussion on oxygen systems. By successfully completing the PADI Emergency Oxygen Provider specialty course, you may qualify to use modern positive pressure oxygen units that combine some of the advantages of both systems.

Which of these are characteristics of a continuous flow oxygen system?

Wastes more oxygen

May be used with nonbreathing patient. undefined
May be used with nonbreathing patient
May be used with patient who has difficulty breathing
Can deliver nearly 100% oxygen
Used only with a breathing patient

Question 6 of 14

Assess the situation, act on your plan, delegate, attend to injuries, control the scene and arrange evacuation to medical care. Review the section on emergency management if you had difficulty with this question.

After you assess the situation, act on your plan and delegate duties, what is the next basic step for emergency management?

Arrange evacuation to medical care
Attend to injuries
Control the scene
Complete a report

Question 7 of 14

All of these are useful skills, but underwater navigation and search and recovery are not generally considered self-rescue skills.

Which of the following skills increase your self-rescue abilities? (Choose all that apply.)

Underwater navigation
Good buoyancy control. undefined
Good buoyancy control
Search and recovery
Airway control. undefined
Airway control
Cramp removal. undefined
Cramp removal
Handling air depletion. undefined
Handling air depletion
Responding to vertigo

Question 8 of 14

When faced with a problem, your first responses should be to maintain control and respond rationally, based on your training. So stop, breathe, think and then act based on your assessment of the situation.

While diving, you and your buddy suddenly start to get swept away in an unexpectedly strong current. Your first response(s) should be to

ascend and surface.
set your compass.
stop, breathe, think and act.
swim into the current.

Question 9 of 14

Panicked divers are divers who become overwhelmed by stress and fear. They tend to reject their gear, fail to establish buoyancy and kick escessively, do not respond to commands and may attempt to climb onto anyone or anything to get out of the water.

A diver who is panicked at the surface may show which of the following characteristics? (Choose all that apply.)

Reject equipment
Signal for help
Respond to directions
High tread and excessive kicking
Will climb on anything or anyone
Usually assists with your efforts

Question 10 of 14

A diver floating on the surface who doesn't seem to be moving should be considered unresponsive until you determine differently, especially if floating in an unusual position.

You see a diver who is floating on the surface, not moving. Until you determine otherwise, you should assume that this diver needs help.

True. undefined
True
False

Question 11 of 14

Taking care of yourself gives the victim the best chance because you can't help someone if you get into trouble yourself. Furthermore, you divided any remaining rescue resources because now two divers need help.

Your safety takes priority over a distressed diver's safety because it is in the victim's best interest.

True
False

Question 12 of 14

Swim out to help is your last choice. Provide assistance by reaching, throwing, wading or taking a boat before getting fully into the water.

You're on shore by a lake and someone calls for help a short distance out in the water. If the person is too far out to reach or extend something to, your next best option is to

wade into the water.
swim out to assist.
throw something like a float and line.. undefined
throw something like a float and line.

use watercraft or boat.

Question 13 of 14

Although the diver doesn't appear panicked (yet), that can change even as you provide help. Always assess the diver's mental state, note the BCD inflator location and ask the diver to establish buoyancy (if not already buoyant) before moving in to assist.

You're in the water at the surface and a diver signals for help. The diver has the mask on, has inflated the BCD and responds to your directions. As you go to help,

you make immediate contact with the diver.
stop outside the diver's reach and assess whether the diver is panicked.

Question 14 of 14

Whether you approach on the surface or underwater depends upon your relative size and strength compared to the victim's. A surface approach is fastest, but an underwater approach poses less risk of having the victim overwhelm a rescuer.

You're assisting a diver at the surface. The diver is high-treading, has no mask on and an uninflated BCD. After assuring your own safety in handling the situation, you want to approach the diver _____ and assist the diver in inflating the BCD and/or dropping weights.

on the surface
underwater
either on the surface or underwater

SECTION TWO

Barbara, a woman in her late thirties, and Gary, her 62-year-old father, were diving on a tropical shipwreck about 24 metres/80 feet deep. They were wearing T-shirts and swimsuits, but no leg, arm or hand protection. The dive had been enjoyable and, being low on air with no current running, the pair decided to ascend away from the boat.
Careful to watch their ascent rate, they kept a close eye on their dive computers as they ascended. Gary, in fact, watched his gauges the entire time. They made no safety stop.

As they rose through the last 5 metres/15 feet, Barbara looked up and saw a large Portuguese Man-o-war above. She kicked to get out of the way, but got stung on the legs. Gary ascended directly into it, let out a yell and pushed the Man-o-war away with his hands. He managed to inflate his BCD, crying out in pain. Barbara turned around, found the boat and began yelling for help. Gary's cries stopped, and as far as Barbara could tell he was losing consciousness.

Divemaster Wendy first heard Barbara's calls of "Help! He's been stung by a

jellyfish!" She quickly spotted the divers struggling about 18 metres/60 feet from the boat.

THE PSYCHOLOGY OF RESCUE II

As a PADI Rescue Diver, you need to learn to recognize stress in yourself and other divers. You've already learned that unmanaged stress leads to panic, and that stress can contribute to make an emergency worse by causing a diver to overbreathe the regulator and feel air-starved, therefore raising anxiety further.

The first way to recognize stress is by your direct observation. Once an emergency's underway, stress may be very obvious. However, stress signs can be subtle, especially before an emergency occurs. Yet this is the best time to catch it, because doing so may avoid the accident and need for rescue in the first place.

Look for behavorial changes, especially those that appear inappropriate or abnormal, such as uncharacteristic talkativeness, silence, irritability or hesitation. The normally patient diver who snaps and complains about something trivial, or a normally talkative diver who says little and seems preoccupied, may be someone under stress.

Physical stress signs tend to be a bit more obvious, such as a shivering diver. However, you may still need to look for behavioral changes. A mildly seasick diver may not be at the rail ready to throw up, but instead become quiet and subdued managing the nausea.
Since you probably won't know every diver you're around, it's not always obvious whether what you're seeing is a stress sign. A diver sitting quietly may simply be a shy, quiet person. The diver who's talking a mile-a-minute may do that all the time, or may have had one too many cups of coffee. Therefore, the second way to recognize stress in a diver is to simply ask. That's the best way to confirm whether you're witnessing a sign of stress or are misreading the situation.

In talking to a diver who may be under stress, the most important thing is to not pressure the diver. Otherwise, you may get the answer the person thinks you want to hear rather than what the person really feels. It may even add stress by creating some peer pressure. The best approach is to ask about your concerns privately in an open, caring and nonjudgmental manner. A sincere, "Hey, are you up for this dive?" or "You seem really quiet today. Everything okay?" goes a long way. It may help to add or follow up with reassurance that it's not only acceptable, but smart to skip a dive you're not ready for, or to alter the dive plan. This reassurance may remove any peer pressure so the diver feels more comfortable about being honest and open.

Once you identify stress, it's important to break the cycle that leads to anxiety and, potentially, panic or other problems. Recalling the Stress Response Cycle Chart, your goal is to lead the diver to problem recognition and solution thinking, and away from anxiety and worry. It's not that the diver should disregard potential concerns, but that the diver's concerns should be realistic, and the diver should feel that they're adequately addressed and managed. The diver should feel

capable of making the dive, confident that the risks will either be avoided, or should a particular problem occur, that there's an immediately workable and reliable solution response that can reasonably be expected to resolve the situation.

If someone enters the water feeling differently, anxiety lingers and arguably, the dive plan's inadequate at least with respect to that person.

You can encourage solution thinking by guiding the diver through four steps. The first is problem recognition. Often the diver knows exactly what the worry is, but not always. It may help to ask questions and help the person specifically identify the cause or causes of stress. The second step is a plan of action formulated by encouraging the diver to think of ways to handle the concern. The third step is to have the plan successfully implemented, which should lead to the fourth step of the problem reduced or eliminated.

Four Steps to Solution Thinking

1. Problem Recognition
2. Plan of Action Formulated
3. Plan Successfully Implemented
4. Problem Minimized or Eliminated

A source of stress may be a problem that already exists or a problem that could exist, but the process is the same. For example, suppose you identify that a diver is stressed because the dive site is going to be far deeper than the diver's experience and training level. After discussing it, the diver admits that it's probably best not to make the dive, but the cost and time of getting there is an issue. At your suggestion, you and the diver go discuss it with the boat's divemaster. The divemaster agrees to put the boat on a mooring in shallow water near the deep site, allowing the experienced divers to make the deep dive, but giving the less experienced divers a shallow reef to explore. The problem's eliminated and the diver can now make the dive safely and without undue stress or anxiety.

Now suppose you're about to make a boat dive and notice an apparently stressful diver. Your conversation uncovers the concern is with the current – the diver has little current experience and fears getting swept away from the boat. Your conversation identifies that more familiarity with current diving procedures would help, so you and the diver go to the divemaster. The divemaster provides a thorough briefing on using swim lines, the mooring line and staying ahead of the boat to prevent getting behind the boat. Next, the divemaster explains how to use the current line if swept past the boat, and finally, makes sure everyone has an inflatable signal tube and points out the ready-to-go chase boat in case someone misses the current line. With this information, the diver feels comfortable making the dive. The diver now realizes that getting swept away from the boat is much less likely with the proper techniques, and even if it should happen, the boat's set

up for it and it would be no big deal. The problem has been practically eliminated, and minimized if it happens anyway.

In going through this process, it's important that you avoid sounding judgmental or applying peer pressure. Empathy goes a long way – statements like, "I feel (or, have felt) the same way," help someone recognize that there's nothing wrong with having a concern. If it appears the diver isn't forthcoming about concerns, the best course may be to take it on yourself by saying, "You know, I've got some concerns about this dive. Maybe we should…" You may be surprised how many people will come up to you after and say, "I'm glad you spoke up because I was worried about that, too."

Exercise 2 – 1

Question 1

What steps do you apply to recognize stress in a diver? (Choose all that apply.)

Direct observation
Ask the diver

Question 2

When you recognize diver stress, you should alert the divemaster to cancel the dive.

True
False

BEING PREPARED FOR A DIVER EMERGENCY II

EQUIPMENT FUNCTION AND FUNCTION-RELATED PROBLEMS

Dive equipment familiarity allows you to go beyond recognizing problems to understanding their possible causes on an operational level. This enables you to recognize a decline in performance before it reaches the problem stage.

To understand how scuba operates, let's look at a typical scuba unit – cylinder, regulator with submersible pressure gauge (SPG), alternate air source and low-pressure hose; and BCD with low-pressure inflator – one piece at a time.

CYLINDERS AND CYLINDER VALVES

As you know, a scuba cylinder is simply a steel or aluminum cylinder capable of holding gas compressed to between 150 bar/2250 psi and 280 bar/4200 psi. The cylinder valve controls airflow into the cylinder (when filling) and out to the regulator (when in use).

The K-valve operates as a simple on-off valve.

The J-valve has a spring loaded reserve valve that shuts off your air when the pressure drops to approximately 20 bar/300 psi – this alerts you that you're almost out of air; you pull the lever on the valve to release your remaining air. The J-valve simply alerts the diver; there's no more or less air than without one. The J-valve has become increasingly less popular since the introduction of the SPG.
Valves may also have (varies internationally) a burst disk, which blows out if tank pressure rises too high. This prevents cylinder rupture in case of accidental exposure to high heat or gross overfilling.

The most serious problem involving cylinders is debris inside them. This usually develops if someone accidentally pumps moist air or water into the tank, causing it to corrode inside. You can also get moisture in the tank by draining it rapidly, causing condensation, or by storing it completely depressurized (keep about 7 bar/100 psi in a cylinder when storing).

In the short term, corrosion can flake off and clog the valve or regulator. Over the long term, corrosion weakens the cylinder. Annual visual inspections keep this problem in check, but if you hear anything in a cylinder when you turn it over, or if you suspect you may have had moisture pumped in, have it visually inspected at a PADI Dive Center or Resort immediately.
Getting a bad fill with contaminated air has become almost unheard of, but the possibility exists and you should be alert for it. If air smells bad or has a funny taste, don't use it. You can see if air discolors a white handkerchief when you blow the air through it. If so, don't use it. Alert the dive operation where you got the fill that there may be a problem.

You'll find that the most common cylinder problem arises when a diver doesn't properly secure it in the BCD. The cylinder may slip out, or it may be too high and bang against the diver's head. Watch for cylinders that sink slowly when the diver stands, especially when the diver is walking to or from the water; keep an eye on where the valve ends up relative to the diver's head with the unit on.

The most common valve problem tends to be a worn O-ring. Slight leakage during a dive doesn't pose a concern, but advise the diver to replace the O-ring as soon as possible. Major leaks, on the other hand, call for aborting the dive due to rapid air loss. Major leaks develop due to wear, but also when an O-ring dislodges from its seat so the regulator doesn't seat properly. You can prevent major leaks by replacing O-rings frequently, before they show wear, and by making sure they seat properly when setting up your equipment. Note that with DIN equipment you'll find the O-ring on the regulator, not the valve.

Human error leads to another common valve problem: it being turned off or only partially turned on. This can happen if after setting up gear to check the air supply and regulator function, a diver turns the air off, but doesn't purge the pressure. The SPG still reads "full," and the hoses hold enough pressure for a couple of breaths. The diver may think the air is on and enter the water, only to "run out" of air after

two or three breaths. You can prevent this by depressurizing the regulator after making a system check.

Similarly, a diver may open the valve only partially, usually to check the pressure, then forget and begin the dive with the valve barely open. Or, a stiff valve that needs servicing may feel like it's all the way open when only partly open. At the surface this usually makes no difference, but at depth this may restrict airflow sufficiently to affect breathing. Look at the SPG if you think this may have happened; the pressure will usually fall and rise sharply as the diver inhales and exhales. To prevent this, as well as the previous problem, divers should confirm open cylinder valves during the predive safety check.

REGULATORS

Air exiting the cylinder valve flows into the first stage of the regulator. The first stage reduces the cylinder pressure to an intermediate pressure, which it delivers to the second stage, the alternate air source second stage and the low-pressure inflator hose. The first stage also feeds high pressure air directly from the cylinder to the SPG.

When you inhale from the second stage, you draw the diaphragm inward, which opens the downstream valve and releases the air you breathe. When you exhale, the diaphragm returns to its normal position, allowing the valve to close. Your exhaled breath exits through the one-way exhaust valves.

As air flows when you inhale, the pressure drops in the first stage intermediate pressure chamber. In a piston first stage, the piston moves toward the intermediate pressure chamber, opening the valve and permitting air to flow from the cylinder. In a diaphragm first stage, the diaphragm flexes toward the intermediate pressure chamber, pushing the valve seat open to permit air to flow from the cylinder (see illustrations). The same thing happens when you put air in your BCD with your low-pressure inflator.

When you stop inhaling (or inflating your BCD), air from the cylinder accumulates, raising the pressure until the piston/diaphragm return to their normal closed position. Note that water reaches the piston or diaphragm, so that as you descend, rising water pressure also actuates the first stage, so its intermediate pressure remains constant above the ambient pressure. Most regulators maintain an intermediate pressure of about 10 bar/150 psi.

To make breathing as effortless as possible, scuba regulator valves usually close against the airflow (called downstream valves), with the springs set to just barely close.

This means that only slight effort overcomes the springs holding the valves shut, allowing air to flow. It also means that if a downstream valve fails, it virtually always fails open, allowing air to flow continuously instead of cutting it off.
Most problems involving regulators begin with inadequate maintenance or failure to have them serviced annually. A regulator that doesn't get properly rinsed

accumulates salt and minerals (even when used in most freshwater sites). As these build up, parts that used to move against each other freely begin to resist, especially if the diver hasn't had the regulator serviced regularly so it lacks lubrication. This not only increases breathing resistance, but may also cause unnecessary wear. A regulator that breathes stiff should be professionally serviced, even if it's not due for service yet.

Because downstream valves open with the airflow, misadjustment plus salt/mineral build up and sand can keep the valve from completely seating, resulting in an annoying constant hiss from the second stage. Although it's the second stage that makes the noise, the problem may be in the first stage. If the first stage valve doesn't seat completely, high-pressure air from the cylinder flows down to the second stage where it pushes open the valve. This action prevents the second stage hoses, which weren't designed to handle high cylinder pressures, from rupturing. Ironically, a regulator that won't stop free flowing can also breathe hard. A regulator that won't stop freeflowing needs professional servicing.

Second stage exhaust valves can also have problems by sticking or failing to seal. Either means the regulator needs servicing. You can often free stuck valves by soaking the second stage for a few minutes, then blocking the mouthpiece with your fingers (not in your mouth!) and pressing the purge button. Nonetheless, have the regulator serviced as soon as possible.

The mouthpiece deserves attention apart from rinsing and servicing. Divers sometimes bite through the bite tabs, and the mouthpiece can tear, allowing water to drizzle in during use. If the plastic tie that secures it to the second stage breaks, the mouthpiece can separate from the second stage. Inspect the mouthpiece and the plastic tie before each dive; they're simple to replace if you carry spares.
Divers sometimes overlook hose wear. Inspect the hoses frequently, especially where they meet the regulator. Hose protectors reduce wear, but they can also hide it. Slide hose protectors back periodically and check for damage underneath. Have your PADI Dive Center or Resort replace damaged hoses before diving with the regulator.

Diving in freezing climates can cause a temporary "malfunction" when a regulator freezes, usually causing an uncontrolled freeflow. This happens because the temperature lowers the regulator to near-freezing temperature. Air flowing and expanding through the regulator drops the temperature below freezing, causing water inside and in contact with the regulator to freeze. This jams everything in place, including the open piston or diaphragm. Turn off the air and take the regulator some place where it can rewarm. You may need to remove ice from both stages.

To prevent regulator freeze, some divers use special regulators that enclose the first stage in a special fluid that won't freeze. The fluid transmits water pressure to the first stage so it operates normally, but keeps water out of contact with the piston or diaphragm. Cold water diving, especially ice diving, requires special

considerations, so it's recommended you receive specialized training from a PADI Instructor.

Some final thoughts regarding regulators: Don't use a regulator that leaks water until it receives professional servicing, unless a torn mouthpiece caused the leakage and you've replaced the mouthpiece. Never spray lubricants into your regulator – it won't help, and may damage the regulator by attracting grit, deteriorating parts or dislodging the second stage diaphragm. Also, some lubricants are toxic.

ALTERNATE AIR SOURCE

There are two basic types of alternate air source: alternate air sources that allow buddies to share air from the same cylinder, and alternate air sources that are entirely independent air supplies that permit self-rescue. Because divers have individual preferences, and different alternate air sources have differing set up requirements, alternate air source configuration hasn't become standardized. However, the dive community has standardized three points with respect to alternate air sources.

First, the second stage the out-of-air diver should use should be clearly identified. Second, it should not be allowed to dangle, and third, it should be secured in the triangle formed by your chin and the corners of your rib cage.
Allowing an alternate air source to dangle may damage it, fill it with sand or mud and render it unusable, and make it hard to find in an emergency. Also, it may snag, bang and destroy aquatic life, or snag during your entry and snap off. Securing it and making it conspicuous makes it readily available and ready to use.

The most common problem, then, arises when divers in a buddy team don't familiarize each other with their alternate air source configurations. This can lead to problems in a low or out-of-air situation. It's recommended that you become familiar with the options available, and their advantages and disadvantages.

Most divers use an extra second stage as their alternate air source, although many divers use alternate inflator regulators, pony bottles and self-contained ascent bottles. An alternate inflator regulator consists of an extra second stage combined with a BCD low-pressure inflator; a pony bottle consists of a miniature tank and a separate regulator; self-contained ascent bottles consist of very compact, miniature tanks with a built-in regulator. Since they're all variations of scuba regulators, what you've already learned covers their operation and potential mechanical problems.
The extra second stage alternate seems to have the most configuration and use options, and perhaps the most confusion potential. It can be mounted coming off the diver's right shoulder or left shoulder, and it can have a standard length hose or an extra long hose.

Those who favor a right-shoulder configuration note that this allows the donor as well as the receiver to use the second stage if necessary. Because this is consistent with the primary second stage, divers are used to looking for a second stage on

the right. Also, with the low-pressure inflator and SPG already on the left, right-shoulder routing reduces clutter and hose confusion on the left. With a right shoulder routing, the hose must have an "S" bend when used, so most divers prefer an extra long hose.

Those who favor a left-shoulder configuration note that this positioning orients the second stage so it faces the receiver without an "S" bend in the hose. The primary drawback to the left configuration is that the donor cannot use the alternate without severely bending the hose – not a preferred option in an emergency situation.

Divers also differ on which second stage to give the receiver. Some divers advocate giving the primary to the receiver and switching to the alternate. The advantages are that there's no question that the primary works, and the donor can find it quickly. Also, panicked out-of-air divers may snatch the primary out of the donor's mouth in the first place. Two drawbacks seem to be that both divers momentarily have no air during the switch, and that a longer hose becomes inconvenient. Because the donor gives away the primary, it must have the longer hose (if a longer hose is used); in use, an extra long hose protrudes and may snag more easily than a standard hose.

Divers who advocate giving the alternate to the receiver cite better control because the donor always retains the primary air source. Giving away the alternate allows the donor to route a longer hose out of the way until needed. The primary drawback seems to be delay in locating the alternate if the diver doesn't secure it where he or the receiver can find it easily. Note that tec divers use extra-long hoses (2.5 metres/7 feet) on their primaries and always give the primary. They're trained to route the hose to control its length and for use in more complex gas-supply emergency procedures.

Alternate inflator regulators always mount on the left because they integrate with the BCD inflator. With an alternate inflator regulator, the donor always gives away the primary and switches to the alternate inflator regulator. Those who use this system like getting rid of the additional hose, plus the other advantages listed for giving the primary second stage to the receiver. The drawbacks listed apply, too, of course.

Because pony bottles permit a diver to self-rescue in a low or out-of-air situation, they're nearly always set up with a right-shoulder hose configuration for use by the donor as well as an out-of-air buddy. The pony bottle's advantages consist of a system that allows easier self-rescue, additional air and, in a malfunction situation, a completely independent scuba system. The cost and bulk comprise the main drawbacks. Many divers who use pony bottles also keep an extra second stage on their primary regulators.

Self-contained ascent bottles share many of the pony bottle's advantages without the bulk and expense. Those who use these point to the fact they're completely independent air sources in a compact unit. Also, you can hand an out-of-air buddy a self-contained ascent bottle for an unassisted ascent. However, self-contained

ascent bottles hold a very limited air supply – just enough to reach the surface from a moderate to shallow depth, without making a safety stop. Most divers who carry self-contained ascent bottles also keep an extra second stage on their primary regulators

As a PADI Rescue Diver, try to note what type of alternate air sources the people you dive with use. During your pre-dive safety check, agree with your buddy which second stage you'll donate and which you'll receive, and vice versa, should the need arise.

SUBMERSIBLE PRESSURE GAUGE

In the past few years, the submersible pressure gauge has evolved significantly, so that you'll find divers using conventional mechanical SPGs, SPGs integrated with computers and, most recently, hoseless SPGs.

The hose leading to your SPG routes high-pressure air directly from your tank to the gauge. In a conventional SPG, the air enters a flexible metal tube, either in a spiral, C-shape or similar design, called a Bourdon tube. The pressure tries to straighten the Bourdon tube, much like party toys uncurl when you blow into them. The tube flexes, rotating the gauge needle in response. The more pressure, the more the tube flexes, showing a higher reading on the gauge.

Most of the newer electronic SPGs are actually part of an integrated computer. These computers not only read your tank pressure, but also estimate your air consumption and air time remaining at depth, plus your no decompression status. The SPG portion uses a pressure transducer instead of a Bourdon tube. Changes in pressure produce a change in electronic resistance in the transducer, which the computer measures to determine and display your pressure. Computer-integrated SPGs provide high accuracy and convenience, with the drawback that if your computer fails, you lose the ability to read your air supply at the same time.

The latest version of SPG eliminates the hose by attaching a transducer/transmitter to the regulator where the SPG hose normally goes. The transducer reads the pressure and transmits a signal to your computer on your wrist, which displays your pressure and uses the data for consumption calculations.

The most common SPG problems result from letting the gauge dangle instead of securing it. A dangling SPG can snag during an entry, damaging or destroying the gauge, snapping the hose or causing the diver to lose his balance.

Underwater, dangling SPGs receive blow after blow against the bottom and other obstacles, which can cause premature hose failure, loss of accuracy, or entanglement, destroying aquatic life in the process. An entire console or computer dangling aggravates the problem with added mass, damaging several instruments at once while affecting the environment that much more.

You can make an important safety and ecological contribution through the simple step of properly securing your SPG/console and diplomatically encouraging other divers to do the same.

Most SPG mechanical failures involve the SPG hose and hose connections. Watch for hose wear and replace SPG hoses at the first signs of damage. The connection between the hose and the gauge has several tiny O-rings that leak if not replaced regularly.

A tiny bubble trail from that connection doesn't usually require cancelling a dive, but you should have the gauge serviced as soon as possible. When you have your regulator serviced annually, ask the service technician to service the SPG connections, too.

With high-pressure cylinder air feeding it, major SPG hose or connection failure looks impressive, with a monstrous bubble cloud and tremendous noise. Although it may appear the diver's cylinder will take only moments to drain, unless it's nearly empty already there's usually ample time to make a safe ascent. This is because manufacturers, recognizing the potential for accidental gas loss, intentionally restrict flow to the SPG by making all ports and hose openings to it pin-hole sized. Nonetheless, if someone's SPG hose or connection fails, a buddy at hand with an alternate air source ready adds a margin of reassurance and safety. Note that the hoseless SPG systems eliminate dangling SPGs and limit major air leakage to the O-ring port where the transducer/transmitter connects.

Also, with a mechanical SPG, look at the needle during your predive safety check before you turn the air on. If it reads above zero with the air off, realize that you can empty your cylinder with the SPG still showing air left. If you notice this, have your SPG serviced to correct its accuracy.

BCDS AND LOW-PRESSURE INFLATORS

Compared with your regulator, the BCD and low-pressure inflator enjoy mechanical simplicity and few problems. The BCD consists of little more than a highly specialized airtight bladder made of incredibly durable material, shaped so you can wear it, and with straps for adjustment and holding a tank.

Because they're simple and sturdy, properly maintained BCDs seldom have bladder-related problems such as leakage. The most common problem involving the BCD bladder is simply a BCD that's too large or too small for the diver. One that's too large may not hold the diver comfortably at the surface, and one that's too small can restrict breathing (especially when fully inflated), making the diver feel air starved during exercise.

The BCD inflation system takes low-pressure air from your regulator and injects it into the BCD when you press the inflator button. The inflator valves have a much simpler design than regulator valves. Most aren't particularly temperamental and function reliably for years with normal maintenance. In some areas, BCDs with

integrated pony bottles have become popular; these systems require care and maintenance comparable to your regulator.

Most of today's popular BCDs have two or three exhaust valves.

The exhaust control that you also use for oral inflation employs a simple open-close valve that opens when you depress it.

1. At the base, where the corrugated hose attaches to the BCD, you may find a "quick-dump" exhaust valve that lets you deflate quickly without raising the BCD hose. This valve opens when you pull the inflator mechanism, thanks to a cable running through the BCD hose. When rinsing a BCD with a quick dump, be sure to let fresh water exit this valve, too.
2. Finally, BCDs have an overpressure relief valve (which may have a quick dump integrated into it). A spring holds these valves shut until pressure inside the BCD rises too high. The pressure forces the valve open, relieving pressure rather than bursting the BCD. Rinse this valve carefully and check it periodically for leakage when the BCD's inflated normally.

As you may imagine, most BCD problems involve the inflation and exhaust valves. Most inflation system problems result in continuous inflation rather than noninflation. Generally, this begins as a slow leak that continuously fills the BCD, sometimes so slowly the diver doesn't even know it's happening. If you find your BCD fully inflates itself when left alone with the cylinder on, have your inflator checked and overhauled if necessary.

Inflators can also stick in the open position, usually as a result of not being serviced and maintained properly. Salt and debris cause the inflator to leak or jam when activated, inflating the BCD rapidly. This can cause a runaway ascent. You can stop the airflow by disconnecting the low-pressure hose. Slow the ascent by using your quick dump and by flaring out your arms and legs to create drag. Inflate orally to finish the dive and have the inflator serviced before using the BCD again.

Other common inflator problems include leaks at the inflator connection and disconnected inflators. A leak where the inflator hose connects to the inflator seldom poses a hazard, because the released air goes into the water instead of the BCD, but have it serviced before leakage becomes significant.

Divers sometimes forget to connect the inflator hose when setting up their equipment; you can avoid this problem by checking BCD operation during your pre-dive safety check.

Exhaust valves also tend to leak slowly, not fail completely, when they need service. You may not notice a quick-dump valve or overpressure valve leaking because they may be out of sight with your mask on. If you find yourself adding air to your BCD frequently without changing depth, have your buddy check them for bubbles. You'll probably see leaks in the exhaust valve on the BCD hose.

If an exhaust valve sticks open, how you respond depends on the valve. If it's the

hose deflator valve or an overpressure valve located low on the BCD, the BCD will still hold air if you remain upright and hold the hose deflator (if that's the failed valve) as low as possible. A failed quick-dump valve may be more difficult; you may have to swim to the surface and dump your weights to remain afloat. If you're too heavy to swim to the surface, you may need to abandon some or all of your weight underwater.

Exercise 2 – 2

Question 1

A regulator's intermediate pressure _____the ambient pressure.

remains constant below
remains constant above
varies above or below

Question 2

You can classify alternate air sources into those you can use independently, and those that require a buddy's assistance.

True
False

Question 3

The dive community agrees that an alternate air source should be conspicuous to the diver needing air, not allowed to dangle, and secured in the area formed by a diver's chin and lower rib cage corners.

True
False

Question 4

Salt or debris jamming a low-pressure inflator can cause a runaway ascent.

True
False

COMMON EQUIPMENT PROBLEMS

Although function-related problems can occur as you just learned, when a diver encounters an equipment problem, it usually has one of these six general causes:

1. The diver uses unfamiliar or specialized equipment without learning to use it properly first. For example, dry suit diving requires some techniques you don't need when wet suit diving that relate to buoyancy control, valve use, proper zipper maintenance and other considerations. Preferably, the diver learns specialized equipment use from a qualified instructor. Even standard equipment, such as the BCD, can be misused by failing to inflate or deflate as needed.

2. The diver uses equipment that doesn't fit properly. This can be a simple adjustment problem, such as a proper sized BCD that needs its straps tightened, or it can be a size selection problem, such as a wet suit that's too big or too small.

3. The diver substitutes makeshift, homemade or obsolete equipment for accepted standard equipment. An example might be a diver who makes a weight belt from an old automobile seat belt.

4. The diver lacks essential equipment for the dive environment, or uses the wrong equipment. For instance, a diver might show up for a cool water dive with a shorty wet suit. The suit may be in good shape and fit properly, but if the dive calls for full wet suits with hoods, problems may result.

5. The diver severely modifies the equipment. Simple, proper modifications and adjustments don't usually cause problems; in fact, they usually reduce problems by adapting the equipment to the diver better. Nonetheless, be wary when you see extreme or excessive modifications.

6. The diver doesn't properly maintain and inspect the equipment. Like any equipment, dive equipment wears out. Without proper care, it wears even faster. A diver who doesn't regularly check fin straps, for instance, may eventually have one break during a dive. A diver who doesn't have his regulator serviced annually may find it won't deliver as much air as he demands during a hard swim.

Pre-dive equipment checks and proper maintenance play primary roles in preventing accidents, and should not be neglected.

Obviously, your responsibilities as a PADI Rescue Diver do not include taking care of every diver's equipment. All divers have to take care of their own equipment. Still, by learning to look at other divers' equipment, you may spot possible problems before they happen.

There's always the possibility that a diver will dive with equipment that has a problem despite your advice against it. If this happens, you can't do much more than hope for the best and be ready to help if necessary. The diver, not you, bears the responsibility for the consequences.

Diplomatically discussing what you see may prevent a rescue, especially if you can correct a problem, such as by offering to replace a worn fin strap with one from your spare parts kit. Look for the problems identified below.

MASK

Problem: Water in mask
Cause: Skirt torn, improper fit, leaky purge valve, hood, hair, etc. under skirt.
Effect: Preoccupies diver and causes stress. Obstructs vision.
Prevention: Visual inspection, inhaling to test before dive.

Problem: Lost mask
Cause: Strap broken, dislodged, dropped
Effect: Eliminates effective underwater vision. Surface swimming difficult.
Prevention: Check strap for cracks, entering the water.

SNORKEL

Problem: Unable to clear
Cause: Leaky self-drain. Incorrectly positioned on head or in mouth.
Effect: Breathing difficulty. Water inhalation.
Prevention: Check before and after entering the water.

Problem: Lost snorkel
Cause: Lost mask, snorkel not attached to mask. Broken snorkel keeper.
Effect: Unable to snorkel at surface. High energy expenditure to swim at surface.
Prevention: Check snorkel security. Wear securely attached to mask.

FINS

Problem: Lost (fins)
Cause: Fins too large. Strap slippage. Broken or loose strap. Dislodged in surf.
Effect: Loss of effective propulsion and direction control.
Prevention: Check straps and adjustment before dive. Secure straps to prevent movement.

Problem: Cramp
Cause: Fins too stiff or large. Foot pocket too small. Strap or bootie too tight.
Effect: Ineffective swimming. Stress.
Prevention: Check fins for fit, comfort and adjustment prior to dive.

EXPOSURE SUIT

Problem: Chilling
Cause: Suit fits improperly.
Effect: Shivering, anxiety, rapid air use, cramps.
Prevention: Recommend proper insulation. Check fit.

Problem: Breathing difficulty
Cause: Suit too tight.
Effect: Air starvation, anxiety.
Prevention: Check fit of suit.

Problem: Flooded dry suit
Cause: Torn or punctured suit, zipper failure, damaged seals.
Effect: Cold water shock. Negative buoyancy.
Prevention: Proper maintenance. Examine before the dive.

Problem: Overly buoyant
Cause: New suit, salt water, air in suit, not enough weight.
Effect: Struggling descents. Overexertion, lung injury, runaway ascent.

Prevention: Check buoyancy; add weight if needed.

BCD

Problem: Air leakage
Cause: Hole in bladder, slow leak, hose pulled out, missing/defective valve.
Effect: Loss of buoyancy. Overexertion.
Prevention: Check BCD before dive. Store BCD partially inflated.

Problem: Excessive buoyancy
Cause: Stuck or leaking inflator valve. Lost deflator hose, trapped hose.
Effect: Runaway ascent. Possible air expansion injury or decompression illness.
Prevention: Know and maintain equipment. Test before dive.

WEIGHT SYSTEM

Problem: Difficult to remove
Cause: Strap too long; excess tucked or tied. Rotated weights next to buckle. Nonstandard belt. Belt under BCD harness. Release mechanism frozen.
Effect: Difficulty in establishing buoyancy in an emergency.
Prevention: Check weight system carefully before dive.

Problem: Unintentional loss
Cause: Belt not buckled securely. Buckle caught. Attempted adjustment. Improper position or adjustment. Weight system release mechanism snagged and opened.
Effect: Runaway ascent. Possible decompression illness.
Prevention: Check weight system carefully before dive and adjust after entry.

SCUBA

Problem: Little or no air upon demand
Cause: Poor maintenance. No pressure gauge. Inaccurate gauge. Valve only partially open. Dive started with nearly empty cylinder.
Effect: Respiratory distress.
Prevention: Proper routine maintenance and service. Monitor cylinder pressure. Check air supply before dive.

Problem: Air loss
Cause: Freeflowing primary or secondary second stage. Ruptured hose or burst disk. Leaky pressure gauge, leaky O-ring or leaky connections.
Effect: Early termination of dive leading to buddy separation. Unexpected depletion of air supply.
Prevention: Call attention to air losses. Encourage correction before dive. Adequate predive check.

Problem: Freeflowing
Cause: Regulator needs service. Dented cover. Foreign matter in regulator. Freezing.
Effect: Distress and possible air expansion injury.

Prevention: Proper routine maintenance and service. Proper use. Antifreeze provision in very cold water. Keep second stages clear inside.

Problem: Inhalation of water
Cause: Loose or damaged mouthpiece. Stuck exhaust valve. Hole in regulator diaphragm.
Effect: Respiratory distress, coughing, choking.
Prevention: Proper maintenance. Check regulator before dive.

Problem: Cylinder out of backpack
Cause: Backpack improperly adjusted. Incorrect cylinder band. Releasing of cylinder band.
Effect: Awkward situation. Possible loss of air supply.
Prevention: Check cylinder security before dive.

Exercise 2 – 3

Question 1

Causes of common equipment problems include (choose all that apply)

using unfamiliar, specialized gear without learning to use it properly.
substituting makeshift gear for accepted standard equipment.
failing to inspect and maintain equipment.
severely modifying equipment.

Question 2

Equipment-related causes of breathing difficulty may include a (choose all that apply)

weight system under BCD.
cylinder valve only partially open.
exposure suit is too tight.
loose or damaged mouthpiece.

RELEASE FUNCTION AND PROBLEMS

Rescue commonly requires removing and disconnecting equipment, so as a rescue diver you'll want to recognize the most common releases used in scuba equipment, how to operate them and possible difficulties you may encounter with each. Also, releases can create rescue situations if they let go unexpectedly. You can avoid many release problems simply by inspecting them during your predive safety check, making sure you've secured them properly and that you and your buddy know how to operate each other's releases. During an emergency, you'll want to work each release without having to stop and figure it out.

Quick-Release Buckle.

You'll find the familiar quick-release buckle on most weight belts and used as a waist strap on some BCD jackets. Made from plastic or metal, the majority of these work simply by biting into the nylon webbing, although wire quick-release buckles lock into a matching wire loop.

The quick-release buckle releases simply by flipping open the buckle, though it's usually wise to pull a weight belt clear of other equipment before dropping it. The most common problems involve the buckle not holding, so that the weight belt or other equipment comes loose unexpectedly. This can happen due to a broken buckle, or if the diver accidentally misaligns the webbing so the buckle doesn't close all the way.

Sudden weight belt loss can create a hazardous uncontrolled ascent, so never dive with a broken weight belt buckle, and be sure to close it properly. Check the buckle and webbing alignment for your buckles and your buddy's during your pre-dive safety check. Many divers carry a spare buckle so they don't have to miss a dive if they accidentally break one.

The dive community has standardized the weight belt release as a right-hand release, preferably with all other releases being left handed. This makes it easier for a rescuer to locate the proper release by touch in an emergency.

Quick-Disconnect Fasteners.
You'll usually find quick-disconnect fasteners used for BCD chest and shoulder straps, for attaching accessories to weight belts or BCDs, and sometimes to attach fin straps. Occasionally a diver may use a large one as a weight belt buckle.
Quick-disconnect fasteners release easily by squeezing them, even under strain. They may become less reliable with heavy wear, however, so that they pull free unexpectedly under strain. Also, putting too much strain on one may cause it to pop free (though this has become less of a problem with improvements in the quick-disconnect designs). To prevent these problems, inspect quick-disconnect fasteners for wear, and use one large enough for the load.

Touch Fasteners.
Known commonly as "Velcro™" after the most popular brand, touch fasteners join fabric to fabric. You'll find touch fasteners used on BCD cummerbunds, and to take up slack when you adjust nylon webbing. Nylon cylinder bands, for example, usually have touch fasteners to hold the web end after you cinch the buckle down.
Touch fasteners wear out, and they can get clogged with sand and lint, making them less reliable. Therefore, they're not commonly used for weight belts or to hold significant loads. Inspect the material for wear and replace it as necessary.

Cylinder-Band Releases.
Several cylinder-band release designs have debuted over the years, but the one shown has become the most common by far. Used properly, this release snugs the nylon cylinder band firmly, so the cylinder stays put even with a long walk to and from the water.

Divers commonly encounter problems with this release if they don't thread it properly, or if they don't adjust it properly. To prevent threading problems, the manufacturer usually prints a threading diagram on the buckle or strap; consult the diagram.

Most adjustment problems result from securing the band while it's dry. Nylon stretches when wet, so the band loosens after the diver enters the water. The cylinder may slip free during the dive, or more commonly, soon after exiting the water. Prevent this by wetting the band first, and by snugging the band tightly before swinging the release closed for a tight grip.

Inflator Quick Disconnect.
The common low-pressure inflator quick-disconnect hose has rapidly become the dive community standard. You'll most commonly find this connection on BCD low-pressure inflators, dry suit inflators, and used on many air powered accessories. As you probably know, you simply pull back on the knurled ring, though it may take two hands.

Alternate inflator regulators often employ a larger connection to provide the alternate with adequate airflow for breathing, and a few high-volume low-pressure inflators use the same connector. However, these connect and disconnect exactly like the standard quick disconnect; they're just larger.

A common problem with the inflator quick disconnect is failure to connect it before the dive. Another problem is that the inflator can leak and inflate the BCD, but this is a malfunction of the inflator mechanism rather than the quick disconnect.

Integrated-Weight Releases.

Weight-integrated BCDs continue to grow in popularity. These systems use distinct weight quick releases, though they're generally similar. Most have a right-handed grip or T-handle that, when pulled, opens the system's weight pockets.
A few use touch fastener (Velcro™) releases, and some may have a right and a left release, each of which ditches half the weight.

These systems function well; the most common problem is a diver who doesn't know how to work a buddy's. Because different systems may operate slightly differently, divers using such weight systems should be sure their buddies know how to release their weights.
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Exercise 2 – 4

Question 1

Which of the following describes dive equipment release function and problems? (Choose all that apply.)

Quick-release buckle works by biting into webbing.
A common problem is not knowing how to work a buddy's integrated-weight release.
A common problem is failure to connect the inflator quick disconnect to the BCD low-pressure inflator.
A touch fastener is commonly used on BCD cummerbunds.

ACCIDENT MANAGEMENT II

COMMON AQUATIC LIFE INJURY FIRST AID

Although few aquatic animals naturally attack divers, many have natural defenses that can injure a diver who inadvertently touches, steps on or blunders into them. Aquatic life injuries fall into three primary types: bites, cuts/abrasions/punctures and stings (envenomations).

Moray Eel
Aquatic animals don't commonly bite divers, even if they're capable of it. Most bites involve feeding behavior, though they may also be defensive, such as if a diver sticks a hand into a moray eel's hole. You give first aid for bites the same way you would a similar sized wound caused by something else.
Although rare, sharks sometimes bite divers. With a shark bite, your primary concern will be blood loss from a massive wound, and your first aid will focus on controlling bleeding, managing shock and basic life support.

Sea Urchin
Abrasions, cuts and punctures result from falling against barnacle-covered surfaces, scraping bare skin across coral, stepping on sea urchins or similar misfortunes. Again, first aid for these is the same as for similar wounds caused by anything else. Give particular attention to sea urchin injuries, however.
You may find it difficult to remove a fully imbedded spine, and punctures may be prone to infection. It's always wise to have a physician examine and treat even minor injuries.

Fire Coral
Venomous wounds may arise from contact with a wide variety of aquatic organisms including jellyfish, stingrays, cone shells, fire coral, scorpionfish and others. Fortunately, serious injuries don't happen often. However, when diving in an unfamiliar area, always check to see what local aquatic life can sting or produce venomous wounds.

Scorpionfish

Stingray

Venomous wounds vary in severity from minor local pain to life threatening cardiac arrest. The signs and symptoms tend to be species specific, though the exact reaction will depend on individual susceptibility to the venom, the individual's size, age and health, how much venom entered the injury, where the individual received the injury, and whether the individual has been exposed to the same toxin before.

Lionfish
Divers with a venomous wound may: 1) suffer excruciating pain, 2) have local swelling, inflammation and tentacles or welts on the affected area. More serious signs and symptoms include 3) weakness, nausea, shock, unconsciousness and confusion. The diver may have 4) a spreading numbness or paralysis, or convulsions. In the most severe cases, the diver may 5) suffer respiratory and cardiac arrest.
Treat venomous wounds beginning with primary assessment. Remove spines (scorpionfish, urchin, stingray, etc.) or stingers with forceps or other tools, or by irrigating (running water over) the wound. Don't touch these with your hands. Soak the affected area with hot water (43˚C to 49˚C/ 110˚F to 120˚F) for 30 to 90 minutes. If the injury occurred to a limb, keep the limb below heart level. Treat the patient for shock, maintain the AB-CAB'S and get the patient to emergency medical care as soon as possible.

Treat jellyfish, Portuguese man-o-war and similar organism injuries by liberally rinsing the wound with five percent solution acetic acid, or household vinegar, which contains acetic acid. This neutralizes jellyfish stinging cells. Because tentacles often stick to the wound, use gloved hands to remove tentacle pieces or other stingers – they can still sting, even when detached from the animal. Use forceps or other tools to gently lift the pieces off. Rinse again with sea water or saline solution (fresh water can cause further nematocyst discharge). For pain relief, apply a heat pack or hot water. If the patient has signs or symptoms more serious than mild pain at the wound, get the diver to emergency medical care while monitoring the patient's lifeline.

Immerse injuries caused by spines or barbs in hot water 50˚C/122˚F until the pain subsides (using fresh water is not an issue here). Use hot packs if you can't immerse the wound. After the patient feels relief, allow the injury to cool; the patient will probably feel pain again. Repeat the heat treatment and cooling until the patient doesn't feel pain when the injury cools.

Sea Wasp (box jellyfish)
Some marine life injuries may benefit from pressure immobilization to reduce the spread of venom until reaching professional medical care. You can use this with sea snake bites, cone shell stings, sea wasp (box jellyfish) stings and blue-ringed octopus bites, but don't use it with stonefish, stingray or other fish-spine injuries. Apply pressure to the injury with a gauze bandage (or something similar), wrapping over the bite/sting first, and then above and below. Wrap joints as well and use a splint if available, with tension comparable to bandaging a sprain – don't cut off circulation. The injured areas must be kept as still as possible because movement aids venom spread and absorption.

Severe injuries, such as sea snake bites, stonefish and South Pacific sea wasp stings usually require professional medical care and antivenom treatment.

DON'T UNDERESTIMATE THEIR POWER

Stings from marine animals vary from annoying to life threatening. Cone shells, sea wasps, Portuguese man-o-war, sea snakes, and other venomous creatures have killed swimmers and divers. Whether a sting can be lethal depends on the organism, the severity of the wound and the victim's individual reaction.

This means:

1. Wear appropriate exposure suits and other protection.
2. Watch where you put your hands and feet, and watch where you swim.
3. If you don't recognize something, don't touch it, no matter how harmless it looks.
4. Heed posted warnings.Cone shell

MARINE INJURY FIRST AID SUMMARY

Pressure Immobilization

- Sea snake bites
- Cone shell
- Blue-ringed octopus
- Sea wasp (box jellyfish)

Hot water

- Stonefish/scorpionfish
- Stingray
- Fish spines

Vinegar

- Jellyfish

Sprays, Ointments, Ice

- Jellyfish

Antivenom

- Sea snake
- Sea wasp (box jellyfish)
- Stonefish

Basic Life Support and CPR

- May be required by any severe marine injury

Exercise 2 – 5

Question 1

The three forms of aquatic life injuries include (choose all that apply)

bites.
cuts, abrasions and punctures.
venomous stings.
impact injuries.

Question 2

The first-aid step that applies to all aquatic life injuries is

pressure immobilization.
immerse the wound in hot water.
begin with primary assessment and the AB-CAB's.
apply ice packs.

Question 3

If it is not a venomous wound, the first aid for aquatic life bites, cut, abrasions and punctures is the same as for a similar wound caused by something else.

True
False

Question 4

The signs and symptoms of venomous aquatic life injuries include (choose all that apply)

severe pain.
inflammation.
nausea.
paralysis and cardiac arrest.

Question 5

The basic first aid for jellyfish stings includes (choose all that apply)

rinsing the injury with fresh water.
rubbing the affected area with sand.
applying acetic acid (vinegar).
applying a tourniquet.

RESPONDING TO DIVER EMERGENCIES II

MORE ON RESPONDING TO RESPONSIVE DIVERS AT THE SURFACE

In the first two rescue training exercises, you practiced the basic procedures for rescuing responsive divers at the surface when you're already in the water. In Rescue Training Exercise Three, you'll practice responding as though you were ashore or on a boat, and you'll also practice exiting the water with the victim. Previously, you learned that you should always opt for a rescue by reaching, throwing, wading or a small vessel before an inwater rescue, if possible. You'll practice some of those types of rescues in Rescue Training Exercise Three as well.

Entry and Approach Considerations.
Imagine you're relaxing after a dive with a buddy and suddenly a diver in the water starts calling for help. You have your scuba gear but there's no way to reach, throw or wade to assist, and you have no small boat or vessel, meaning you're going to need to make an inwater rescue. What equipment do you take with you? What's the most effective way to enter the water?

The equipment you should take will depend on the circumstances, but you almost always want your mask, fins, snorkel and some form of flotation. The added advantages these give you more than offset the time it may take to grab them. Other equipment may depend on the circumstances, how long it will take to reach the victim and so forth.

For example, if you're wearing a buoyant exposure suit you may need your weight belt in case you need to freedive down to a sinking victim (you can ditch the belt after bringing the victim up).
Or, if you see the victim going under immediately and you know the water is deep, you may want to don your scuba gear. With more than one rescuer, someone can move to the victim's aid quickly just snorkeling, while another rescuer prepares for the worst case by getting kitted up in scuba.

Put your mask, fins and snorkel on as close as possible to the water, but without losing sight of the victim. You want to keep your eyes on the victim constantly so you don't lose track. If you have a long shallow distance to cross, you may want to wade to chest deep water before donning your fins, again keeping the victim in sight.

Enter the water as close as possible without losing sight of the victim. Enter in a manner that keeps the victim in view – wading in or easing in is usually best. If possible, have spotters watch and point to the diver. Ask them to not look away for any reason – that way, if you lose track of the victim in waves or while navigating around an object, you can look back at the spotters to see where they're pointing. If you must step into deep waters, wear your fins and snap your legs together as you go in to keep your face above water and your eyes on the victim.

As you've already learned, swim with your head up and eyes on the victim. You may have farther to go than if you were in the water already, so pace yourself. Swim as fast as possible, but save enough energy to perform the rescue and tow the diver to safety. This will depend on your physical condition, the distance, the victim's relative size, environmental conditions and other factors.

You may find that a crawl stroke using your arms as well as your legs allows you to approach quickly while leaving your legs more rested. But again, you need to conserve enough upper body strength to handle the rescue.

Quick Reverse.
As you learned, you stop to evaluate the victim's mental state, note the BCD inflator location, make sure you have ample buoyancy and tell the victim to drop weights or inflate the BCD. As you do this, be prepared for a quick reverse, which is simply being ready to back away from a panicked diver.

As you stop, lean backward in the water with your legs toward the victim. If the victim reaches and struggles toward you – threatening to climb onto you and (depending on your relative sizes and strengths) overpower you – you're already positioned to swim away from the diver's grasp.

Using Emergency Flotation.
While responding from a boat or shore likely means a longer swim than if you were in the water near the victim, the upside is you're more likely to have emergency flotation you can take with you. The advantage of a flotation device is that it simplifies the rescue by providing immediate buoyancy and allows you to avoid contact with a potentially panicked diver. After stabilizing the situation, it's often easier to tow the diver to safety by a flotation device than by towing the diver directly.

Anything with adequate buoyancy that you can tow or push with you as you respond will work. Sometimes you'll have available flotation that was thrown to the victim, but fell short; you pick up the device on your way to the victim. PFDs (personal flotation devices) are obvious rescue aids, but a spare BCD, a gear bag stuffed with wet suits, a boat fender or even a sealed cooler may work. All that matters is that it floats enough to support a diver, and you can swim or tow it.

With emergency flotation available, put it between you and the victim as you approach. Extend if from a safe distance and tell the diver to hold on to it. A panicked diver may grab and climb on to it before you can say anything, or (less commonly) fail to recognize it and disregard it.

If you don't have emergency flotation available, or the victim doesn't take it, you'll make contact and assist like you've already learned, using tired diver or panicked diver rescue techniques, as appropriate for the situation.

More than One Responsive Diver.
It's rare, but possible, that two or more divers may need help at the surface. This is more complex than a single victim, obviously, but often even a single rescuer can assist several victims if the right resources exist. But, you can only do so much. Remember that your safety comes first because you can't help anyone if you get into trouble.

With two or more responsive divers in trouble at the surface, your first response to consider is the same as with a single victim: look for ways to reach, throw, wade or use watercraft. If there are other qualified rescue divers present, immediately agree who will help whom, effectively turning the situation into multiple single-diver rescues going on at the same time.

If you have no choice but to attempt an inwater rescue of multiple victims yourself, emergency flotation may be almost essential. Find something, however improvised, and take it with you.

As you enter and approach, try to determine which diver needs the most help. Commonly that will be the one who initiated the situation. Give flotation to that diver first, confirm that it solves the immediate threat and stabilizes the situation, then go assist the next diver. Tell the first victim to hang tight and that you'll be right back. Approach and evaluate each diver just as you would a single diver.

In rare circumstances, you may need to separate two panicked divers. Your best bet is usually to approach from underwater or behind, inflate the divers' BCDs and/or drop their weights. The expanding BCDs tend to push them apart, just as when you use the technique for a release like you practiced in Rescue Training Exercise Two.

If handling more than one panicked diver presents unacceptable risk, stay clear until one or more exhaust themselves. This may mean you have to follow up with an unresponsive diver rescue, but that's better than getting into trouble yourself. Stop, breathe, think, and act, do the best you can and keep yourself safe so you can continue to help.

Exercise 2 – 6

Question 1

When responding to a responsive diver at the surface from a distance (choose all that apply)

take your mask, fins and snorkel.
don't waste time looking for flotation devices.
keep your eyes on the victim continuously.
be prepared to make a quick reverse.

Question 2

The advantages of emergency flotation in responding to a responsive diver at the surface are that it provides immediate buoyancy and may eliminate the need for direct contact.

True
False

Question 3

When assisting more than one responsive diver at the surface (choose all that apply)

your safety comes first.
emergency flotation may be almost essential for inwater rescues.
never attempt the rescue from in the water.
remember to rescue by reach, throw, wade or watercraft first if possible.

EXITS WITH A RESPONSIVE DIVER

Equipment Removal
After you've handled the immediate emergency by establishing buoyancy for yourself and the victim, and given the situation a chance to calm down, you'll usually assist the diver to the boat or shore. In some situations, getting rid of some equipment may be advantageous by making a swim less tiring or simplifying an exit. In other situations, it may be better to keep all equipment in place, and in yet others it may make little difference. Think about the following:

How far do you have to go?
If you have a short swim to safety or help, the additional weight and drag from equipment probably won't make much difference. If you have a long swim, eliminating the drag may help you save both strength and energy.

Even with a long swim, a diver may be perfectly capable of resting adequately to avoid the expense of tossing equipment.

What is the environment like?
You can remove almost any equipment that doesn't provide buoyancy or help you swim in flat, warm water with an exit on a calm shore or aboard a boat. On the other hand, you and the victim probably need your masks and snorkels in choppy seas. If you have to exit through heavy surf, both you and the distressed diver may need to keep all your equipment, but through mild surf an exhausted diver might be best off with mask and snorkel, but no heavy scuba unit or weights.

What's the victim's condition?
If the diver recovers completely, there may be no need to remove any equipment. With tired, injured or distressed divers who have trouble recovering and appear weak, it may be best to eliminate equipment to reduce drag and make it easier for them to exit the water.
There are no hard rules when it comes to equipment removal. Think about the situation and do what's necessary to give the best chances for you and the victim to reach safety.

Tows.
In Rescue Training Exercise One, you practiced towing distressed divers, and in

Rescue Training Exercise Three you'll practice several specific tows. The ideal tow meets the following general criteria:

- The tow keeps the diver's face out of the water.
- The tow reduces drag by letting you and the tired diver move through the water horizontally.
- The tow gives you control.
- The tow doesn't restrict your swimming.
- The tow allows you to communicate with the tired diver, preferably with eye-to-eye contact, so you can continue to reassure the diver as you swim.

Unfortunately, no single tow really meets all of these criteria, which is why you learn several tows. That way, you can choose the tow that best meets the needs of the situation.

Underarm Tow
Grasp the tired diver under the arm and continue to swim to safety while your face remains close to the diver's face. This is a good tow for a short swim, and is especially useful for maintaining eye-to-eye contact and reassuring the victim.

Modified Tired Swimmer's Carry
With the diver floating face up in the water, put the diver's feet on your shoulders with the fins out of the water, and grasp at or above the knees while you swim, pushing the diver to safety. This has some eye-to-eye contact and is a good position for a long swim. If you're a second rescuer arriving to help, it's also a good way to assist with transport while the first rescuer remains close to the victim's face.

Cylinder Valve Tow
Grab the diver's cylinder valve and swim the face up diver to the shore or boat. This tow does little to reassure and provides no eye-to-eye contact, but is an effective tow for speed over a short distance. You can also use it over a longer distance once a victim settles down and trusts that all will be okay, making the eye contact less important.

Exit Considerations.
Circumstances affect how you'll exit the water with a responsive diver. Variables to consider include the exit terrain, surface conditions, whether the victim needs medical assistance and where that assistance may be, and how tired you and the diver are.

For a shore exit, you may need to assist a weak, distressed diver to safety. Stand at the diver's side with the near arm across your shoulder, secured by grabbing the wrist with your far hand. Support the diver with your free arm around the waist or tank. You should be able to walk the tired diver to safety.

You may decide the diver is too weak to walk ashore or climb aboard a boat with equipment on. In this case, and if environmental conditions allow, remove the victim's equipment before exiting. With a difficult shore exit, or one where it's best to wear gear due to conditions, you may opt to have the diver crawl out.

In many instances, a seemingly difficult exit with a weak, tired diver may be simplified by allowing adequate time for the victim to rest and recover enough to manage the exit with relatively little assistance from you (though you should stay at hand in case needed). If time and conditions allow, this is often the best solution because it is often beneficial to the diver psychologically by helping restore self-confidence.

Exercise 2 – 7

Question 1

When deciding whether to remove equipment from a distressed diver (choose all that apply)

remember that you always remove all gear.
how far you have to go to reach safety is not important.
a victim who recovers adequately may not need to remove anything.

Question 2

The ideal tow meets which of the following criteria? (choose all that apply)

It keeps the diver's face out of the water.
It reduces drag.
It avoids eye contact.
It gives you control.

Question 3

Things that may affect how you exit the water with a tired diver may include (choose all that apply)

the exit terrain.
the need for medical assistance.
how tired you and the victim are.
surface conditions.

POST ATTENDANCE

Once out of the water, you have three primary concerns with a responsive diver. First, assess the diver for injury or illness that needs your attention, based on your Emergency First Response training. Second, if your assessment finds a serious medical condition, contact emergency medical care.

Third, be sensitive to the diver's feelings. Many responsive-diver-at-the-surface rescues end up with little or no physical injury, but the potential for emotional

injury. It's important to not play hero. Instead, downplay any remarks along those lines, even with good intentions. A good response to such comments would be something like, "I only did what that person would have done for me."

Realize that the diver you helped may experience self-esteem loss, especially if that person panicked. Residual fear may be significant, and your actions at this point may influence whether that person continues to enjoy diving, or even ever dives again at all.

Try to reassure and praise the diver's correct actions, but don't minimize the situation – especially a panicked diver. Realize that in panic, the person faced an overwhelming fear, and to be told the cause was "really nothing" is insensitive. To the diver at the moment, it wasn't "nothing," and it was frightening. But, you can show the diver how a simple, different set of responses would easily prevent an emergency if the situation were to arise again.

Following panic, the most important thing for the diver to do is to go diving – which is probably the last thing the person wants to do. Encourage, but don't push, the person to buddy up with an instructor or divemaster and go diving again as soon as possible in a nonchallenging environment.
The sooner the person goes diving again, the sooner that diver can get past the fear, learn from the incident and move on. If you can encourage the diver to accomplish that, you will have not only helped the person when the incident occurred, but you will have also helped the person to become a better diver because of it.
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Exercise 2 – 8

Question 1

Concerns regarding a responsive diver once you're safely on the boat or shore include (choose all that apply)

assessing for illness or injury.
contacting emergency medical care if required.
being sensitive to the diver regarding the incident

SUMMARY

Assessing the situation, Wendy noted that Barbara and Gary were the first divers up; with other divers in the water and due up soon, she couldn't have the captain start up the boat. Eighteen metres/60 feet was just beyond what she could throw a rescue line effectively. Calling for Captain Nicolas to assist, she grabbed her mask, snorkel and fins, then quickly retrieved the trail line, which no one was using because there was no current anyway. With a full body suit on, she felt she could make a direct assist with only minimal chance of getting stung herself if she watched where she went.

She reached the divers quickly; Gary was breathing but didn't respond to her. She grabbed him with one arm, and suspecting Barbara may also have trouble swimming, had her hang on to her same arm. With her other arm, Wendy held on to the line while Nicolas pulled them to the boat, making sure no water splashed into Gary's airway. The calm conditions made this easier.

Nicolas and Wendy pulled Gary aboard. Wendy began her primary assessment, finding Gary's breathing shallow and his pulse rapid and weak. Wendy maintained the lifeline while Nicolas summoned the coast guard by radio. At the same time, Wendy kept watch on Barbara, who was experiencing much pain, in case she began to react more severely to the stings.

The coast guard advised them to head for port where they would have an ambulance waiting, which would be the fastest way they could get medical care based on their location. Nicolas recalled all the divers. Several rescue divers were among the first aboard, so Wendy had them get the first-aid kit and help Barbara take care of her stings. At this point, Wendy noticed that her unprotected hands were burning, having been stung by tentacles still on Gary. At her request, one of the rescue divers helped carefully remove remaining tentacles from Gary and apply first aid for stings while Wendy maintained the lifeline.

All the divers came aboard quickly. About 10 minutes after the boat pulled away, Gary stopped breathing and his pulse stopped. Wendy began CPR with a rescue breathing mask. Five minutes later, Gary resumed breathing and had a weak pulse. The boat reached the dock about 15 minutes later.

Paramedics took both Gary and Barbara to the local emergency unit. Wendy remained behind and Nicolas helped her apply first aid to the stings on her hands for the first time since they occurred. The next day Barbara was released, and Gary was in serious but stable condition. Eventually he recovered, but the medical opinion was that had medical care been delayed, due to his age, he probably would not have survived the accident, despite Wendy's efforts.

Gary and Barbara resumed diving again within a year. They had learned that some of the simplest rules from their training – such as to look up while ascending – can have dramatic importance. They also switched to full- length skin suits for better exposure protection. Although Portuguese man-o-war were not common to the area, that didn't mean they would never encounter one, or another stinging organism. They also learned that in clear water, a safety stop, besides helping prevent DCI, provides an opportunity to stop and thoroughly check what's overhead before finishing the ascent.

Wendy and Nicolas had responded well to the incident, but they learned a few things. Most importantly, Wendy realized that she jeopardized her own safety and her ability to help Barbara and Gary by not fully protecting herself. In this case, latex or even reef gloves would have prevented the stings to her hands. Had she reacted to the stings like Gary, Nicolas may have had to handle her rescue as well as Gary and Barbara's. She also realized that as a matter of practice, she should

wear latex gloves when providing any first aid to reduce concerns of disease transmission.

KNOWLEDGE REVIEW

Question 1 of 13

Ask about your concerns privately in an open, caring and nonjudgmental manner that avoids pressuring the person. Break the cycle that leads to anxiety and, potentially, panic or other problems. Encourage solution thinking.

Preparing for a dive in challenging conditions, someone in another buddy team with whom you're familiar seems more withdrawn and quieter than usual. To determine whether your observation indicates stress about the dive, the best approach is to

tell the divemaster you have a genuine concern.
talk to the diver privately in an open, caring manner.
stay close to the buddy team during the dive.

Question 2 of 13

Your alternate air source should be clearly identified and secured in the triangle formed by your chin and rib cage corners so that it frees easily with a tug. Don't allow it to dangle and don't put it in a pocket where it's difficult to see.

Setting up your equipment following what the dive community agrees on, your alternate air source is

tucked in your right side BCD pocket.
tucked in your left side BCD pocket.
hanging free on the right cylinder side.
hanging free on the left cylinder side.
secured in the triangle formed by your chin and rib cage corners.
secured on the lower outside right side of your BCD.

Question 3 of 13

All of these are common causes of equipment-related problems except not using top-of-the-line gear. Top-of-the-line equipment offers the best performance and is generally worth the investment, but all equipment produced by reputable manufacturers meets the requirements of recreational diving.

Which of the following are causes of equipment-related problems? (Choose all that apply.)

Not using top-of-the-line equipment.
Using unfamiliar equipment.
Using equipment that doesn't fit properly.

Using makeshift or obsolete equipment.
Failing to use equipment essential for the environment.
Using equipment with unauthorized modifications.
Failing to properly inspect/maintain equipment.

Question 4 of 13

Dive equipment releases are highly reliable when your use and care for them properly. Review the discussion on release problems if you don't understand the possible problems.

Which of the following are possible problems related to equipment releases? (Choose all that apply.)

Cylinder band release has strap threaded improperly.
Quick-release buckle does not hold.
Quick-disconnect fastener with a lot of wear pulls free.
Failure to connect inflator quick-disconnect before dive.

Question 5 of 13

Aquatic life injuries are classified as bites, stings and cuts, abrasions and punctures. Aquatic injuries generally result from defensive mechanisms and behavior, not from attacks, malice or aggression. You can classify aquatic life injuries as what forms? (Choose three.)

Bites
Maliciousnesses
Stings
Attacks
Aggressives
Cuts, abrasions & punctures
Whiplashes
Ambushes

Question 6 of 13

Begin all treatment and first aid for any aquatic life injury with primary assessment. Maintain the primary cycle of care before worrying about more specific first aid, and for serious injuries get the patient to emergency medical care as soon as possible. Treatment for all aquatic life injuries begins with

removing spines/stingers.
treating for shock.
soaking the affected area.
primary assessment.

Question 7 of 13

After primary assessment and monitoring, remove the tentacles by rinsing with acetic acid solution, then use forceps or other tool. Don't use fresh water or rub the area because this will trigger further stinging cells. For pain relief, apply a heat pack or hot water. If the patient has signs or symptoms more serious than mild pain at the wound, get the diver to emergency medical care while monitoring the patient's lifeline.

Surfacing from a dive, your buddy accidentally brushes an exposed arm against jellyfish tentacles. Which of the following first aid steps may apply? (Choose all that apply.)

Rub the area vigorously.
Remove tentacles with forceps or other tool.
Rinse with acetic acid (vinegar).
Follow local emergency protocols.

Question 8 of 13

Keep your eyes on the victim at all times. Enter the water as close as possible to the victim using a technique that lets you keep the diver in sight.

You're on a boat when a diver surfaces and signals for help, too far to throw to and there are no watercraft available. When you enter the water, you would get in

as close to the diver as possible, keeping sight on the diver all times.
where you are when sighted, using a head-first racing dive.

Question 9 of 13

You want to get there quickly, but with enough strength to handle the rescue, so pace yourself. Don't waste all your energy swimming to the victim.

As you swim to help the diver in Question 8, you swim

as quickly as you can.
paced to conserve energy.
as slowly as you can.

Question 10 of 13

By having your feet angled toward the victim, you can quickly reverse away should the diver become panicked and attempt to climb on to you.

When you approach the victim in Question 8, you stop outside of the diver's reach to evaluate, prepared for a quick reverse. This means you

have your feet angled toward the victim.
will swim back to the boat for more equipment.
may decide to abandon the victim.

Question 11 of 13

Providing a source of immediate buoyancy allows you to avoid contact with a panicked diver and usually solves the immediate problem. Once the diver is buoyant and calm, it may be easier to tow the diver with the PFD.

In the scenario in Question 8, as you go to the entry area to quickly put on your mask, fins and snorkel, you pass a PFD (personal flotation device). You should take the PFD with you.

True
False

Question 12 of 13

Communicating is important because it helps further reassure the diver. The diver may also be able to assist your efforts by following your directions.

When towing the diver in Question 8, you would choose a tow that allows you to communicate with the diver.

True
False

Question 13 of 13

The immediate concerns are checking for medical conditions and contacting EMS if you suspect anything serious, and being sensitive to the diver's feelings. Divers who need a rescue may be embarrassed. Being sensitive can help the person learn, feel reassured and continue to enjoy diving.

After getting the diver from Question 8 back aboard the boat, the immediate concerns are (choose all that apply)

assess the diver for injuries or illnesses
find out what happened
contact EMS if the diver has a serious medical condition
be sensitive to the diver's feelings
check that the diver's gear is stowed properly

SECTION THREE

Blake and Émile arrived at one of their favorite dive sites, a shallow reef just offshore, which they reached by swimming from a steep rocky beach. Normally the beach had a steady flow of sunbathers and anglers, but this day was overcast and windy, and in the middle of the week. When they arrived, they were alone.

The pair entered from shore through moderately heavy surf – normal for this steep beach. Because the water and the air were cool, they had chosen dry suits. This would make their entry and surface swim to the reef more tiring, but they reasoned that it would allow a longer dive in comfort. The high surf at this site called for breathing from their scuba units during both their entry and exit. Although it wasn't

likely they'd encounter boats under the conditions, they towed a float with dive flag as required by local law.

Both divers were experienced and dived often. Both stayed physically fit, but Blake had recently recovered from knee surgery, and had been away from his regular schedule of physical activity. He found the entry and swim out much more tiring than usual, and used far more air than normal swimming through the surf.

The pair reached the dive site and, after resting, descended. The dive progressed normally, but unknown to Émile and Blake, pushed by the growing wind, the swell and surf rose considerably while they were underwater. When they surfaced, three-metre/nine-foot waves were breaking. Also, because Blake had used more air than usual on the entry, he had little air remaining.

They timed their exit for a lull in the waves, but in these conditions the "lull" still had two-metre/six-and-a-half foot waves breaking. They swam toward the surf zone, switched to their regulators and descended, with Blake holding Émile's forearm to maintain contact while Émile towed the float, planning to swim in under the waves as far as possible, then crawl out on their hands and knees.

It was hard work pulling against the surge. They had hardly entered the surf zone when Blake ran out of air.

Blake's tug alerted Émile to a problem. Émile was turning back to deep water when Blake let go. Émile surfaced immediately, and found Blake a short distance away, choking and coughing, but in control. A few waves nearly broke on them, but they were still on the ocean side of the surf zone. Blake orally inflated his BCD and they swam a safe distance from the surf.

"I'm nearly out of air," said Blake, who appeared to Émile to be exhausted. "And I don't think I can make it through on the surface. I'm too weak."

Émile looked toward shore to see who he could call for help, but they were alone.

INTRODUCTION

Section Three shifts to new areas and aspects of managing diver emergencies. You'll start by looking at making an emergency action plan – which is a way to think as much as a way to prepare yourself. From there you'll learn specifics about how your CPR and first-aid skills apply to the unique concerns of diving, including how dive scenarios affect Basic Life Support considerations, and specific first-aid situations that diving can present.

To this point, most of your rescue training has focused on handling problems at the surface. In this section, you'll start to look at rescue situations that take place underwater.

THE PSYCHOLOGY OF RESCUE III

EMERGENCY ACTION PLANS

You might think that the topic of emergency action plans fits more appropriately under "Being Prepared for an Emergency III." Certainly it wouldn't be out of place there, but it appears under "The Psychology of Rescue III" because this topic involves a way to think as much as it involves writing a plan.

The most effective emergency responses result from teamwork and preparation. By thinking about what may happen, and how you and others would have to respond, you mentally prepare a list of answers to likely questions. When trouble arises, you draw upon this preparation. Actually practicing emergency scenarios takes this a step further. Preparation increases the speed and efficiency with which you handle an emergency, so make it a habit to constantly prepare for an emergency.

At the most basic level, an emergency action plan is simply an extension of the emergency assistance plan you learned about in Section One. It is the information you will need, at a particular dive site, in the event of a dive accident. This can be a short list in well-developed areas with sophisticated diver medical services, or it can be extensive in a remote area with little coordinated public emergency support. It may be something you just know – like "dial 911" – or you may need a formal, written detailed plan.

Regardless, you want to have an emergency action plan for the sites you visit, and ideally, practice using the plan with other rescue divers and higher-level divers. Practice with the plan helps identify hazardous areas where problems are most likely, additional information the plan may need, ways to refine your responses and so on.

Your emergency action plan should consider your team: yourself, other divers, the local emergency response team (EMS or local fire department), and appropriate local medical services. To the degree feasible, involving these in forming emergency action plans makes them more efficient and more effective. In some areas, you may be able to arrange for your group to practice procedures with outside emergency personnel.

In putting your emergency action plan together, consider what you're likely to have to do. Most plans include some or all of the following:

- the sequence of steps to follow that may be affected by the local environment;
- a list of emergency phone numbers (see Section Two);
- a script for what to say when calling emergency services – especially helpful when delegating untrained bystanders to make call for you;
- the procedures for responding to, moving and transporting an injured diver out of the area to within reach of emergency medical care;
- procedures for completing any required accident and incident reports.

Although it's not always feasible or practical, when you can there are three benefits to practicing emergency procedures regularly based on your emergency plan: The first is that it refines your response skills. Second, it makes a real emergency less stressful because you and other divers are familiar with your roles, you know what to do and you're more confident because you've done it. Third, after practicing you can evaluate your performance and refine the plan based on areas you could improve.

A practice run does not have to be an all-day event. A good time to run through a scenario may be at the end of a day of diving, and simply take 15 to 20 minutes. Even when you can't do a full-blown simulated accident scenario, there's tremendous benefit if you and those with whom you dive regularly walk through the steps, discussing what you would do, when, where, why and how.

Emergency action plans are not necessarily complex or difficult to complete. As mentioned, when diving in an urban area with emergency medical services, your contact information may be a single local number and the local diver emergency service number. Transport and evacuation may be as simple as carrying the diver up the stairs or meeting emergency medical personnel at the dock. Likewise, one of the benefits of going out with professional dive operators is that they maintain an emergency action plan for their operation and area. As a PADI Rescue Diver, your role would most likely be part of a team carrying out their plan as delegated to you – which can include being asked to stay clear unless asked to assist.

On the other hand, the more remote your dive site and away from a dive operation, the more thought and information your plan requires. You may need to have separate contact information for emergency medical services – you may even need multiple service contacts, each for a different type of emergency. Your plan may need to consider first aid and Basic Life Support for many hours. If you'll be diving in this type of situation, you may want to consider further training in remote area first aid and emergency management.
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Exercise 3 – 1

Question 1

Basically, an emergency action plan is the information you would need in the event of an emergency in a particular location or at a particular site.

True
False

Question 2

Areas of information an emergency action plan may include (choose all that apply)

steps to follow.

emergency phone numbers.

a script for what to say when calling emergency services.
information about any required accident reports.

Question 3

Benefits of practicing emergency procedures regularly based on your emergency action plan include that (choose all that apply)

it eliminates need to brush up on rescue skills periodically.
it reduces stress in the event of a real emergency.
it refines your response skills.
it allows you to evaluate your performance and refine your plan.

BEING PREPARED FOR A DIVER EMERGENCY III

BASIC LIFE SUPPORT FOR DIVE EMERGENCIES

As you know from your Emergency First Response training in CPR and first aid, Basic Life Support (BLS) includes monitoring and enacting emergency procedures for patient respiratory and/or cardiovascular system failure, which cuts off oxygen to the body, making death imminent. In following the AB-CABS (Airway, Breathing, Chest Compressions, Airway, Breathing, Serious Bleeding, Shock, and Spinal Management) of the patient's lifeline, you provide BLS.

Many circumstances that cause medical emergencies in day-to-day life can cause the same emergencies in diving circumstances, but dive accidents have unique emergencies that can also require BLS. Dive accidents involving drowning, decompression sickness and lung overexpansion injuries can cause respiratory and/or cardiac arrest. Heavy exposure suits in hot weather can cause heat stroke and heat exhaustion. Prolonged exposure to cold water can cause hypothermia.

Diving is a physical activity with physical stress. Predisposed individuals exerting beyond their physical limits can suffer heart attack or stroke. These are not dive accidents per se, but the activity of diving can be the trigger just like any other sport, and complicate rescue efforts if they occur underwater or in the water.

BLS in dive accidents may require rescue breaths for a nonbreathing diver using mouth-to-rescue breathing mask, mouth-to-mouth or other ventilation methods. You'll practice rescue breathing in the water. For a diver with no heartbeat, BLS requires CPR chest compressions, but because you need the person on a firm surface, you can't begin compressions until you remove the victim from the water. You'll also practice managing emergencies for divers who aren't breathing and have no pulse.

As you recall, time affects Basic Life Support. You want to begin BLS as soon as you recognize the need because, without oxygen, brain damage can occur in four to six minutes. Time is critical. After six minutes, brain damage is likely and after 10 minutes it is almost certain.
In diving circumstances, one challenge is that it's harder to recognize the need for BLS as quickly. For example, it is often impossible to tell if an unresponsive,

nonbreathing diver has a heartbeat or not. Even if you can tell, you may not be able to begin BLS until you exit the water – and exiting the water may present difficulties and delays due to environment and conditions.

Any emergency situation – diving or nondiving – will have conditions beyond your control. That's just how it is. The realities of diving can keep you from beginning BLS as soon as you'd like, but whatever circumstances you face as a rescuer, keep time in mind as you formulate plans for helping a diver who needs, or who may need, BLS. Do whatever you can to shorten the time to beginning BLS.

Focus on beginning rescue breaths and/or CPR as soon as possible, without compromising your own safety. Part of BLS procedures includes contacting the local Emergency Medical Service (EMS) system as soon as possible. In a diving context, you may have a delay before you can begin CPR, but not in contacting EMS. For example, you may be a ten-minute swim from shore with a victim, but able to yell for someone to contact EMS. This brings emergency medical care to the site ten minutes faster.
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Exercise 3 – 2

Question 1

Basic Life Support is (choose all that apply)

the emergency care found only in a trauma center.
monitoring and enacting emergency procedures for respiratory and/or cardiovascular system failure.
not ever applicable to a dive accident.

Question 2

Dive accidents that may require BLS include (choose all that apply)

drowning.
decompression sickness.
heart attack.
heat stroke.

Question 3

Time affects BLS because the longer the brain goes without oxygen, the more likely it becomes that brain damage will occur.

True
False

EMERGENCY CARE

In your Emergency First Response training, you learned that a primary assessment is the process of assessing a victim/patient's situation and condition. In dive accidents, you follow the same steps you've already learned, but the environment

may affect your assessment. Here are the steps of primary assessment in order of priority, with a look at how diving circumstances can affect them:

1. Assess the situation.
Look for hazards that may cause further harm to you or the injured diver. In diving, watch out for things like stinging organisms, boat traffic, waves or current. Water can conceal potential dangers, so beware of submerged objects or other hazards, especially if you're entering the water from boat or shore.

2. Establish responsiveness.
Shake and tap on an apparently unresponsive diver, and turn a diver who is face down in the water face up.

3. Upon discovering unresponsiveness or other serious medical emergency, call for help as soon as possible.
In nondiving circumstances, this has become increasingly easier thanks to modern communications like cell phones. But when you're diving, you may not be able to contact help as quickly, such as if you're underwater or a long way from boat or shore. As you've learned, summon help as soon as possible.

4. Establish an airway if the diver is unresponsive.
You've learned to do this out of the water, but doing so in the water requires special techniques that you'll learn and practice later. Diving circumstances also require protecting the victim's airway from water, which is part of those techniques.
5. Check for breathing.
If the victim isn't breathing, begin giving rescue breaths, again using techniques for doing so in the water.

6. Check for circulation (heartbeat).
If the diver has no circulation, you need to begin CPR, but you can only do this after getting the person out of the water and onto a hard surface. Further, it's so difficult as to border on impossible to determine whether a victim has a heartbeat in the water, so the protocol is that you don't waste time trying. If the diver isn't breathing, you begin rescue breaths and tow the victim to boat or shore as quickly as possible for further assessment, and begin CPR as necessary.

7. Check for bleeding.
If the victim is breathing (which means there's a heartbeat, too), determine if there's any serious bleeding that you must control. In dive contexts, a responsive victim will usually know if there's a substantial injury (bite or wound) to check. Direct pressure will work in water, but it may be difficult or impossible to use pressure points through an exposure suit. Elevating an arm above the surface may be effective for short periods. When there's bleeding from a leg, it may be most effective for the victim to apply pressure (if responsive and possible) while you tow, or for one rescuer to apply pressure while another tows. The body's clotting mechanism may be slowed by water, so getting the diver out of the water is a priority.

MANAGING SHOCK

The previous steps are all part of shock management. Out of the water, you continue shock management as you learned in the EFR course, while following the priorities for rescue breathing, CPR and first aid.

As you recall, shock is a state in which profound depression of vital body processes occurs. Severe, sustained shock is a critical condition that can have permanent effects, even death.

There are nine signs and symptoms of shock. (Remember, a sign is something you observe and a symptom is something the injured diver describes to you):

1. Rapid, weak pulse
2. Pale or bluish tissue color
3. Moist, clammy skin – possibly with shivering
4. Mental confusion, anxiety, restlessness or irritability
5. Altered consciousness
6. Nausea and perhaps vomiting
7. Thirst
8. Lackluster eyes, dazed look
9. Shallow, but rapid, labored breathing

Many dive accidents can cause shock, including decompression sickness, lung overexpansion injury, aquatic life injuries, heat stroke or exhaustion, hypothermia and drowning. Anything that causes a serious wound or trauma can cause shock. Once out of the water, shock management procedures begin with primary assessment and monitoring the patient's AB-CABS until a medical professional takes over.

Maintain the patient's body temperature. In dive circumstances, this may mean removing a wet exposure suit – cutting it away if necessary with a weak patient. It can also mean protecting the patient from heat, by providing shade and sun exposure protection, and removing a hot exposure suit.

Keep the patient lying down. This is important in shock treatment, but as you'll learn more about later, is also a specific first-aid step for treating decompression sickness and lung overexpansion injuries. Elevate the legs, (except for head or chest injury, heart problem, stroke or if the leg may be broken). Generally avoid giving the patient anything to eat or drink, though a diver with suspected decompression sickness or lung overexpansion injury may drink water to maintain hydration. But, do this with the patient taking small sips lying down – not by sitting or standing.

SECONDARY ASSESSMENT

Just as you learned for general first aid, in dive accidents you perform a secondary assessment on a responsive diver only after a primary assessment determines that no life-threatening conditions exist. You do this exactly as you learn in your EFR

training, with the patient in the position found if possible. In diving, this situation is most often in circumstances such as a hard fall while wearing dive gear, or getting injured by waves while entering or exiting the water.

Examine the diver from head to toe as you've learned, checking for sensitive areas, looking for deformities, fluid, swelling or reaction to pain. An exposure suit may interfere with injury assessment, but don't try to remove it if you suspect spinal injury. If you suspect spinal injury and you need to get the patient out of the suit to prevent overheating while waiting for EMS, cut the suit off carefully, while keeping the patient immobile.

Begin first aid for any injuries you discover during injury assessment, again following the protocols you learn in EFR. Monitor the diver's AB-CABS until medical personnel arrive.

Exercise 3 – 3

Question 1

The first two steps for primary assessment are establishing responsiveness and checking for a heartbeat.

True
False

Question 2

When rescuing an unresponsive diver in the water, it is important to check for a heartbeat.

True
False

Question 3

Signs and symptoms of shock include (choose all that apply)

shallow breathing.
moist, clammy skin.
nausea.
restlessness.

Question 4

Shock almost never occurs in dive accidents.

True
False

Question 5

Treating shock in diving circumstances may require keeping a patient warm, or keeping a patient cool.

True
False

Question 6

The procedures for a secondary assessment in diving are the same as those you learn in EFR secondary assessment.

True
False

THERMAL PROBLEMS

With heavy exposure suits, cool water and hot climates, diving presents the potential for heat-related emergencies, including too much heat and too little. The body maintains its core (internal) temperature at approximately 37°C/98°F via different physiological mechanisms that promote heat loss or cooling as needed. As a PADI Rescue Diver, you're concerned with heat exhaustion, heat stroke and hypothermia, which can occur if exposure to heat or cold exceeds the body's ability to maintain its core temperature.

HEAT EXHAUSTION AND HEAT STROKE

Heat exhaustion and heat stroke are forms of hyperthermia (too much heat) that generally occur before a dive, when a diver wears a heavy exposure suit in a hot climate. Exercise, which generates body heat, makes the situation worse. Two of the body's chief methods for cooling are perspiration, which cools by evaporation, and dilating capillaries to promote blood flow and cooling through the skin. An exposure suit effectively negates both of these mechanisms.

Heat exhaustion occurs when the body's ability to cool becomes taxed. Symptoms and signs include profuse sweating, nausea, dizziness, weakness and faintness. The body temperature will be near normal, with cool clammy skin. To handle suspected heat exhaustion, begin with primary assessment and move the patient to a cool, shaded area. Have the patient remove the exposure suit and drink water. Up to a litre/quart is acceptable, because heat exhaustion often causes dehydration. If symptoms don't subside within approximately 30 minutes, contact emergency medical care.

Heat stroke is a far more serious condition, and occurs when rising temperatures exceed the body's cooling mechanisms. These mechanisms fail, and the core temperature begins to rise, which like a high fever, can destroy tissue and cause permanent disability. You should consider heat stroke to be immediately life threatening.

Symptoms include hot, dry flushed skin. The patient is hot to the touch and does

not perspire. Begin with primary assessment. Get the patient into a cool area, remove the exposure suit and immerse the patient in cool water or apply cool wet towels. Contact emergency medical care while monitoring the patient's lifeline.

HYPOTHERMIA

Hypothermia occurs when the body cannot maintain its internal temperature and begins to cool. It usually results from diving in cool water, but can occur from failing to wear adequate protection before or after a dive in cold climates.

It's important to recognize that "adequate exposure protection" varies to some degree. In all but the warmest water, even with a wet suit or dry suit, a diver loses heat faster than the body can generate it. This is because, without protection, water absorbs heat about 25 times faster than air does. Furthermore, the diver loses some heat to each breath as the body warms the cool gas.

An exposure suit slows the heat loss down significantly compared to diving without one, but given enough time the body may lose too much heat. A diver may be adequately protected and comfortable with a given amount of protection at a certain temperature for 30 minutes, for example, but become uncomfortable in an hour. If a diver encountered circumstances that prevented exiting the water for three hours, hypothermia could be a substantial concern.

Likewise, in many multiple dive circumstances, divers partially rewarm between dives, but don't have time to entirely rewarm. In these instances, hypothermia may be even more of a concern.

Hypothermia can also occur or become worse when a diver leaves the cold environment. This phenomenon is believed to be caused by cool blood from the extremities returning to the core and cooling it as normal circulation restores in the warm environment.

Short of causing immediately life-threatening symptoms, hypothermia affects divers in three concerning ways. First, the cold exposure is a distraction that takes the diver's focus away from the dive. Second, with extremity numbness, especially in the fingers, the diver loses manual dexterity and strength, making it difficult or even impossible to operate dive gear.

Third, as hypothermia becomes more severe, it impairs mental processes, slowing emergency responses and altering good judgment.

Signs and symptoms begin with shivering, numbness and blueness in fingers, lips and toes (may be difficult to see underwater). Shivering is the body's attempt to generate heat by muscle contraction and internal friction. Numbness and blueness result from the body reducing blood flow to the extremities, which radiate too much heat.

First aid begins with primary assessment. Take an alert patient with mild hypothermia to warmth, remove the exposure suit and dry the patient, rewarming

by covering the head and applying heat to the neck, armpits and groin. Keep the patient lying down and not exercising, both of which can lead to heart beat irregularities in hypothermia.

For severe hypothermia, contact emergency medical care and protect the patient from further cooling, but leave rewarming to EMS because doing so is medically complicated. Improper rewarming can further injure the patient and cause cardiac disturbances.
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Exercise 3 – 4

Question 1

Heat _____ causes profuse sweating, whereas with heat _____, the patient does not perspire. Treat heat _____ as immediately life threatening.

stroke, exhaustion, exhaustion
stroke, exhaustion, stroke
exhaustion, stroke, exhaustion
exhaustion, stroke, stroke

Question 2

If the patient isn't shivering, then hypothermia is not a concern.

True
False

Question 3

For severe hypothermia, you should protect the patient from further cooling but leave rewarming to medical professionals.

True
False

RESPONDING TO DIVER EMERGENCIES III

MANAGING AN EMERGENCY UNDERWATER

Underwater, signs of trouble tend to be more subtle, but as you've already learned you can often spot them by being alert. Watch for rapid breathing, awkward kicking, or other signs indicating exhaustion and tiring. A panicked or near-panicked diver underwater may have wide eyes, breathe rapidly and tend to maintain a vertical posture. Jerky movements, using arms to swim, and sinking while swimming upward all point to imminent panic. Panicked divers may reject their masks and regulators and bolt for the surface, forgetting to exhale; this poses a serious danger of lung overexpansion injury. A similar situation may arise from an uncontrolled ascent caused by ineffective buoyancy control, a sticking low-pressure inflator, or accidentally losing weights.

Nonetheless, you can help another diver effectively in many situations, including the following common problems:

Overexertion.
As you've already learned, overexertion can be closely linked to stress and panic. Rapid, shallow breathing, whether initiated by fear or trying to swim too hard, can cause the diver to feel air starved, setting up a stress cycle that leads to more rapid breathing, increased air starvation and eventually panic.

Watch for overexertion when you see a diver swimming hard or doing anything strenuous underwater. Also look for more bubbles than usual; if you've been monitoring the diver's air supply and can get a look at the SPG, check for a sharp increase in air use.

Have an overexerting diver stop everything and rest. Preferably, make contact and have the diver hold on to something stationary, such as a rock or anchor line, except in heavy surge where this may require even more effort. When doing this, however, make sure there's nothing that could sting or cut the diver on the stationary object.

Encourage the diver to relax and resume breathing normally by signaling or writing on your slate. After the diver recovers, it's a good idea to keep watching to avoid accidental overexertion again.

Uncontrolled Descent.
While you might expect uncontrolled descents from only overweighted divers, any diver can have this problem. Uncontrolled descents result from improper buoyancy control, and can happen if a diver fails to compensate for lost exposure suit buoyancy by putting air in the BCD during descent, causing the descent to accelerate with depth. Uncontrolled descents can also result from carrying something heavy, BCD or dry suit seal failure, inflator or valve failure, and in some instances, strong down currents. A diver sinking out of control initially faces a high risk of ear and sinus squeeze, with greater hazard as the diver reaches extreme depths where nitrogen narcosis, rapid air use and short no decompression limits complicate the problem.

You can often stop an uncontrolled descent by signaling the diver to add air to the BCD and level off. If this doesn't work, make contact with the diver to arrest the descent. Use caution and avoid descending below safe depths as you swim after the diver. When you reach the diver, grasp the BCD or cylinder valve, then add air to the BCD. If the victim's BCD doesn't work, then use your BCD. Keep in mind that this will make you excessively buoyant if you let go, so be ready to prevent a runaway ascent, if necessary.

If a diver has extreme negative buoyancy, such as with dry suit flooding, you may need to drop the diver's weights. Generally, don't do this unless you have no alternative because dropping weights can cause excessive buoyancy, turning an uncontrolled descent into an uncontrolled ascent. Also, divers sometimes kick

hard when fighting an uncontrolled descent, so watch for overexertion.

Excessive Buoyancy.
A sticking low-pressure inflator or accidentally dropping weights can cause excessive buoyancy, but you usually see it in a diver who starts the dive with insufficient weight. The diver swims in a head-down attitude, kicking to fight the buoyancy and consequently using air rapidly. Rapid air consumption aggravates the problem because the tank becomes lighter.

Escort an underweighted diver to the surface and get the right amount of weight. Sometimes an underweighted diver can kick down deep enough to compress the exposure suit or carry rocks, but these practices can lead to rapid ascents and make it difficult to maintain safety stops.

Divers sometimes find themselves with excess buoyancy when they ascend over something without releasing expanding air from their BCDs. The increased buoyancy lifts them, causing more expansion and more buoyancy. If they don't react quickly, they may find themselves in a runaway ascent.
If you're close to someone as a runaway ascent begins, you need to make contact and correct the problem quickly. Use the quick dump on the diver's BCD if possible, and reduce your own buoyancy by dumping your BCD. If the diver's inflator has stuck, disconnect the low-pressure hose.

If you can't stop the ascent or reach the diver in time, let go. You won't help the victim by making a rapid ascent, too. Try to signal the victim to flare arms and legs to create drag and slow the ascent. Ascend at a normal, safe rate and check that the victim hasn't been injured.

Cramps.
You practiced cramp relief in the Self Rescue Review, and you've practiced relieving your own and another diver's cramps. Before helping the diver stretch and massage a cramp, point to the muscle you suspect has cramps and confirm with the "cramp" signal. You can use the same signal to tell your buddy you have a cramp, of course.

After relieving the cramp, encourage a slower pace and stay close, just in case the diver needs a tow back to the boat or shore.

WHAT CAUSES CRAMPS?

A cramp is a sudden, involuntary muscle contraction involving a single muscle or a series of muscles. This happens when the body temporarily loses its ability to control the muscle.

The most common reasons for cramps are low potassium (which the body uses for muscle control), dehydration (which alters the availability of potassium and other minerals), and lack of fitness in the affected muscle group for the exercise it's doing. All of these can contribute simultaneously.

Prevent cramps by staying well hydrated (which also reduces DCI risk) and eating a properly balanced diet. Bananas supply high potassium if you believe you need to boost your potassium levels. If you frequently experience cramps in a particular muscle group, exercise to develop those muscles.

Entanglement.
Divers seldom swim into something that causes severe entanglement, but fishing line is by far the most common cause. Divers sometimes have problems with nets in low visibility when wreck diving. Severe entanglement more commonly results when a diver becomes slightly tangled behind his back and turns to try to extricate himself. Turning wraps more of the rope, kelp, fishing line, etc., around the diver, making the situation much worse.

Therefore, your first priority when dealing with entanglement is to have the victim hold still. Signal "stop," and get the victim to hold still while you disentangle him. Reassure the diver as you progress to discourage turning to see how you're doing and causing more tangles.

Usually you can free an entangled diver without cutting. If you must cut the diver free, use caution. You may find that large, heavy-duty dive knives don't always have the sharpness you want for cutting, so you may prefer to carry a second, smaller dive knife kept very sharp and reserved exclusively for emergencies.

Entrapment.
Entrapment situations, such as getting a limb stuck under something, or wedged into a gap, are very rare in recreational diving. If a diver becomes entrapped, your first concern will be ensuring adequate air supply while working to free the diver.

If you believe you won't be able to free the victim before you run out of air, it may be best to ascend and get more while you still have ample time. If you decide to do this, mark the site in any way possible so you can return easily with additional tanks. You may also consider leaving your scuba unit with the victim and making an assisted or emergency ascent.

Entrapment can also occur when an improperly trained and improperly equipped diver enters an overhead environment and loses his way back out. Unless you're both properly trained and properly equipped for the particular overhead environment, do not attempt to rescue a diver believed lost in it. The chances are that you'll become a victim, too, rather than rescue the lost diver. You can do the most for the lost diver by seeking qualified help as quickly as possible.

Passive Panic.
As discussed earlier, panic may not manifest itself with wild struggling. In some instances, the victim freezes into a trance-like state unaware of the surroundings or anything happening.

Approach the diver from the front and signal, "Okay?" If you get no response, go behind the diver and, holding the regulator in place, take the diver to the surface.

It's important to help the diver from behind because passive panic may change to active panic without warning; by remaining behind the victim, you'll be out of the diver's immediate grasp.

Once you reach the surface, establish buoyancy for the victim and yourself, and help the victim out of the water.

Active Panic.
Assisting a diver with active panic underwater poses a serious situation for both you and the victim. The victim may go from stress to total panic in seconds, sometimes as you're approaching to help. As with panic on the surface, the victim may claw, grab and struggle with tremendous strength, possibly yanking out a rescuer's second stage or knocking off the mask. The panicked diver may fight to reach the surface, instinctively holding his breath and creating a serious risk of lung overexpansion injury.

Often a panicked diver will bolt for the surface ahead of you, forcing you to grab a foot or leg to restore control to prevent an uncontrolled ascent. You probably can't stop a panicked diver from ascending, but you don't need to. You want to prevent a rapid, breath-held ascent. If the victim has the regulator in the mouth, simply hanging on and flaring out will usually suffice to control the ascent rate. If the victim is breath-holding, delay is your best bet at getting the diver to resume breathing before ascending too far. If without air, your delay may get the diver to signal for your alternate air source or reach for the second stage in your mouth.

If the diver has dropped the regulator and is breath-holding, the victim probably ran out of air. Slow the ascent as much as possible while providing your alternate air source. Since a panicked person doesn't usually respond rationally, you may have to force the mouthpiece into the mouth while depressing the purge button lightly to keep it clear. Even if the diver refuses it, the diver must begin breathing eventually; you want to slow or arrest the ascent until the victim at least begins exhaling. Once you get the diver breathing from it, even though possibly coughing and choking in the process, finish the ascent.

Once you reach the surface with a panicked diver, establish positive buoyancy for the victim, and exercise control using the procedures for rescuing a panicked diver at the surface

Exercise 3 – 5

Question 1

Signs that a diver may have a problem underwater may include (choose all that apply)

rapid breathing.
horizontal posture.
swimming with arms.
jerky movements.

Question 2

In the case of a panicked ascent you want to

stop the ascent entirely.
let the diver go.
prevent a rapid, breath-held ascent.

MISSING DIVER PROCEDURES

Missing diver situations can arise suddenly, without warning. You may be in a group aboard a charter dive boat or ashore after a dive, when a diver surfaces alone and announces he can't find his buddy. Or, you may simply be near water when someone nearby calls for help – in this case, the missing "diver" may not be a diver, but a swimmer, water-skier, angler or other person (Note: For brevity, the term "missing diver" or "victim" will be used from here on.) Regardless of who the victim is, time is precious. You need to get things going quickly. Remember, if the victim isn't breathing, permanent brain damage is likely after six minutes.

How you respond will depend on the resources you have, but put the following steps in motion as practical:

1. Have someone call for emergency help (EMS, coast guard, etc. as appropriate for the area) while you find out where anyone last saw the missing diver.

2. Assign spotters to look in that area for bubbles and to direct rescuers to the area. Tell them where to get binoculars if you have them.

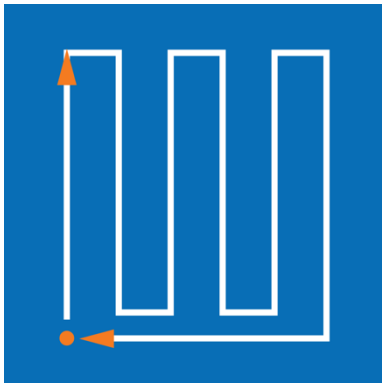
3. Try to determine if the missing diver may have left without telling anyone. Have someone look for the diver's clothes, gear bag, automobile, etc.

4. Immediately assign qualified divers to don scuba equipment and head to the area where the diver was seen last, to begin an underwater search.

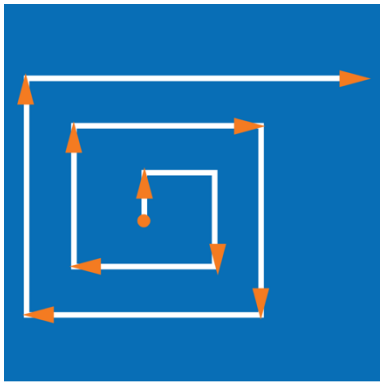
5. If immediately available, send two or more skin divers to mark the search area with buoys. If they don't have commercially made marker buoys, they may be able to improvise with dive floats, empty bottles and twine, etc. Don't waste time doing this – delegate and stay focused on getting the rescue moving. The skin divers should save you time, or begin the rescue if they find the victim in water shallow enough to locate and surface the person by freediving. However, don't waste time with this step if it won't do anything to make the rescue more efficient.

A missing diver search calls for executing a search pattern; random searches may, perhaps, be better than nothing, but provide less chance of finding the missing diver. Since you're in a time-critical situation, your best bet will generally be a simple pattern requiring little or no special equipment. The most effective search

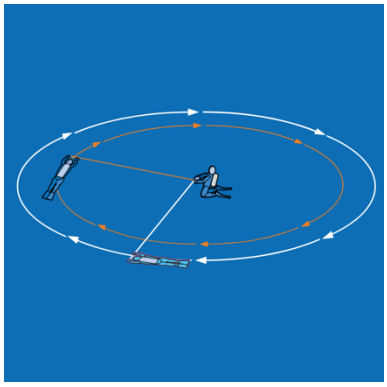
pattern depends on environmental conditions, but you'll usually find one of these four patterns appropriate:



U-Pattern.
The U-pattern works well for covering a large area using minimal equipment. It's a good choice when you have several search teams, each conducting a U-pattern in a different direction away from where the victim was seen last.



Expanding Square.
The expanding square works well when you have only moderate visibility and you believe the missing diver hasn't gone far. It's a good choice when you have only a single search team. The pattern begins where the diver was seen last and expands outward.



Circular Search.

The circular search allows you to search effectively in poor visibility. However, because it requires a line, it takes longer to set up than the U-pattern or the expanding square. Also, you can only make the search over a relatively unobstructed bottom.

Surface Led Search.
If you need to cover a large, complex area, a surface-led search allows the divers to look for the victim while a skin diver or small boat controls the pattern from the surface. You can search a large area relatively quickly with this method, so it's a good choice for most situations and relatively shallow water.

When searching for a missing diver, keep the following considerations in mind:

1. Have a way to recall searchers to save time when someone finds the victim. Electronic recalls work well, but you can improvise by banging on a boat ladder or holding a tank underwater and rapping on it.

2. Permit searches in buddy teams only. This helps increase safety for the searchers, and it puts two rescuers on the scene when they find the missing diver. Also, make sure searchers have ample air and no decompression time to perform the search. Rescuer safety takes priority; don't permit search divers to jeopardize themselves.

3. Currents don't usually move an unresponsive diver very much on the bottom, so begin searches where someone last saw the diver. If you think the victim lost consciousness on the surface and sank, have rescuers descend from that point without swimming so their descent simulates a sinking unresponsive diver. Keep in mind that strong currents, tidal currents and surge may affect where an unresponsive diver ends up.

4. If you don't have qualified divers present for the search, you may need to choose a buddy and begin the search yourself.

5. Search for 30 minutes, until you find the victim, until you reach the safe limit of air supply, no decompression time or exposure for the searchers, or until relieved by professional assistance.

6. If unsuccessful to this point, turn the search over to professionals.

EXERCISE 3 – 6

Question 1

If you discover a diver is missing (choose all that apply)

determine where anyone last saw the diver.
check to see if the diver may have left the area.
request a helicopter from local authorities.
assign spotters to look for bubbles.

Question 2

Time is critical in a missing diver scenario because you don't want the diver to get too cold.

True
False

Question 3

In moderate visibility with a single buddy team, no equipment and it's not likely the missing diver is too far from the last known spot, the most appropriate search pattern would probably be

the U-pattern.
the expanding square.
the circular search.
the surface led search.

Question 4

When implementing a search for a missing diver

start at the farthest point the diver's likely to be and work inward.
start at the point where the diver was last seen.
it really doesn't matter where you start.

SUMMARY

Émile assessed the situation and his options. He could leave Blake on the float while he went ashore for help. If Blake dropped his weights, there'd be little chance he'd go under in his dry suit, plus the dry suit ensured little chance of hypothermia for a while yet. However, the waves were growing and Émile didn't know how long it would take to get help. Blake could be carried out to sea if he took too long.

They could also abandon their scuba units and go in through the surf with Blake hanging on to the float. The problem was that this could be just as tiring as going under the waves, and without scuba, there wasn't any guarantee that Blake would handle it any better.

Émile checked his air. Because Blake had used air fastest and ended the dive, Émile had 61 bar/900 psi left.

"If we rest a few minutes and you use my alternate air source, do you think you can make it in if you hang on to me while I pull us ashore?" he asked Blake.

"Yes, I think so."

Émile's plan was to have Blake use his alternate second stage and hang on to him while he pulled and swam along the bottom. If they were separated, Blake still had enough of his own air supply to make it to the surface safely.

When Blake felt ready, they again descended, this time with Émile doing most of the kicking

and pulling while Blake hung on to him. Shortly, they crawled safely out of the surf, having only lost their float, which Émile abandoned due to drag during the exit.

From this incident, Blake and Émile learned several lessons. Because they had had to manage alone, they realized that it's much easier to manage an emergency with more than one rescuer present. Therefore, the more challenging the conditions, the more important it is to have several people at the dive site, just in case. Second, they learned the importance of checking weather reports and erring on the conservative side when assessing conditions. Third, they learned that a lengthy period of inactivity is likely to affect diving fitness and skills, and that you need to account for that when planning a dive. Finally, they learned they should never be afraid to abort a dive when problems start to develop.

Émile handled the situation through excellent emergency management. He assessed the situation and, despite very limited resources, he came up with a workable plan by analyzing the rescuer's condition and thinking through his options. In this case, he took advantage of the fact that Blake wasn't panicked and could assist with his own rescue. With a panicked victim or a more seriously tired or injured victim, he would have needed a different approach.

KNOWLEDGE REVIEW

Question 1 of 15

Correct
An emergency action plan is the information you would need in the event of an accident at a particular site. What you need varies with the site, but may include steps to follow, local emergency phone numbers, protocols for interacting with emergency services, procedures you may need for moving/transporting a patient, and any details you may need regarding accident/incident reports.

An emergency action plan is

a comprehensive manual detailing diver emergencies.
a brief discussion on where to get help in a given local area.
the information you would need to manage an accident at a particular site.

Question 2 of 15

BLS (Basic Life Support) means monitoring a patient's heartbeat and breathing, and providing CPR if needed. Providing emergency oxygen is often an important first aid step in diving, but is not considered part of BLS. Your regulator is part of your underwater life support system, but is not termed "BLS."

What is BLS (Basic Life Support)?

Monitoring heartbeat and breathing
Providing emergency oxygen
Another term for your regulator

Question 3 of 15

Correct

Any condition that can cause respiratory or cardiac arrest requires BLS. If the patient stops breathing and/or loses a heartbeat, you may need to provide CPR and defibrillation with an AED. Going underwater may require a life support system, but that isn't termed BLS.

Which of the following may require BLS? (Choose all that apply.)

going underwater
decompression illness (DCI)
heart attack
heat stroke
hypothermia
drowning
stroke

Question 4 of 15

Monitoring breathing and heartbeat is a priority because the longer a patient goes without oxygen to the brain, the more likely brain damage and death. Note, however, that in some circumstances such as drowning in cold water, automatic body responses may supply the brain with oxygen for durations longer than 10 minutes. Therefore, even if the patient has not been breathing or had a heartbeat for a long interval, provide BLS and CPR (as needed) until emergency medical care arrives.

Timely BLS is important because it attempts to keep the brain supplied with oxygen. After _____ minutes without oxygen brain damage is likely, and after _____ minutes it is almost certain.

2; 8
4; 10
6; 10
6; 14

Question 5 of 15

If you had difficulty with this, review the Emergency First Response Primary and Secondary Care Participant Manual as well as the discussion in this section.

Primary assessment begins by assessing the situation, establishing responsiveness and calling for help, followed by opening the patient's airway and

checking for breathing and circulation.
checking for circulation and bleeding.
managing shock and checking for breathing.
checking for bleeding and managing shock.

Question 6 of 15

You may need to turn a diver face up at the surface to establish responsiveness. A diver must be out of the water to manage shock. Underwater, it may be harder to assess the situation for potential hazards. It's almost impossible to check for a heartbeat in the water, so don't waste time on this step. If you find severe bleeding, applying pressure to the wound may help, but it is difficult or impossible to use a pressure point through a wet suit or dry suit. It's important to protect the victim's airway from water, so you need to use techniques you learn in this course when opening airway, checking for breathing and providing rescue breaths if needed.

In which of the following ways may diving affect your primary assessment? (Choose all that apply.)

To establish responsiveness you need to turn the diver face up.
To manage shock you must get the diver out of the water.
Assessing the situation is more difficult because the water may conceal danger.
Checking for circulation is almost impossible so you may skip this step.
You need to open the diver's airway and check for breathing carefully to protect the diver's airway from water..

Question 7 of 15

This is an example of appropriately treating shock in a diving emergency. You may also slightly elevate the patient's legs to help favor blood flow to the heart, but this isn't mandatory. You would not elevate the legs if you suspect leg injury or if it causes patient discomfort.
A diver has had an accident in a cool climate. You and your buddies have gotten the diver ashore and are providing BLS and emergency oxygen. EMS is on the way. The diver is lying down, responsive and breathing, but in pain. You've gotten the wet suit off and put a blanket over the patient to help maintain body temperature.

By enacting these steps, you've followed the procedures for treating shock in a diving emergency.

True
False

Question 8 of 15

With heat exhaustion, the body's cooling ability it taxed. The patient will be sweating profusely and may be nauseous, dizzy, weak or faint, with cool clammy skin that's nearly normal temperature. Heat stroke results when the body's cooling systems fail. The patient's core temperature rises, like a serious fever, and can cause brain injury, tissue damage and permanent disability. A patient with heat stroke has hot, dry, flushed skin, feels hot to the touch, and no longer perspires.

Which of the following are signs/symptoms of heat exhaustion? (Choose all that apply.)

Profuse sweating
Hot, dry skin

No perspiration
Patient hot to touch
Cool, clammy skin
Patient temperature near normal

Question 9 of 15

Correct
The diver is showing signs of heat stroke, which is a medical emergency. Take immediate steps to drop the patient's temperature and contact emergency medical care.

After too long in the hot sun wearing a dry suit, a diver is feeling very poorly. Once out of the suit, the diver isn't sweating and feels hot to the touch. You should call EMS and get the patient into cool water or apply cool wet towels.

True
False

Question 10 of 15

Your buddy is showing the signs/symptoms of hypothermia, meaning the body core temperature has fallen below normal. As hypothermia becomes severe, shivering stops, and the patient becomes more confused, eventually losing consciousness.

You and your buddy have surfaced after a long dive in cool water. You wore a dry suit, but your buddy was in a thin wet suit. The air temperature is brisk, and your buddy was standing around in the wet suit rather than changing into warm dry clothes. Your buddy is now shivering uncontrollably, and complains of numb fingertips and no grip strength. Your buddy's lips, fingers and toes appear bluish. You should begin first aid for

decompression sickness.
decompression illness.
gas narcosis.
hypothermia.

Question 11 of 15

You probably can't stop a panicked diver's ascent, but you usually don't need to. If the diver's breathing from the regulator, hanging on and slowing the ascent will usually suffice. If the diver is breath-holding, this is also your best bet to getting the diver to resume breathing. If the diver has dropped the regulator and/or appears out of gas, provide your alternate air source while slowing the ascent.

A diver bolts for the surface. Assisting the diver requires you to stop the person's ascent.

True
False

Question 12 of 15

Correct
If you or your buddy suffers overexertion, stop and rest. Relax and restore normal breathing. If possible, hang onto a stationary, insensitive object.

Fighting a current, your buddy seems to be breathing very hard and appears over exerted. You should signal your buddy to _____ and restore normal breathing.

stop, hold onto a stationary object, rest
ascend, make a safety stop
slow down, press the regulator purge

Question 13 of 15

When entangled, turning usually makes the situation worse. Signal "stop" and have the diver hold still while you untangle everything. Carefully use your cutting tool if you don't think you can free your buddy in a reasonable period.

While diving on a wreck, your buddy gets some monofilament fishing line wrapped around the cylinder valve and can't get to it. Your first step would be to have your buddy turn to see if that releases it.

True
False

Question 14 of 15

These are all steps to enact if a diver is missing. When diving from shore, you may also have someone try to determine if the diver may have surfaced and left without telling anyone.

A diver is missing after a boat dive. Which of the following steps might you put into action? (Choose all that apply.)

Try to determine where the diver was last seen.
Assign a spotter to look for bubbles.
Call for emergency help.
Assign qualified divers to begin an underwater search on scuba.
If immediately available, have skin divers mark the search area.

Question 15 of 15

These are all important considerations in implementing a search. If there are no qualified divers present, you may have to conduct the search. Search for 30 minutes, until you find the victim, until you reach a gas supply/no stop/exposure limit or until you're relieved by professionals.

When implementing a search for a missing diver, permit searches only by buddy teams within safe gas supply, no stop time and exposure limits. Have a way to recall searchers.

True
False

SECTION FOUR

INTRODUCTION

David, Omar and Maria were at a dive site aboard their favorite charter dive boat. The boat was full, but not overcrowded, and many of their other diver friends were aboard. There were also several divers they didn't know.
The sea conditions were calm, the water warm and there was no current running. The divemaster had just briefed everyone for the first dive, which would be a 30 metre/100 foot deep dive along a drop off.

As David finished assembling his scuba gear, he overheard a diver he didn't know tell his buddy, "My regulator's breathing really stiff, but it'll be okay because this first dive will be short."

Believing what he'd heard might be a safety problem, David told Maria and Omar what he had heard. All three agreed it wouldn't be wise to ignore the problem.

In Section Four, you begin looking at the possible psychological consequences that follow a dive accident, then move into the specific first aid for pressure-related injuries and drowning. Following that, this section discusses managing accidents that involve the unresponsive diver at the surface, which you'll practice in Rescue Training Exercise Seven.

THE PSYCHOLOGY OF RESCUE IV

THE CAUSE OF DIVER EMERGENCIES

A critical incident is an emergency involving a serious injury or death – as you know, dive accidents can involve both. The acute stress such an incident causes may overcome or impair a person's ability to cope emotionally. This acute stress is called critical incident stress

Critical incident stress effects may appear almost immediately, or not manifest themselves until days, weeks or even months have passed. It's important to recognize that after being involved with a dive emergency, you and others involved may experience critical incident stress. It is most likely if the affected diver died or became disabled as a result.

The signs and symptoms of critical incident stress include:

- confusion
- changes in interactions with others

- lowered attention span; restlessness
- increased or decreased eating (weight gain or weight loss)
- denial
- guilt or depression
- uncharacteristic, excessive humor or silence
- anger, humor or silence
- anxiety
- sleeplessness
- unusual behavior
- nightmares

While some of these immediate, short-term reactions to an unpleasant incident are normal, if they persist or worsen then it's likely to be critical incident stress. Don't leave it untreated. Critical incident stress requires professional help to prevent post-traumatic stress disorder. A process called critical incident stress debriefing brings together those with critical incident stress with some of their peers and a trained mental health professional. This process helps those with critical incident stress share and understand their feelings while learning to cope with them.

Exercise 4 – 1

Question 1

Critical incident stress is the stress you feel while handling a rescue situation.

True
False

Question 2

Signs and symptoms of critical incident stress include (choose all that apply)

confusion.
anger.
guilt or depression.
excessive humor.

Question 3

To reduce critical incident stress,

do nothing; it will pass on its own.
enlist professional help.

BEING PREPARED FOR A DIVER EMERGENCY IV

PRESSURE-RELATED INJURIES

Up to this point in your diver training, you've learned about two serious pressure-related injuries that divers can suffer: lung overexpansion injuries and decompression sickness (DCS).

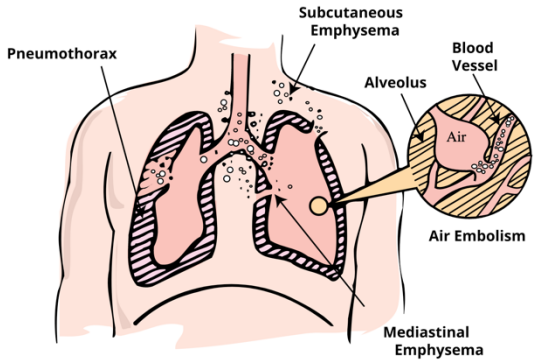
You should be familiar with the different types of injuries lung overexpansion can cause, and be able to contrast those injuries with decompression sickness. However, in the field, lung overexpansion injuries and DCS can be difficult to distinguish because the symptoms overlap. Also, you apply the same first aid for both. Therefore, in the field you'll usually use and hear the term decompression illness (DCI), which combines both lung overexpansion injuries and DCS. At an accident scene, there's no benefit from trying to distinguish between the two.

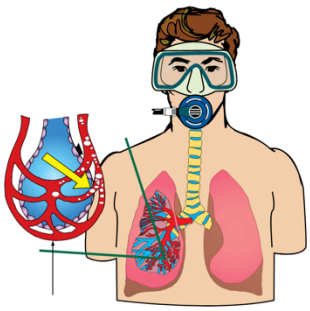
Signs/symptoms of decompression illness include:

- pain in the joints, fatigue
- dizziness
- extreme fatigue
- paralysis
- unconsciousness
- cardiac arrest
- nausea

LUNG OVEREXPANSION INJURIES

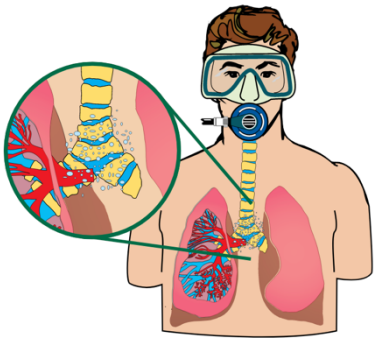
As you probably recall from your PADI Open Water Diver course, lung overexpansion injuries result when a diver holds his breath and ascends, or when a physiological condition (like diving with a chest cold) traps air in the lung during ascent. In either case, the expanding air can rupture the lung, releasing bubbles into body tissues, leading to four distinct possible injuries: *air embolism, mediastinal emphysema, subcutaneous emphysema and pneumothorax.* These four can occur independently, or more than one can occur at once.



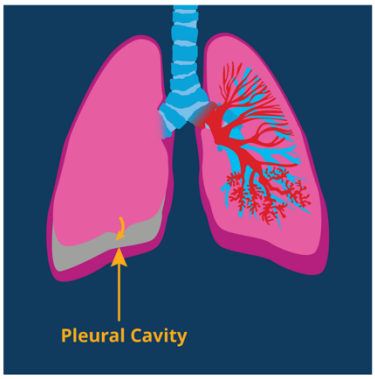


The most serious and (unfortunately) the most common of these is **air embolism**, also called "arterial gas embolism" (or AGE). Air embolism arises when expanding air forces through the alveoli (lung air sacs) into the pulmonary capillaries (blood vessels surrounding the alveoli). This air forms bubbles that travel in the blood stream through the heart into the arterial blood supply, then to the body tissues where they lodge themselves, blocking blood flow. The symptoms of air embolism, then, vary depending upon where the bubbles end up.

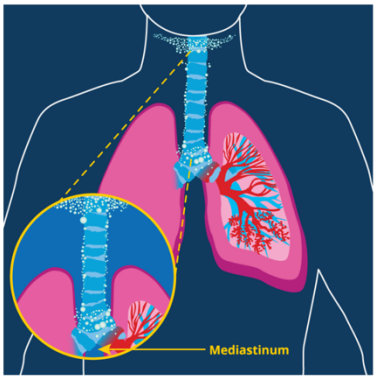
The most serious (and again, unfortunately the most common) symptoms from air embolism result from bubbles traveling through the carotid arteries to the brain. The bubbles block blood flow, depriving the brain tissue of oxygen. These symptoms occur swiftly – usually within five minutes – and are similar to stroke. The diver may experience blurred vision, dizziness, sudden unconsciousness and loss of coordination. The signs include a bloody froth from the mouth, breathlessness, coughing, personality changes and respiratory/cardiac arrest.



Mediastinal emphysema occurs when the expanding air becomes lodged in the chest cavity between the lungs (the mediastinum). As the diver continues to ascend, this air expands, constricting the heart and lungs. Signs and symptoms include pain under the breastbone, shortness of breath and other breathing difficulties, fainting, shock and cyanosis. Mediastinal emphysema isn't as serious as air embolism, but it is serious.



If the air from an overexpansion injury forces its way into the space between the lung and the chest wall (called the pleural cavity), it can totally or partially collapse the lung, which is called a pneumothorax. Signs and symptoms include severe chest pain, extreme difficulty breathing and irregular pulse.



Subcutaneous emphysema occurs when the expanding air accumulates under the skin around the neck and collar bone (subcutaneous means "under the skin"). The signs and symptoms include fullness in the neck area, voice changes, neck swelling, difficulty swallowing and a crackling sensation when the skin is moved.
Clearly, all the lung overexpansion injuries are serious. What is more important, if you assist a diver with mediastinal emphysema, subcutaneous emphysema or pneumothorax, always assume that an air embolism is present and give first aid accordingly, even if you don't see signs immediately.

THE MOST COMMON CAUSE OF LUNG OVEREXPANSION INJURIES

The most important rule in scuba diving is, "Breathe continuously; never hold your breath." The inference might be, "Make sure you always have something to breathe, so you won't be tempted to hold your breath."

The most common cause of AGE and other overexpansion injuries is running out of air. Sometimes a diver runs out of air and, instead of responding according to his training, panics and rushes to the surface without exhaling continuously.

So, one of the easiest ways divers can reduce the possibility of lung overexpansion injuries is to check their air often and encourage their fellow divers to do the same.

DECOMPRESSION SICKNESS

Decompression sickness also results from gas bubbles in the body, but the mechanism that causes them differs. As you probably realize, DCS arises when excess dissolved nitrogen comes out of solution forming bubbles in the body after a dive. The bubbles block circulation, much like air embolism. This most commonly happens due to diver error – failure to properly use dive tables or a dive computer, or failure to adhere to safe diving practices relating to decompression. However, though it's improbable, DCS can also occur even when you do everything right. Because people differ in their susceptibility to decompression sickness, no dive table (or dive computer) can guarantee that DCS will never occur, even when you dive within table (or dive computer) limits.

Because bubbles can come out of solution almost anywhere in the body, DCS symptoms tend to be variable and range in seriousness. The most common symptom is pain, usually but not necessarily in the joints. More serious cases affect the nervous system, causing unusual fatigue, inability to urinate, blurred vision, vertigo, hearing or speech impairment, paralysis, loss of sensation and unconsciousness. Bubbles can form in the veins of the lungs causing breathing difficulties, chest pain and uncontrollable coughing. Divers commonly call this form of DCS "the chokes."

Typically, DCS symptoms manifest themselves more slowly than air embolism symptoms. In over half of DCS cases, symptoms appear more than 30 minutes after the dive. Symptoms appear within three hours in about 95 percent of cases.

COMPARISON OF SYMPTOMS

	EMBOLISM	DECOMPRESSION SICKNESS
Onset of Symptoms	Usually within five minutes of surfacing	Tend to be delayed
Most Common Symptoms	Sudden unconsciousness	Pain in joints, fatigue
Location of Symptoms	One side of the body	Both sides of the body (usually upper or lower)
Change of Symptoms	May improve as result of first aid	Usually no change or worsening condition

USE THE COMPUTER BETWEEN YOUR EARS

Although it's possible to experience DCI even when you correctly use dive tables or a dive computer, the most common cause of DCI is diver error. Accident statistics show that DCI problems arise from failure to use dive tables or a

computer, or even more commonly, disregarding basic guidelines and safety principles while using them.

So, when planning your dives, always use a computer – the one in your head – as well as your dive tables or dive computer.

SQUEEZES – A REMINDER

Squeezes occur when the pressure outside an air space exceeds the pressure inside. A squeeze injury is a barotrauma (pressure injury).

Ear squeeze is the most common squeeze and, without treatment, can cause infection and permanent hearing impairment.

Ears and Sinus

Middle Ear Squeeze occurs when divers descend and can't equalize causing sharp ear pain. Continued descent causes fluid to fill the ear spaces, making them feel full with diminished hearing. If this occurs, the diver should discontinue diving and seek medical treatment.

Eardrum Rupture occurs when a diver descends rapidly without equalizing. Symptoms are the same as ear squeeze except the diver gets relief as water enters the air space through the ruptured eardrum. It can cause vertigo. If this occurs, the diver should discontinue diving and seek medical treatment.
Inner Ear Round-Window Rupture occurs if a diver delays equalization and then attempts a forceful or lengthy equalization. Symptoms include full or blocked ears, hearing reduction, deafness, vertigo and ringing sounds. This serious injury needs medical treatment.

Reverse Block results when expanding air cannot escape the ear's air space on ascent. It causes pain similar to a middle ear squeeze. If this occurs, the diver should ascend slowly. Sometimes, reverse equalization (inhaling against a pinched nose) may relieve the block. Severe cases can rupture eardrums.

Sinus – Rapid descents with blocked sinuses can cause pain between eyes, over teeth or in cheekbones. Fluids enter sinuses to equalize the pressure. On ascent, expanding air forces these fluids out, often leaving blood in the mask. If this occurs, the diver may relieve discomfort by ascending and attempting to equalize. Sinus

squeezes typically heal, but if the pain is severe or extended, the diver should seek medical advice.

Relieving Ear and Sinus Squeeze

Encourage divers showing signs of equalization trouble – very slow descent, pointing to ears, repeated or exaggerated attempts at equalization – to ascend or surface before continuing to descend. Divers with colds or congestion shouldn't dive.

Other Squeezes

Mask – An unequalized mask can cause eye capillary rupture and skin bruising. Mask squeezes look dramatic and painful, but divers may not feel them or realize it's happening. To correct this, a diver must exhale through the nose. Capillary rupture or bruising typically clears without medical treatment, but divers may want to consult a physician as a precaution.

Suit – Dry suit divers can experience suit squeeze if they don't add air to equalize the suit. Suit squeeze can cause skin bruising and blisters or, if unchecked, welts and further injury.
Back to top

Exercise 4 – 2

Question 1

Decompression illness refers to (choose all that apply)

the condition that results from inert gas coming out of solution in the body.
the conditions that result from lung overexpansion releasing air into the bloodstream.

Question 2

Signs and symptoms of decompression illness include (choose all that apply)

pain in the joints.
foolish behavior at depth.
blue lips.
paralysis and unconsciousness.

Question 3

Air embolism results from air overexpanding the lungs escaping into the bloodstream, whereas decompression sickness results from inert dissolved nitrogen coming out of solution following a dive.

True
False

Question 4

The most common cause of lung overexpansion injury is

simply forgetting to never hold the breath.
running out of air.
runaway low-pressure inflator.

Question 5

_____ occurs when the expanding air accumulates under the skin around the neck and collar bone.

Air embolism
Mediastinal emphysema
Subcutaneous emphysema
Pneumothorax

ACCIDENT MANAGEMENT IV

FIRST AID FOR DECOMPRESSION ILLNESS

At an accident scene, it doesn't really matter whether the diver suffers from air embolism or DCS. First aid for suspected decompression illness remains the same no matter what the cause; in fact, you may not be able to determine which cause affects the diver. More than one form of DCI can be present at once.

Begin with a primary assessment. With an unresponsive patient, maintain the AB-CAB'S, providing rescue breathing and CPR if necessary. Encourage a responsive patient to lie down and relax.

Ask the patient (or the patient's buddy, if the patient is unconscious) these questions, noting the answers on the PADI Diving Accident Management Work Slate:

1. Were you scuba diving today or breathing compressed air?
2. Did you make a forced or rapid ascent?
3. How deep did you go?
4. What was your bottom time?
5. Do you feel excessively tired?
6. Where do you hurt?
7. Do you feel dizzy?
8. Does any part of you feel numb or tingle?

9. Are you having trouble breathing?

Give a breathing patient oxygen, ideally 100 percent concentration supplied by a nonresuscitator demand valve unit. (You'll learn the specifics for oxygen administration in the next knowledge development and rescue training exercises). In all cases, maintain the patient's lifeline. Be ready to switch to the rescue breathing mask and provide rescue breathing and CPR if necessary. Protect the patient from excess heat or cold, and arrange for emergency evacuation and medical care, which will usually include recompression in a hyperbaric chamber.
Keep the patient as comfortable as possible, but lying down because some people have experienced significantly worsened symptoms when they sit up.
Provide oxygen until you get the patient to emergency care. If you find yourself in a situation where you won't have enough oxygen, give the highest concentration possible for as long as it lasts. This benefits the patient more than trying to extend the oxygen by reducing the flow rate or switching it on and off. If you run out of oxygen, but have enriched air nitrox available, you can give that to a responsive patient with a scuba regulator.

Never attempt to recompress a diver suspected of DCI by putting the patient back underwater.

Recompression therapy takes hours; even if you had sufficient air supply to do this, you wouldn't be able to keep the diver adequately warm, or to administer necessary drugs and fluids. Without the proper equipment and training, attempts to recompress a patient in the water invariably lead to worsening symptoms and delays in proper treatment. Inwater recompression is only used in very remote areas with long intervals to a hyperbaric chamber. It requires specialized equipment and training, and may only be attempted with patients with specific symptoms. If your diving takes you to situations where inwater recompression may be called for, have the training and equipment required before attempting it.

Exercise 4 – 3

Question 1

First aid steps for a patient with suspected decompression illness include (choose all that apply)

providing emergency oxygen.
maintaining the patient's lifeline.
arranging for emergency evacuation and medical care.
putting the patient in a slanted head-down, feet-high position.

Question 2

The ideal position for a patient with suspected decompression illness is sitting or standing.

True

False

DROWNING

Although a variety of causes may initiate fatal dive accidents, in most instances drowning ultimately causes death. Drowning is defined as any incident in which a patient experiences respiratory impairment due to being immersed or submerged. Due to drowning, a patient may survive without complications, survive and suffer complications/permanent effects, die immediately or die after some interval due to complications.

In the past, respiratory difficulties caused by immersion were called “drowning” if immediate death resulted, “near drowning” if the patient revived, and “secondary drowning” if a “near drowning” patient suffered symptoms/complications some interval after revival. The medical community now only refers to drowning , with a spectrum of symptoms as described.

The most common immediate symptom of drowning is that the patient isn’t breathing. Therefore, regardless of how long the person was submerged, the primary first aid is immediate rescue breathing, with CPR if the patient has no heartbeat.

Be prepared to turn the patient and keep the airway clear. Symptoms also include coughing, shortness of breath, blueness of lips (cyanosis), frothy sputum, vomiting and cardiac arrest. Give a breathing patient emergency oxygen, keep the patient lying down and treat for shock. Contact local EMS. Drowning can also involve decompression illness, so contact DAN or other appropriate local diver emergency services to begin preparations for recompression until DCI has been ruled out by appropriate medical personnel.

Although in most instances brain damage occurs in as little as four to six minutes without oxygen, for reasons not completely understood, immersion (especially in cold water) can make revival possible even after fairly long periods. Therefore, begin emergency care immediately, even if the victim has been submerged for longer than four to six minutes.

Sometimes a revived drowning patient appears fully recovered. However, while drowning symptoms usually appear immediately, they can start and/or worsen eight or more hours after the incident. Therefore, anyone who has drowned should receive immediate medical evaluation, but especially if the person has breathing difficulties, coughing, frothy sputum, lethargy or doesn’t behave normally. Untreated complications can be fatal. Proper medical care greatly reduces this risk.

Exercise 4 – 4

Question 1

The primary first aid for drowning is

oxygen.
keeping the patient lying down.
recompression.
rescue breathing.

Question 2

A patient who has drowned, but has been revived and seems fully recovered, still needs medical evaluation because drowning symptoms can occur several hours after the incident.

True
False

RESPONDING TO DIVER EMERGENCIES IV

MANAGING AN UNRESPONSIVE DIVER AT THE SURFACE

If you spot an apparently unresponsive diver at the surface, you need to act quickly. If the diver isn't breathing, time is critical.

As you approach, call out, splash and so on to get the person's attention. If the diver is actually responsive, this helps you determine so.

If not, make contact and confirm unresponsiveness, while turning the diver face up (if face down). One way to do this is from above the diver's head. Cross your arms with your stronger arm on top, grasp the diver's wrists and then uncross your arms. This spins the diver face up.

Establish buoyancy for you and the victim. You may do this by inflating your BCDs and dropping weights, though you may want to keep your weights if wearing a substantially buoyant exposure suit (dry suit or heavy wet suit) to help position yourself in the water for the rescue. Call for help if there's someone within hearing distance.

Remove the victim's mask and regulator, open the airway by lifting the chin and tilting the head, and check for breathing. If you suspect spine or neck injury may be involved, open the airway by lifting the chin only (also called jaw thrust), tilting the head if it's the only way to get the airway open. You may need to remove your mask, too, so that you can get close enough for the check, and depending upon the rescue breathing you will use if needed (you'll learn about the specifics for inwater rescue breathing techniques shortly).

Look, listen and feel for breathing for 10 seconds.

If the victim is breathing, hold the airway open and protect it from splashes and water while towing to safety. Be careful to not turn the diver's face into the water

or push the diver's face under the surface. Recheck for breathing every couple of minutes as you tow.

If you establish the diver isn't breathing, you'll begin inwater rescue breathing. Start with two slow rescue breaths. If your rescue breaths cause the diver to begin breathing, proceed as above for a breathing victim.
If there is no response to your two rescue breaths, assess your situation. If there is a boat nearby and you can attract the attention of those on board, then do so since they may be able to come to your aid or send others to help you in the water.

If a boat is coming to you, stay where you are and support the victim with further rescue breaths. If not, then how you proceed will depend on how far you are from surface support (a stationary boat or the shore).

If you are less than about five minutes from surface support, tow the diver there while continuing to provide rescue breaths. Get the diver out of the water, continuing rescue breaths and perform a circulation check. Begin CPR if necessary and continue with the AB-CAB'S as you learned in your EFR training.

If you are more than five minutes from surface support give rescue breaths for one to two minutes while watching the victim for signs of movement or other response to the ventilations. If there is a response, but continued absence of spontaneous breathing by the victim, continue providing rescue breaths while towing the diver to the surface support. If there is no response to this period of rescue breathing then cardiac arrest is likely. Rescue breaths don't benefit someone in cardiac arrest without chest compressions, so it's necessary to get the victim out of the water as quickly as possible to start CPR. Discontinue rescue breaths in favor of speed. Tow the victim to safety as quickly as possible, exit the water, perform a circulation check and begin CPR and rescue breathing as appropriate according to your Emergency First Response training.

Others factors to consider with inwater rescue breathing are the environmental conditions, your condition and the victim's condition. In some rare situations, attempting to give rescue breaths in the water could present additional hazard to you and/or the victim. Just as you learned in EFR, you assess the scene and, if necessary, rapidly tow the victim to a safe area before beginning rescue breathing.

Why Give Rescue Breaths?
Earlier you learned that in the water, it's difficult to determine whether a diver has a heartbeat. If there's no heartbeat, rescue breaths don't do any good, so you may wonder why you would give them.

The reason is that while you can't easily detect a heartbeat in the water, one may be present. Especially in water-related accidents, respiratory arrest often precedes cardiac arrest. If you correct respiratory arrest quickly with rescue breaths, cardiac arrest may not occur. The survival rate for respiratory arrest is much higher than survival for full cardiac arrest.

In dive scenarios, if the victim has only respiratory arrest, without inwater rescue breaths the interval before exiting the water would likely be long enough to trigger cardiac arrest. Providing inwater rescue breaths reduces this risk. The potential disadvantage is that if the diver is already in cardiac arrest, a prolonged period of inwater rescue breathing may delay removal from the water and administration of CPR. There is limited research that suggests the advantage of inwater rescue breathing outweighs this potential disadvantage. This will be most true of a situation where a skilled rescuer can provide rescue breaths while towing the victim toward surface support at a similar speed to that which would be achieved without rescue breaths.
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Exercise 4 – 5

Question 1

Procedures for rescuing an unresponsive diver at the surface include (choose all that apply)

opening the airway.
checking for breathing.
giving rescue breaths if breathing is absent.
inwater oxygen therapy.

Question 2

You give rescue breaths in the water because waiting until exiting the water would likely cause a victim who is only in respiratory arrest to go into cardiac arrest.

True
False

INWATER RESCUE BREATHING TECHNIQUES

INWATER RESCUE BREATHING TECHNIQUES

For inwater rescue breathing, you'll follow the same steps as for rescue breathing on land, but with some modifications to account for being in the water. You give priority to providing regular ventilations every five seconds, keeping the airway open and free of water, and pacing yourself so you have sufficient energy to get the diver out of the water when you reach the exit.

Positive buoyancy saves your energy because you don't have to struggle to stay at the surface. As mentioned, though, you may want to keep your weights, if they help you attain a vertical orientation for giving rescue breaths. Whether this will be a factor depends on the exposure suit you're wearing and the inwater rescue breathing technique you use. If you decide to keep your weights, inflate your BCD just enough to keep you comfortably at the surface. You'll get a feel for what works best for you as you experiment and practice in Rescue Training Exercise Seven.

You'll give rescue breaths using one of three methods. In order of recommended preference, these are mouth-to-rescue breathing mask, mouth-to-mouth (or nose), and mouth-to-snorkel. Watch the video for demonstrations of each of these. Remember that the techniques you use may vary depending upon the situation and local protocols. The main priority is to activate the emergency medical system and, if the victim isn't breathing, to maintain regular rescue breaths while towing the victim to the boat or shore.

Mouth-to-Rescue Breathing Mask.
As you approach an unresponsive diver, retrieve your rescue breathing mask from your BCD pocket (or wherever you store it) and prepare it for use. Move above the victim and place the mask on his face, thumbs on the mask and fingers on the bony part of the jaw. You may find it fastest to administer the two initial breaths, then secure the mask strap, but in rough water you may want to put the strap on initially so you don't lose it.

Leave the mask on while you look, listen and feel for breathing. If the victim doesn't breathe, give rescue breaths every five seconds as you tow the diver to safety. You'll find the rescue breathing mask makes it easy to give rescue breaths, maintain the airway and tow at the same time. In rough water, seal the rescue breathing mask to keep the airway dry between breaths by putting your thumb over the opening while applying pressure.

Once you begin rescue breathing, maintain the open airway with one hand, even between breaths. This ensures the victim can begin breathing independently. Give regular, rhythmic rescue breaths priority over other rescue procedures such as removing equipment. If you must interrupt breaths (to get the victim out of the water, for example), precede the interruption with two slow, full breaths, interrupt no longer than 30 seconds, and resume regular ventilations with two slow, full breaths.

Mouth-to-Mouth.
If you lose your rescue breathing mask or don't have one, mouth-to-mouth rescue breathing is the next option. You can use the do-si-do or head cradle methods.

For the do-si-do method, face the victim's side. Take your arm closest to the victim's feet, slide it behind the victim's arm and reach up to grab the victim's hair, hood, or BCD. Place your other hand on the victim's forehead to tilt the head and open the airway, while pinching the nose.

Roll the victim toward you (this is easier than climbing over the victim) so you can provide rescue breaths – two initially and one every five seconds as described earlier. You may find that placing a flotation aid under you helps you get higher out of the water, over the victim, making it easier to give rescue breaths. When practicing mouth-to-mouth during training, it's recommended that you seal your mouth on the victim's chin, which better simulates the height and position you need than sealing on a cheek.

To perform the head cradle method, put your hand closest to the victim's feet under the neck. Put your other hand on the victim's forehead and pinch the nose as before. Because you don't have the leverage that you have with the do-si-do, you may have to rise over the victim to give breaths rather than roll the diver toward you.

However, this position may work better if you're a lot smaller than the victim, or if the victim is wearing a bulky exposure suit that prohibits an effective do-si-do position.

In some circumstances, you may find mouth-to-nose rescue breathing effective, which is a variation of the head cradle position. For mouth-to-nose, put your hand farthest from the victim's feet under the neck, and use the other hand to simultaneously hold the mouth closed and tilt the head. Give rescue breaths through the nose just as you would through the mouth. Mouth-to-nose works well when choppy conditions or equipment configurations make mouth-to-mouth ineffective, or if you can't get the victim's mouth open.

If a common technique in your area, your instructor may have you practice mouth-to-nose rescue breathing.

When giving mouth-to-mouth rescue breaths in cold climates that require neoprene gloves, keep in mind that your gloves may hold considerable water. By shaking them quickly out of the water before sealing the victim's nose, you'll reduce the amount of water that flows from your gloves onto the victim's face and possibly into the airway.

Mouth-to-Snorkel.
At one time, most divers considered mouth-to-snorkel rescue breathing the best method for giving ventilations while towing the victim a long way. However, the rescue breathing mask has largely replaced mouth-to-snorkel, because it's so much easier for most divers, it reduces communicable disease risk out of the water as well as in it, and because so many divers now use self-drain snorkels. Mouth-to-snorkel rescue breathing requires a snorkel without self-drain. Today it is not as widely used; your instructor will have you practice it if it is still common in your area for some reason, such as rescue breathing masks aren't readily available.

You begin mouth-to-snorkel rescue breathing with mouth-to-mouth for the initial two breaths, look, listen and feel. If you decide to remove any equipment, you also do that while using mouth-to-mouth rescue breathing (equipment removal discussed shortly). When ready to begin the tow, move above the victim and hold the snorkel up to drain it. Put the mouthpiece in or on the victim's mouth and hold there between your middle and ring finger.

Use your index finger to block the nostrils, while your other fingers seal the mouthpiece and keep the head tilted. Keep the snorkel tip out of the water while you do this.

Keep the snorkel tip out of the water by clamping it along the side of the victim's

head, or by simply holding it. Give rescue breaths every five seconds through the snorkel. Note that ideally, you should get into the mouth-to-snorkel position without interrupting regular ventilations. If it takes longer than five seconds, resume ventilations with two slow rescue breaths. Allow the victim to exhale through the snorkel, which you can check by feeling the breath on your cheek.
No matter which technique you use, remember that you do not check for a pulse or attempt CPR in the water. (Although there have been attempts to create inwater CPR techniques, none have proved practical and effective.) If you think the victim doesn't have a pulse (heartbeat), you nonetheless follow the inwater rescue breathing protocols because a heartbeat may be present.
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Exercise 4 – 6

Question 1

Mouth-to-rescue breathing mask is the least preferred inwater rescue breathing technique.

True
False

Question 2

If you suspect a victim does not have a pulse,

do not give rescue breaths.
follow the rescue breaths protocols.

UNRESPONSIVE DIVER UNDERWATER

When you find an unresponsive diver underwater, getting the diver to the surface takes priority over everything except your personal safety. With a nonbreathing victim, you can only begin rescue breathing at the surface; with a breathing victim, only at the surface can you take steps to protect the airway and try to prevent drowning.

Circumstance will dictate the most effective steps in bringing up the victim, but the following procedures generally apply:

1. Upon finding the victim, quickly note the diver's position, whether the regulator is in the mouth, whether the mask is on and any other clues about the accident. Don't waste any time doing this, but make a conscious effort to remember these details.

2. If you find the regulator in the victim's mouth, hold it in place even if the victim isn't breathing. This may help keep water out of the victim's lungs, and it provides air if the victim resumes breathing during ascent. The second stage won't interfere with expanding air escaping from the victim during ascent. If you find the regulator out of the victim's mouth, don't

waste time trying to put it back; expanding air may prevent water from entering his lungs.

3. You'll probably want to hold the victim from behind so that you can keep the regulator in the mouth (if it's still in) and hold the head in a normal position. Holding the victim from behind also allows you to vent the victim's BCD.

4. For the best control, you'll usually use your own BCD to ascend with the victim. Begin your ascent, venting air from your BCD as necessary to maintain a safe rate. If releasing air from your BCD doesn't control the ascent, you may need to release air from the victim's BCD. You can also flare out to reduce ascent speed. If you can't keep the ascent under control, allow the victim to ascend separately. Ascend at a safe rate and regain contact with the victim at the surface.

   If possible, don't drop the victim's weights or inflate the victim's BCD until you reach the surface. This makes it easier to control the ascent. However, in some instances you could find the victim too heavy to bring up using your BCD. You may need to use the victim's BCD or drop the victim's weights, but this may make it harder to control the ascent. However, with the exception of your personal safety, getting a nonbreathing diver to the surface is the top priority.

5. During the ascent, keep the victim's head in a normal position. Expanding air will vent by itself, so you don't need to squeeze the victim's chest to expel air.

6. As you ascend, think about the steps you'll take when you reach the surface. This mental rehearsal will help you progress through the rescue more effectively.

7. If you didn't have to ditch the victim's weights on the bottom, you may want to drop them just below the surface. This assures positive buoyancy for the victim, making it easier to move into your surface rescue procedures as you just learned.

However, you may want to retain your own weights if they make it easier to perform inwater rescue breathing. Note: During training, practice dropping weights over sand or another insensitive area that falling weights won't damage. For training in a pool, your instructor may put a mat or other protection on the bottom.

Exercise 4 – 7

Question 1

You should attempt to replace the regulator of an unresponsive diver underwater if the victim has dropped it.

True
False

EQUIPMENT REMOVAL

During the rescue of an unresponsive diver (and a responsive diver too, for that matter), equipment removal takes a very low priority. The exception is discarding weights to establish buoyancy, of course, but aside from that the priorities are providing an open airway, providing rescue breaths if needed, and getting the victim to safety as quickly as possible.

Learning equipment removal with an unresponsive diver at the surface is a complex motor skill on which you'll spend a lot of time in training. This is necessary for learning, but keep equipment removal in perspective. Even though you'll spend a fair amount of time mastering the techniques, in most rescue situations you wouldn't need to do it.

It's a technique to apply intelligently. Stop, breathe, think, and then act.

Equipment removal is only a means to an end, and that end is to get the victim to safety and out of the water in the fastest way possible. Equipment removal takes time, so it only makes sense to do it if doing so more than offsets the time required. Typically, this would be a situation requiring a long tow, so that by reducing the equipment's drag, you speed up the swim enough to cancel out the equipment removal time. For a short tow, on the other hand, it makes little sense to remove gear. Open the airway, check for breathing and give rescue breaths if needed, while towing to safety. Think, "What's the fastest way out of the water?" rather than, "I need to take this gear off."

If you need to remove equipment to get the diver out of the water, again, think about what's fastest. The gear has to go, but it's usually easier to get it off when you can stand in waist deep water, or if there's a boat ladder or swim step you can use for leverage. It's faster still if there are other rescuers there who can help. So, the fastest way out of the water may be to tow to shallow water or up to the boat before worrying about the gear.

Removal Techniques.
If in your best judgment the fastest way out of the water is to get rid of the gear for a faster swim, how and what equipment to ditch will depend upon circumstances. Apply the following procedures and techniques:

First, think buoyancy. Don't dump anything you need to maintain adequate buoyancy. In warm water, the victim may not have an adequately buoyant exposure suit to allow getting rid of the BCD, though you might quick-release the

cylinder to reduce drag. In cooler water that requires full wet suits or dry suits, once the weight's gone there's more than enough buoyancy without the BCD.

Second, do things in a logical order, always keeping one hand on the airway to ensure it stays open. The exact order isn't important, provided you think about what you're doing. To be obvious, you want to ditch weights before a BCD. You want to disconnect a dry suit inflator before attempting to remove the scuba unit.

Third, keep a rhythm. When giving rescue breaths, remove equipment between breaths. Breaths have priority, so don't try to do too much at each step. Removing a single piece of gear may take several small steps between breaths. For example: breath, unlatch BCD waist buckle, breath, disconnect BCD center strap, breath, deflate BCD, breath, push BCD off right shoulder, breath… etc.

Fourth, keep moving! Remember, what you're concerned with is getting to safety as fast as possible. Swim and tow while ditching the gear.

In deciding what, how and when to remove equipment, don't assume that you have to remove from yourself everything you remove from the victim. As previously mentioned, in a buoyant exposure suit, assuming you still have adequate buoyancy, you may want to retain your weights for better positioning when giving rescue breaths – but you'll almost certainly remove the victim's weights. Think about what gear you may need to complete the exit with the victim.

Environmental circumstances can limit or affect the equipment you remove and when. In calm conditions, you probably wouldn't worry about keeping your mask and snorkel, but you'd probably keep them for an exit through surf. Rough conditions may make it necessary to keep the victim's BCD to hold the airway high above the chop, yet you may remove yours to reduce drag. Obviously you need your fins to help you swim, but you may need to ditch them in shallow water so you can wade ashore with the victim. Exiting into a boat may require you to keep your fins so you can kick yourself up onto the swim step. At the same time, the victim's fins aren't doing anything, but neither are they in the way, so it's not likely you'd pay any attention to them until well after you're ashore and have completed primary assessment.
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Exercise 4 – 8

Question 1

The priority of equipment removal during a rescue is

very high.
moderate.
very low.
not something easily determined.

Question 2

When removing equipment from an unresponsive diver (choose all that apply)

disregard rescue breaths if necessary when getting the gear off.
keep moving.
take things off in a logical order.
keep a rhythm.

Question 3

Just because you remove something from the victim doesn't mean you have to remove it from yourself.

True
False

Question 4

Environmental conditions can affect what gear you remove from yourself or an unresponsive diver.

True
False

SUMMARY

David, Omar and Maria privately told the divemaster what David had overheard. Further, Omar volunteered that he had a spare regulator that had just been overhauled, one the diver could use if he wished. The divemaster thanked them for their consideration and explained that the boat carried a couple of regulators for just such situations.

The divemaster spoke privately with the diver. Shortly after, the diver put a different regulator on his scuba tank. Later, after the dive, David overheard the diver thank the divemaster for the regulator.

From this incident, the diver in question learned to inspect his equipment well in advance of going diving, and to have it serviced regularly. He also learned that it's a good idea to have spare equipment when feasible. David, Omar and Maria realized that by being observant and tactful, a rescue diver can perform a "rescue" before an accident ever happens.

KNOWLEDGE REVIEW

Question 1 of 12

Your friend is showing signs of critical incident stress, which has signs and symptoms including confusion, lowered attention span; restlessness, denial, guilt or depression, anger, anxiety, unusual behavior, changes in interactions with others, increased or decreased eating, uncharacteristic excessive humor or silence, sleeplessness or nightmares. Your friend may require professional help to prevent post-traumatic stress disorder.

A friend of yours was involved in an incident that resulted in a serious injury of another person. Now your friend seems restless and depressed, and expresses feeling guilty about what happened. Your friend

may have critical incident stress.
is reacting normally to the incident.
has signs likely unrelated to the incident.
will definitely get through this without help.

Question 2 of 12

Decompression illness is a term that combines decompression sickness and lung overexpansion injuries. Although the underlying causes differ, in the field they can appear similar and require the same first aid, so it's not important to determine which it is. So, you refer to "decompression illness" when managing the situation.

Decompression illness is a term that means

decompression sickness.
lung overexpansion injuries.
decompression sickness and lung overexpansion injuries.
decompression sickness, lung overexpansion injuries and gas narcosis.

Question 3 of 12

The most common cause of lung overexpansion injuries is running out of gas, followed by a panicked breath-held ascent. You prevent this by properly planning and managing your gas. If you do have a gas supply problem underwater, remember your training and do not hold your breath as you ascend.

The most common cause of lung overexpansion injuries is prevented by properly planning and managing your gas supply.

True
False

Question 4 of 12

All four types of lung overexpansion injury are caused by holding the breath while ascending, with different results depending upon the damage caused by expanding gas in the lungs. All are serious and more than one can be present at the same time. Air embolism can be the most immediately life threatening if bubbles forced into the bloodstream block blood flow to the brain, causing stroke-like symptoms.

Which of the following accurately characterize lung overexpansion injuries? (Choose all that apply.)

Air embolism forces gas into the bloodstream.
Gas under the skin at neck/collar bone is a result of subcutaneous emphysema.
Pneumothorax is a collapsed lung.
Mediastinal emphysema occurs when gas becomes lodged in the chest cavity between the lungs.

Question 5 of 12

All of these are appropriate parts of DCI first aid. If you don't understand some of these steps, review the discussion about first aid for decompression illness.

A diver is suspected of having DCI. The diver is breathing and responsive, and you have contacted emergency care. Which of the following actions are also appropriate? (Choose all that apply.)

Have the diver breathe emergency oxygen.
Keep the diver lying down.
Treat the diver for shock.
Monitor the diver's breathing and heartbeat.

Question 6 of 12

Physiological complications occur in about 85% of drowning cases and are often delayed by several hours. These complications are serious and can be fatal, so a drowning patient should receive medical attention in all cases.

While diving from shore, you're involved in an emergency involving a man (nondiver) who has experienced drowning. He was retrieved from underwater and wasn't breathing, but resumed breathing and regained consciousness after two or three rescue breaths. He now claims he feels fine and there's no reason to go to the hospital. You should respond

that this is normal in drowning cases, but he should monitor himself for anything unusual.
that he should get medical attention because dangerous secondary symptoms can develop hours after drowning.

Question 7 of 12

In this situation, the victim likely has no heartbeat, so rescue breaths don't provide any benefit without CPR compressions. Discontinue the breaths in favor of speed and tow the victim to shore where you can exit and begin CPR. If the diver showed signs of responsiveness, or if you were less than five minutes from safety, you would continue to provide breaths while towing the victim.

You're rescuing an unresponsive diver who isn't breathing. You're in the water at the surface giving rescue breaths and estimate that you're about a 15-minute swim to shore. After a minute of giving breaths, the victim shows no signs of response. The best action would be to tow the diver to shore giving rescue breaths.

True
False

Question 8 of 12

If you correct respiratory arrest quickly, you may prevent cardiac arrest. The survival rate for respiratory arrest is much higher than for cardiac arrest. As discussed in the previous questions, you would discontinue inwater rescue breathing only if you are a long way from safety, after determining that cardiac arrest has likely already occurred.

It's difficult to detect a heartbeat in the water, so you provide rescue breaths (at least initially) because one may be present.

True
False

Question 9 of 12

Give breaths every five seconds. You want to secure the mask with the strap to help prevent loss as you use one hand between breaths to remove equipment, etc. Form a good seal by pressing the mask firmly with your thumbs on it, pushing against the face held firmly by your fingers on the jaw. Keep the mask on while checking for breathing; doing so helps protect the airway and doesn't interfere with looking, listening and feeling for breathing.

Which of the following steps apply to giving mouth-to-rescue breathing mask rescue breaths? (Choose all that apply.)

Give breaths every two seconds.
Secure the mask strap.
Hold the mask with your thumbs, fingers on bony part of jaw.
Remove the mask to check for breathing.

Question 10 of 12

When rescuing an unresponsive diver underwater, if the regulator is in the mouth, hold it there. But, if it is out, don't waste time trying to put it back. The priority is getting the victim to the surface.

While returning to the boat, you and your buddy come upon a diver, unresponsive, lying on the bottom. The diver's regulator is out of the mouth. You should replace it before taking the victim to the surface.

True
False

Question 11 of 12

Holding the head in the normal position will allow expanding air to escape from the diver's lungs. There's no need to tilt the head back or take any other unusual step to accomplish this.

During ascent with the victim in the previous question, keep the victim's head in a normal position. Expanding air will vent from the victim by itself.

True
False

Question 12 of 12

The priorities with an unresponsive diver are basic life support – doing whatever most quickly provides rescue breaths and/or CPR as needed – and getting the diver into emergency medical care. This means doing whatever gets the victim out of the water as quickly as possible. If you're a short distance from safety and help, there's little benefit in removing gear. Tow the victim to where you will have help getting equipment off and exiting. If you have a long swim, then removing gear while continuing to monitor breathing/provide rescue breaths may get the victim to safety faster by reducing drag and speeding up the swim.

You're providing rescue breaths for an unresponsive diver at the surface, and are about 6 metres/20 feet from the boat's swim step where the divemaster and other divers stand ready to help. You should ____ rescue breaths and _____ as you swim to the boat.

discontinue; remove equipment
continue; leave equipment in place
continue; remove equipment
discontinue; leave equipment in place

SECTION FIVE

INTRODUCTION

"Okay, that's it for the day," Gabriel told the group. They had just finished a 24-metre/80-foot shore dive on the wreck of a large paddleboat. Although it had been in the lake for years, it was well preserved with most of its structure intact.

Gabriel, with his fellow divemasters Marc and Max, had been particularly adamant with the group that no one was to enter the wreck unless properly trained and equipped for wreck penetration diving. Gabriel, who was thoroughly familiar with wreck penetration diving, and this wreck in particular, having made more than 100 dives on it, took this seriously. All in the group said they'd stay outside the wreck.

With everyone getting out of the water, Gabriel, Marc and Max left their equipment by the shore and, still in their exposure suits, walked up to their cars to discuss the plans for the evening and the next day. This took about 10 minutes, then they went back to where the divers were getting out. Immediately, Gabriel noticed that two of the group were missing. He asked the others where they went.

"They said they had some air left and decided to go back to the wreck," one diver told him. "They said something about going inside. They took a light."

"How long ago?" Gabriel asked.

"They swam out right after you went up to your car."

Gabriel recognized immediately that the situation was probably very serious.

Section Five marks the end of your knowledge development in the PADI Rescue Diver course. By now you've learned a great deal, and this section provides the final touches you'll need to complete the course. You'll start by learning a bit about completing accident reports, which may be required in some areas and circumstances. Next, you'll learn the procedures and techniques for providing emergency oxygen, which you'll practice and apply during Rescue Training Exercise Nine. Finally, you'll look at managing an accident scene while waiting for emergency medical care, and techniques and considerations for exiting the water with an unresponsive diver.

THE PSYCHOLOGY OF RESCUE V

POST ACCIDENT REPORTS

In some areas, a dive accident will require you and others involved to write a report. Obviously, you don't write accident reports for trivial incidents, such as a minor scrape on a rock that you adequately treat with antiseptic and a bandage. Nor would you normally write a report for an incident such as successfully helping a buddy to the surface with your alternate second stage in a low air situation.

However, following an accident that requires first aid and summoning emergency medical care or other emergency personnel, you may be asked by authorities to complete or file an accident report. Or, emergency personnel may interview you to complete such a report. By gathering and providing as much factual information

as possible, accident reports help investigators determine what happened. This is done partly to prevent and reduce such accidents in the future, if possible, and to help emergency systems better respond when they do occur.

Be aware that accident reports are usually considered legal documents that could be used in litigation as well as investigation. For this reason, it's important to report only facts that you personally witnessed to the best of your ability. Nothing else belongs in an accident report because guesses and speculations can confuse the facts and interfere with determining what happened.
Try to answer the following questions on a report, but again, do not guess or speculate.

- How did you become aware of the problem?
- Where was the victim (depth, location, etc.)?
- Was any of the victim's equipment out of place or unusual (regulator out of mouth, etc.)?
- How soon were you able to respond to the emergency?
- What did you do when you responded to the emergency situation?
- Were you able to identify the person you helped?
- What did you personally see happen?
- What first aid was administered?
- Was emergency oxygen necessary? Was the individual responsive or unresponsive? Was the person breathing or not breathing?
- Was EMS called? At what time? When did they respond? What action did you see EMS take?
- Was the victim's gear recovered? If so, and you personally checked it, was it functioning properly, and how much gas was in the cylinder?

It's not unusual for news media to show up following an incident that required contacting emergency personnel. In many countries, reporters have the right to try and interview you and any others involved and ask questions.

While reporters probably wish you no intentional ill will, there's sometimes a tendency for reporting to sensationalize or speculate. Reporters may push those they're interviewing for opinions and speculations which, unfortunately, may be used out of context and reappear in legal circumstances. Well-meant thoughts may seem insensitive and cause further hurt to the patient and patient's loved ones.

Although the media may have the right to report and ask questions, you do not have to answer their questions, especially those that would require you to guess

or speculate. Immediately after an accident, you seldom have all the facts, and you're usually emotionally stressed.
Feeling guilty or bad may lead you to make statements that lay the blame on you, when in fact you did nothing blameworthy and have nothing to feel guilty or bad about. Therefore, your best action after an incident is to only answer questions asked by police or other government authorities.

Refer reporters and other media personnel to the proper authorities to get their questions answered. Since "no comment" is often interpreted as being noncooperative and possibly hiding something, say something like, "An accident investigation is underway and I'm not in a position to answer questions. Please get a statement from the authorities when they have completed their investigation."

Not to belabor the point too much, but remember that following an accident you may feel considerable emotional stress and may believe you know what happened. Be very careful to think about what you really know because you witnessed it, and what you only think happened. When answering questions and making statements, again, avoid speculation and don't guess. Don't give your opinion about what caused an accident, but instead only say what you know because you observed it. This may mean you answer some or many questions, "I don't know – I didn't see," but being honest makes the authorities' jobs easier, not harder.
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Exercise 5 – 1

Question 1

You should write a report following any dive incident, no matter how trivial.

True
False

Question 2

Questions you might answer, if you know because you personally witnessed it, may include (choose all that apply)

how you became aware of the problem.
what you did in response to the emergency situation.
what first aid was administered.
your best guess at what might have happened

Question 3

The best approach with media after a dive accident is to politely refer them to authorities for information.

True
False

Question 4

When writing a report or answering questions (choose all that apply)

try to be helpful with your opinions and ideas.
never guess or speculate.
state only facts you personally witnessed.

BEING PREPARED FOR A DIVER EMERGENCY V

USE OF EMERGENCY OXYGEN

When comparing the first aid you learn in the PADI Rescue Diver course with your Emergency First Response training for more general medical emergencies, perhaps the most significant difference is the emphasis on oxygen use in diver emergencies. Administering emergency oxygen to a patient with suspected decompression illness is the dive community standard of care. You also provide oxygen for drowning patients, you may recall. Administering emergency oxygen is crucial because field experience shows that emergency oxygen provides significant benefit in many (but not all) cases of decompression illness. Medical case histories show that prompt oxygen first aid can improve the effectiveness of recompression treatment, and the probability of a complete recovery.

It's important to realize that while oxygen may be beneficial, it isn't a cure by itself, and there are types of decompression illness that do not respond well to oxygen. However, in those instances, it does no harm, so there's never a reason to not give oxygen.

As you've already learned, the preferred oxygen system for rescue divers is the nonresuscitator demand valve type, with continuous flow capability. During Rescue Training Exercise Nine, you'll practice using oxygen systems so that you're capable and qualified to provide emergency oxygen in diver emergencies. You can also further your training through the PADI Emergency Oxygen Provider course.

HANDLING OXYGEN

During Rescue Training Exercise Nine, you'll get a chance to assemble and disassemble an oxygen unit. You'll find that it's pretty much like your scuba gear and shares many characteristics, so working with it is pretty simple. However, some materials that would not normally be flammable in air at surface pressures can become combustible or even explosive in pure oxygen. This tendency increases with elevated pressure. Therefore, you have some handling concerns that differ from regular scuba. With proper handling and common sense, oxygen systems are safe to have around, though.

Follow these six procedures when handling oxygen and oxygen systems:

- Keep your unit clean and protected in its box until needed. Particularly avoid putting the system in contact with greases, oils or even silicone grease.

- Never attempt to lubricate oxygen equipment or use standard scuba parts in it. Pure oxygen requires that only special lubricants and materials come in contact with the system.

- Always open valves on oxygen equipment slowly, so as to pressurize the unit slowly. Rapid pressurization creates heat, which can spark a fire if any flammable materials have contaminated the equipment.

- Keep your unit assembled to minimize the possibility of contaminants getting into it, as well as to save time in an emergency. Wash your hands if possible before handling your equipment; in an emergency, at least try to wipe off any oils or grease (including suntan lotions and oils).

- Never attempt to clean or service the equipment yourself. Oxygen servicing requires special cleaners and procedures. If your equipment gets wet or contaminated in any way, it needs professional servicing by someone specifically trained to work on medical oxygen systems. Have it serviced regularly as required by the manufacturer, just as you would scuba equipment.

- Always extinguish any source of flame (such as cigarettes) before deploying oxygen. Use the equipment as far away as possible from engines, gasoline or anything combustible, preferably in a ventilated area.

Administering Oxygen

There are three basic ways to provide oxygen with a nonresuscitator demand valve system. Which one you use will depend upon the patient's condition. In an emergency, you may need to change the delivery method based on changes in the patient's condition.

Breathing Injured Diver.
In all cases, you want to provide the highest oxygen concentration possible. With a breathing patient, this normally means using the demand valve on the oxygen unit. Follow these steps:

Open the oxygen kit. The kit should be set up in advance according to manufacturer's instructions.

1. Slowly open the valve and then test the unit by inhaling from the mask. Do not exhale into the mask (for sanitation reasons).

2. Secure the tank and protect it from being knocked over or rolling loose. The best place for it is cradled in its box.

3. Say to the injured diver, “This is oxygen. It will help you. May I give it to you?”

5. Assuming agreement, place the mask on the diver’s face and instruct the person to breath normally. A responsive diver can hold the mask in place. This makes the patient feel more in control and frees you to do other things.

6. If the diver is unresponsive and breathing, you may assume the diver would want oxygen, and supply it (called implied consent) with the nonresuscitator demand valve unit.

7. Monitor the oxygen pressure gauge. Don’t let the unit run empty with the mask still on the diver.

Weakly Breathing Injured Diver.
In some instances, a diver may be breathing, but very weakly. In this case, the patient may be too weak to activate the demand valve, which like a scuba regulator has some breathing resistance.

In this case, you will use the continuous flow outlet and a nonrebreather mask. This is also how you would set up the unit to supply oxygen to a second patient from a single unit, or older oxygen systems that lack the demand valve system.

Follow these steps:

1. Open the kit and attach the tube from the nonrebreather mask to the continuous flow outlet on the regulator (if this is not done in advance).

2. Slowly open the valve and set the continuous flow rate to 15 litres per minute.

3. Using a nonrebreather mask, hold your thumb over the inlet inside the mask and allow the reservoir bag to inflate.

4. Say to the injured diver, “This is oxygen. It will help you. May I give it to you?”

5. Assuming agreement, place the mask on the diver’s face and instruct the person to breathe normally. Use the head strap and be sure the mask fits snugly. You may assume implied consent with an unresponsive diver.

6. If the reservoir bag collapses completely when the diver inhales, increase the flow rate to 25 litres per minute.

7. Monitor the oxygen pressure gauge. Don’t let the unit run empty with the mask still on
the diver.

Nonbreathing Diver.

If your patient is not breathing, you can still provide oxygen while giving rescue breaths by using a rescue breathing mask with an oxygen inlet valve. The valve accepts oxygen from the system's continuous flow outlet.

Follow these steps:

1. Have someone open the kit while you continue rescue breaths, and attach the oxygen tube from the continuous flow outlet to the rescue breathing mask (if not already done). Don't let this interfere with rescue breathing or CPR procedures.

2. Slowly open the valve and set the flow rate at 15 litres per minute.

3. Give rescue breaths through the rescue breathing mask as usual. Each rescue breath will carry in extra oxygen from the continuous flow.

4. If the diver begins to breathe, switch to the demand or nonrebreather masks as above.

Exercise 5 – 2

Question 1

Administering emergency oxygen to a diver with suspected decompression illness is crucial because

it will cure the diver.
it may improve the effectiveness of recompression and the chances of a complete recovery.
it is not actually crucial, though desirable.

Question 2

When handling oxygen (choose all that apply)

keep the unit thoroughly lubricated with silicone grease.
keep the unit disassembled for easy cleaning.
open the valves rapidly to purge the hoses of contaminants.
extinguish any sources of flames to reduce fire hazard.

Question 3

Which method of oxygen administration would you normally use for a breathing diver?

Nonresuscitator demand valve
Continuous flow with nonrebreather mask
Continuous flow with rescue breathing mask

ACCIDENT MANAGEMENT V

MANAGING THE SCENE UNTIL HELP ARRIVES

In a serious diver emergency, you may often reach a point where you have the patient out of the water and under first-aid care, but emergency medical care has not yet arrived. During this interval, you need to manage the scene until help arrives.

After beginning primary care, secondary care, oxygen and other first aid as needed, your priority is to monitor the patient's lifeline and the AB-CAB'S. Following a serious injury, a diver's condition can change from breathing to nonbreathing, or responsive to unresponsive.

Protect the patient from excess heat or cold (shock management), and as necessary, control bystanders to keep the areas open and unconfusing for arriving emergency medical personnel. Pressure-related injuries usually require recompression in a hyperbaric chamber, so maintain contact with the local diver emergency service. Keep a responsive patient comfortable, but lying down.

For a diver with suspected decompression illness, you will provide oxygen until emergency care arrives. If you find yourself in a situation where you won't have enough oxygen, give the highest concentration possible for as long as it lasts. This benefits the diver with a pressure-related injury more than trying to extend the oxygen by reducing the flow rate or switching it on and off. If the oxygen runs out, but there's enriched air nitrox available at the site, a responsive diver can breathe it from a scuba regulator. This isn't as beneficial as pure oxygen, but may offer more benefit than breathing air.
Generally, you try to collect the following information and write it down to send with the injured diver (use the PADI Accident Management Slate):

- Diver's name and contact information
- Significant medical history
- First-aid procedures initiated
- Dive profile information
- Comments relative to emergency care received
- Contact information for local diver emergency system and name of doctor or personnel you've spoken with

Exercise 5 – 3

Question 1

After beginning primary care, secondary care, oxygen and other first aid as needed for a patient (choose all that apply)

monitor the patient's lifeline.
protect the patient from excess heat or cold.
control bystanders.
maintain contact with the local diver emergency service.

Question 2

Information that is typically sent with the injured diver includes (choose all that apply)

diver's name and contact information.
significant medical history.
dive profile information.
first aid procedures initiated.

SECTION FIVE

Learning: 83.333%

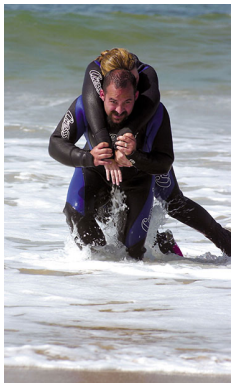
-
  - Content
    - Introduction
    - The Psychology of Rescue V
    - Being Prepared for a Diver Emergency V
    - Accident Management V
    - Responding to Diver Emergencies V
    - Summary

Previous
29.41%
29.41%
PADI Rescue Diver – Section Five

RESPONDING TO DIVER EMERGENCIES V

EXITING WITH THE UNRESPONSIVE DIVER

In Rescue Training Exercises Six and Seven, you practiced tows, providing rescue breaths and equipment removal for unresponsive divers at the surface. In Rescue Training Exercise Eight, you'll get to practice some methods for exiting the water with an unresponsive diver. Here are six techniques you can use, though the method you use will depend on where you're diving, your strength, whether you have help and other factors. Your instructor may have you practice some of these, but some may not be appropriate to practice depending upon your physical characteristics, equipment available, etc.



Packstrap Carry

The injured diver is draped over the rescuer's back and arms are pulled over the rescuer's shoulders. This is the preferred method of exiting with an injured diver because the victim's weight assists with the carry, yet it is not too difficult to lower the person gently to the ground.

Saddleback Carry

For this carry, the injured diver is stretched across the rescuer's back. It is normally an exit over a sloping shore. The hard part is holding the victim in place during the carry, but it is easier to lower the victim gently to the ground without help.

Fireman's Carry

In this carry, the injured diver is swung across the rescuer's shoulders. This is normally used as a shore exit. It is an easier carry than the saddleback because the victim is held in place by weight on your shoulders, but it may be harder to lower the victim gently to the ground without help once out of the water.

Roll Up Technique
This is a multirescuer technique used to lift the victim up a considerable height. It requires a net or tarp that can be lowered from a pier or boat deck to roll up an injured diver. One end is secured to pier/boat deck, with the other end lowered and placed under the victim, who lies in the tarp parallel to the deck. Rescuers roll the victim up by pulling up the far end of the tarp (ropes may be secured to the lower end if necessary for length).

Ladder Exit
This technique is used to bring a victim up alone. It requires the rescuer to be strong, and the victim not too large in relation to the rescuer. The ladder also has to be strong enough for the weight of both – don't attempt this technique if there's an unreasonable chance of getting hurt.

The injured diver is straddled over the rescuer's high thigh and shoulder, cradled between the arms during the climb. The rescuer steps up one rung with high thigh (with victim), then brings the other foot to the same rung and continues up the ladder.

Lifeguard Exit (1)
One of the most useful exits to learn, this technique works well when alone at a low dock or swim step. The rescuer places the injured diver's hands on the deck. The rescuer pushes out of the water, keeping one hand on the victim's hands so the victim doesn't slide back in...

Lifeguard Exit (2)
Holding the diver by the wrists and standing, the rescuer lifts the victim's waist to dock level...

Lifeguard Exit (3)
...then lowers the diver face down on the deck.

Lifeguard Exit (4)
From there, the rescuer rolls the victim over, and may drag the person the rest of the way from the water if necessary.

Environmental conditions and other circumstances will affect what you have to do when you exit the water, including the technique you use – you obviously can't use the packstrap carry to climb a ladder.

Remember that maintaining rescue breaths takes priority. For shore exits without help, give two slow, full breaths and then carry the diver ashore using the saddleback carry, fireman's carry or the packstrap carry. If the diver is too heavy to carry, simply drag the victim ashore by the two wrists. Resume rescue breathing with two slow, full breaths within 30 seconds.

When you exit through surf, do your best to protect the victim's airway from crashing waves (a rescue breathing mask is the easiest way). If you have trouble standing, crawl out with the diver rather than walk. Exits over rock can be difficult. Proceed cautiously and allow the water to carry you and the injured diver up the rocks in stages. Brace yourself for the next wave. Avoid exits with rock if at all possible; a longer swim to an easier exit may prove the fastest way to get the victim out of the water.

If you expect help shortly, consider staying in the water, maintaining the airway and/or giving rescue breaths until help arrives. This may be more effective than attempting a difficult exit alone.

Exits onto swim steps, low docks and small, stable boats may be easiest using the lifeguard exit.

For a tall dock, boat or pier, you might be able to use the roll up technique with a tarp, net, rope or even several lengths of fire hose, though this is difficult alone. This raises the point that a second rescuer can help with any portion of the rescue, but especially the exit. One rescuer can continue rescue breathing while another goes ahead and prepares exit equipment, or they may provide the strength of two people to lift a victim ashore. Even bystanders make a big difference because they can help based on your instructions. Always ask for help if it's available.

The priorities are maintaining rescue breathing and contacting emergency medical care (if you've not been able to do so already). But you have to balance even these variables amid the demands of the situation. For example, it may be impossible to exit the water without interrupting rescue breaths more than 30 seconds, such as if you're alone and have to carry the victim up a tall ladder. There could be circumstances in which it may be impossible for you to get the victim out of the water at all, there's no one there to help, yet you know that you must exit the water to get help.

In such extreme circumstances, there aren't easy answers. You can only do the best you can. Do that, and resume rescue breathing/start CPR as soon as possible. The victim generally has a better chance out of the water than in it, and with emergency medical care on the way rather than delayed.

SOME IMPORTANT CLOSING THOUGHTS

When you successfully complete the PADI Rescue Diver course, you can take pride in your accomplishment. You'll have grown as a diver, and become better prepared to deal with an emergency if you ever face one.

Of course, rescue skills and knowledge erode with time, so refresh your rescue and Emergency First Response abilities periodically. You can do this by taking part in rescue workshops and refresher programs, as well as the EFR refresher program, at least every two years. In addition, read dive magazines and other periodicals to keep your knowledge fresh and up to date.

Finally, it's important that you understand that one day you may help someone in a serious emergency, the result of which the victim/patient dies or has a permanent serious disability, despite everything you do. Realize that your training doesn't guarantee happy endings. You often can't control what caused the accident, the severity of an injury, the victim's physical condition before the accident or any of hundreds of other influences that determine the emergency's outcome.
As a rescuer, all you can expect is to do the best you can with the resources you have under the circumstances. All you can do is give the victim/patient more of a chance, not certainty, for a more favorable ending. Realize that even if your efforts, in the end, made no difference to the outcome, they still made a difference in that they improved what chances the victim/patient had.
So, if you're ever involved in a rescue situation that doesn't have a happy ending, when it's all over, don't tell yourself you "failed" and second guess yourself. Don't play "If only I'd . . ." with yourself because the fact is, you don't know and can never know whether anything would have made a difference. Usually, the reality is nothing would have.

You did something wonderful – you reached out and did the best you could to help another person. That's not failure. It's compassion.

Exercise 5 – 4

Question 1

The technique for exiting the water with a victim onto a low dock or swim step alone is

packstrap carry.
lifeguard exit.
fireman's carry.

Question

There is never a time when you would let environmental conditions affect regular rescue breaths.

True
False

SUMMARY

"We need to get out there right away," Gabriel told Marc and Max. He assigned one of the group to watch for the missing divers and make notes about the rescue, then took Marc and Max up to the car for fresh tanks and to get his wreck penetration equipment.
Marc was also penetration trained, so Gabriel asked him to assist with the rescue. He had Max help them get set, then told him to contact help on his cellular telephone. Marc and Gabriel returned to the water's edge, made a quick but thorough safety check and began swimming out on the surface to the buoy that marked the wreck.

The pair descended as quickly as they could. There were several places to enter the wreck, but figuring the divers wouldn't have gone far with partially empty tanks, Gabriel and Marc tied off their penetration line and entered the closest entry, a large deck hatch. Almost immediately they encountered thick silt, which indicated someone had been there. Fortunately, the silt was settling, so they could see.

Turning a bend, Gabriel spotted the missing divers lying inert, one in a passage and the other partially in a cabin. Neither was breathing. Gabriel took the penetration line past both victims, locked the reel and secured it. He signalled Marc to take the diver closest to the exit, and watched to be sure Marc could handle the diver by himself.

Gabriel took the second diver, following Marc and the line out. He ascended as quickly as he could safely. At the surface, he found Marc already giving inwater rescue breaths and towing the victim toward shore. He did the same with his victim.

Max was waiting when Marc came ashore first. He helped pull the victim out and began CPR while Marc took off his equipment. Marc took over CPR so Max could help Gabriel with his victim. Paramedics arrived shortly after.

The two divers never regained a pulse or resumed breathing, and were pronounced dead on arrival at the local emergency room.

The victims had willfully broken multiple safe diving practices that they had learned as entry-level divers and that Gabriel had reiterated that same day, including making a deep repetitive dive without full tanks and entering an overhead environment without the proper equipment. They had even disregarded Gabriel's statement that diving was through for the day.

The rescue wasn't a failure – it was an example of doing everything correctly, including taking reasonable steps to assure rescuer safety while rescuing the victims from an overhead environment. They had the proper training, planning and equipment to respond quickly and effectively to an emergency. Gabriel, Marc and Max could not have done anything else. They did the best they could, which is as much as anyone can do.

KNOWLEDGE REVIEW

Question 1 of 10

Only provide facts that you personally witnessed. If you don't know, say so. Don't offer guesses, opinions or speculations because they can interfere with determining the true cause or causes of the incident. Avoid suggesting fault. Due to the emotions following a serious incident, these suggestions are often inaccurate and mislead investigators.

After a dive incident that required summoning emergency medical care, an official asks you questions for a formal accident report. Which of the following would be appropriate for you to provide when answering? (Choose all that apply.)

Events/facts that you personally witnessed
Events/facts that someone told you about
Your opinion/guess about what happened
Whose fault the incident was

Question 2 of 10

Emergency oxygen has shown to be beneficial in many DCI cases. There are some types of DCI that don't seem to benefit from oxygen, but providing it does no harm. Oxygen is only first aid, however. Recompression is still needed for treatment of the vast majority of DCI cases.

Administering emergency oxygen promptly is crucial for suspected decompression illness because it has been shown to improve the effectiveness of recompression in many, but not all cases.

True
False

Question 3 of 10

Equipment used with pure oxygen requires special lubricants; never use standard scuba lubricants. Have oxygen equipment serviced by the manufacturer. Put out any flames before using oxygen, and pressurize the unit slowly by opening the valve slowly. This reduces the risk of heat caused by pressurization. When not in use, keep the unit assembled (but not pressurized) to reduce the risk of contaminant entering the system.

You've just invested in an emergency oxygen system to have with you when diving. Which of the following are true? (Choose all that apply.)

Keep the valve lubricated with standard silicone grease.
Always put out any flame before deploying oxygen.
When using oxygen, always open the valve quickly.
Keep the unit assembled even when not in use.

Question 4 of 10

A breathing patient can use the nonresuscitator demand valve, which makes the best use of oxygen. A patient who is breathing weakly may have difficulty with the demand valve, so a continuous flow, nonbreather mask is a better choice. A patient who isn't breathing at all needs rescue breaths, which you can give with supplemental oxygen using a continuous flow rescue breathing mask.

Which oxygen system is the best choice for an injured diver who is breathing weakly?

Nonresuscitator demand valve
Continuous flow, nonrebreather mask
Continuous flow, rescue breathing mask
Enriched air cylinder

Question 5 of 10

When providing oxygen with a continuous flow unit, set the flow for 15 litres per minute. This is the same whether you're helping a breathing patient with a nonrebreather mask, or providing oxygenated rescue breaths with a rescue breathing mask. If a breathing patient collapses the reservoir bag completely on inhalation, increase the flow to 25 litres per minute.

When using a continuous flow oxygen system, initially set the flow rate at _____ litres per minute. If the reservoir bag collapses completely when the patient inhales, change it to _____.

5; 20
15; 25
10; 30
25; 40

Question 6 of 10

The nonresuscitator demand valve oxygen system delivers nearly 100% oxygen and wastes less because it only flows when the diver inhales. You need to switch to continuous flow for nonbreathing/weakly breathing patients. Most oxygen systems intended for dive emergencies have both nonresuscitator demand and continuous flow ability. The manually triggered resuscitator valve is a system that allows you to provide 100% oxygen to nonbreathing patients, and also works as a demand or continuous flow unit. You may be able qualify to use these units by completing the PADI Emergency Oxygen Provider course. Ask your PADI Instructor for more information.

The advantage(s) of a nonresuscitator demand valve oxygen system is (are) (choose all that apply)

less expensive
delivers nearly 100% oxygen
suitable for nonbreathing patients
accepts standard scuba regulator
wastes less oxygen

Question 7 of 10

These are all appropriate steps following primary and secondary care, summoning EMS and providing oxygen, except for allowing the patient to sit up. Keep the patient comfortable, but lying down.

You're managing a dive accident scene. You've completed primary and secondary care and summoned EMS. The patient is breathing emergency oxygen. While waiting for EMS you (choose all that apply)

manage shock.. undefined
manage shock.
keep the area open for EMS access.. undefined
keep the area open for EMS access.
monitor the patient's breathing and circulation.
allow the patient to sit up (if more comfortable).
contact local diver emergency service.

Question 8 of 10

Provide all the information listed, but as with incident/accident reports, provide only facts. Guesses and speculation can make things more difficult, so don't guess.

What information should you collect (as available) to send with the injured diver and EMS? (Choose all that apply.)

Diver's name and contact information
Dive profile information
Significant medical history
Emergency care provided

Local diver emergency system number and contact name
Best guesses to any of the above

Question 9 of 10

The lifeguard exit is useful if you have to get someone onto a low boat swimstep or dock without help. Review the discussion on exiting with an unresponsive diver and talk to your instructor if you don't understand this and/or other exit procedures.

For a lifeguard exit, you place the injured diver's hands on the deck and push out of the water while keeping one hand on the diver's hands. Next, you stand and

---

lift the diver's waist to deck level and lower the dive face down on the deck.
turn the diver around and drag the diver onto the deck.
lift the diver up to a kneeling position on the deck.
hold the diver in place until you can get some assistance.

Question 10 of 10

The environment, your personal characteristics, whether you have help and other circumstances will affect what you have to do when you exit the water, including the techniques. In all cases, protect the victim's airway and continue providing rescue breaths if required. If you must interrupt rescue breathing for an exit, give two quick breaths, stop for no more than 30 seconds, then resume with two quick breaths. Review the discussion on exiting with an unresponsive diver and talk with your instructor if you don't understand these and/or other exit procedures.

You're exiting the water onto shore through mild surf with an unresponsive victim who isn't breathing. It will take more than five seconds to pull the person ashore. The protocol for interrupting rescue breaths is to begin the interval with ____ breaths, then resume with _____ breaths after no more than ______ seconds.

2; 8; 120
4; 4; 45
6; 8; 60
2; 2; 30