Study Questions for PADI Open Water Course Final Exam

These study questions closely parallel actual test questions. The biggest difference between the study questions and the questions that will be on the final exam is that, for the most part, the final exam questions provide multiple choice answers and these questions do not. Therefore, if you can answer these questions, and understand how you arrived at the correct answers, then you will find the final exam easy.

1. Which is more buoyant, salt water or fresh water?

   Salt water

   Because of dissolved salts in the water, saltwater is more buoyant than fresh water.

2. If an object is neutral in salt water, what will be the effect on buoyancy of placing the object in fresh water?

   It will be negative

   If it's neutral in saltwater, it'll sink in fresh water.

   If it's neutral in fresh water, it'll float in saltwater.

3. What happens when a balloon filled with air is taken to the bottom of pool?

   The balloon gets smaller.

   The air inside the balloon gets denser.

   The pressure inside the balloon increases.

   The air inside a sealed, flexible container will be compressed by water pressure as the container is taken deeper. This compression decreases the volume of the container and increases the pressure and density of the air inside.

   The air inside a sealed, flexible container will expand as the container is brought to the surface as the water pressure decreases, increasing the container's volume and decreasing both the air density and pressure.

4. What will be the volume of a balloon taken to 33 feet compared to the volume at the surface?

   It will be 1/2 of its original size at the surface.

   33 feet equals 2 atmospheres (ATM) of pressure (1 ATM at the surface, plus 1 more ATM for each 33 feet of depth). Since volume is inversely proportional to pressure, the volume of a sealed, flexible container taken to 2 atmospheres will be 1/2 of it's volume at the surface. (Or 1/3 volume at 3 ATMs, 1/4 volume at 4 ATMs, and so forth.)

5. What happens to the density of the air in the balloon if it is taken back to surface?

The density decreases.

Air density is directly proportional to pressure—the greater the pressure, the greater the density. So the density of the air in a sealed, flexible container taken from a deeper to a shallower depth will decrease as the depth and water pressure decrease.

As water pressure decreases from 3 ATMs at 66 feet to 2 ATMs at 33 feet, the density inside a sealed, flexible container also will decrease from 3 times normal (surface) density to 2 times normal density.

6. What will be the *volume* of an 80-cubic-foot scuba tank if it is taken to 66 feet?

It will remain 80 cubic feet.

This is a trick question. Since a scuba tank is not a flexible container, it's volume essentially is not affected by changes in pressure.

7. If a scuba tank lasts an hour at surface, how long will it last at 66 feet?

20 minutes

Although a scuba tank's volume is unaffected by changes depth and pressure, the air from a scuba tank is breathed into lungs, which are flexible. Therefore, the same rules regarding pressure and volume relationships apply. At 33 feet (2 ATMs), a diver requires twice as much air to fill his lungs, and the air in the tank would last only half as long as it would on the surface. At 66 feet (3 ATMs), a diver requires three times as much air, so the tank would last only one-third as long.

8. Why shouldn't you dive if you have a cold?

Because of your inability to equalize pressure.

Colds generally mean clogged sinuses and ear passages. Clogged sinuses and ear passages could keep a diver from equalizing properly. An inability to equalize could result in discomfort or injury to the ears and sinuses.

The reason divers should not use decongestants to clear sinuses and ear passages for diving is that while the decongestant may permit the diver to descend without difficulty, the decongestants can wear off at depth and the sinuses and ear passages could become blocked. The diver then may have difficulty surfacing due to a condition known as "reverse block." At best, reverse block can be cause significant discomfort—and there's not much you can do about it. A diver can always decide not to go diving because of a cold. But a diver can't very well decide not to ascend at the end of the dive.

9. During what part of dive would lung-expansion injury be most likely to occur?

During ascent.

Since the air in a diver's lungs expands as depth and pressure decrease, a diver risks lung overexpansion if he holds his breath while ascending from a deeper to a shallower depth.

10. At what depth is the most risk of lung overexpansion injury?

30 feet or shallower.

Since the greatest change in pressure occurs nearer the surface, the greatest risk of lung-expansion injury occurs at shallower depths.

11. How often is visual tank inspection required?

Every year.

A visual inspection of the inside of a scuba tank is required every year. A hydrostatic test of structural integrity of the tank is required every five years.

12. What is the difference between a J-valve and a K-valve?

A J-valve incorporates a manually operated mechanism that provides a small reserve of air.

A K-valve is simple on/off valve without any reserve capability.

In the old days before submersible pressure gauges (SPG), the only way divers knew they were getting low on air is when their tanks ran dry. The old-style J-valve allowed divers to reach back and pull a metal rod that pulled the valve down, giving them another minute or so of air, which supposedly was enough to get back to the surface safely—provided, of course, that the diver had remembered to put the valve into the "up" position before the dive. You still see a lot of J-valves on older steel 72-cubic-foot tanks.

With the advent of accurate SPGs, a diver doesn't need a manual reserve because he can see exactly how much air is in his tank at any time. The simpler, less expensive K-valve has become the standard.

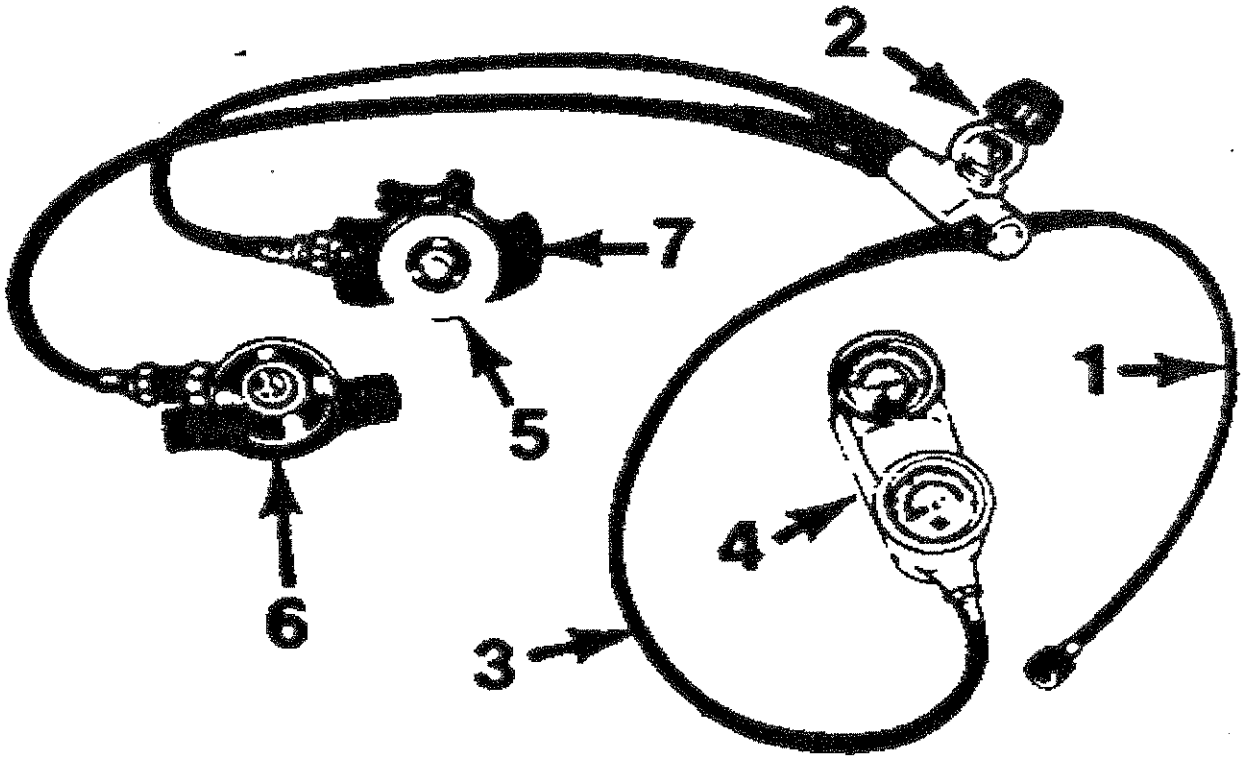
13. What's the most important thing a diver can do to prolong the life of a scuba tank?

Keep water out of the tank and don't overpressurize tank.

If water gets inside a scuba tank, the tank can rust or corrode, which weakens the tank's structural integrity and makes it unsafe for use. The best way to keep water out of the tank is to never allow the air pressure inside to fall below 200 to 300 psi.

If a tank is filled beyond it's safe, rated operating pressure, it can literally be stretched, which weakens the tank's structural integrity and makes it unsafe for use.

14. Name these parts?



1. Low-pressure hose.

2. Regulator first stage.

3. High-pressure hose.

4. Console (gauges).

5. Regulator second stage (alternate).

6. Regulator second stage (primary).

7. Regulator exhaust port.

15. Water is denser and more resistant to movement. How should divers move under water?

Slowly and deliberately.

Think of the difference between trying to stir a pot consommé soup and trying to stir a pot of thick pudding. It's a lot easier and less tiring to stir the thinner liquid. The same is true with diving. You'll use up a lot less energy by moving slowly and deliberately, and by keeping your body and equipment streamlined.

16. What should you do if you get exhausted at depth?

Stop all activity.

Hold onto something.

Rest.

Overexertion is the diver's nemesis. If you get tired under water, the best thing you can do is get untired. Stop moving around, grab onto something to hold your position. Try to breathe slowly and deeply until your breathing returns to normal.

17. How do objects appear under water (closer, farther, larger, smaller)?

Closer and larger than actual.

Because light refracts when it hits the surface of the water, objects under water appear to be 25% closer and 25% larger than they really are.

18. Can a diver use sound as means of determining direction under water? Why or why not?

No, because sound travels faster underwater than in air.

Sound travels four times faster under water than it does in the air. A diver can determine direction on the surface because the brain is able to detect how much time elapses between the sound striking one ear and then the other. Sound travels so fast under water that all but the most keen divers are unable to determine its where it is coming from.

19. As skin diver in wetsuit and weights descends, what happens to his buoyancy?

He becomes less buoyant.

As the diver descends, the water pressure compresses all of the air spaces in his body—especially his lungs—and it also compresses the tiny air bubbles in his neoprene wetsuit. The result is that these air spaces provide less buoyancy under water than they do at the surface.

20. What is the primary advantage of having an alternate air source?

An alternate air source eliminates the need to share a single regulator in an out-of-air emergency.

Sharing air by swapping the same regulator back and forth between the donor and the receiver in an out-of-air emergency is a complex task requiring coordination and practice. In a true emergency, the complexity merely puts additional stress on the divers and creates a greater opportunity for other problems.

21. Fully suited, a diver should float at what level while holding a normal breath at surface?

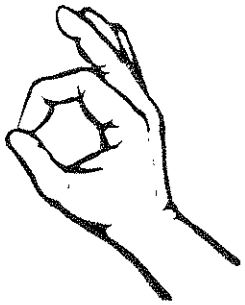
Eye level.

A properly weighted diver should be neutrally buoyant at the surface. The typical test for neutral buoyancy at the surface is for the diver to completely deflate his BCD, enter the water until up to about chest height, take a normal breath and hold it, and then lift up his legs. If he's properly weighted, he should float with the water at about eye level. If his head remains out of the water, more weight is needed. If he sinks, some weight should be removed.

Once neutral buoyancy has been attained, the final test is for the diver to exhale. He should then sink slowly beneath the surface.

20.

21.



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(Continued)

23. What procedure should you follow if you lose your buddy at depth?

Look for one minute, then surface and meet.

Buddy separation is a common concern, particularly in the Northwest where underwater visibility can be limited. If you lose your buddy under water, you should search for him for a short time, about a minute, and then surface if you don't find him. When he surfaces you may resume the dive, other considerations permitting.

Follow this technique when looking for a lost buddy:

- ☐ *Look up. Often times, your buddy is just a little higher in the water column than you are.*
- ☐ *Do a complete, slow 360° sweep search.*
- ☐ *If you have a dive light, use it in your 360° search, not so much to help you find your buddy, but to help your buddy find you.*
- ☐ *Rise up off the bottom 5 to 10 feet and repeat the 360° sweep.*
- ☐ *Look for your buddy, his bubbles, or a cloud of silt or mud suspended in the water that might have been disturbed by your buddy.*
- ☐ *If you don't find your buddy after about a minute, make a normal, direct ascent to the surface.*
- ☐ *Wait for your buddy to join you on the surface. Then resume the dive if you both have sufficient air remaining.*
- ☐ *If your buddy does not return to the surface within three minutes, call for assistance—do <u>not</u> return to depth alone to search for him.*

24. When would diver most likely feel disoriented?

In midwater and without a visual reference.

It's quite easy to become disoriented under water, particularly if you are in midwater where you can see neither the bottom nor the surface and have no other visual reference like a line or a wall. Although disorientation can cause anxiety, it's really nothing serious to worry about as long as you know how to deal with it.

First, stop, think, and act. Breathe slowly and deeply. Stay calm. Watch your depth gauge so you something to look at and so you can ensure that you don't ascend (or descend) too fast. Watching your bubbles to determine which way is up, adjust your body to an upright, feet-down position. Hug yourself. If a wave of vertigo (dizziness) hits you, just try to relax and repeat these steps. Don't panic; the vertigo will pass shortly. To surface, watch your depth gauge and use a timing device or simply count to yourself as you ascend at about 1 foot per second, 10 feet in 10 seconds.

25. In mild current, how should you begin a dive?

Start your dive swimming against any mild current.

Avoid currents over half a knot in velocity, unless you plan a drift or current dive. In a mild current, begin the dive swimming against the current. That way, at the end of the dive when you're tired, you can use the current to help you return to your exit point. If you swim with the current at the beginning of the dive, the current may take you so far away from your exit point that you may not be able to return under water on your remaining air. You may have a long and tiring surface swim before you can exit.

26. What's best position to place unconscious, breathing diver?

Place the diver in a horizontal position on his left side with his head supported.

The reason a diving-accident victim should be placed on his left side is to keep his heart in the lowest possible position. Should there be a lung-overexpansion injury or an air embolism, the theory is that this position will lower the risk of air bubbles lodging in the blood vessels around the heart, which could cause a blockage and heart attack. Rescue divers used to be taught to place an unconscious, breathing victim in an inclined position with the feet elevated. This is no longer recommended because it is thought that elevating the feet will raise the blood pressure to the rest of the body, possibly increasing the risk or effects of an embolism or stroke. Finally, the head should be supported, primarily for comfort and to maintain an open airway. If the patient is not breathing, he should be placed flat on the ground rather than on his side, so that artificial respiration or full CPR may be performed.

27. What aspect of a dive will be most affected by the composition of the bottom?

Visibility.

Even the most alert and careful diver may not be able to entirely avoid disturbing silt or mud from a loose bottom, which will reduce visibility. If the bottom composition is extremely silty, even a slight current may stir it up. In silty conditions, try to swim well off the bottom and check behind you to see if the wake of your fins stirs up the muck. If it does, take shorter leg kicks or get farther off the bottom.

One good thing about diving in silty conditions is that you can follow other divers, even if you can't see them. Just follow the cloudy path of suspended particulates.

28. What are the five low-on-air/out-of-air emergency procedures— in order of preference.

1. ***Normal ascent***
2. ***Alternate air source ascent***
3. ***Controlled emergency swimming ascent***
4. ***Buddy breathing ascent***
5. ***Emergency buoyant ascent***

A normal ascent should be used if you suddenly realize you are low on air, but not out. You made a mistake by not monitoring our air supply more closely, but no harm is done.

An alternate air source ascent should be used if you are suddenly out of air and your buddy is nearby and has an alternate air source. Once again, you made a mistake by not monitoring your air supply, but you did the right thing by diving with someone who has an alternate air source and by staying near him.

Use a controlled emergency swimming ascent if you are not very deep, say 30 to 40 feet, and your buddy is not nearby or doesn't have an alternate air source. Now you've made several mistakes: You didn't monitor your air, you dove with a buddy who doesn't have an alternate air source, and/or you didn't stick close to your buddy. But at least you weren't diving very deep, so you can still get back to the surface easily and safely.

Use a buddy breathing ascent if you are deeper than 30 to 40 feet and your buddy doesn't have an alternate air source. Your several mistakes are now beginning to gang up on you. Not only did you fail to monitor your air, you dove with a buddy who doesn't have an alternate air source, and you dove to a depth from which you cannot easily and safely make a controlled emergency swimming ascent by yourself. You can still make a controlled ascent with your buddy by buddy breathing from his single regulator, but the procedure is more complex.

Use an emergency buoyant ascent if you are deeper than 30 to 40 feet and can't find your buddy or get to him quickly enough to obtain air at depth. This time you've really screwed up. You didn't monitor your air, you didn't maintain effective buddy contact, and didn't stay shallow enough to make a controlled emergency swimming ascent. The emergency buoyant ascent similar to the controlled emergency swimming ascent, except that you ditch your weightbelt, giving you positive buoyancy. Your ascent rate may be faster than the recommended 60 feet per minute, especially at the beginning the ascent. As you approach the surface, vent your BCD and flare your body out horizontally to slow your descent. This is not a controlled situation and should be your last resort. At least you'll wind up on the surface where others can assist you easier, if needed.

29. What signs will a diver in distress display on the surface?

Head high out of the water, mask and mouthpiece removed, quick and jerky movement, rapid and shallow breathing.

A distressed or panicked diver may forget basic safety training. He will forget to inflate is BCD or ditch his weights. He may try keep his head high above the water solely by kicking. He may forget that air is as close as his snorkel or regulator and remove the mouthpieces. He may displace other gear, too, such as his mask. And the panicked diver may thrash about in the water ineffectively, using up more energy. Finally, a diver in distress may be wide-eyed and breathing in short, rapid, shallow breaths. Sometimes a diver in distress will simply freeze up and simply not be able to summon the motor skills required for even the simplest skill, such as swimming toward the boat or shore.

30. What is the primary concern in dealing with an unconscious diver?

Ensure that the diver is breathing.

The longer a person goes without oxygen, the greater the risk of serious brain injury or death. It is imperative to check an unconscious diver for breathing and initiate artificial respiration and/or CPR as soon as possible.

31. What factors might easily contribute to the onset of decompression sickness (DCS)?

Fatigue, cold, illness, obesity, smoking, drinking.

Divers with one or more of these contributing factors can get a DCS "hit" even if they stay within "safe" diving limits. A person who isn't physically and mentally prepared should not dive. If you plan an unusually strenuous dive or a dive into unusually cold water, plan your dive with an extra margin of safety; plan it as though it were 10 feet deeper than actual. Don't dive when you're sick. And don't drink or use drugs before diving. If you smoke, refrain from smoking for at least several hours before diving and don't light up the instant you exit the water.

32. Should a DCS victim be allowed to continue diving if the symptoms subside?

No way.

Under no circumstances should a diver who thinks he may have DCS be allowed to do any diving until he has been seen by a physician—even if symptoms subside. DCS symptoms may come and go, only to return again later, and the symptoms are not the same in every case and may effect different divers differently.

If you have an uncontrolled, rapid ascent or realize that you have completed a dive profile that exceeds safe-diving practices and dive table limits, suspect DCS—even if there are no symptoms whatsoever. In some cases, DCS symptoms may not show up until days or even weeks after the event. Let your buddies know what happened, stay out of the water for at least 24 hours, breathe 100% oxygen if available, drink lots of fluids, and be alert for the onset of symptoms. If symptoms begin, seek immediate medical attention.

33. What procedure should be followed if a diver begins to act foolishly or displays intoxicated-like behavior at depth?

Ascend to a shallower depth until the behavior returns to normal.

Nitrogen narcosis has different affects on different people, affects different people at different depths, and may affect the same person differently on different dives. The easiest way to avoid it is simply keep your dives shallow. The easiest way to get rid of it is to ascend to a shallower depth.

34. A diver completes a dive to 68 feet for 32 minutes, then does a 30-minute surface interval. He wants to do a second dive to 50 feet. What is his maximum allowable bottom time for his second dive?

47 minutes.

Using Table 1, a dive to 68 feet for 32 minutes puts the diver in the "P" pressure group. Using Table 2, a P diver who does a 30-minute surface interval becomes a J diver. Using Table 3, the blue box at the intersection of the J-diver column and the 50-foot depth row shows an adjusted no-decompression limit (ANDL) of 47 minutes. (The number in the white box, 33, is the residual nitrogen time (RNT) after the first dive and surface interval.)

35. A diver plans to dive to 70 feet for 30 minutes on his first dive and to 60 feet for 30 minutes on his second dive. What is the minimum surface interval allowable between the dives?

29 minutes.

Using Table 1, a dive to 70 feet for 30 minutes puts the diver in the "O" pressure group. Because we don't know what the surface interval is (that's what we're going to find out), skip Table 2 for now and move to Table 3. Using Table 3, find the 60-foot depth row (the planned depth for the second dive) and move across this row until you reach the first column with an ANDL (blue box) of 30 minutes or greater. It happens to be the row under the "I" pressure group. Now return to Table 2 and find the box where the "O" group and the "I" group intersect. The times range in this box is from 29 minutes to 34 minutes. The shorter time is the minimum surface interval.

36. After two dives in one day, a diver's accumulated bottom time is 1 hour and 30 minutes. How long should he wait before boarding an airliner for his trip home?

At least 12 hours.

If in a single day the accumulated bottom time is less than 2 hours, it is recommended that you wait 12 hours before flying (or driving) to an altitude between 1,000 feet and 8,000 feet. (Airliners are pressurized to 8,000 feet.) If the accumulated bottom time is more than 2 hours, wait <u>at least</u> 12 hours; longer is better.

37. What if accumulated bottom time is more than 2 hours?

Somewhat beyond 12 hours.

After multiple repetitive dives over multiple days, or any dives that require decompression stops, you should wait somewhat more than 12 hours. PADI used to recommend a 24-hour wait, but now recommends "an extended surface interval beyond 12 hours before flight."

38. A diver does a 60-foot dive for 45 minutes followed by a 30-minute surface interval. On his second dive, he gets so interested in an octopus den at 58 feet that he loses track of time and suddenly realizes that his bottom time is now 28 minutes. What should he do?

Ascend to 15 feet and do an emergency decompression stop for 8 minutes, then surface and remain out of the water for at least 6 hours and refrain from flying for at least 24 hours.

This is a typical example of how a diver can miss a no-decompression limit and be forced to do an emergency decompression stop to lower the risk of getting decompression sickness. Using Table 1, a dive to 60 feet for 45 minutes makes him an S diver. Using Table 2, after a 30-minute surface interval he is an L diver. Turning to Table 3, find the depth of the second dive, 58 (60) feet, and move across the row until it intersects with the L column. The adjusted no-decompression limit (ANDL) in blue is 24 minutes. He has exceeded that limit by four minutes and must make an emergency decompression stop.

If an NDL or ANDL is exceeded by no more than 5 minutes, an 8-minute emergency decompression stop at 15 feet is required. On surfacing, the diver must remain out of the water for at least 6 hours and refrain from flying for 24 hours. If an NDL or ANDL is exceeded by more than 5 minutes, an emergency decompression stop at 15 feet is required for no less than 15 minutes or as long as his air supply will let him. He must refrain from diving or flying for at least 24 hours. In either case, the diver should let his buddies know what happened, be alert for any signs of decompression sickness, and avoid any activities that might contribute to DCS such as drinking, smoking, and strenuous exercise.

39. The Sea Horses are planning a pair of boat dives. One dive is to a reef in about 60 feet of water, and the other is a dive on a wreck lying in about 100 feet. Which dive should be done first?

We should do the 100-footer first.

Always do the deeper dive first. All successive dives should be to increasingly shallower depths. The PADI Recreational Dive Planner and most modern dive computers are designed for successive dives to ever-shallower depths. Their readings are inaccurate and unsafe if any repetitive dives are to depths deeper than the initial dive in the sequence.

40. What should you do if you want to dive in a mountain lake that is higher than 1,000 feet?

Use special tables and procedures, which require special training.

Because the diver will be surfacing to an atmospheric pressure that may be considerably less than the 1 ATM of sea level, any dive at an altitude of higher than 1,000 feet requires specialized training in the use of special procedures and high-altitude dive tables. Under no circumstances should standard dive tables be used for such a dive. Some dive computers, however, automatically adjust for altitude and can be used safely with the special training and procedures.

41. The Sea Horses are planning a winter dive in Hood Canal. The dive profile calls for a 60-foot dive for 30 minutes in January when the air and water temperatures are near freezing. What special procedures should be followed?

We should plan the dive as though it were to 70 feet for 30 minutes instead of 60 feet.

Always plan cold or strenuous dives as though they were 10 feet deeper than they actually are.

42. A diver is doing a series of three repetitive dives. Dive #1 is to 88 feet for 18 minutes followed by a 45-minute surface interval. Dive #2 is to 57 feet for 28 minutes followed a surface interval of 1 hours. The diver plans to go to 50 feet on his third dive. How long can he stay at that depth?

54 minutes.

Using Table 1, the first dive to 88 feet for 18 minutes makes him a K diver. Using Table 2, he becomes an E diver after the first surface interval of 45 minutes. Using Table 3, the intersection of the 60-foot depth row and the E diver column shows that the diver has a residual nitrogen time (RNT) of 17 minutes. Add the RNT to the actual bottom time (ABT) of 28 minutes to obtain the total bottom time (TBT) of 45 minutes.

Return to Table 1 and use the TBT of 45 minutes to plan the second dive. A 57-foot dive for 45-minute makes him an S diver, and Table 2 tells us that after a 1-hour surface interval he is a G diver. Now return to Table 3 and intersect the 50-foot depth row with the G-diver column. The diver's maximum allowable bottom time, or ANDL, at that depth is 54 minutes.