EAN$_x$ Review
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These are sample review questions based on my course in oxygen enriched air. These problems are based on my lecture slides for a class on oxygen enriched air.

Myths

1. NOAA I is _______ % oxygen. It can also be written as E .

2. NOAA II is ______ % oxygen. It can also be written as E .

3. OEA is abbreviation for _________________________________.
4. True or False: Nitrox is safer than air.

5. True or False: Nitrox is for deeper diving.

6. True or False: Nitrox eliminates all risk of DCS in diving.

7. True or False: Using nitrox prevents hyperbaric treatment for DCS.

8. True or False: Using nitrox prevents narcosis.

9. True or False: Using nitrox is too complicated for sport divers.

EAN$_x$ Advantages

1. EAN$_x$ provides a (longer, shorter) no-decompression required bottom time than the same dive on air.

2. EAN$_x$ provides a (longer, shorter) repetitive dives without deco obligation than the same dives on air.

3. EAN$_x$ provides a (longer, shorter) surface intervals between dives than the same dives on air.

4. EANx no-deco times compared to air is termed the “(Decompression, Physiological) Advantage.”

5. Diving EAN$_x$ on air is equivalent to diving air at a (shallower, deeper) depth.

6. Using EANx while diving with air tables/computers is the “(Decompression, Physiological) Advantage.”

7. For most non-working dives, divers report being (more, less) fatigued than the same dive on air.

8. In addition to monitoring time and depth , EAN$_x$ dive planning adds concerns about __________ exposure.

Medical Matters

1. Air is primarily a mix of _______ % nitrogen and ______ % oxygen.

2. Two major maladies associated with too much on-board nitrogen are ________ and ___________.

3. Martini's Law is considered (valid, not valid) by the hyperbaric medical community.

4. Meyer-Overton suggests anesthesia effects can be explained by gasses dissolving in _________ of nerves.

5. Oxygen has a diminished narcotic effect because it is ____________ in metabolism.

6. Signs and symptoms of narcosis in warm water include:

7. Signs and symptoms of narcosis in cold water include:

8. Narcosis problems are exacerbated by:

9. Narcosis impairment can be relieved by (ascending, descending) in the water column.

10. High CO_2 loads are a (major, minor) problem in diving.

11. Sources of excess CO_2 include:

12. You are a bit winded and getting ready to dive. Your regulator does not seem to be working. You should:

13. Two primary symptoms of excess carbon dioxide:

14. At depth, the pN_2 is (much larger, the same, or much smaller) than pO_2.

15. Gases move into / out of tissues until the partial pressures of all gases are (< , = . >) ambient.

16. Symptoms of DCS depend on the __________of bubbles and their ________.

17. The primary symptom of DCS is __________.

18. The majority of DCS cases show symptoms within _____ hours.

19. Symptoms of DCS type I (Pain Only) include:

20. Symptoms of DCS type II (CNS) include:

21. The heart condition in ~ 25% of the population that appear implicated in serious CNS lesions is the_______.

22. DCS Risk factors include:

23. The best prevention of swimmer's ear is a post dive rinse with _________.

Physics

1. Pressure in physics is defined as a ______________ per unit area.
2. An atmosphere is the _________________________ directly above point of measurement.

3. One atmosphere equals:

mm Hg
psi
bar
fsw
ffw

4. Convert the US cylinder pressure below (psi) to rest of the world pressure (bar)

3000 psi

2000 psi

1000 psi

500 psi

5. Convert European cylinder pressure (bar) to US equivalent (psig).

100 bar

200 bar

6. Covert the following depths to atmospheres absolute (ata):

101 fsw =

56 ffw =

7. Total pressure in a gas mix is the of the pressures of all components in a mix.

8. Boyle's Law is important for understanding changes in volume as the diver changes .

9. Charles' Law is important for understanding changes in volume as diver changes .

10. Guy-Lussac's Law is important for understanding changes in cylinder pressure with .

11. Henry's Law is important for understanding obligation.

12. The amount of gas dissolved in a tissue is a function of the of each individual gas.

13. In cold water, (more, less) gas dissolves in tissues.

Oxygen Toxicity

1. Hypoxia generally results when the pO_2 is ___________ ata.

2. Hyperoxia generally results when the pO_2 is __________ ata.

3. Symptoms of hypoxia include:

4. Hyperoxia is a function of _____ and ____________ .

5. Hyperoxia symptoms are remembered by the pneumonic:

6. Hyperoxia effects are exacerbated by:

7. Major concern of CNS toxicity involves an .

8. An inexpensive protection of tissues from oxidative damage is ________________ just before diving

9. Whole Body (pulmonary) toxicity is of concern when breathing .

10. Symptoms of whole body oxygen toxicity include:

11. The oxygen toxicity unit (OTU) is based on

12. 1 OTU is defined as

13. OTU's are best tracked by

14. For diving EAN_x more shallow than 130 fsw, it is (necessary, not necessary) to track OTU accumulation.

Dive Planning

1. The optimum EAN_x mix minimizes $\mathbf{N_2}$ (limit deco obligation) while keeping ________ below toxic levels.

2. The pO_2 scientific standard for extended diving is a maximum ______ ata.

3. The current NOAA and recreational diving pO_2 standard maximum is ____ ata.

4. The NOAA single dive time limit for a pO_2 of 1.4 ata is ________ .

5. The NOAA single dive time limit for a pO_2 of 1.6 ata is _________ .

6. Increasing pO_2 in the breathing mix (increases, decreases) bottom time.

7. a. The pO_2 for EAN_{32} at 94 fsw is

   b. The oxygen single dive exposure limit for this dive is

8. a. You dive for 40 minutes at a pO_2 of 1.4 ata. The % CNS exposure for this dive is

   b. You have a surface interval of two hours and 10 minutes. Your % CNS exposure is now

   c. You now dive for 27 minutes at a pO_2 of 1.6 ata. Your % CNS for this dive is

   d. The total oxygen exposure for this dive is

9. The MOD for EAN_{34} for a pO_2 of 1.4 ata is

10. The pO_2 of EAN_{32} at 110 fsw:

11. The best mix for 85 fsw at a pO_2 exposure of 1.4 ata is

Dive Planning Tools

1. The NOAA EAN_x Dive Tables are based on ______________ using the _______ concept.
2. EAD is based on (nitrogen, oxygen) content and not on the actual physical depth.
3. Using EAD, the diver is assumed to be (more shallow, deeper) than actual physical depth.
4. EAD is the basis for the (physiological, decompression) advantage of EAN_x.
5. a. The EAD for EAN_{32} at 82 fsw is

   b. For this dive, you can use US Navy or NOAA air tables entering at .
6. Dive computers are most useful for (multi-level, constant depth) diving.
7. The two options for using a dive computer:
8. Desirable computer features:
9. When diving EANx with an air computer, the diver must know
10. Air computers (will, will not) alert the diver when MOD has been exceeded.
11. 11. DCS hits have been associated with (increasing, decreasing) ambient pressure.

Dive Tables
Problems use the NOAA (2015) Nitrox Tables

1. Dive tables assume a ______ % tolerance of oxygen concentration.

2. When using EAD, always use on-site ________ oxygen concentration.

3. Always use next (greatest, smallest) values for depth and time.

4. a. The rep group for an air dive to 56 fsw for 38 minutes is:

   b. After a SIT of 2 hours, the rep group is

   c. The available bottom time for 80 fsw is minutes.

   d. After 14 minutes at 80 fsw, the rep group is

   e. After a 3:20 SIT, the rep group is

5. a. The rep group for an EAN_{32} dive to 56 fsw for 38 minutes is:

   b. After a SIT of 2 hours, the rep group is .

   c. The available bottom time for 80 fsw is

   d. After 14 minutes at 80 fsw, the rep group is

   e. After a 3:20 SIT, the rep group is.

6. a. The rep group for an EAN_{36} dive to 56 fsw for 38 minutes is:

   b. After a SIT of 2 hours, the rep group is

   c. The available bottom time for 80 fsw is

   d. After 14 minutes at 80 fsw, the rep group is

   e. After a 3:20 SIT, the rep group is .

7. You dive EAN_{32} to 88 fsw for 44 minutes. Your emergency deco obligation is

8. Your gas analysis indicates 30.9 % oxygen. The time allowed at 52 fsw is

9. NOAA Tables assume a descent rate of _____ fsw / min and an ascent rate of ______ fsw / min.

10. NOAA tables assume the dive site of less than _________ feet altitude.

11. a. The rep group for an air dive to 56 fsw for 38 minutes is:

b. After a SIT of 2 hours, the rep group is

c. The available bottom time for 80 fsw is

d. After 14 minutes at 80 fsw, the rep group is

e. After a 3:20 SIT, the rep group is

f. As an F air diver, how much maximum no-deco time is available on EAN_{36} for a dive to 54 fsw?

g. As an F air diver, you dive EAN_{36} to 54 fsw for 45 minutes. Your rep group is now:

h. After 4:30, your rep group is

i. You now want to dive on EAN 32 to 43 fsw. Your maximum no deco time is _____ minutes.

j. You dive to 43 fsw for 45 minutes, your rep group is now:

Handling Gasses

1. Oxygen (burns, does not burn).

2. Oxygen (increases, decreases) the ability of other chemicals to burn.

3. Adiabatic compression is a concern because this process (heats, cools) gases.

4. Always open gas valves (slowly, quickly).

5. a. Compressed air contains two undesirable components for preparing EAN_x:

b. The concerns of these components are:

6. The preferred CGA grade of air is

7. Most recreational scuba uses a standard.

8. The preferred grade of oxygen for EAN_x blending is _______________ grade.

9. The industry term for air used in EANx blending is ______________________ .

10. A measure of water in a breathing mix is the ________________________ .

11. A high dew point in a breathing gas can result _____________from adiabatic expansion.

12. Partial pressure blending is (most, least hazardous) method of preparing EANx.

13. For partial pressure blending the cylinder and valve need to be ________________________ .

14. Membrane / Stik methods typically are used for EAN_x mixtures having less than _______ % oxygen.

15. __________________ can be used for concentrations up to 95 % oxygen.

16. Medical oxygen cylinders should be filled at an ________________________

17. EAN_x cylinders must be clearly marked with the word ________________________

18. Non-yellow cylinders have an additional ________________________

19. The data on an EAN_x tag includes:

20. A __________ valve should never be used on an oxygen line.

Oxygen Cleaning

1. NOAA standards allow EANx mixes of _____ % to be treated as air.

2. Equipment used with oxygen mixes > 40 % must be ______________.

3. The two types of oxygen cleaning are:

4. Scuba equipment is cleaned to (formal, informal) protocols.

5. Oxygen cleaning removes

6. Visual inspection for oxygen cleaning uses (ordinary white light, UV light.)

7. Any scuba gear used with ___________ % must be oxygen clean.

8. A cylinder certified as oxygen clean is used for ordinary air. Before using with EAN_x, it should be

9. The color of O-rings (is, is not) a reliable indicator of acceptability for use with EAN_x mixes.

Gas Analysis

1. Typical scuba oxygen analyzers use (polarographic, electrochemical) detection.
2. Every oxygen analysis (degrades, has no effect, improves) oxygen electrode response.
3. The standard of the community is to replace the electrode at a max of (one, two, five) years.
4. Meter sensitivity should be + / - ________ %
5. Factors which can degrade analyzer performance include:

6. a. Your analyzer indicates a 30.4 % oxygen for a purchased NOAA I cylinder. Your pO_2 1.40 ata MOD is

   b. Your extended exposure pO_2 1.60 ata MOD is

7. Your analyzer indicates a 37.4 % oxygen for a purchased NOAA II cylinder. Your pO_2 1.40 ata MOD is

   b. Your extended exposure pO_2 1.60 ata MOD is

8. Your calibration using air reads 19.6 % oxygen. You should (continue to use, replace**)** the oxygen sensor.
9. Two on-site analyzers report a NOAA I cylinder as having 30.5 and 33.8 % oxygen.
   a. your deco obligation is dictated by the % value.

   b. your MOD is tracked using the _______ % value. For a pO2 of 1.4 ata, this is

10. Every EAN_x cylinder should be analyzed: