

# Pre-Nitrox Workbook

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## II Acknowledgements

Special thanks to Tro Ota who helped edit and refine many of the questions in this document.

## III Contact

Humans are fallible. This document may not be free from errors. If you find any errors or have any suggestions, please let me know. For comments, suggestions, or inquires, you will find my relevant contact information at <https://github.com/maxwenger>

## IV Preface

This workbook is designed to help prepare you to take a recreational nitrox class. It covers the various subjects you will need a basic understanding to get the most out of that class. This is not designed to be an exam in any way, merely a tool to refresh your skills or remind you of topics you may have forgotten.

If you do not understand any concepts, please make a note of them as topics to brush up on before your nitrox class. Use this workbook as a reference, then use any and all resources, including your instructor, to find the correct answer. The point is not to see what you get wrong, but to understand all the subjects being covered.

This document is not meant to be a scuba training guide. Please seek out an active dive instructor that is affiliated with an RSTC approved dive agency for full and complete training.

# 1 Math

1. Convert the following decimal numbers to percentages.

- (a) 0.2
- (b) 0.21
- (c) 0.84
- (d) 0.843
- (e) 1
- (f) 1.2438
- (g) 10.8

**Solution:**

- (a) 20%
- (b) 21%
- (c) 84%
- (d) 84.3%
- (e) 100%
- (f) 124.38%
- (g) 1080%

2. Convert the following percentages to decimals.

- (a) 20%
- (b) 32%
- (c) 89.2%
- (d) 86.48%
- (e) 100%
- (f) 120.138%
- (g) 6100.9%

**Solution:**

- (a) 0.2

- (b) 0.32
- (c) 0.892
- (d) 0.8648
- (e) 1
- (f) 1.20138
- (g) 61.009

3. Calculate the following.

- (a)  $1 \times 0.5$
- (b)  $1 \times 1.5$
- (c) 200% of 1
- (d) 132% of 8
- (e) 96% of 6
- (f)  $16 \times 0.46$
- (g)  $87 \times 1.67$
- (h) 100% of 24

**Solution:**

- (a) 0.5
- (b) 1.5
- (c) 1
- (d) 10.56
- (e) 5.76
- (f) 7.36
- (g) 145.29
- (h) 24

4. When you multiply a number by a factor that is less than one, the product will be \_\_\_\_\_ the original number.

☐ greater than    ☒ **less than**    ☐ equal to

5. When you multiply a number by a factor that is greater than one, the product will be \_\_\_\_\_ the original number.  
☒ **greater than**    ☐ less than    ☐ equal to
6. 100% of a number is \_\_\_\_\_ the original number.  
☐ greater than    ☐ less than    ☒ **equal to**
7. Solve for  $x$ .  
 (a)  $y = a + x$   
 (b)  $y = a - x$   
 (c)  $y = a \cdot x$   
 (d)  $y = \frac{x}{a}$   
 (e)  $y = \frac{a}{x}$

**Solution:**

- (a)  $x = y - a$   
 (b)  $x = a - y$   
 (c)  $x = \frac{y}{a}$   
 (d)  $x = y \cdot a$   
 (e)  $x = \frac{a}{y}$

## 2 Units

8. Atmospheres, PSI, and bars, are all units of **pressure**.
9. 1 atmosphere of pressure is equal to **14.7** psi, and roughly equal to **1** bar.
10. Roughly **33** ft, or **10** m of saltwater exerts 1 atmosphere of pressure.
11. Roughly **34** ft, or **10.3** m of freshwater exerts 1 atmosphere of pressure.
12. Calculate the pressure in atmospheres at each given depth of fresh water.  
 (a) 34ft  
 (b) 84ft

- (c) 184ft
- (d) 34m

**Solution:**

- (a) 1ata
- (b) 2.47ata
- (c) 5.41ata
- (d) 3.3bar

13. Calculate the pressure in atmospheres at each given depth of salt water.

- (a) 33ft
- (b) 84ft
- (c) 184ft
- (d) 46m

**Solution:**

- (a) 1ata
- (b) 2.55ata
- (c) 5.58ata
- (d) 4.6bar

### 3 Physics

- 14. If I am properly weighted in freshwater, I will have to add weight for saltwater.
- 15. The Atlantic ocean has a higher salinity than the Pacific ocean. If I am properly weighted for the Atlantic, I may have to remove weight to dive in the Pacific.
- 16. You experience the greatest change in pressure going from the surface to 15ft of depth than going from 100ft to 115ft of depth. ☒ **True**   ☐ **False**
- 17. If you fill a balloon full of air on the surface, and take it to a depth of 33ft in seawater, the volume will decrease to a volume 50% of the original size, and the density of the gas will increase to a density that is 200% of the original density.

18. If you fill a balloon full of air on the surface, and take it to a depth of 99ft in seawater, the volume will decrease to a volume 25% of the original size, and the density of the gas will increase to a density that is 400% of the original density.
19. If you fill a balloon full of air at 33ft of depth in seawater, and take it to the surface, the volume will increase to a volume 200% of the original size, and the density of the gas will decrease to a density that is 50% of the original density.
20. If you fill a balloon full of air at 132ft of depth in seawater, and take it to the surface, the volume will increase to a volume 500% of the original size, and the density of the gas will decrease to a density that is 20% of the original density.
21. Air is 21% oxygen and 79% nitrogen.

## 4 Physiology

22. Both oxygen and nitrogen are absorbed into your tissues, and can cause DCS if an unsafe amount of excess nitrogen and oxygen bubbles form inside your body due to decompression.  
☐ True    ☒ **False**
23. Oxygen is an inert gas.  
☐ True    ☒ **False**
24. \_\_\_\_\_gasses contribute to the bubbles that cause DCS.  
☐ All    ☒ **Only inert**    ☐ All except inert
25. NDL stands for **No Decompression Limit**.
26. NDLs are a measure of time.
27. Dive tables calculate NDLs using two variables: depth and **bottom time**.
28. Based on the last question, fill in the following variables.  
(a) The longer or deeper the dive, the shorter the NDLs.  
(b) The shorter or shallower the dive, the longer the NDLs.
29. Describe the significance of NDLs to divers.

**Solution:** Answers may vary. Possible answer: NDLs are calculated using dive tables or a dive computer to determine the maximum allowable bottom time on a no decompression dive. Exceeding these limits greatly increases the risk of DCS.

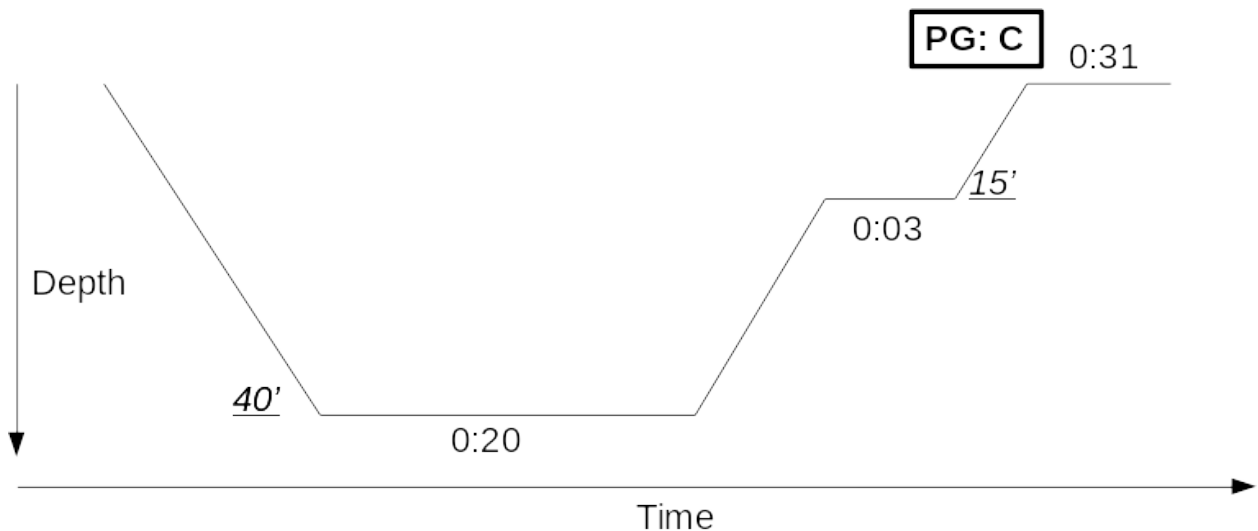
- 30. On-gassing is when our tissues absorb gasses.
- 31. Off-gassing is when our tissues release gasses.
- 32. At what point in the dive do you start to on-gas? **At the start of the descent.**
- 33. At what point in the dive might you begin to off-gas? **At the start of the ascent.**
- 34. At what point in the dive do your NDLs begin to count down? **At the start of the decent.**
- 35. At what point in the dive do your NDLs stop counting down? **At the start of your ascent.**
- 36. How do tables vary from computers in how they calculate NDLs?

**Solution:** Answers may vary. Dive tables do not take multilevel diving into account by default. Dive computers calculate multilevel profiles automatically.

## 5 Dive Tables

For the following questions use the PADI RDP (if using the erdml or other tables your answers may be inaccurate)

37. Use the following graphic for all parts of this question.



- (a) This diver's safety stop was 3 minutes long at 15 ft.
- (b) This diver's was in pressure group C after the dive.
- (c) This diver did a 31 minute surface interval after the dive.
- (d) This diver's bottom time was 20 minutes.
- (e) This diver never exceeded a depth of 40 ft.

38. Are safety stops always required? If not, when are they required?

**Solution:** A safety stop is not always required, but is always recommended. A safety stop is required when you come within three pressure groups of your NDL or on any dive deeper than 100ft.

39. The NDL for a dive at 72ft is 30 minutes.
40. You do a 34 minute dive to 63ft.
- (a) What is your pressure group? Q
  - (b) Is a safety stop required? Yes
  - (c) After this dive, how long of a SI is required before you are in PG K? 26 minutes.
41. Your first dive is a 21 minute dive to 90ft. You do a 23 minute safety stop. Your second dive is a 28 minute dive to 54ft.
- (a) What is your pressure group after the first dive? M
  - (b) What is your pressure group after the surface interval? I
  - (c) What is your pressure group after the second dive? V
  - (d) Was a safety stop required for the first dive? No
  - (e) Was a safety stop required for the second dive? Yes
42. Your initial pressure group is K. What is your adjusted bottom time for a dive to 72 ft? 9 minutes.
43. Your initial pressure group is Q. What is the minimum surface interval required to do a 58 minute dive to 41 ft? 64 minutes.

## 6 (Optional) Nitrox

44. Why do you want to learn how to dive nitrox?



**Solution:** Answers may vary.