# Pre-Nitrox Workbook

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August 24, 2020

## I Licence
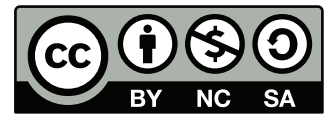
## II Acknowledgements

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

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**Solution:**

   (a) 20%

   (b) 21%

   (c) 84%

   (d) 84.3%

   (e) 100%

   (f) 124.38%

   (g) 1080%

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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%

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**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) $1 \cdot 0.5$

   (b) $1 \cdot 1.5$

   (c) 200% of 1

   (d) 132% of 8

   (e) 96% of 6

   (f) $16 \cdot 0.46$

   (g) $87 \cdot 1.67$

   (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.

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 can 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?

# 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.
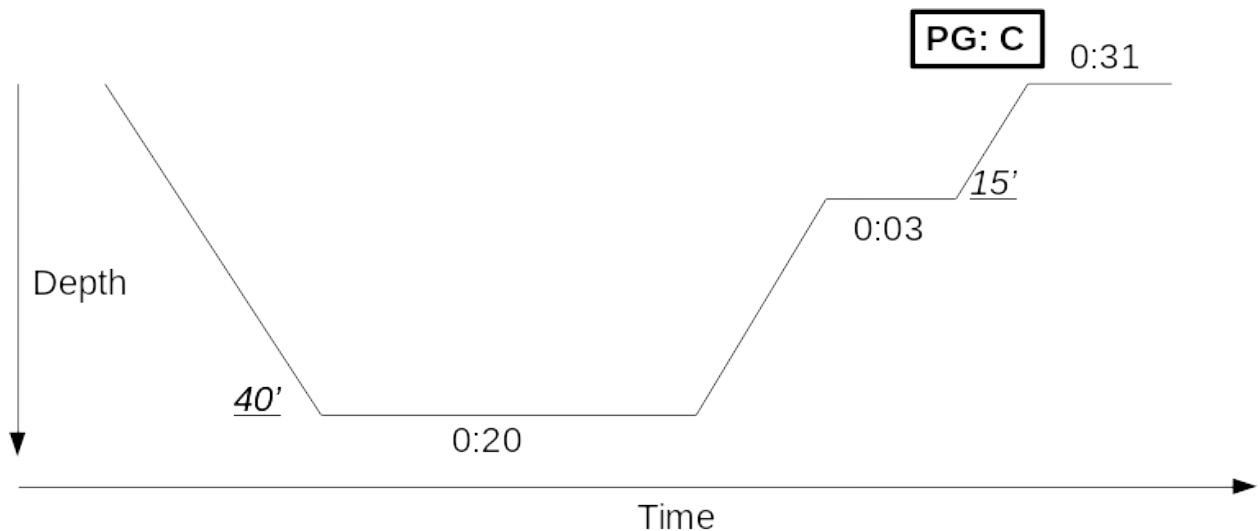
(a) This diver's safety stop was _____**3**_____ minutes long at _____**15**_____ ft.

(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.