



The British Sub-Aqua Club

FIRST CLASS DIVER

DIVING KNOWLEDGE EXAM March 2008

Name:

Please read the following instructions carefully before you begin answering the questions.

- **Answer all 30 questions.** Write your answers in the spaces on the question paper. Please remember to put your name on the paper.
- Brief answers are possible for most questions. Answer as concisely as possible. Use diagrams where these help your answer or where they are asked for.
- There are 2 marks for each question.
- The time allowed is 60 minutes.
- Write all answers in ink, as clearly as possible.
- You may use a calculator but please show all calculations.
- You will need your own copy of the complete BS-AC'88 Tables, levels 1-4 and BSAC Nitrox Tables. No other reference material of any kind is allowed.
- All questions assume sea water (density 1.025 kg/litre) and the prevailing conditions in the United Kingdom unless otherwise stated.
- Please check your work very carefully. A mistake at an early stage of some questions may result in a series of wrong answers and a loss of marks.

Please note that the mark awarded by the examiners for your performance on this paper is final and under no circumstances can the examiners enter into any correspondence or discussion with you regarding this paper.

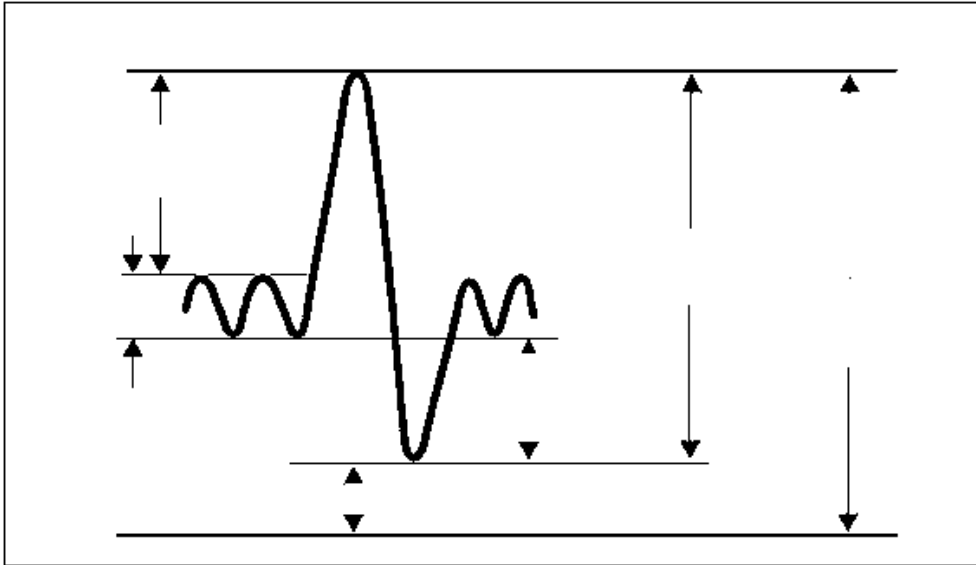
Medical

1. Give 6 symptoms of hypoxia.

2. An acronym is used for the signs and symptoms of CNS oxygen toxicity. Give the acronym and state what each part stands for.

3. Label the given volumes of lung capacity on the graph below:

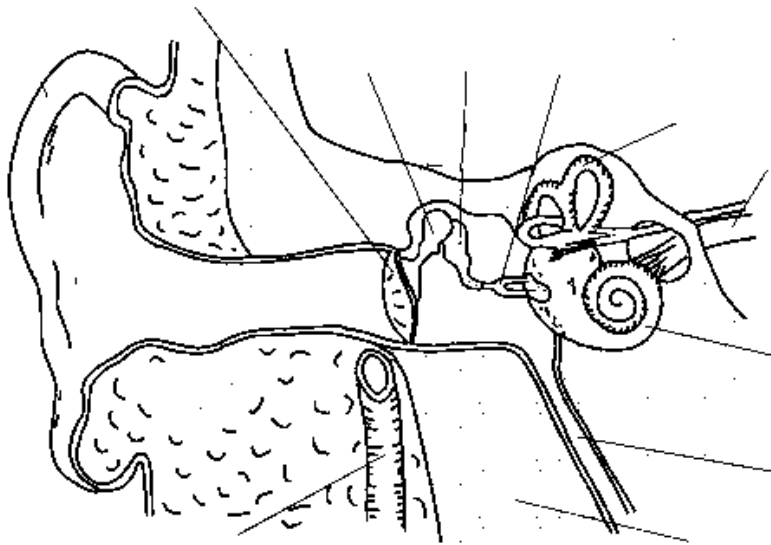
- a) Residual Volume
- b) Vital Capacity
- c) Tidal Volume
- d) Total lung capacity



4. When are neurological symptoms of Arterial Gas Embolism likely to present themselves in a diver? List 6 of these symptoms.

5. Label the 6 given parts of the ear on the diagram below:

- a) Eardrum
- b) External ear
- c) Eustachian tube
- d) Semi-circular canals
- e) Cochlear
- f) Stapes or stirrup



CROSS SECTION OF THE EAR

6. In detail what are:

- a) The Valsalva manoeuvre
- b) The Toynbee manoeuvre?

Decompression

6. BSAC has recently published some buoyancy achievements for grades of diver. Give the acceptable limits for the following:

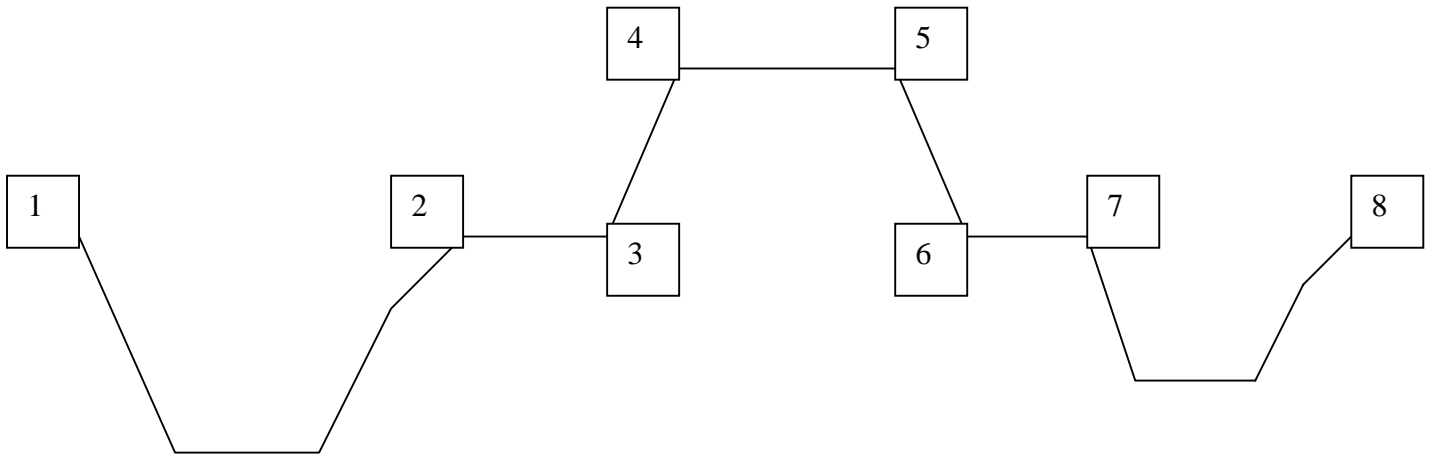
Minimum tolerable target for trainees

Ocean/Sports

Decompression procedures and Instructor

8. Gradient Factors are a way to modify a raw Buhlmann algorithm. What does a GF of 30/80 mean?

9. The line diagram below shows a dive profile, which includes a flight followed by another dive; all dives are at sea level and an atmospheric pressure of 1013 millibars. Using BSAC'88 table definitions:



- What are the recommended ascent and descent rates between points 1 and 2?
- Which table is used to calculate offgasing between points 2 and 3?
- Which table is used to deal with pressure changes between points 3 and 4?
- What is the main factor you need to know at point 7 to plan the next dive?

10. Match the tissue half times to the tissue representations given.

Half times (minutes):

2.5, 5, 10, 40, 120, 480

Tissues:

Spinal cord, muscle, brain, skin, blood, joints

11. What does the acronym RGBM stand for and what does its use in decompression theory aim to do?

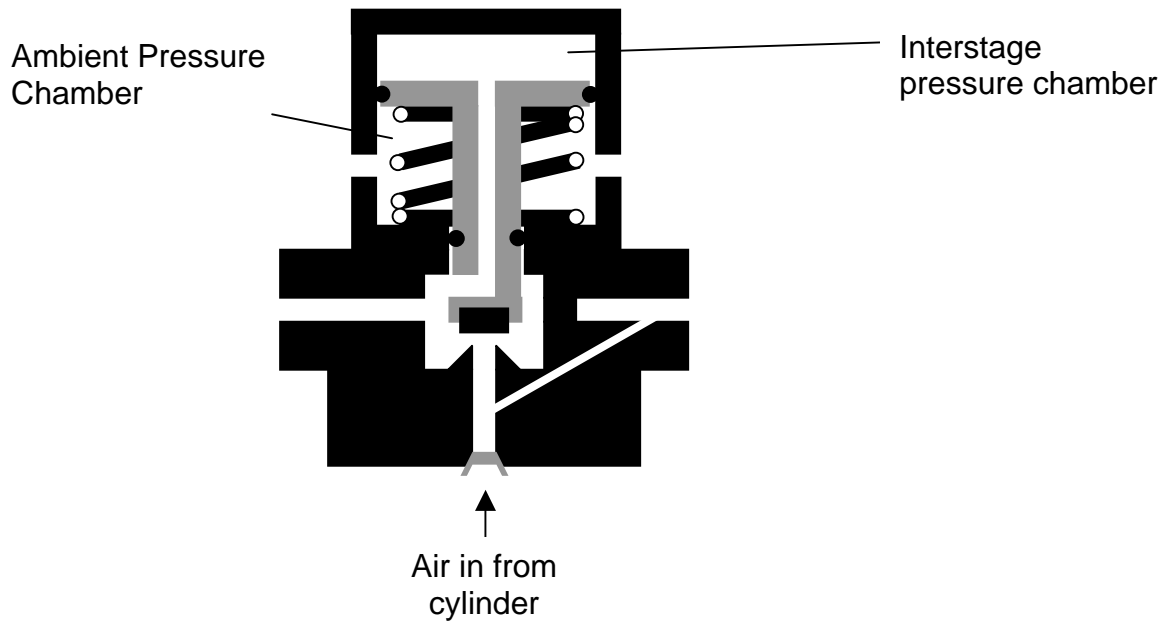
12. What are ultrasonic Doppler measurements used for in diving?

Equipment

13. A night dive has been planned onto a local wreck in 30 m of water; you have been tasked to provide a suitable shot arrangement. Describe, giving all appropriate sizes, the shot arrangement you would use.

14. Describe or sketch the appearance of a “Bourdon tube”, in what piece of diving equipment one might be found and the principle of how it works.

15. The diagram below shows a typical example of one type of first stage.



Add labels to identify the following parts:

- a) Piston
- b) High pressure seat
- c) Filter
- d) High pressure out
- e) Low pressure out

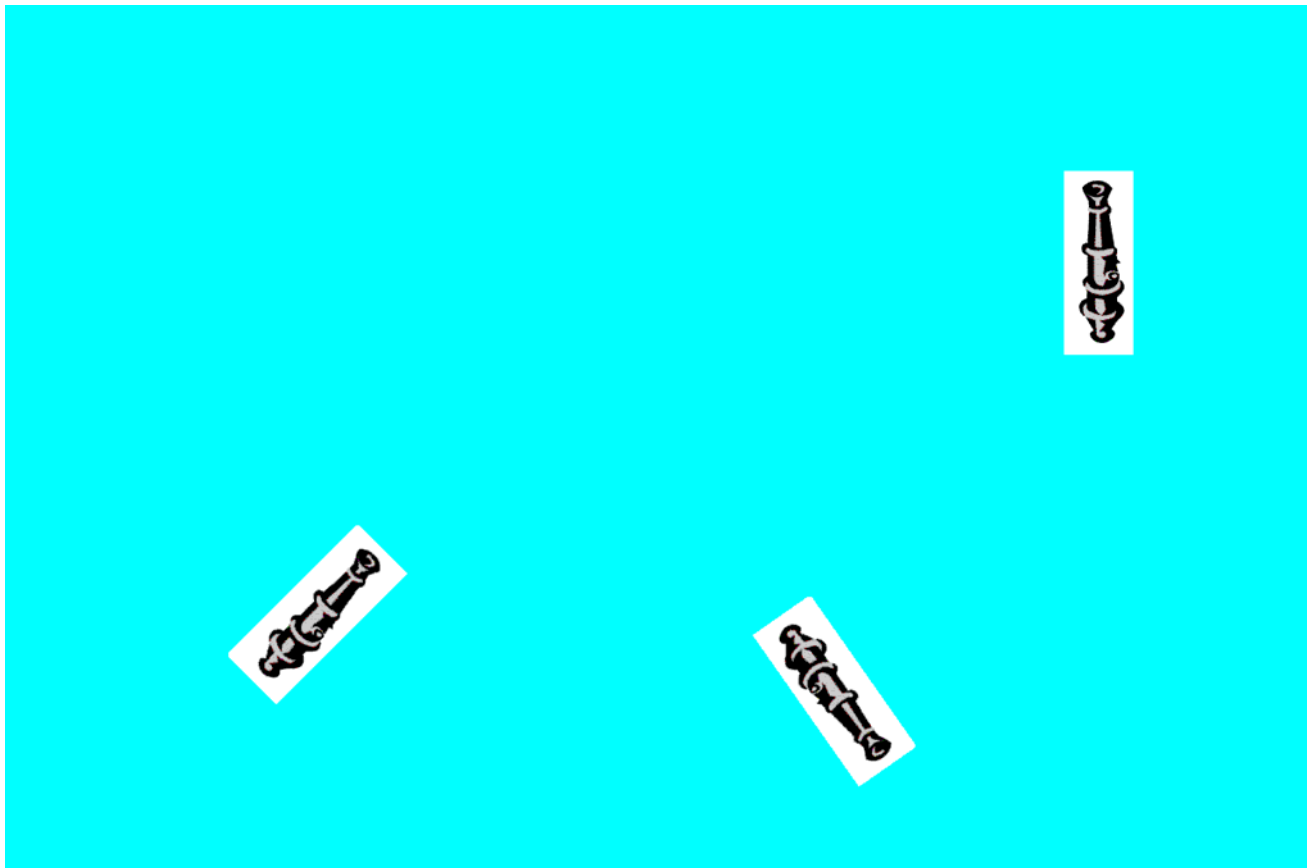
16. Explain the operation of this first stage, referring to the diagram where appropriate.

17. The diagram above shows an unbalanced first stage, explain how the performance characteristics differ between an unbalanced and a balanced first stage.

18. What is the difference between a hitch and a bend?

Dive Planning and Techniques

19. You have discovered an unknown wreck site in 35m, 2 miles off of the south coast of the Isle of Man. There are three cannon lying close to each other in flat sand and you wish to record the relative position of each. Using a single datum line on the sea bed and a surveyor's tape measure, explain how you would survey and plot the relative positions of the three cannons (to each other) in order that you can draw an accurate sketch of their relative positions to scale when you are back ashore.



20. You are the appointed dive manager for a club dive organised from a hard boat to dive a wreck that lies at an angle on a reef two miles from shore. The top of the wreck is at 40m and the bottom of the wreck has not yet been determined. Two divers arrive with twin 12l cylinders marked Tri-Mix with the numbers 17/35 written on the cylinders. What questions would you ask the divers in order to determine if you will allow them to dive the wreck with this gas and if you do allow them, what will be their MOD? If you will not allow them to dive the wreck please explain your reasons.

21. You have been asked to set up a marine survey site in the entrance of a small fishing port. The area will be 49m² (7x7 metres) and will be spread over a flat sandy bottom. The objective is to count the number of edible crabs found within the area. Explain how you would:

- a) Set up a perfectly square area with lines marking the perimeter on the seabed –include a list of the equipment needed, techniques to be employed, and the number of personnel required.
- b) Establish an accurate survey to count the crabs – equipment, technique, personnel
- c) Ensure the safety of all divers in relation to boat traffic

23. You have been asked to lift an outboard motor from the seabed, 25m deep. You have calculated how much lift you will need based on the in water weight of the motor. However, the motor has been partly submerged in mud and will require additional lift to free it from the suction of the mud. Explain how you would overcome this problem ensuring that the motor does not come uncontrollably to the surface as soon as it breaks free from the suction of the mud.

24. You have planned to dive a wreck, which lies in a charted depth of 39 metres. On the day you plan to dive, high tide is at 14:00 and is stated as being 8 metres. Low tide is approximately 6 hours later and is stated as being 2m. The gas you are using is Nitrox 27%. What is the earliest time that you can safely make the dive using BSAC maximum PO₂ guidelines? Write down your calculations.

Weather and Seamanship

25. Which type of fog is most common around Britain in March, explain your reasoning?

26. You are based upon a liveaboard in the UK. According to a weather forecast a warm front is approaching and is due to pass by soon.

- a) What does “soon” mean in weather terminology?
- b) Sketch the symbol that would indicate a warm front on a meteorological pressure chart.
- c) State an early sign that would be seen as the warm front approaches

27. A vessel travels from anchor at position N49 25.400 W2 31.200 to position N49 27.400 W2 31.200, at which point it travels on a compass bearing of 86° for 6 minutes. Given that the vessel is travelling at 16 knots and the variation is 3°W , find:

The total distance travelled in nautical miles.

The reciprocal magnetic bearing followed in each leg as the vessel retraces its course.

Bearing for first leg of reciprocal course _____

Bearing for second leg of reciprocal course _____

29. What is Buys Ballot's Law?

30. What is the main air mass, which affects the British Isles and list the two main types of weather patterns associated with it?