**The British Sub-Aqua Club**

# FIRST CLASS DIVER

DIVING KNOWLEDGE EXAM: Mar 2019

ANSWER GUIDELINES

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Please note the answers provided here are for guidance only. The nature of the examination means that for some questions there may be other "correct answers".

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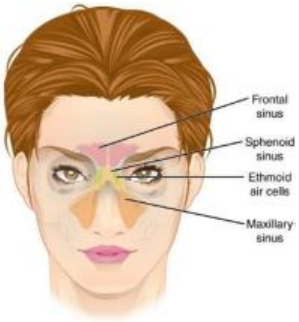
## MEDICAL




1a) Frontal
b) Sphenoid
c) Ethmoid
d) Maxillary

2a) Diver has a stable blood sugar before the dive no less than 150mg/dL
b) Diver carries oral glucose
c) Diver should avoid cold, strenuous or long dives
d) Diver should be hydrated and relaxed
e) Diver may carry a Continuous Glucose Monitoring system to check in real time
f) Diver has seen a doctor and is certified for the depth of the dive
g) Current Diving Medical from approved Medical Referee.
h) No recent issues? Hypos, etc
i) Buddy familiar with issues, symptoms, responses, etc
j) Recently eaten, has medication, food, drinks etc, as required
k) Dive Plan, response to issues. Location of medications, glucose etc if required

3a)
- 2 large sterile dressings
- 2 large triangular bandages
- 6 safety pins
- 1 large pack of assorted adhesive dressings
- Rescue blanket
- Disposable gloves

4a) Temporomandibular dysfunction (TMD) occurring in the temporomandibular joint (TMJ), also known as TMJD. It is more likely to occur in women than men

b) It can be reduced by having a correctly fitting and sized mouthpiece and ensuring the regulator or rebreather mouthpiece is directly in line with the mouth and not pulling to the side or up and down

5a) Reduction in blood pressure causing dizziness or fainting due to external pressure on the carotid sinuses in the neck.

b) Can occur when a diver has an overly tight neck seal on a dry suit or helmet putting pressure on the neck. Can also occur with tight neck closures on wet suits

6a) Becoming short sighted due to breathing high inspired partial pressures of oxygen for extended periods

b) Can occur if diving rebreathers with a PO2 setpoint of 1.3 bar for several hours a day for typically 5 or more days continuously (as may happen on a live aboard boat)

## DECOMPRESSION

7a) Age

b) Medical (PFO)

c) Fitness, BMI, Exercise

d) Dehydration

e) Stress, water temperature, medication

8a) 24ltr * 230bar = 5520ltrs Available Air
Cylinder Volume * Cylinder Pressure = Available Air
5.5 * 30 * 20 = 3300ltrs
Pressure * Time * Breathing rate = Gas needed
Volume of Gas remaining = 5520 – 3300 = 2220ltrs
P = 2200/24 = 92.5 = **90Bar**
1.9 * 3 * 20 = 114ltrs
1.6 * 18 *20 = 576ltrs + 114ltrs = 690ltrs
2220 – 690 = 1530ltrs = 63.75 = **60Bar**
Deco would be 3minutes @ 9mtrs and 18minutes @ 6mtrs

9a) Make sure everyone dives the same gases, so same decompression stops

b) Use a trapeze so everyone decompressor in the same area, do not release trapeze due to proximity of shipping lane.

c) Check for any planned shipping in the area

d) Reel off so that everyone gets back to the shotline

10a) Blue, as the high GF is 75 whereas Red is 65 requiring a longer last stop. GF Low is the bottom stop, so GF10 would create deep 1st stop and GF100 would be a shallow 1st stop. GF High 10 would create a long stop and GF High 80 a shorter stop

11a) A2
b) G4
c) C2
d) 3mins 6mtrs

12a) 5.2-6.2 g/litre
b) PO2 of oxygen in mix is 0.2 x 1.428 = 0.2856 x 7 = 1.9992
PN2 of nitrogen in mix is 0.4 x 1.251 = 0.5004 x7 = 3.5028
PHe of helium in mix is 0.4 x 0.179 = 0.0716 x7 = 0.5012
Add these up to 0.8576 then multiply by Pabs (7 bar) to get 6.00g/litre. This is in the range

## EQUIPMENT

13a) They are designed to minimize a catastrophic failure of the hose in the event of the inner part of the hose failing
b) The inner part of the hose is beginning to fail and gas is being released along the length of the hose rather than building up and causing the hose to balloon in one place. The hose needs to be replaced

14a) Two and half years interval
b) EN 12021 gas quality, Air Purity Standard
c) Cylinder known to be filled out with EN 12021 suspected contaminated gas fill
d) Cylinder that has lost all gas pressure above ambient underwater

15a) Maximum authorized mass. (This is combined mass of trailer, boat and tow vehicle)
b) Gross Vehicle Weight (GVW) or permissible maximum weight

16a) The towing law changed on 1 January 1997. If you passed in July 1997 they are limited to a combined MAM of 3500kg, if the trailer is over 750kg
The maximum car weight is therefore 3500 – 1400 = 2100kg
b) Towball and connection Breakaway cable Wheels and Tyres
Lights and Indicators Load and weight limit

17a) Longer leg on the engine
b) Reduce the propeller pitch
c) Fit a more flexible propeller
d) Repair the propeller if damaged

18a) Ideal Gas Laws are a hypothetical model which follow a few rules, they were created to help explain Real Gas Laws. Ideal Gases do not attract or repel each other and take up no volume. Some Real Gases take up a greater volume than predicted by the Ideal Gases Law and this error gets worse the more compressed (higher pressure) the gas gets. Ideal Gas Law is a combination of the Gas Laws (Boyles, Charles, Avogadros and Gay-Lussacs) For applications involving high pressure, we need to consider a more precise description of the physical properties of the gases involved.

When doing this the gases are described as the Real gases Laws. Van der Waals equation for the relationship between the pressure and volume of a gas made allowances for the presence of molecules. So some gases are more affected by pressure than others, helium is more affected than air or oxygen. The pressure of gas in a cylinder results from the atoms or molecules of the gas, the more molecules present the greater the pressure. 02 and N2 have two atoms, He has only one atom. Ideal gas laws work up to about 240 bar after that Real gas laws. A nitrox mix to 240bar no adjustment needed, 300 bar fill a reduction of available gas of 10% should be assumed
24 litres x 230 bar =5520 litres are available.
24 litres x 300 bar =7200 litres but under real gas laws, as the gas pressure is greater than 240bar, this needs to be reduced by 10%
7200 litres minus 10% = 7200-720 =6480 litres are available

## DIVE PLANNING & TECHNIQUES

19a) Establishing diver's qualifications and experience
b) Knowledge/ information on the dive site (tides, currents, key features, access to charts)
c) Risk assessment of the dive and updating on the day
d) Checking weather in advance and on day and having a backup site
e) Knowing the dive team have the appropriate gas for the depth and how much gas they are carrying and their dive plan
f) Monitoring the site (surface traffic, location and direction of divers)
g) Monitoring time (day plan, dive times) keeping on track and updating plan throughout
h) Communication with the divers and skipper via briefings

20a) Abandoned Lost Discarded Fishing Gear
b) Exemption notification form
c) Marine licence
d) Lifting by hand, with an air bag under 100kg, not been on seabed for 12months

21a) Remove the scrubber canister and place it in a sealed bag to prevent the loss of water bound up in the absorbent. Generally how well the absorbent is stored will affect its ability to absorb C02
If the scrubber is approaching 3 hours duration, or 3 hours will be exceeded on the planed dive change the scrubber material

22a) 43mtrs 28 mins = 45mtr 28min = 2min @9mtrs and 4min @6mtrs
Gas loss refer to nitrox tables so 45mtrs 28mins = 2mins @9mtrs and 15mins @6mtrs
b) 1st Dive Bottom Gas Air 1.2 * 28 = 9.6 + 2.4 + .96 + .48 = **13.44**
1st Dive Deco Gas Air 0.65 * 2 = 0.32 0.65 * 15 = 1.6 + 0.8 = 2.4 + 0.32 = 2.72 + 13.44 = **16.16**

1st Dive Using 80% 1.6 * 2 = 4.44 1.3 * 6 = 2.78 + 0.56 = 3.34 13.01 + 4.44 + 3.34 = **20.79**
Table C 3mins @6mtrs
2nd Dive Bottom Gas 27% 1.00 * 20 = 6.67
2nd Dive Deco Gas 50% 0.44 + 0.22 = 0.66 6.67 + 0.66 = 7.33 + 16.16 =
Total CNS = **23.49**

23a) Procedures within Buddy guard should be followed, club welfare officer contacted for clarification if unsure
b) Parents should be given full information regarding the event including details of venues, cost involved and transport arrangements. Any special requirements of their child should be noted and acted upon e.g. medical conditions, health, dietary, religious
c) If parents do not attend, they must agree with the club chaperones who will satisfy the requirements of caring for those students who are unaccompanied minors (CPSU guidelines should be followed)
d) Arrange room sharing for students in line with CPSU guidance
e) Club instructors and other staff shall never share a room with a student, unless related to that student and with the parent/carer's consent. They shall, however, be easily accessible to students should need arise - e.g. have a room near to students and give students the room phone
f) Persons supervising under-18s shall refrain from drinking alcohol throughout the event
g) Name an individual not attending the event as the "club contact". A club contact must hold emergency contact phone details for every attendee and is responsible for informing relevant contacts of any situation that arises (e.g. illness requiring collection or change to arrival time home, etc.)

24a) Identify the hazards
b) Decide who might be harmed and how
c) Evaluate the risks and decide on control measures
d) Record your findings and implement them
e) Review your assessment and update if necessary

## WEATHER & SEAMANSHIP

25a) Course: direction boat should be steered
b) Track: direction in which boat is moving
c) Bearing: direction of an object
d) Heading: direction in which the boat is pointing

26a) Isolated danger mark
b) 2 white flashes

27a) High pressure Anticyclone
b) Clear skies, light winds, cold as November, sunny
c) East or SE
d) The cross tells us the front is weakening

28a) The drying height is 1.2m above CD. Draught of RHIB is1.8m so 3m of water is required to cross the green area. Looking at the tidal information from Easytide you have 3m of water between 0530 and 1130 and 1800 to 2400. The time to avoid therefore is 1130 to 1800
29a) A MAYDAY - Grave and imminent danger to vessel or person
b) C SECURITE - Safety message
c) D SEELONCE MAYDAY - Imposes radio silence by Mayday controlling station
d) F SEELONCE FEENEE - Ends radio silence after Mayday

30a) Cyclonic Indicates that there will be considerable change in wind direction across the path of a depression within the forecast area
b) Very rough Wave height of 4 to 6m
c) High Wave height of 6 to 9m
d) Very high Wave height of 9 to 14m