

FIRST CLASS DIVER

DIVING KNOWLEDGE EXAM: October 2019

ANSWER GUIDELINES

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”.

MEDICAL

- 1a) Sight (rise and fall of the chest)
- b) Feel (resistance to inflation indicating airway not open)
- c) Sound (exhalation of casualty)
- d) Appearance (change to casualty's colour)

- 2a) Initial reaction of the brain to the increased Oxygen partial pressure
- b) Passage of Oxygen into the nitrogen bubbles in the blood, leading to an increase in bubble size

- 3a) Appears exhausted, restless, headaches, dizziness, nausea, lower limb cramps, pale clammy skin, normal or falling temperature, fast shallow breaths, weak rapid pulse
- b) Lay casualty down in a cool place, give them plenty to drink (water or sports drink or electrolyte), place in recovery position if necessary, evacuate to medical facility

- 4a) hypertension
- b) Immersion in cold water
- c) Pre-hydration with fluids before immersion
- d) Exertion

- 5a) Stroke
- b) FAST (Face, Arms, Smile, Time)

- 6a) Echocardiogram (2d ultrasound imaging) performed, with saline solution containing microbubbles injected into a vein. If a PFO is present then bubbles should be seen passing through the PFO from the right atria to the left atria
- b) Point an ultrasound transducer at the vein of interest – if bubbles are present then they will appear as “chirps” on account of the stronger reflection from the bubbles than from the blood vessels

DECOMPRESSION

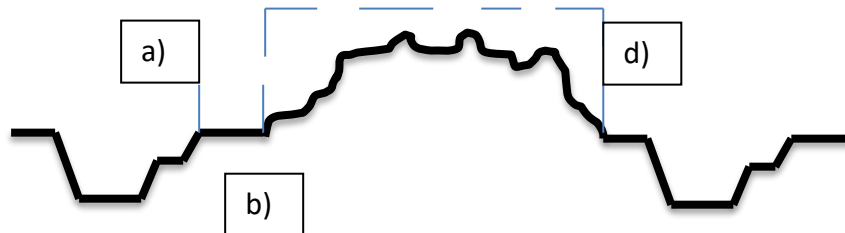
- 7a) HPNS High Pressure Neurological Syndrome
- b) ICD Isobaric Counter Diffusion
- c) RMV Respiratory Minute Volume
- d) RGBM Reduced Gradient Bubble Model

- 8a) The diver has stayed longer at depth which has increased the requirement for decompression
- b) They have ascended at a lower rate than that expected by the dive computer which has also increased the requirement for decompression.

- 9a) Exercise
- b) Immersion
- c) Water temperature
- d) Total pressure
- e) Individual susceptibility
- f) Exposure to High ppO_2

- 10a) Using the 80/90 gradient factor the diver will reduce the amount of time they need to spend doing in water decompression. This will reduce the amount of bailout gas that is required and hence reduce the likelihood of them running out
- b) The risk is that the reduced amount of in water decompression will increase the likelihood of Decompression Illness (DCI)

- 11a) SC = G1
- b) CTC = C1
- c) CTC = F3
- d) You need to have a CTC of B, so you will need to wait three hours after arriving at the dive site



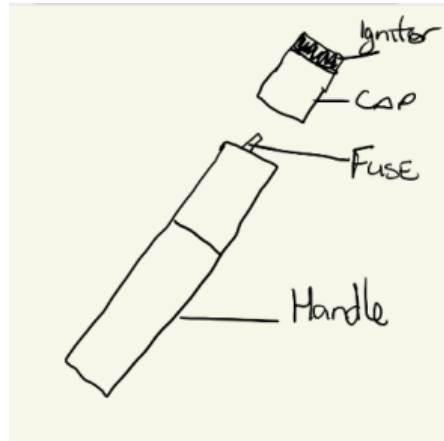
- 12a) Decompression trapeze
- b) Lazy shot
- c) Jon line

EQUIPMENT

- 13a) Buoyancy = weight of displaced water minus weight of the cylinder
 Weight of displaced water:
 Aluminium volume = weight of cylinder/ density of aluminium = $9.8 / 2.6 = 3.8\text{L}$
 (Aluminium density is 2.6kg/L ($\text{kg/m}^3 = 0.001 \text{ kg/L}$)
 Total volume = cylinder volume + aluminium volume = $7 + 3.8 = 10.8\text{L}$
 Density of fw is 1kg/L , therefore weight of water displaced is 10.8kg
 Weight of cylinder:
 $9.8\text{kg} + 0.2 \text{ kg (valve)} = 10\text{kg}$
 Buoyancy – $10.8 - 10 = 0.8\text{kg}$
- 14a) Cylinder
- b) First stage
- c) Hose
- d) Over-pressure valve (OPV)
- 15a) The condensers in the compressor are less efficient at low pressures and so extract less moisture, meaning more moisture reaches the filter, shortening its life.
 Air goes through the filter more quickly at low pressures, hence less dwell time, hence filters are less able to remove impurities.

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- 16a) AIS Automatic Identification System
 - b) GPS Global Positioning System
- AIS is an active system, where a ship transmits its location. GPS is passive, where a ship receives signals from satellites and uses them to calculate its location. AIS probably uses a location derived from GPS

- 17a) Sacrificial rope used to tie a shot into a wreck.



18a)

- b) Do not strike next to oxygen, deploy immediately, do not deploy directly on top of divers

DIVE PLANNING & TECHNIQUES

19 Formula: $P_1V_1 = P_2V_2$

$P_1 = 44$ bar of O_2

$V_1 =$ twinsets $(2 \times 12) \times 12$ divers

$P_2 = ?$

$V_2 = 72L$

Rearrange formula so that $V_2 = P_1V_1 / P_2 = (44 \times 2 \times 12 \times 12) / 72 = 176$ bar

a) 36% at 232bar = 44 bar oxygen $12 \times 2 \times 12 \times 44$ bar = 12,672 litres

b) Pressure drop in J cylinder = $12,672 / 72 = 176$ bar

20a) The dive objectives

- b) Anticipated site conditions
- c) Depth
- d) Anticipated visibility
- e) Currents
- f) Possible points of interest/hazards
- g) Anticipated surface conditions
- h) The divers Buddy pairs - order of diving,
- i) Maximum dive times
- j) SMBs/DSMBs, other equipment

21a) Two vertical diamonds on one side indicates the side to pass, two vertical balls indicates an obstruction on that side.

b) 3 short blasts - operating stern propulsion

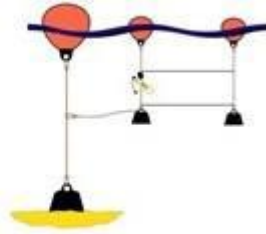
c) It may pull the boat towards the dredger if you are passing close by.

22a) The amount of Nitrogen required to be added for the final mix

23a)

Decompression Trapeze

- Requires two additional bouys, weights, lines and solid bars
- Bars can be set-up at various or multiple depths.
- Back-up deco cylinder may be attached if needed
- Again, it can be detached to drift with current - Requires Diver 'logging' system



- b) If any divers fail to reach it, the trapeze can be released without divers having to return to the shot line to do it.

24a) Dive within your limits

- b) Choose dive partners with comparable experience who you can trust
- c) Practice to improve your diving skills
- d) Anticipate what problems may occur and practice solving them
- e) Learn as much as you can about the dive site before the dive
- f) Dive with the correct equipment for the dive and be familiar with its use
- g) Take adequate air/gas supplies

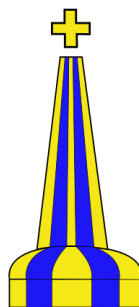
25a) Equivalent air depth of a nitrox mix

WEATHER & SEAMANSHIP

26a) LAT = Lowest Astronomical Tide

- b) MLWS = Mean Low Water Springs
- c) Height of buildings from MHWS
- d) Height of lights and cables from HAT

27a)



- b) Coloured in equal number and dimensions of blue and yellow vertical stripes (minimum of 4 stripes and maximum of 8 stripes).
- c) Fitted with an alternating blue and yellow flashing light with a nominal range of 4 nautical miles (the range may be altered depending on local conditions) and the blue and yellow 1-second flashes are alternated with an interval of 0.5 seconds.

- d) Emergency wreck marking buoy is designed to provide high visual and radio/radar recognition. It is intended that such wreck marking buoys should be maintained in position only until appropriate Lateral or Cardinal buoys can be deployed.

28 The contents of this safety briefing could form the basis of a safety checklist to be used by the Dive Manager/Diver Coxswain.

- a) Lifejackets
- b) VHF radio and emergency use
- c) First Aid kit
- d) Oxygen Kit
- e) Flares
- f) Extinguisher(s)
- g) Any additional safety equipment specific to the craft

29.	Name	Source area	Weather characteristics
	Tropical Maritime (mT)	Atlantic Ocean	Warm and wet
	Tropical Continental (cT)	Southern Europe and North Africa	Warm and dry
	Polar Maritime (mP)	North Atlantic	Cold and wet
	Polar Continental (cP)	Northern Europe	Cold and dry

The temperature of an air mass is also determined by seasonal changes.

Temperatures in the summer months are always higher than in winter months. The air mass known as the Arctic Maritime does not occur very often, but when it does it brings heavy snow.

- 30a) RYA SafeTrx now supersedes the HM Coastguard CG66 scheme
The Maritime & Coastguard Agency (MCA) and the Royal Yachting Association (RYA) have today [4 July 2018] joined forces to reveal RYA SafeTrx as HM Coastguard's new official voluntary safety identification scheme.