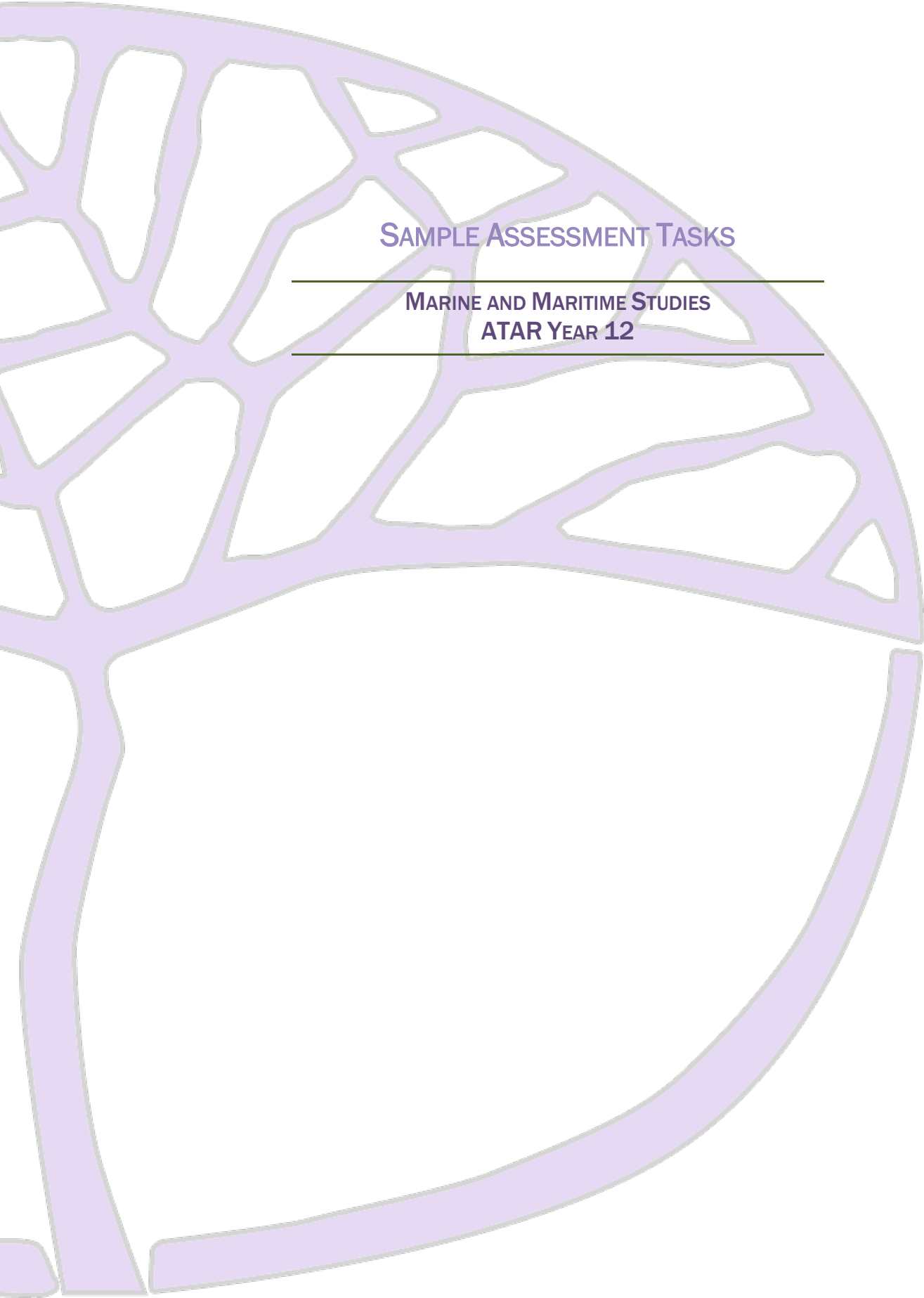




Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE ASSESSMENT TASKS

MARINE AND MARITIME STUDIES
ATAR YEAR 12



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Sample assessment task

Marine and Maritime Studies – ATAR Year 12

Task 1 – Unit 3

Assessment type: Scientific skills

Conditions

Period allowed for completion of the task: one week

Task weighting

5% of the school mark for this pair of units

Identifying phytoplankton and zooplankton in marine ecosystems

(61 marks)

In this activity, you will collect water samples from **four** marine aquatic locations and examine them for their phytoplankton and zooplankton. You will make a comparison of the number and types of species of the planktons in the **four** locations.

The types and numbers of organisms, including planktons, in an ecosystem will be affected by the abiotic or non-living factors in the ecosystem, so you will need to collect data on the abiotic factors at each of your sites.

Phytoplankton and zooplankton in marine ecosystems

Planning for collection of samples and data

1. Through class discussion, identify **four** different marine ecosystems from which you can sample the water for phytoplankton and zooplankton, and take water samples. Places you may like to consider include:
 - open ocean
 - estuary river mouth
 - near jetty pylons/structures
 - area near boat launching facility/ramp
 - area subject to human activity
 - sewerage outlet.
2. Before collecting samples and other data, design and prepare a table to record your data. You will need to read the whole activity sheet to recognise data to be collected for inclusion in the table. The table may be prepared in a spreadsheet and printed for taking to the sites. (4 marks)
3. Working individually, prepare a list of equipment needed to collect your data. Show your list to your teacher **before** discussing your list with your group. Amend your list, if needed. (3 marks)

Individual ideas	Any refinements after group discussion

Sample collection

4. Using a technique appropriate for collecting plankton, sample the water for organisms and collect water (~150 mL) from each site. Label the samples with appropriate data for identification. Provide a description of each sampling location and, if appropriate, take a picture to attach to your report. (16 marks)
5. The following abiotic data need to be collected while at the site:
- temperature of the water (1 mark)
 - turbidity of the water (measured with a turbidity tube) (1 mark)
 - dissolved oxygen in the water (measured with a dissolved oxygen meter). (1 mark)

Classroom-based data collection

6. On return to the classroom, working individually, use microscopes, dichotomous keys (and other resources as needed) for each sample to identify any phytoplankton and zooplankton in your water samples. Keep a record of each species identified and provide a sketch of the organism. Record the total number of species of phytoplankton and total number of species of zooplankton for each sample in your table. (16 marks)

Note: You should aim to examine your planktons within 24 hours of collection to minimise their deaths.

7. On return to the classroom, working in your groups, for each water sample:
- measure the nitrate level using nitrate meters (can be supplied by Ribbons of Blue) (4 marks)
 - measure the phosphate level by the *total orthophosphate* test (supplied by Ribbons of Blue) (4 marks)
 - measure the pH (can be done with a pH meter or universal indicator and a pH chart). (4 marks)

Ensure your data is recorded in your table. Your finished table should be printed and attached to your report. (3 marks)

Data processing and analysis

8. Describe and explain any patterns or trends in your data. (4 marks)

Marking key for sample assessment task 1 – Unit 3

2. Before collecting samples and other data, design and prepare a table to record your data. You will need to read the whole activity sheet to recognise data to be collected for inclusion in the table. The table may be prepared in a spreadsheet and printed for taking to the sites.

Description	Marks
Appropriate rows	1
Appropriate columns	1
Units included, where needed	1
Title of table provided	1
Total	/4

3. Working individually, prepare a list of equipment needed to collect your data. Show your list to your teacher **before** discussing your list with your group. Amend your list, if needed.

Description	Marks
Appropriate equipment listed	1–3
Total	/3

4. Using a technique appropriate for collecting plankton, sample the water for organisms and collect water (~150 mL) from each site. Label the samples with appropriate data for identification. Provide a description of each sampling location and, if appropriate, take a picture to attach to your report.

Description	Marks
Water sampled for planktons at four locations	1–4
Water samples collected at each location	1–4
Samples labelled for each location	1–4
Description (and, if appropriate, picture) provided for each location	1–4
Total	/16

5. The following abiotic data need to be collected while at the site:

- temperature of the water
- turbidity of the water (measured with a turbidity tube)
- dissolved oxygen in the water (measured with a dissolved oxygen meter).

Description	Marks
Temperature of the water measured at each site	1
Turbidity of the water measured at each site	1
Dissolved oxygen in the water measured at each site	1
Total	/3

6. On return to the classroom, working individually, use microscopes, dichotomous keys (and other resources as needed) for each sample to identify any phytoplankton and zooplankton in your water samples. Keep a record of each species identified and provide a sketch of the organism. Record the total number of species of phytoplankton and total number of species of zooplankton for each sample in your table.

Description	Marks
Microscope slide preparation:	
• Cover slip placed on water drop	1
• No bubbles under cover slip	1
• Slide cleanly prepared	1
Microscope focused correctly	1
Identification and sketches of planktons provided for each sample (up to 2 marks for each sample)	1–8
Record of number of each species of phytoplankton and zooplankton for each sample (1 mark for each sample)	1–4
Total	/16

7. On return to the classroom, working in your groups, for each water sample:
- measure the nitrate level using nitrate meters (can be supplied by Ribbons of Blue)
 - measure the phosphate level by the *total orthophosphate* test (supplied by Ribbons of Blue)
 - measure the pH (can be done with a pH meter or universal indicator and a pH chart).

Ensure your data is recorded in your table. Your finished table should be printed and attached to your report.

Description	Marks
Nitrate levels measured for each sample (1 mark for each sample)	1–4
Phosphate levels measured for each sample (1 mark for each sample)	1–4
pH measured for each sample (1 mark for each sample)	1–4
Nitrate, phosphate and pH measurements recorded in table (1 mark for each set of measurements)	1–3
Total	/15

8. Describe and explain any patterns or trends in your data.

Description	Marks
Any trends described	1–2
Any trends explained	1–2
Total	/4
Answer could include, but is not limited to:	
<p>Trends that may be observed include:</p> <ul style="list-style-type: none"> • more phytoplankton species in water with higher nitrate concentration • more phytoplankton species in water with higher phosphate concentration • more phytoplankton (and zooplankton) species in water with higher dissolved oxygen concentration • more zooplankton species in water with higher number of phytoplankton species <p>Explanations for trends may include:</p> <ul style="list-style-type: none"> • more phytoplankton species in water with higher nitrate and phosphate concentrations arise because these substances are plant nutrients • more phytoplankton (and zooplankton) species in water with higher dissolved oxygen concentration arise because this supports respiration of the organisms • more zooplankton species in water with higher number of phytoplankton species arise because the zooplankton feed on the phytoplankton <p>Note: Trends related to turbidity are more complex – high turbidity may be associated with fewer types of plankton because the lower light levels reduce photosynthesis by the phytoplankton; but high turbidity may also be associated with more planktons. This arises because the high number of planktons causes the turbidity. This high population-high turbidity association is likely short lived at the end of the population cycle when the population begins to decline; in part, due to the high turbidity, reducing light for photosynthesis.</p>	

Sample assessment task

Marine and Maritime Studies – ATAR Year 12

Task 2 – Unit 3 and Unit 4

Assessment type: Practical

Conditions

Period allowed for completion of the task: 4–6 weeks

Task weighting

5% of the school mark for this pair of units

Snorkelling skills assessment

(74 marks)

You are required to develop the snorkelling skills identified below. You will have 4–6 weeks to practise and receive feedback to assist in the development of the required skills.

Your teacher will collect evidence of your performance through direct observation or through the use of video over this time. The skills checklist will be used to record evidence.

Note: A prerequisite water-based skills test needs to be successfully completed before taking part in snorkelling activities.

Characteristics of the locations in which you will be assessed

While introductory skill development may occur in a swimming pool, once confident, skills are usually further developed and assessed in closed/open water along the coast.

What you need to do

After practice and feedback, you will need to demonstrate the snorkelling skills identified below.

1. Fitting snorkelling equipment (8 marks)
2. Buddy pre-dive safety check (3 marks)
3. Water entry techniques relevant to a natural environment (23 marks)
4. Snorkelling skills and techniques (40 marks)

Snorkelling skills assessment**(74 marks)****Skills checklist****Student's name:** _____

This skills checklist can be used to note skills demonstrated over time. The teacher enters a mark for each section at the end of the snorkelling section of the course.

1. Fitting snorkelling equipment

Description	Marks
Mask	
Straps correctly positioned and adjusted	1
Good seal achieved (no hair caught underneath)	1
Mask is treated to reduce fogging so clear vision is achieved	1
Student score	/3
Snorkel	
Correct bore chosen for lung capacity	1
Fitted to mask correctly, at correct height and angle, on left-hand side	1
Student score	/2
Fins	
Fitted correctly (won't fall off, cause blisters or cramp, booties worn if open-heeled)	1
Student score	/1
Weight belt	
Fitted above waist and firmly fixed to prevent slipping (not tight) and demonstrates weight balance	1
Demonstrate a quick-release, right-hand removal	1
Student score	/2
Final total	/8

2. Buddy pre-dive safety check

Description	Marks
Checks buddy's gear: not perished, securely fitted, correctly positioned and adjusted, check appropriate buoyancy	1
Checks hand signals for understanding (are you okay, going up, going down, stop, stay together (with buddy), something is wrong, okay on surface)	1
Give each other the okay signal when ready to begin snorkelling	1
Total	/3

3. Water entry techniques relevant to a natural environment

Description	Marks
Slide in entry (unknown water entry)	
Ensure entry area is clear	1
Place hands to the side, swivel body around and lower gently into the water	1
Once upper chest level is reached, the diver then lies horizontally and fins away	1
Once in the water, a self-check occurs and surface okay signal is given	1
Student score	/4
Giant stride/standing entry (boat or jetty)	
NB* This entry should not be attempted in water less than 2 m in depth	
Ensure entry area is clear	1
Stand on edge with toes hanging over	1
Hold mask firmly with one hand	1
The other hand holds the weight belt buckle or wraps around other arm	1
Check to ensure entry point is clear	1
Looking directly ahead, steps off, maintaining vertical body position	1
Once in the water, a self-check occurs and surface okay signal is given	1
Student score	/7
Backward roll (preferred boat entry)	
Ensure entry area is clear	1
Sit on edge with knees to chest, back to water	1
Hold mask firmly with one hand	1
Other arm holding legs firmly tucked into chest	1
Roll backward onto back, maintaining ball shape, clearing the boat completely	1
Kick-away, surface, self-check occurs and surface okay signal given	1
Student score	/6
Beach entry	
Ensure entry area is clear	1
Snorkelling gear fitted above water line	1
Mask on, snorkel in mouth	1
Walk in backwards wearing fins, side by side with buddy	1
Watch for hazards – potholes, waves, select appropriate entry place	1
Once past surf, re-align gear, re-check buddy, give surface okay signal, commence diving	1
Student score	/6
Final total	/23

4. Snorkelling skills and techniques

Description	Marks
Finning a set distance in a natural environment	
Hands by the side, legs straight	1
Leg movements are steady, up and down movements originating from the hip	1
Fins remain consistently below the surface (no water thrashing kick)	1
Face consistently remains in the water	1
Controlled direction and pace over set distance	1
Student score	/5
Snorkel clearing – Blast method (shallow water)	
Kneel in water, face to water, breathe in and out through snorkel	1
Duck head underwater until snorkel fills	1
Raise head (tilt back), ears level with surface	1
Blow out	1
Inhale, hold breath, continue snorkelling, face in water (does not remove snorkel from mouth)	1
Student score	/5
Snorkel clearing – Displacement method	
Submerge to required depth, swim horizontally	1
Ascend with head tilted back and snorkel pointing towards bottom, one arm above head, other hand covering purge, if present	1
Break surface; when fingers touch surface start blowing and continue blowing until head is on surface	1
Face to water, all water removed, continue snorkelling	1
Student score	/4
Mask defogging – at surface	
Rub saliva around inside of mask	1
Put it back on	1
Student score	/2
Mask defogging – underwater	
Tilt head forward, pushing top of the mask against head	1
Steadily blow air gently out of nose	1
Pull bottom of mask away from nose with thumb	1
Tilt head back and exhale through nose until all the water is cleared	1
Student score	/4
Underwater swimming in a natural environment	
Submerge no less than 1 m	1
Demonstrate appropriate technique and buoyancy skill while swimming underwater	1
Demonstrates underwater swim of 9 m, one breath, no push-off or dive OR underwater swim of 18 m, taking three breaths during swim	1
Student score	/3
Duck diving and ascending technique	
Deep breath in, pivot from the hips (making a pike)	1
Legs move into the air above the dive	1
Equalise ears on descent	1
Descend on a gradual angle to required depth	1
Swim horizontally underwater	1
On ascent, look up, with one arm up above head	1
Turn in a slow, circular movement while ascending	1
Student score	/7

Description	Marks
Ditch and recovery of an object: weight belt	
With all snorkelling gear on, enter water	1
Duck dive to the bottom using correct technique	1
Ditch weight belt and ascend back to the surface using correct technique	1
Clear mask	1
Re-submerge, duck dive down to where the weight belt was ditched	1
Retrieve weight belt and secure firmly in correct position	1
Re-surface using correct technique	1
Student score	/7
Establish neutral buoyancy at the surface	
Achieves weight balance for neutral buoyancy	1
Student score	/1
Making observations while snorkelling in a natural environment – slates/photography	
Chooses the most appropriate method to record observations required	1
Records observations that are required consistently and accurately	1
Student score	/2
Final total	/40

Marking key for sample assessment task 2 – Unit 3 and Unit 4

1. Fitting snorkelling equipment

Description	Marks
Mask	
Straps correctly positioned and adjusted	1
Good seal achieved (no hair caught underneath)	1
Mask is treated to reduce fogging so clear vision is achieved	1
Subtotal	/3
Snorkel	
Correct bore chosen for lung capacity	1
Fitted to mask correctly, at correct height and angle, on left-hand side	1
Subtotal	/2
Fins	
Fitted correctly (won't fall off, cause blisters or cramp, booties worn if open-heeled)	1
Subtotal	/1
Weight belt	
Fitted above waist and firmly fixed to prevent slipping (not tight) and demonstrates weight balance	1
Demonstrate a quick-release, right-hand removal	1
Subtotal	/2
Final total	/8

2. Buddy pre-dive safety check

Description	Marks
Checks buddy's gear: not perished, securely fitted, correctly positioned and adjusted, check appropriate buoyancy	1
Checks hand signals for understanding (are you okay, going up, going down, stop, stay together (with buddy), something is wrong, okay on surface)	1
Give each other the okay signal when ready to begin snorkelling	1
Total	/3

3. Water entry techniques relevant to a natural environment

Description	Marks
Slide in entry (unknown water entry)	
Ensure entry area is clear	1
Place hands to the side, swivel body around and lower gently into the water	1
Once upper chest level is reached, the diver then lies horizontally and fins away	1
Once in the water, a self-check occurs and surface okay signal is given	1
Subtotal	/4
Giant stride/standing entry (boat or jetty)	
NB* This entry should not be attempted in water less than 2 m in depth	
Ensure entry area is clear	1
Stand on edge with toes hanging over	1
Hold mask firmly with one hand	1
The other hand holds the weight belt buckle or wraps around other arm	1
Check to ensure entry point is clear	1
Looking directly ahead, steps off, maintaining vertical body position	1
Once in the water, a self-check occurs and surface okay signal is given	1
Subtotal	/7
Backward roll (preferred boat entry)	
Ensure entry area is clear	1
Sit on edge with knees to chest, back to water	1
Hold mask firmly with one hand	1
Other arm holding legs firmly tucked into chest	1
Roll backward onto back, maintaining ball shape, clearing the boat completely	1
Kick-away, surface, self-check occurs and surface okay signal given	1
Subtotal	/6
Beach entry	
Ensure entry area is clear	1
Snorkelling gear fitted above water line	1
Mask on, snorkel in mouth	1
Walk in backwards wearing fins, side by side with buddy	1
Watch for hazards – potholes, waves, select appropriate entry place	1
Once past surf, re-align gear, re-check buddy, give surface okay signal, commence diving	1
Subtotal	/6
Final total	/23

4. Snorkelling skills and techniques

Description	Marks
Finning a set distance in a natural environment	
Hands by the side, legs straight	1
Leg movements are steady, up and down movements originating from the hip	1
Fins remain consistently below the surface (no water thrashing kick)	1
Face consistently remains in the water	1
Controlled direction and pace over set distance	1
Subtotal	/5
Snorkel clearing – Blast method (shallow water)	
Kneel in water, face to water, breathe in and out through snorkel	1
Duck head underwater until snorkel fills	1
Raise head (tilt back), ears level with surface	1
Blow out	1
Inhale, hold breath, continue snorkelling, face in water (does not remove snorkel from mouth)	1
Subtotal	/5
Snorkel clearing – Displacement method	
Submerge to required depth, swim horizontally	1
Ascend with head tilted back and snorkel pointing towards bottom, one arm above head, other hand covering purge, if present	1
Break surface, when fingers touch surface start blowing and continue blowing until head is on surface	1
Face to water, all water removed, continue snorkelling	1
Subtotal	/4
Mask defogging – at surface	
Rub saliva around inside of mask	1
Put it back on	1
Subtotal	/2
Mask defogging – underwater	
Tilt head forward, pushing top of the mask against head	1
Steadily blow air gently out of nose	1
Pull bottom of mask away from nose with thumb	1
Tilt head back and exhale through nose until all the water is cleared	1
Subtotal	/4
Underwater swimming in a natural environment	
Submerge no less than 1 m	1
Demonstrate appropriate technique and buoyancy skill while swimming underwater	1
Demonstrates underwater swim of 9 m, one breath, no push-off or dive OR underwater swim of 18 m, taking three breaths during swim	1
Subtotal	/3
Duck diving and ascending technique	
Deep breath in, pivot from the hips (making a pike)	1
Legs move into the air above the dive	1
Equalise ears on descent	1
Descend on a gradual angle to required depth	1
Swim horizontally underwater	1
On ascent, look up, with one arm up above head	1
Turn in a slow, circular movement while ascending	1
Subtotal	/7

Description	Marks
Ditch and recovery of an object: weight belt	
With all snorkelling gear on, enter water	1
Duck dive to the bottom using correct technique	1
Ditch weight belt and ascend back to the surface using correct technique	1
Clear mask	1
Re-submerge, duck dive down to where the weight belt was ditched	1
Retrieve weight belt and secure firmly in correct position	1
Re-surface using correct technique	1
Subtotal	/7
Establish neutral buoyancy at the surface	
Achieves weight balance for neutral buoyancy	1
Subtotal	/1
Making observations while snorkelling in a natural environment – slates/photography	
Chooses the most appropriate method to record observations required	1
Records observations that are required consistently and accurately	1
Subtotal	/2
Final total	/40

Sample assessment task

Marine and Maritime Studies – ATAR Year 12

Task 4 – Unit 3

Assessment type: Extended response

Conditions

Period allowed for completion of the task: Research and preparation – one week; in-class validation questions – 50 minutes

Task weighting

5% of the school mark for this pair of units

Marine pollution – discharge of treated sewage water to the ocean

(27 marks)

There are many sources of marine pollution. One source, often associated with cities located on the coast, is the discharge of treated sewage water to the ocean.

In Western Australia, there are four waste water treatment plants – Alkimos Wastewater Treatment Plant, Beenyup Wastewater Treatment Plant, Subiaco Wastewater Treatment Plant and Woodman Point Wastewater Treatment Plant – servicing the needs of the wider Perth metropolitan area. Each of these treatment plants discharges their treated waste water to the ocean.

In this activity, you will be researching the discharge of waste sewage water to the ocean. The questions below can be used to guide your research.

The Water Corporation website can be a useful source of information

(<http://www.watercorporation.com.au/water-supply-and-services/wastewater/our-wastewater-treatment-plants>).

When you have completed the research component, you will complete in-class validation questions.

You may have annotated copies of any articles you find in your research and a page of notes with you during the in-class validation.

Guide questions

- What are the common types of pollutants that need to be removed from waste sewage?
- What are the locations of the discharge outlets for the four waste water treatment plants servicing Perth? How far out into the ocean is each of their discharge pipes? At what depth are the outlet pipes and why is this considered important?
- What issues are associated with the differences in the density of the discharge water and the sea water?
- What are the typical volumes of waste water discharged at the Sepia Depression, Swanbourne and Ocean Reef ocean outlets? (see Water Corporation annual reports for ocean outlets at <http://www.watercorporation.com.au/about-us/environment-and-sustainability/ocean-outfall/perth-monitoring-program>).

- What **two** pollutants, able to act as plant nutrients, are often likely to remain in the water discharged to the ocean? What effect might these pollutants have on the marine ecosystems into which they are discharged?
- The Water Corporation monitors the water around the discharge site on a regular basis. How often is the monitoring undertaken and when does it usually occur?
- What pollutants are typically assessed in the monitoring? (See Water Corporation annual reports for ocean outlets.)
- Describe the monitoring of algal biotoxins.
- Using **one** of the Water Corporation annual reports for ocean outlets, describe its environmental management strategy including its three Environmental Values. What are the Environmental Quality Objectives for each of the three values?

Note: For the in-class validation, bring a copy of the section titled 'Water quality monitoring' from the Water Corporation annual report for one of the ocean outlets.

Marine pollution – discharge of treated sewage water to the ocean**(27 marks)****In-class validation questions**

1. Identify **four** pollutants in sewage that typically need to be removed/treated. (4 marks)

2. For **one** of the Perth ocean outlet locations, give the distance from shore of the outlet, its depth and the typical daily volume of water discharged. (3 marks)

Outlet location: _____

Distance from shore: _____

Depth: _____

Daily volume of water discharged: _____

3. State the **four** physio-chemical parameters of water that are measured at the outlet sites. (4 marks)

4. Identify the **two** aspects of water quality measured to indicate if addition of phosphorus and nitrogen compounds to the water is above acceptable levels. (2 marks)

5. Describe the problems that may arise from high levels of phosphorus and nitrogen compounds in the water discharged into the ocean. Your description should relate to the ecosystem into which the water is discharged and the potential human health problems this may cause.

(4 marks)

6. Identify **three** bioavailable metals for which waste water from the treatment plants is analysed.

(3 marks)

7. What sorts of organisms are used for monitoring algal biotoxins and metal toxicants? Explain why these types of organisms are suitable for this purpose.

(3 marks)

8. Describe the steps that are involved in the Water Corporation’s environmental management strategy. (4 marks)

End of questions

Marking key for sample assessment task 4 – Unit 3

1. Identify **four** pollutants in sewage that typically need to be removed/treated.

Description	Marks
Four pollutants identified	1–4
Total	/4
Answer could include, but is not limited to:	
<ul style="list-style-type: none"> • biosolids • phosphate • nitrate and other nitrogen compounds • pesticides/herbicides • metal toxicants • pharmaceuticals 	

2. For **one** of the Perth ocean outlet locations, give the distance from shore of the outlet, its depth and the typical daily volume of water discharged.

Description	Marks
Correct distance given	1
Correct depth given	1
Correct daily volume of water given	1
Total	/3
Answer could include, but is not limited to:	
<p>For Sepia Depression:</p> <ul style="list-style-type: none"> • distance ~4.2 km • depth ~20 m • daily volume of water ~134 ML <p>For Ocean Reef:</p> <ul style="list-style-type: none"> • distance – outlet A ~1.65 km and outlet B ~1.85 km • depth ~10 m • daily volume of water ~116 ML <p>For Swanbourne:</p> <ul style="list-style-type: none"> • distance ~1 km • depth ~11 m • daily volume of water ~56 ML 	

3. State the **four** physio-chemical parameters of water that are measured at the outlet sites.

Description	Marks
Dissolved oxygen (DO) depth profile	1
Salinity depth profile	1
Irradiance	1
Temperature depth profile	1
Total	/4

4. Identify the **two** aspects of water quality measured to indicate if addition of phosphorus and nitrogen compounds to the water is above acceptable levels.

Description	Marks
Measures of chlorophyll-a (a measure of phytoplankton biomass)	1
Light attenuation (a measure of water clarity)	1
Total	/2

5. Describe the problems that may arise from high levels of phosphorus and nitrogen compounds in the water discharged into the ocean. Your description should relate to the ecosystem into which the water is discharged and the potential human health problems this may cause.

Description	Marks
Ecosystem effects of high P and N compounds may include: <ul style="list-style-type: none"> increased phytoplankton population which could reduce light penetration, so reducing growth of benthic macroalgae with flow-on effects to the rest of the food web in the natural ecosystem 	1-2
Possible human health effects of high P and N compounds may include: <ul style="list-style-type: none"> increased populations of toxic phytoplankton which could poisoning due to eating shellfish that may be toxic from consuming P and/or N compounds eye and skin irritation for swimmers who have direct contact with the toxic phytoplankton 	1-2
Total	/4

6. Identify **three** bioavailable metals for which waste water from the treatment plants is analysed.

Description	Marks
Three bioavailable metals identified	1-3
Total	/3
Answer could include, but is not limited to:	
<ul style="list-style-type: none"> arsenic cadmium chromium copper lead mercury nickel selenium silver zinc 	

7. What sorts of organisms are used for monitoring algal biotoxins and metal toxicants? Explain why these types of organisms are suitable for this purpose.

Description	Marks
Mussels	1
<ul style="list-style-type: none"> • These organisms are filter feeders, feeding on algae and detritus in the water • Any toxins will bio-accumulate in these organisms 	1 1
Total	/3

8. Describe the steps that are involved in the Water Corporation's environmental management strategy.

Description	Marks
Steps in the environmental management strategy are:	
<ul style="list-style-type: none"> • identifying environmental values 	1
<ul style="list-style-type: none"> • establishing and spatially defining environmental quality objectives that need to be maintained to ensure the associated environmental values are protected 	1
<ul style="list-style-type: none"> • monitoring and managing to ensure the environmental quality objectives are achieved and/or maintained in the long-term in the areas they have been designated 	1
<ul style="list-style-type: none"> • establishing environmental quality criteria which are quantitative benchmarks or 'trigger values' against which monitoring results can be compared 	1
Total	/4

Sample assessment task

Marine and Maritime Studies – ATAR Year 12

Task 11 – Unit 3 and Unit 4

Assessment type: Test

Conditions

Time for the task: 50 minutes

Task weighting

5% of the school mark for this pair of units

Snorkelling Theory Test

(51 marks)

Structure of the test

Section	Suggested working time	Number of questions	Marks
ONE Multiple-choice	10 minutes	12	12
TWO Short answer	40 minutes	6	39

Section One: Multiple-choice

(12 marks)

In this section, there are **twelve** questions. Attempt **all** questions from this section.

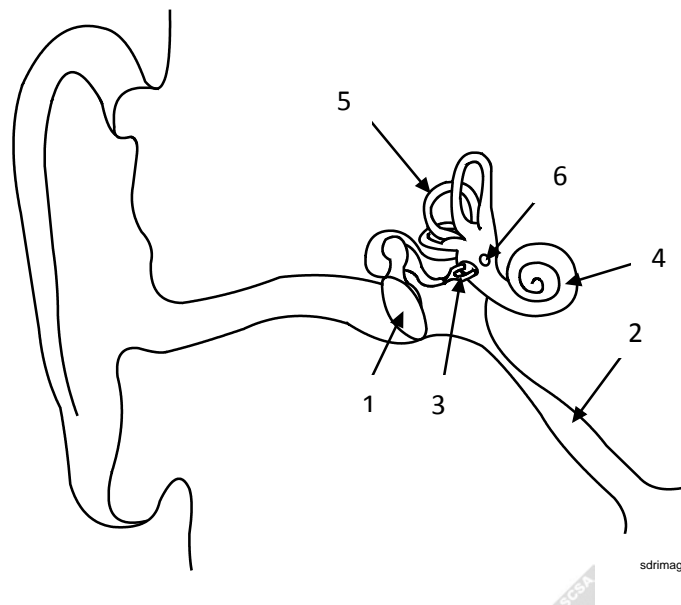
1. Which of the following is the **best** option for equalising the air pressure in your ears?

- (a) closing your mouth, pinching your nose and sucking through your nose
- (b) breathing out slowly through your mouth as you ascend
- (c) closing your mouth, pinching your nose and blowing gently
- (d) pulling your ears and blowing gently through your nose

2. The Eustachian tube connects the

- (a) middle ear and throat.
- (b) middle ear and inner ear.
- (c) inner ear and throat.
- (d) outer ear and middle ear.

Refer to the diagram of the ear below to answer the next question.



3. While diving, a diver may experience pressure changes causing the ear to 'pop'. The 'popping' is caused by

- (a) the gradual increase in pressure on structure **4**, resulting in larger movement of structures **1** and **3**.
- (b) the sudden release of pressure through structure **2**, leading to the sudden movement of structure **1**.
- (c) the release of pressure from structure **5**, producing sound waves to structure **4**.
- (d) the unusual movement of fluids in structures **4**, **5** and **6**, due to the movement of the diver.

4. The part of the ear that detects head position is the
- (a) auditory ossicles.
 - (b) tympanic membrane.
 - (c) Eustachian tube.
 - (d) semicircular canals.
5. Which design feature of a snorkel prevents it from getting caught on overhead objects?
- (a) large bore diameter
 - (b) short barrel length
 - (c) long barrel length
 - (d) small bore diameter
6. If a snorkeller whose mass in air is 63 kg displaces 66 kg of water, her buoyancy can be described as
- (a) neutral.
 - (b) negative.
 - (c) alternative.
 - (d) positive.
7. You are snorkelling with your buddy and he performs the signal shown below.



What does this signal communicate?

- (a) 'Move towards your left.'
- (b) 'There is something on my head.'
- (c) 'There is a crayfish buoy over there.'
- (d) 'OK?' or 'OK!'

8. According to Archimedes' principle, when an object is immersed either wholly or partially in water, the buoyant force is

- (a) equal to the weight of the water displaced by the object.
- (b) less than the weight of the water displaced by the object.
- (c) greater than the weight of the water displaced by the object.
- (d) equal to the gravitational pull on the object.

9. A barotrauma results from

- (a) prolonged heat loss underwater.
- (b) lack of oxygen during a dive.
- (c) failure to equalise differing pressures.
- (d) hyperventilating before a dive.

10. Refraction is

- (a) the bending of light rays as they pass from one medium to another.
- (b) the deflection of light when it encounters suspended particles in the water.
- (c) the absorption and loss of light as it passes through water.
- (d) the diversion or reflection of light when it hits a solid object at the surface.

11. The reason why objects under water appear to be closer and magnified when observed by a diver wearing a snorkelling mask is because

- (a) the light rays from the object are reflected through the glass of the snorkelling mask, magnifying the object.
- (b) there is a layer of air in front of the snorkeller's eyes that refracts the light from the object and magnifies.
- (c) the water-glass interface produces refraction, resulting in magnified objects.
- (d) the glass of the snorkelling mask refracts the light rays, magnifying the object.

12. Read the following quotation from the NAUI Australia Manual.

'The head is tilted back and air is exhaled into the mask from the nose so the water can flow out over the edge of the skirt at the bottom of the mask.'

Which snorkelling technique does this sentence **best** describe?

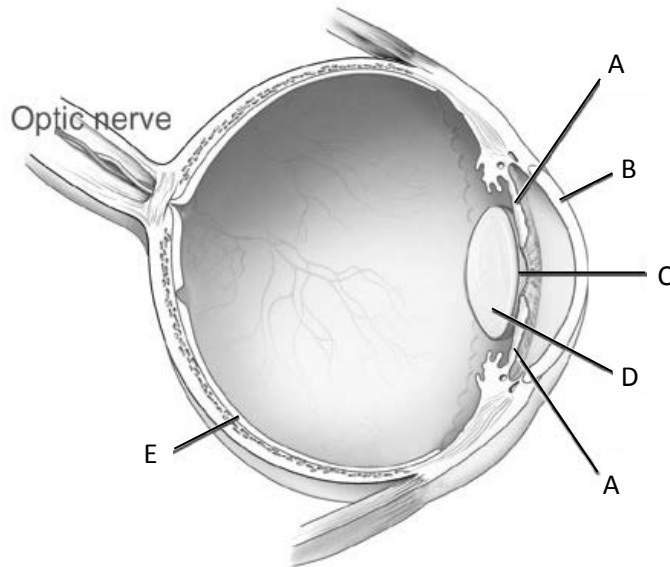
- (a) the blast method
- (b) equalising your ears
- (c) clearing a partially filled mask
- (d) safe descent into deep water

End of Section One

Section Two: written answers

(39 marks)

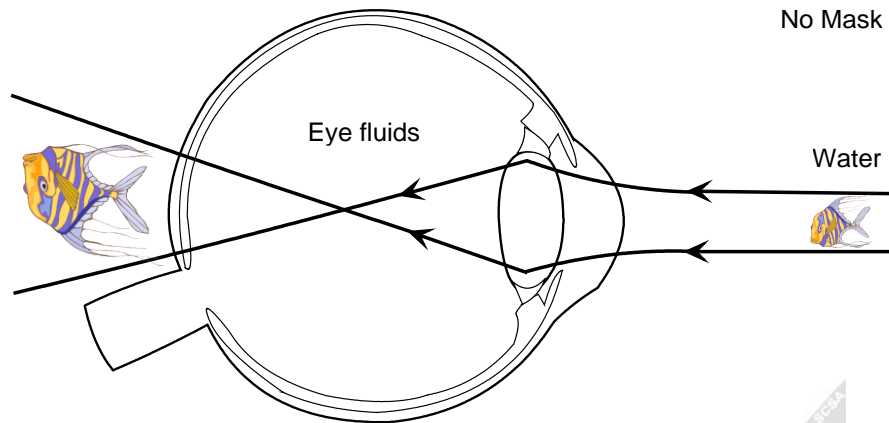
13. Label the parts of the eye indicated below and give their function in the table provided.



Part of eye	Name of eye part	Function
A		
B		
C		
D		
E		

(10 marks)

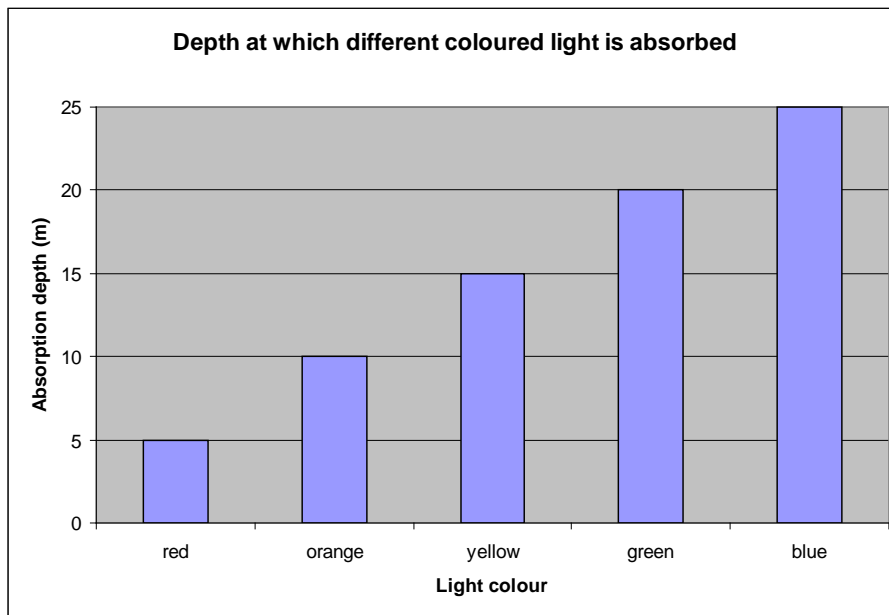
14. Examine the diagram below that shows light rays entering the eye of a diver underwater and the consequent image formed.



Describe the appearance of the image formed and explain why the image forms in this way.

(3 marks)

15. The graph below shows changes in the penetration of light of different colours with ocean depth.



The *Western blue devil* is a reef-dwelling fish commonly seen off the WA coast under overhangs. Their deep-blue skin makes them stand out. What colour will a *Western blue devil* appear to be at a depth of 11 m? Give a reason for your response. (2 marks)

16. The table below shows the approximate values for some of the physical properties of sea water compared with air.

Physical property	Air	Sea water
(a) Speed of sound	350 m s ⁻¹	1550 m s ⁻¹
(b) Thermal conductivity	0.17 W/(m.K)	3.86–4.12 W/(m.K)
(c) Absorption of light	Low	High
(d) Speed of light	290 000 km s ⁻¹	220 000 km s ⁻¹

For **each** of the properties listed above, explain

- (i) how a snorkeller is affected when in water
- (ii) what equipment or techniques are used to overcome that effect.

(a) Speed of sound

- (i) Effect on snorkeller (2 marks)

- (ii) Equipment or techniques (1 mark)

(b) Thermal conductivity

- (i) Effect on snorkeller (2 marks)

(ii) Equipment or techniques (1 mark)

(c) Absorption of light

(i) Effect on snorkeller (2 marks)

(ii) Equipment or techniques (1 mark)

(d) Speed of light

(i) Effect on snorkeller (2 marks)

(ii) Equipment or techniques (1 mark)

17. Alex is planning her next dive and is trying to calculate what weight, if any, she will need on her belt to achieve neutral buoyancy.

(a) State what is meant by neutral buoyancy. (1 mark)

(b) Alex has a land mass of 59 kg and a volume of 63 L. Assuming the density of water that she will be diving in is 1 kg/L, calculate her apparent mass in water. (3 marks)

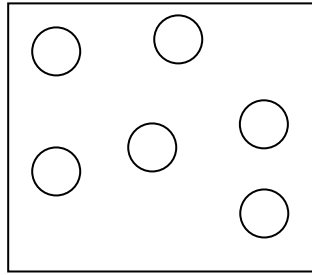
(c) What weight, if any, will Alex need on her belt to achieve neutral buoyancy? (1 mark)

(d) Alex has found out that it is likely stingers will be present in the water where she plans to snorkel. She decides to wear a neoprene wetsuit for protection. What effect, if any, will this have on her buoyancy? Explain your response. (3 marks)

Effect of neoprene wetsuit on buoyancy _____

Explanation

18. The diagram below represents the gas molecules in a snorkeller's lungs before a dive.



- (a) In the box below, draw a representation of the gas molecules in the diver's lungs when the diver is at a depth of 6 m. Your representation needs to clearly show any differences between the arrangement of molecules before the dive and at 6 m. (1 mark)



- (b) State what will happen to the pressure in the snorkeller's lungs at a depth of 6 m compared to the pressure before the dive. Explain your answer. (3 marks)

End of Test

ACKNOWLEDGEMENTS

Section One

Question 7 Image: Southwood, P. (2011). *File:Dive hand signal OK surface 2.png*. Retrieved May, 2015,
from http://commons.wikimedia.org/wiki/File:Dive_hand_signal_OK_surface_2.png
Used under Creative Commons Attribution-ShareAlike 3.0 Unported licence.

Question 12 Quotation from: National Association of Underwater Instructors. (1990). *NAUI textbook* (2nd ed., rev.). Capalaba, Qld: NAUI Australia. (Cited in Moffat, B. (2000). *Snorkelling workbook* (2nd ed.). Ashmore, Qld: Wet Paper.)

Section Two

Question 13 Image adapted from: National Eye Institute. (n.d.). *NEI photos and images: Anatomy of the eye* (Drawing of the eye). Retrieved May, 2015,
from www.nei.nih.gov/photo/anatomy-of-eye

Marking key for sample assessment task 11 – Unit 3 and Unit 4

Section One: Multiple-choice

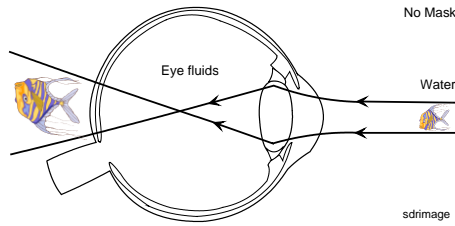
Question	Answer
1	C
2	A
3	B
4	D
5	B
6	D
7	D
8	A
9	C
10	A
11	B
12	C

Description	Marks
1 mark for each question	1–12
Total	/12

13. Label the parts of the eye indicated below and give their function in the table provided.

Part of eye	Name of eye part	Function
A	Iris	Controls the size of the pupil
B	Cornea	Focuses light onto retina
C	Pupil	Allows light to enter the eye
D	Lens	Directs fine focus rays of light onto retina
E	Retina	Detects light (changing it to electrical energy to signal along optic nerve)
Description		Marks
1 mark for each correct answer as in the table above		1–10
Total		/10

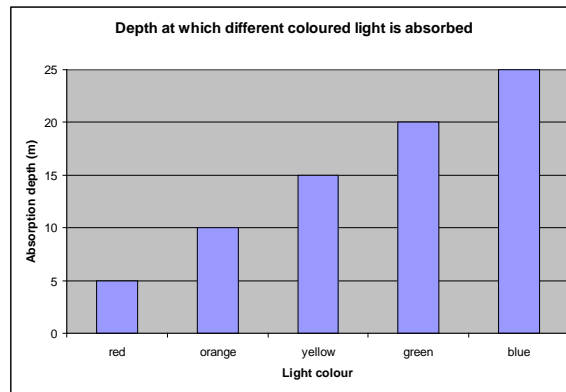
14. Examine the diagram below that shows light rays entering the eye of a diver underwater and the consequent image formed.



Describe the appearance of the image formed and explain why the image forms in this way.

Description	Marks
Image is blurred	1
Explanation:	
• eye has a similar optical density to that of water	1
• light rays are not refracted/bent enough so the focus is behind the retina	1
Total	/3

15. The graph below shows changes in the penetration of light of different colours with ocean depth.



The *Western blue devil* is a reef-dwelling fish commonly seen off the WA coast under overhangs. Their deep-blue skin makes them stand out. What colour will a *Western blue devil* appear to be at a depth of 11 m? Give a reason for your response.

Description	Marks
The <i>Western blue devil</i> will appear blue	1
Blue light has penetrated to this depth	1
Total	/2

16. The table below shows the approximate values for some of the physical properties of sea water compared with air.

Physical property	Air	Sea water
(a) Speed of sound	350 m s ⁻¹	1550 m s ⁻¹
(b) Thermal conductivity	0.17 W/(m.K)	3.86–4.12 W/(m.K)
(c) Absorption of light	Low	High
(d) Speed of light	290 000 km s ⁻¹	220 000 km s ⁻¹

For **each** of the properties listed above, explain

- (i) how a snorkeller is affected when in water
- (ii) what equipment or techniques are used to overcome that effect.

(a) Speed of sound

- (i) Effect on snorkeller
- (ii) Equipment or techniques

Description	Marks
Effect on snorkeller:	
• it is difficult to determine the direction from which the sound comes	1
• it can lead to confusion when trying to source sound underwater	1
Equipment or techniques – one of the following points	
• speech ineffective underwater so need to bang metal object on a second metal object to attract another diver's attention	1
• speech ineffective underwater so communication usually via hand signals	
Total	/3

(b) Thermal conductivity

- (i) Effect on snorkeller
- (ii) Equipment or techniques

Description	Marks
Effect on snorkeller:	
• higher conductivity of water as compared to air means a diver will lose heat faster in water	1
• time able to be in water is limited by the heat loss	1
Equipment or techniques	
• need to wear protective insulated covering such as wet suit, thermal rashie, hood, gloves, metal object to attract another diver's attention	1
Total	/3

- (c) Absorption of light
 (i) Effect on snorkeller
 (ii) Equipment or techniques

Description	Marks
Effect on snorkeller:	
• nearly all light absorbed by 100 m depth so objects appear dark underwater	1
• colours will be progressively lost as a diver goes down	1
Equipment or techniques – one of the following points	
• a torch is used to provide a source of white light at depth	1
• a coloured mask lens can be used	
Total	/3

- (d) Speed of light
 (i) Effect on snorkeller
 (ii) Equipment or techniques

Description	Marks
Effect on snorkeller:	
• blurred image formed without a mask	1
• judgement of distance to and size of object is impaired	1
Equipment or techniques	
• blurring is overcome by use of a face mask	1
Total	/3

17. Alex is planning her next dive and is trying to calculate what weight, if any, she will need on her belt to achieve neutral buoyancy.

- (a) State what is meant by neutral buoyancy.

Description	Marks
When a diver (an object) hangs as though suspended in the water, neither rising nor sinking	1
Total	/1

- (b) Alex has a land mass of 59 kg and a volume of 63 L. Assuming the density of water that she will be diving in is 1 kg/L, calculate her apparent mass in water.

Description	Marks
Alex's volume = 63 L	
• mass of water displaced = 63 L x 1 kg L ⁻¹ = 63 kg (upthrust)	1
• apparent mass = mass in air – upthrust	1
= 59 kg – 63 kg	
= –4 kg	1
Total	/3

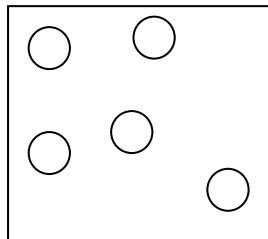
- (c) What weight, if any, will Alex need on her belt to achieve neutral buoyancy?

Description	Marks
4 kg	1
Total	/1

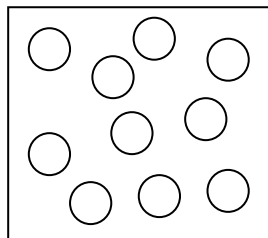
- (d) Alex has found out that it is likely stingers will be present in the water where she plans to snorkel. She decides to wear a neoprene wetsuit for protection. What effect, if any, will this have on her buoyancy? Explain your response.

Description	Marks
Neoprene wetsuit will make her more positively buoyant	1
Explanation:	
• neoprene wetsuits have air bubbles trapped between the lining	1
• there will be an overall increase in volume with very little increase in weight	1
Total	/3

18. The diagram below represents the gas molecules in a snorkeller's lungs before a dive.



- (a) In the box below, draw a representation of the gas molecules in the diver's lungs when the diver is at a depth of 6 m. Your representation needs to clearly show any differences between the arrangement of molecules before the dive and at 6 m.



Description	Marks
Representation shows molecules have reduced space between them	1
Total	/1

- (b) State what will happen to the pressure in the snorkeller's lungs at a depth of 6 m compared to the pressure before the dive. Explain your answer.

Description	Marks
Pressure in lungs will increase	1
Explanation:	
• underwater, the pressure is greater than it is in air on land	1
• the increased pressure of the surrounding water will reduce the lung volume which, in turn, means pressure in lungs increases	1
Total	/3