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

WACE
Western Australian Certificate of Education

MARINE AND MARITIME STUDIES

Stage 3

WACE Examination 2015

Marking Key

Marking keys are an explicit statement about what the examiner expects of candidates when they respond to a question. They are essential to fair assessment because their proper construction underpins reliability and validity.

Section One: Multiple-choice **20% (20 Marks)**

Question	Answer
1	A
2	C
3	C
4	A
5	A
6	A
7	C
8	B
9	D
10	C
11	C
12	D
13	C
14	C
15	B
16	B
17	B
18	B
19	C
20	C

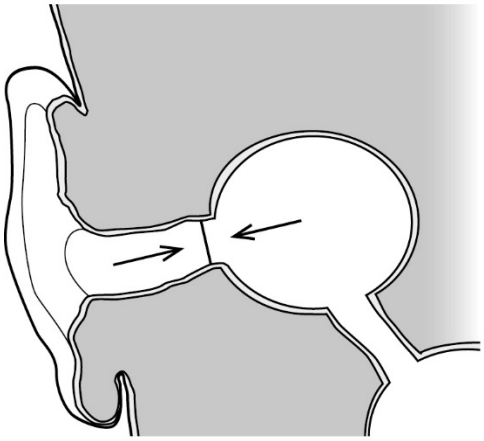
Section Two: Short answer **50% (81 Marks)**

Question 21 **(16 marks)**

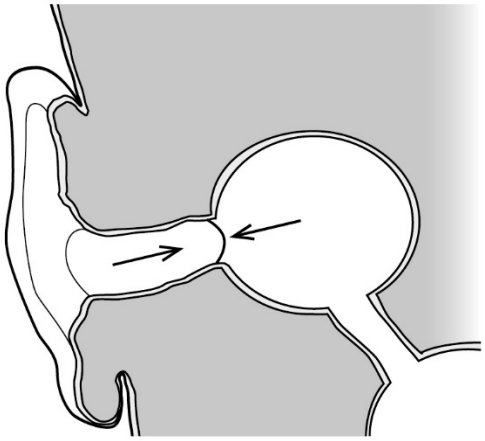
(a) Name the tube associated with the ear that this would directly affect. (1 mark)

Description	Marks
Eustachian tube	1
Total	**1**

(b) On the diagrams below, draw and annotate the shape of the eardrum, and indicate the pressure on either side of the eardrum, before equalising. (4 marks)



At the surface.



At depth.

Description	Marks
At the surface – shows flat ear drum	1
At the surface – explains normal/lower pressure	1
At depth – shows curved/concaved inwards ear drum	1
At depth – explains that pressure increasing causes ear drum movement	1
Total	**4**

(c) Barotraumas are a result of the effect of pressure on the body. Explain how a barotrauma may occur in the ear, and how this can be prevented. (2 marks)

Description	Marks
Barotrauma in ear caused by increasing pressure on ear drum that goes uncorrected/blockage in Eustachian tube	1
Describes one method by which it can be prevented	1
Total	**2**

Prevention methods include but are not limited to:
- moving ear drum back with increasing pressure (equalising) on other side of ear drum
- Valsalva manoeuvre
- Toynbee manoeuvre
- compensating continuously before pain is felt

(d) State how being under water affects the following:

(i) volume/loudness of sound (1 mark)

Description	Marks
Becomes louder(as water allows sound to travel faster)	1
Total	**1**

(ii) interpreting the direction of a sound's origin (1 mark)

Description	Marks
Difficult to detect direction of sound	1
Total	**1**

(iii) speed of sound. (1 mark)

Description	Marks
Sound travels faster in water	1
Total	**1**

(e) Being in water has an effect on the buoyancy of an object.

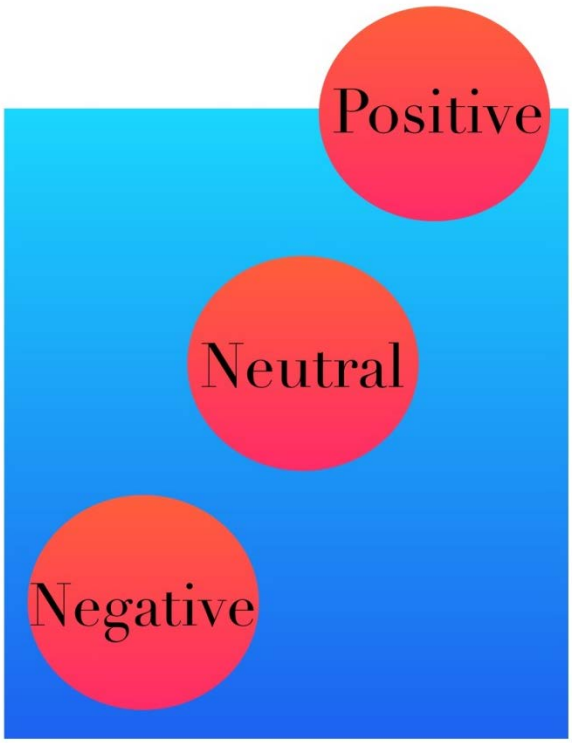
With the aid of diagrams explain the terms ‘positive buoyancy’, ‘negative buoyancy’ and ‘neutral buoyancy’. (6 marks)

Description	Marks
Three terms explained, up to two marks each (text plus diagram)	1–6
Total	**6**

Text:

- Positive buoyancy: an object in a water column rising
- Negative buoyancy: an object in a water column falling
- Neutral buoyancy: an object in water neither rising nor falling

Diagram(s) could show:



Question 22 **(11 marks)**

(a) Describe **three** correct steps that should be carried out in a buddy pre-dive safety check. (3 marks)

Description	Marks
Any three correct steps relevant to a pre-dive safety check, one mark each	1–3
Total	**3**
Checking steps include but are not limited to: • buoyancy • weighting • releases • equipment • streamlined	

(b) Explain how to prepare a mask correctly to reduce the chances of it fogging up under water. (2 marks)

Description	Marks
Any two correct steps, one mark each	1–2
Total	**2**
Steps include but are not limited to: • cooling the face • adding an antifog (spit, spray) • cleaning a new mask with scouring agent • rinsing thoroughly	

(c) Describe **two** steps taken when fitting and adjusting a weight system for snorkelling to provide the correct form of buoyancy. (2 marks)

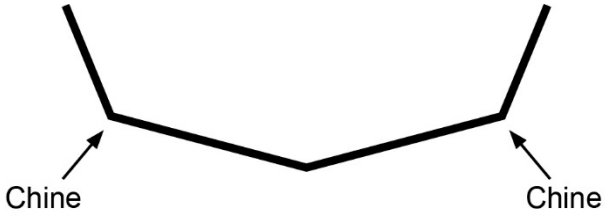
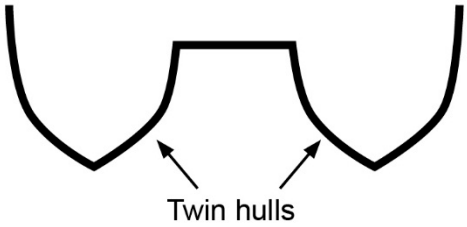
Description	Marks
Any two correct steps, one mark each	1–2
Total	**2**
Steps for fitting include but are not limited to: • left hand release • enough loose tail-end to be able to grab • not tucking away • ensuring that the quick release buckle works Steps for adjusting include but are not limited to: • normal breath floating at eye level if sufficient weights are added	

(d) Describe **two** steps in performing an efficient tow on a tired diver in the event of a surface emergency. (4 marks)

Description	Marks
Any two correct steps, up to two marks each	1–4
Total	**4**
Steps include but are not limited to: • Ensure flotation by removing weights • Ensure flotation by adding air if possible • Tow the diver efficiently by chin tow • Tow the diver efficiently by fin push	

Question 23 **(23 marks)**

(a) Draw a labelled diagram and explain the characteristics, benefits and limitations of each of the following hull designs. (12 marks)

Description	Marks
Diagram of hard chine correct – shows hard lines on hull nearest water level and labels the chine on the hull  	1–2
Two correct benefits of hard chine, one mark each	1–2
Benefits include but are not limited to: • provides lift at speed • planing • deflects spray • possible shallower draft	
Two correct limitations of hard chine, one mark each	1–2
Limitations include but are not limited to: • less stable • weak points in hull • rougher ride	
Diagram of catamaran correct – shows and labels twin hulls  	1–2
Two correct benefits of catamaran, one mark each	1–2
Benefits include but are not limited to: • stable due to wide beam • lighter than a ballasted hull • faster in some conditions • less heel • less likely to capsize	
Two correct limitations of catamaran, one mark each	1–2
Limitations include but are not limited to: • unsettled motion (hobby-horsing) • noisy • harder to tack • slower turning	
Total	**12**

(b) Name and describe a hull design that would suit the following types of vessel. For each type of vessel, describe an advantage of the hull design.

(i) Cruising yacht (3 marks)

Description	Marks
Hull type: displacement hull	1
Description: round edges	1
Provides an advantage	1
Total	**3**

Advantages include but are not limited to:
- stable
- comfortable in rough seas
- can heel over when wind in sails

(ii) Rigid inflatable boat (3 marks)

Description	Marks
Hull type: hard chine hull	1
Description: deep V at bow and flat at stern	1
Provides an advantage	1
Total	**3**

Advantages include but are not limited to:
- planing at stern for speed
- shallow draft
- highly manoeuvrable
- high speed for given motor size
- good ride in rough seas

(c) Care and consideration must be taken when snorkelling around boats. Describe the procedure for a safe descent and ascent when snorkelling if boats are in the dive area. (5 marks)

Description	Marks
Flag up so it is clearly visible	1
Look around to ensure no boats in area and locate where/what they are doing	1
Inhale and descend without hyperventilating	1
Equalise	1
Ascend with hand up above head, looking up for obstacles	1
Total	**5**

Question 24 **(11 marks)**

(a) Describe **two** general trends in the Western Australia south coast graph. (2 marks)

Description	Marks
increasing catch which peaks around 1991	1
then declines to 2010	1
Total	**2**

(b) Give a reason for each of the trends that you described in part (a). (2 marks)

Description	Marks
unsustainable catches up to late 1980s to1990s	1
followed by decline in population due to loss of breeding stock	1
Total	**2**

(c) Give a reason for the difference between the west coast and the south coast herring catches for the period from 1989 to 1992. (1 mark)

Description	Marks
Provides a plausible reason	1
Total	**1**
Answers include but are not limited to: • Fish caught before reaching the west coast	

(d) Describe and explain **three** ways in which these herring catch results might have been collected in order to minimise experimental error. (6 marks)

Description	Marks
Three ways, each description one mark and related explanation one mark.	1–6
Total	**6**
Answers include but are not limited to: • collect data at same time each year – reduces seasonal variations • for same period of each year – reduces sample bias • same locations stretch of coast for each reporting time(s) – reduces distribution variation • same boundary for each of region each time (no overlap of catch areas) – reduces double counting	

Question 25 **(12 marks)**

(a) Describe **three** methods designed to protect whale sharks when swimmers are interacting with them and explain how these methods reduce harmful or detrimental effects on the whale sharks. (6 marks)

Description	Marks
Any three techniques one mark each; correct reason for rule one mark each	1–6
Total	**6**
Answers include but are not limited to: • Quiet in water – reduces changes to shark's normal behaviour • Keep minimum distance from animal at all times - reduces interference with shark's movements and activities • Max number in water any one time - minimum disturbance around shark • Max number in water any one time - better able to control divers • Max number in water any one time - minimum 'contact' at a contact time. • No contact/touching shark - avoid disturbing or frightening the shark • No flash photography - avoid disturbing or frightening the shark	

(b) Name **two** types of Marine Protected Area that can be found in Western Australia. (2 marks)

Description	Marks
Two ways, one mark each.	1–2
Total	**2**
Any two of the following three: • Marine nature reserves • Marine parks • Marine management areas	

(c) (i) What are the **two** main responsibilities of the International Whaling Commission? (2 marks)

Description	Marks
Two responsibilities, one mark each.	1–2
Total	**2**
Answers include but are not limited to: • conservation of whales and other cetaceans • management of whales catch limits, funding of research into whales/conduct of whaling	

(ii) Australia has regulations covering interactions between people in boats and marine mammals. List **two** differences between the regulations involving interactions with whales and interactions with dolphins. (2 marks)

Description	Marks
Two differences, one mark each.	1–2
Total	**2**
Answers include but are not limited to: • dolphins – 50 m no-go zone instead of 100 m for whales • dolphins – 150 m caution zone instead of 300 m for whales	

Question 26 **(8 marks)**

(a) You plan to recover a 280 kg item from a wreck in sea water. This item displaces 80 L of sea water. Calculate how much air you must put in a lifting device to make the item neutrally buoyant. Show **all** workings. (5 marks)

Description	Marks
80 L of seawater displaces 80 × 1.03 kg/L = 82.4 kg	1–2
280 kg – 82.4 kg = 197.6 kg	1
197.6 kg ÷ 1.03 kg/L = 191.84 L	1–2
Total	**5**

(b) Describe **three** points to consider when rigging and using a lift bag to retrieve such an object. (3 marks)

Description	Marks
Any three points, one mark each	1–3
Total	**3**

Answers include but are not limited to:
- possibility of snagging
- safe working loads (ensure that the basket is not overfilled)
- strain on attachment points
- use of safety lines
- safe rigging
- don't be underneath during lift
- manage ascent

End of Section Two

Section Three: Extended answer **30% (50 Marks)**

Question 27 **(25 marks)**

(a) Name and describe **two** wastes that are included in **each** of the following categories:
- human and domestic waste
- heavy metals. (4 marks)

Description	Marks
Names and describes two human/domestic wastes, one mark each	1–2
Answers include but are not limited to: • rubbish from kitchen, e.g. tin cans/plastic wrapping/waste/left over food • rubbish from other parts of the vessel, e.g. detergents, oils • Sewage/toilet wastes, e.g. faeces/urine/water from toilets and showers/bathroom	
Names and describes two heavy metals, one mark each	1–2
Answers include but are not limited to: • lead from antifouling paint, batteries • tin from antifouling paint • cadmium from batteries	
Total	**4**

(b) For each category of waste given above, describe the processes used to manage and control it, so that it does not pollute the marine environment. (8 marks)

Description	Marks
Describes the processes, up to four marks for each category of waste	1–8
Human/domestic: • hold in sullage tanks and dispose of when in port through approved outlets • store dry rubbish in bins until in port • incinerate at sea and hold ash until in port	
Heavy metals • do not scrape hull/vessel at sea or in port • capture waste from scraping and store/dispose of safely • use paint etc. that is low in/free of these metals.	
Total	**8**

(c) Name **two** pollutants that increase nutrient levels in a waterway or ocean. Explain how these pollutants enter the waterway or ocean, and how they affect both water quality and the organisms that live in the water. (13 marks)

Description	Marks
Phosphates and nitrates	1–2
Leads to eutrophication/involving algal blooms/reduction in dissolved oxygen (hypoxia)/when blooms collapse/leads to fish deaths	1–5
Identifies sources – detergents, industrial/domestic run-off, and fertilisers for phosphates and agricultural activities, human wastes, or industrial pollution for nitrates	1–4
Describes how pollutants enter waterways – runoff, rivers, sewage outlets, leaching	1–2
Total	**13**

Question 28 **(25 marks)**

(a) Explain the decay processes of metal corrosion mostly responsible for the declining condition of the wreck. (7 marks)

Description	Marks
Shallow, so not much anaerobic bacterial activity	1
Electrolysis: • sea water is an electrolyte (reasonable conductor of electrical current). • rate of electrolysis depends on concentration of dissolved O_2, pH, water temperature, presence of dissimilar metals	1–3
Up to three others, one mark each	1–3
Total	**7**
Other factors include but are not limited to: • oxygen: reacts with iron to form corrosion products (iron oxides) • decreased pH: acid reacts with metal, releasing H_2 and forming a salt of iron • marine growth: attachment can result in erosion of attachment point • aerobic bacteria: waste products released can react with iron • salinity: increases electrolytic reactions • water currents: slow in a bay but replace reacted oxygen and remove of corrosion products, promoting formation of more corrosion products	

(b) (i) Name **two** materials other than metals that may have been on the wreck and have since decayed. (2 marks)

Description	Marks
Names two materials, one mark each	1–2
Total	**2**
materials include but are not limited to: • wood • clothing • leather • human bodies • glass • pottery	

(ii) Describe the processes involved in the decay of each of these materials. (4 marks)

Description	Marks
Describes processes of decay.	1–4
Total	**4**
Answers include but are not limited to: depends on material named but often bacterial or action of O_2 saturation with $C\ell^-$ and other ions in sea water, i.e. ions move into substrate and replace some of it	

(c) If the local authorities of Vanuatu wished to conserve significant metallic relics of this wreck, describe the conservation techniques that would be used to perform the following:

(i) retrieval (4 marks)

Description	Marks
Raise to surface by lift bags/air lifts/physical diver raise	1
Keep wet/immersed in seawater until treatment time	1–2
Do not remove concretions	1
Total	**4**

(ii) de-concretion (4 marks)

Description	Marks
X-ray (or ultrasound) examination to determine presence of objects	1
Use weak acid (depends upon material in concretion)	1
Use hammer blows and/or chisels (manual/pneumatic/ultrasonic or such) to chip bits off	1–2
Total	**4**

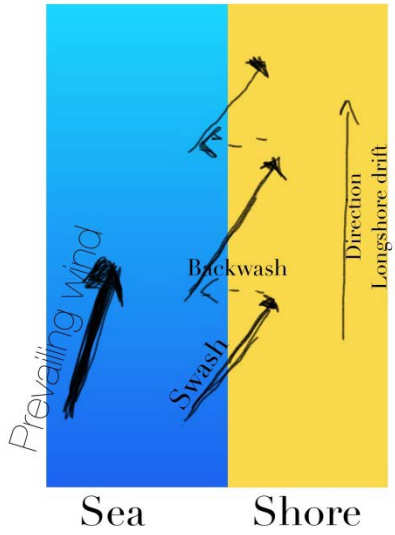
(iii) stabilisation. (4 marks)

Description	Marks
Immersion with added corrosion inhibiters e.g. NaOH, $NaHCO_3$	1
Substitute dissolved ions with other substances such as PVA and other polymers and resins	1
Electrolysis	1
Use of consolidants such as PVA, epoxy resins, cellulose nitrate etc.	1
Total	**4**

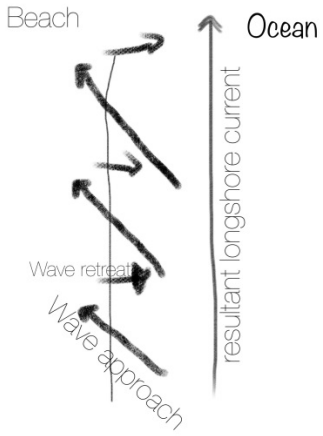
Question 29 **(25 marks)**

(a) Explain, using diagrams where appropriate, the following terms and how each could affect beach structure.

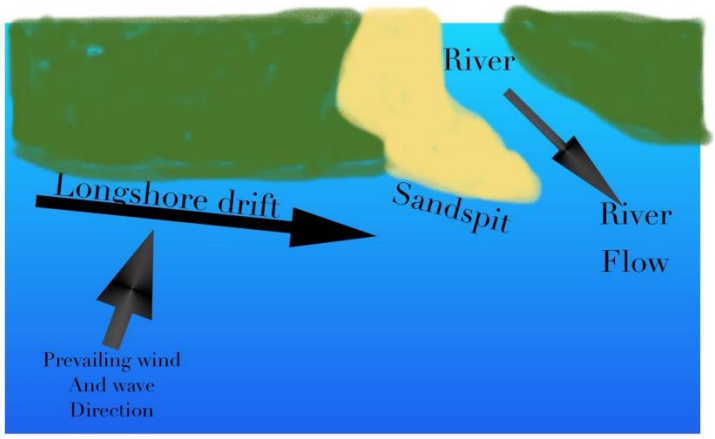
(i) longshore currents (5 marks)

Description	Marks
A current that moves parallel to the shore or Caused by swell sweeping into the shore at angles	1
	1
Causes beach erosion when water carries sediments away	1
Causes headland and beach accretion when water movement deposits sediments	1–2
Total	**5**

(ii) beach accretion and erosion (5 marks)

Description	Marks
Caused by swell, waves and tides	1
	1
erosion is removal of sediment/sand from beaches	1
accretion is the depositing of sediment/sand	1
causes the beach shape to change over time or changes features of island or beach	1
Total	**5**

(iii) sand deposition (5 marks)

Description	Marks
Occurs when the addition of sediments is greater than removal	1
Caused by water movement and wind	1–2
Can create new features (spits, dunes, sand bars, saltmarshes)	1
	1
Total	**5**

(b) Explain the features, role and impact of the following engineering methods that can be used to reduce the erosion of sandy beaches.

(i) artificial reefs (5 marks)

Description	Marks
Human-made structures built from various materials (excess sand, blocks, rubble)	1
May be single long formations or a series of formations	1
Dissipate wave energy or current movement before it reaches beach	1
Reduce environmental impact by only partly affecting the natural cycle of sand movement	1
Create new habitat or become a long term solution	1
Total	**5**

(ii) physical barriers (5 marks)

Description	Marks
May be found in the form of groynes, breakwaters or seawalls	1
Run perpendicular to beach if groynes or parallel when offshore	1
Reduce the movement of water and limit sediment movement	1
Can add to deposition and accretion on either side of groynes	1
Create areas of calm water	1
Total	**5**

Question 30 **(25 marks)**

(a) Using the information above, design an experiment that would add to this information in showing the effects of global warming on ocean sea levels.

In your answer, include the following information:

(i) the relevant background information that you would collect to assist in your experiment (3 marks)

Description	Marks
previous studies physical factors affecting water levels modelling relevant to this study	1–3
Total	**3**

(ii) a correctly-formatted hypothesis (3 marks)

Description	Marks
Hypothesis includes independent and dependent variables, stated correctly	1–3
Total	**3**

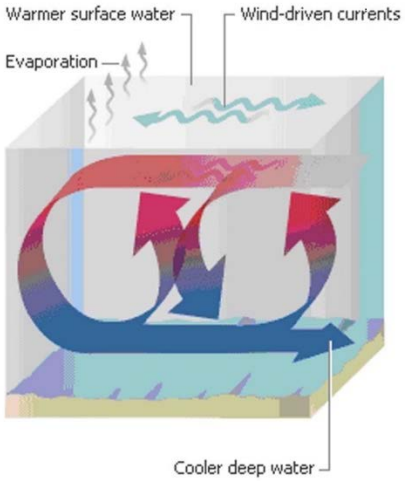
(iii) the variables that would be involved in your experiment (5 marks)

Description	Marks
names up to five appropriate variables, one mark each may be independent, dependent, controlled, uncontrolled	1–5
Total	**5**

(iv) the method that you would use to conduct your experiment. (6 marks)

Description	Marks
Describes relevant method in a procedural format, including: • how variables will be controlled • how data will obtained or measured	1–6
Total	**6**

(b) Explain, with a diagram, what a thermohaline current is, and how it can be affected by global warming. (8 marks)

Description	Marks
Large scale ocean current, upwelling or ocean conveyor belt	1
Caused by differences in water density because of salinity and temperature differences	1–2
Diagram - shows vertical and lateral movement  Thermohaline circulation	1–2
Effect of global warming: change the speed of the current or shut the current down completely	1
Changes in the current are caused by changes in water temperature and/or water salinity	1–2
Total	**8**

End of questions

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