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# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MARINE SCIENCES (P2)**

**NOVEMBER 2022**

**MARKING GUIDELINES**

**MARKS: 150**

**These marking guidelines consist of 18 pages.**

**PRINCIPLES RELATED TO MARKING MARINE SCIENCES**

1. **If more information is given than marks allocated**  
Stop marking when the maximum number of marks is reached and draw a wavy line and write 'max' in the right-hand margin.
2. **If, for example, three reasons are required and five are given**  
Mark the first three reasons irrespective of whether these first three are correct or not.
3. **If a whole process is given when only a part of the process is required**  
Read the whole process given and credit the relevant part.
4. **If comparisons are asked for, but descriptions are given**  
Accept the description if the differences or similarities are clearly stated.
5. **If diagrams are given with annotations when descriptions are required**  
Mark the description.
6. **If flow charts are given instead of descriptions**  
Mark the description only.
7. **If a described sequence is muddled and links do not make sense**  
Where sequence and links are correct marks are given. Should a logical sequence resume, marks are given.
8. **Non-recognised abbreviations**  
Accept the abbreviation if it is first defined in the answer. If the definition is not defined, do not give credit for the unrecognised abbreviation, but credit the rest of the answer if correct.
9. **Wrong numbering**  
If the answer fits into the correct sequence of questions, but the wrong number is given, credit the answer if the answer is in the correct order.
10. **If the language that is used changes the intended meaning**  
Do not accept the answer.
11. **Spelling errors**  
If a word is recognisable (if read out loud), accept the answer, provided it does not mean something else in Marine Sciences terminology or if it is out of context.
12. **In SECTION A only accept and credit the correct letter.**

13. **Be sensitive to the sense of an answer, which may be stated in a different way.**
14. **Title**  
All illustrations (e.g. diagrams, graphs and tables) must have a title written above or below.
15. **Code-switching of official languages (terms and concepts)**  
A term or concept written in any official language other than the learner's assessment language used in their answers should be credited, if it is correct. A marker that is proficient in Marine Science content and the official language used should be consulted. This is applicable to all official languages.
16. **Changes to the marking guidelines**  
No changes must be made to the marking guidelines. The provincial internal moderator must be consulted, who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).
17. **Official marking guidelines**  
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

**SECTION A****QUESTION 1**

1.1	1.1.1	C ✓✓		
	1.1.2	A ✓✓		
	1.1.3	B ✓✓		
	1.1.4	C ✓✓		
	1.1.5	A ✓✓		
	1.1.6	B ✓✓		
	1.1.7	A ✓✓		
	1.1.8	C ✓✓		
	1.1.9	C ✓✓		
	1.1.10	A ✓✓	(10 x 2)	<b>(20)</b>
1.2	1.2.1	Cirri ✓		
	1.2.2	Keratin ✓		
	1.2.3	Claspers ✓		
	1.2.4	Oophagy ✓		
	1.2.5	Alveoli ✓		
	1.2.6	Blastula ✓		
	1.2.7	Carapace ✓		
	1.2.8	Plastron ✓		
	1.2.9	Gill slits ✓		
	1.2.10	Pulmonary ✓ circuit / <u>artery and vein</u>	(10 x 1)	<b>(10)</b>
1.3	1.3.1	Both A and B ✓✓		
	1.3.2	B only ✓✓		
	1.3.3	A only ✓✓		
	1.3.4	A only ✓✓		
	1.3.5	None ✓✓	(5 x 2)	<b>(10)</b>
				<b>[40]</b>
<b>TOTAL SECTION A:</b>				<b>40</b>

**SECTION B****QUESTION 2**

2.1      2.1.1      **1 mark for both variables**  
**1 mark for aim**

- To determine the species of bird caught and the number of each species caught as bycatch (for the winter fishing season). ✓✓

OR

- To determine the number of birds caught by each vessel ✓✓ (2)

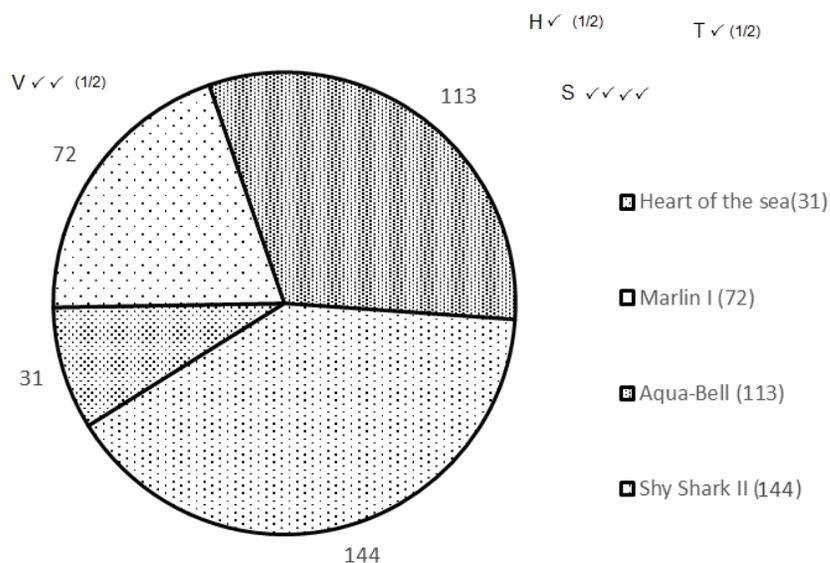
- 2.1.2
- Only used the long-line fishing method. ✓
  - Similar-sized vessel
  - Vessels had no bycatch counter measures. ✓
  - time span / duration of experiment (1 April–31 July.) ✓
  - Same species of bird ✓
  - Birds counted / tallied using the same method ✓

**(Mark first 2 only) (2)**

2.1.3.

MARKING GUIDELINES	
CRITERIA	MARK ALLOCATED
Type of graph, Pie chart (T)	$\frac{1}{2}$
Descriptive heading above or below the graph (H)	$\frac{1}{2}$
Heading references that describe both variables by name (V)	$\frac{1}{2} \times 2 = 1$
For each correct calculation from total number of birds per vessel (CD)	$\frac{1}{2} \times 4 = 2$
For each correct calculation from data to degrees (C)	$\frac{1}{2} \times 4 = 2$
Draw and labelled correct segment (S)	$1 \times 4 = 4$

Pie chart of the proportion (number) of birds caught per fishing vessel in the study

**CD**

Vessel name	Tally	Equals	Mark
Heart of the sea	2+4+3+3=	<b>12</b>	$\frac{1}{2}$
Marlin I	8+4+3+3=	<b>28</b>	$\frac{1}{2}$
Aqua-Bell	12+7+14+11=	<b>44</b>	$\frac{1}{2}$
Shy Shark II	18+13+8+17=	<b>56</b>	$\frac{1}{2}$

**C**

Vessel Name	Plotting	Equals	Rounded	Mark
Heart of the sea	$12/140 \times 360 =$	30.86	31	$\frac{1}{2}$
Marlin I	$28/140 \times 361 =$	72	72	$\frac{1}{2}$
Aqua-Bell	$44/140 \times 362 =$	113.14	113	$\frac{1}{2}$
Shy Shark II	$56/140 \times 363 =$	144	144	$\frac{1}{2}$

(10)

2.1.4 **Open-ended question.**

**Learner should show comprehension of determining the effect that fishing has on non-target (birds) organisms.**

- So, they can determine what the effect of fishing ✓ has on the population of seabirds. ✓  
OR
- To determine the influence of the fishing ✓ industry on the population of marine birds. ✓  
OR
- To determine if it is necessary to raise concern about the amount of seabird bycatch ✓ so mitigation strategies can be established. ✓  
OR
- Ecologists would need to compare this data with other information to determine the significance of the data. ✓  
OR
- So recommendations ✓ can be made on where the vessel operates and measures that are required as mitigation measures. ✓  
OR
- To determine the vulnerability of the bird species ✓ /  
- conservation to formulate solutions ✓

**Any pair (2)**

- 2.1.5
- Their food supplies become less leading to starvation. ✓
  - The birds actively searching for food may need to feed their hatchlings, if the hunting individuals do not return with food the hatchlings might die. ✓
  - Reproducing individuals might be affected reducing the possible breeding individuals. ✓
  - They can get stuck in the nets and drown/ get crushed. ✓
  - Their wings might get damaged by the long line and they cannot fly anymore. ✓
  - Changing sex ratio of breeding birds if different genders feed on different feeding grounds/locations. ✓

**Don't mark synonymous answers**

**Accept any other relevant answer**

**(Mark any 2) (2)**

- 2.1.6 (a) Shy Shark II ✓ (1)
- (b)
- Bird scaring lines. ✓
  - Setting lines at night (when birds aren't actively feeding). ✓
  - Set lines in areas where birds are less prone to be ✓
  - Stay away from MPAs ✓

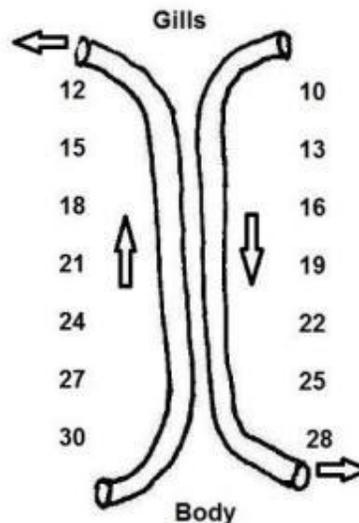
**(Accept any other logical answer. Mark any 1) (1)**

**(20)**

- 2.2 2.2.1 - Blubber/ subcutaneous fat ✓ insulates the organisms ✓  
 - Endothermic ✓, they have to swim in cold water ✓  
 - Counter current heat exchange mechanism ✓, as they have to swim in cold water ✓

(Mark any pair) (2)

2.2.2 a)



Counter current heat exchange mechanism (CCHE)

- *Appropriate heading above or below diagram (H) - (½ mark)*
- *Arrows indicating counter flow (A) - (1 mark)*
- *Temperature gradient (T) - (½ mark)*

(2)

2.2.2 b) Discuss/ Annotation

- Most fish are ectothermic. ✓
- Some can acclimatise to an extent. ✓
- Fast swimming predatory fish have a counter-current heat exchange mechanism (CCHE). ✓ **Do not mark acronym only.**
- Many other fish have this associated with their gills to prevent heat generated by the muscles to be lost to the surrounding environment. ✓
- Warm blood flows towards the gills from deeper within the body ✓
- Cold blood flows from the gills inward towards the body. ✓
- This incoming and outgoing blood streams that pass in close proximity to one another. ✓
- This allows the warmer blood (from the body) to transfer heat to the incoming colder blood (from the gills). ✓
- and redirect it back into the body so that heat is not lost. ✓

(Mark any 4 annotations) (4)

2.2.3 **Odontoceti** ✓\*

- Have (homodontic) teeth ✓
- Use echolocation to find food ✓
- Often seen in large groups with the ability to coordinate ✓

**Mysteceti** ✓\*

- Have baleen (keratin-rich material) growing from the top jaw ✓
- Used to filter feed ✓

(✓\* **Compulsory mark, 1 mark per description**)(4)  
(12)

2.3

***If learner does not write comparisons then only mark one side of the table.******Table drawn (T) - 1 mark******Correct column headings (H) - ½ mark x 2******Mark the first 3 pairs of comparisons***

Table comparing marine mammals and marine fish reproductive strategies	
<b>Sardine(fish)</b>	<b>Southern Right Whale (marine mammal)</b>
Most are oviparous. ✓	All are viviparous ✓
Spawning is common (between pairs of fish or mass spawning)/ external fertilisation ✓	Internal fertilization occurs ✓
Fertilised eggs form part of planktonic cycle ✓ / lay eggs	Embryo is in the uterus and nourished via the placenta ✓ / give birth to live young
Many fish species are hermaphroditic / an undergo sex change during their life stages ✓	They are unisexual / will remain same sex from birth ✓
Sperm and eggs released through the cloaca ✓	Separate urinogenital openings for fertilization ✓
No parental care / Precocial ✓	Parental care / Altricial ✓
Many offspring ✓	Few offspring ✓

**(Any 3 pairs)**

(8)

(8)

**[40]**

**QUESTION 3**

3.1

3.1.1 Sharks skeletons are mainly composed of cartilage. ✓  
 Cartilage does not fossilise well. ✓  
 Denticles and teeth are composed of calcium-based substances. ✓ **(Any 2)** (2)

3.1.2 a) Competition for food ✓ or space ✓ on land might have resulted in some terrestrial vertebrates gradually moving back to the ocean.  
 To avoid predators ✓ **(Mark any one)** (1)

b) **Mark any 3 limitations that had to be overcome with corresponding reason.**

Locomotion ✓ - Limbs used for walking/crawling had to modify for swimming ✓ / Limbs became paddle like to swim better ✓

Gaseous exchange ✓ / exchange gases efficiently (air breathing)

Increase oxygen levels for diving. ✓ / Utilize oxygen efficiently when under water

Osmoregulation ✓ - getting rid of additional salt / ensuring adequate hydration ✓

Temperature ✓ - coping with warmer surface water and colder water as they dive ✓

Pressure ✓ - decreasing internal air spaces to compensate for the increase in pressure as they dive down (e.g. lungs being able to collapse) ✓

The bends (avoiding it) - ✓ getting rid of the built-up nitrogen, accumulated in the blood during diving ✓ / This can expand when ascending and will form bubbles that can inflict severe pain

Reproduction ✓ - aspects of this occur on land (e.g. turtles laying eggs on land) but mating in the ocean ✓

**(Mark any 3 pairs - limitation and description)** (6)

3.1.3 **Not specifically asked for a table. Table here for ease of marking**

(A) Amphibians have ...	(R) Reptiles have ...
external fertilisation ✓	internal fertilisation ✓
lay a <u>soft</u> egg ✓	The eggs are <u>leathery / calcareous / hard shell</u> ✓
hatchlings undergo metamorphosis as they grow ✓	hatchlings resemble adult forms ✓
require water for eggs ✓	lay eggs on land ✓

(Mark the any 3 pairs)

(6)  
(15)

3.2 3.2.1 Shark egg ✓ / mermaid's purse (1)

- 3.2.2
- Strong / flexible (fibrous) wall provides protection ✓
  - Can attach with tendrils to seaweed (stability from drifting away) ✓
  - Colourations allows blending in/ camouflage ✓
- (3)

3.2.3 Oviparous ✓ (1)

- 3.2.4
- Longer gestation period / embryos are protected for longer ✓
  - Advanced developmental before birth ✓
  - In some sharks the hatchlings feed on unfertilised eggs (oophagy) ✓ / more stable source of nutrition
  - Smaller risk of desiccation ✓
  - Less exposed to environmental stressors ✓
- (Any 3) (3)  
(8)

3.3 3.3.1 (a) Class - Agnatha ✓ (1)

(b) Common name - hagfish ✓ (1)

3.3.2 **Mark any 4 of the listed organisms**  
**Do not mark the organism, mark 4 reasons**

Organism **A**/ hagfish

- It is motile/mobile (and can swim away from predation) ✓
- It can actively search for food ✓
- It has slime glands to aid it in protection ✓
- It developed an alternative feeding mechanism (knotting body) ✓
- Has barbels to aid it in searching for food ✓
- They have (keratin) teeth to assist in nutrition ✓

OR

Organism **B**/ Tunicate

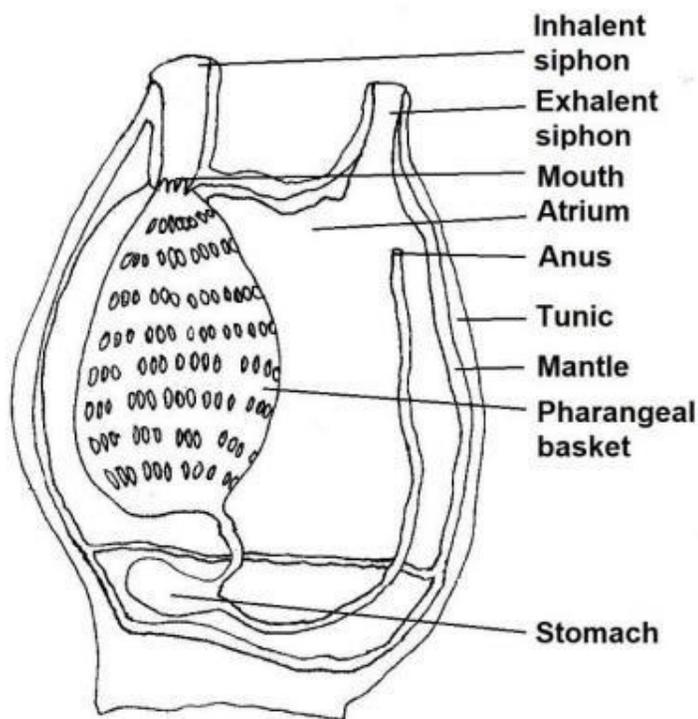
- They have 2 siphons that assist in ventilation and gaining food ✓
  - They occur in a wide range of sizes and in large abundance ✓
  - They go through a larval life stage to aid in diversification/ feeding competition ✓
  - They have a tunic, assisting in protection of the organism ✓
- (4)

3.3.3

CRITERIA	ELABORATION	MARK
Correct drawing (D)	Resembles a tunicate	1
Suitable heading (H)	Descriptive heading	1
Drawing technique (T)	- Drawing in pencil	½
	- Drawing neat, single lines (not sketching)	½
	- Label lines straight, drawn with a ruler	½
	- Labels underneath each other	½
Labels (L)	Mark any 4 (Max 4 x ½)	4 x ½ = 2
<b>TOTAL</b>		<b>6</b>

(6)

**Structure of a tunicate:**



(12)

**TOTAL SECTION B: [35]  
75**

**SECTION C**

***When marking essays, be aware of the maximum marks per subsection (indicate with the designated letter to keep track) and compulsory marks per section (indicate with C). The breakdown of the synthesis marks is indicated for each question. Credit valid content points which may come from external reading, but keep to maximum allocations per subsection.***

**ASSESSING THE PRESENTATION OF THE ESSAY**

<b>MARK ALLOCATION</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>INTRODUCTION 2 marks (INTR)</b>	<p>The introduction shows a contextual link that the candidate understands what the question is, by:</p> <p>Correctly stating in their own words what the question is about AND describing the intention/ purpose of the essay.</p>	<p>Some attempt to write an introduction/ stated intention of essay but to a large extent using the wording from the question. Unclear that candidate fully understands the topic.</p> <p>Stated the intention of the essay in their own words.</p>	<p>There is no introduction. Starts with the asked content straight away. Provides randomly arranged facts.</p> <p>Restating the question.</p>
<b>USE OF PARAGRAPHS 2 marks (PAR)</b>	<p>The internal structure of a paragraph is clearly planned. One main aspect / idea is discussed in a paragraph. If more than one aspect is discussed in a paragraph, the connection is clearly visible.</p>	<p>Some paragraph division but is unclear (not linked) why the content is grouped in these paragraphs.</p>	<p>All content sections written as one paragraph.</p>

<p><b>RELEVANCE</b> <b>2 marks</b> <b>(REL)</b></p>	<p>Sufficient information with many good points made, more than 50% of the content is relevant to the question asked.</p>	<p>An attempt to write on the topic, but 26% to 49% of the content discussed in the essay is irrelevant to the question asked.</p>	<p>Less than 25% of content that the learner addressed is not on the topic asked.</p>
<p><b>LOGICAL SEQUENCE</b> <b>2 marks</b> <b>(LSEQ)</b></p>	<p>Paragraphs show logical sequence and are demonstrably linked to each other.</p>	<p>Generally clear sequence but some facts are not in place - content provided is correct but is meant to be in a different (relevant) paragraph. Essay poorly planned.</p>	<p>Very difficult to read the essay as no logical sequence. Many facts with no clear layout. Clearly unplanned.</p>
<p><b>CONCLUSION</b> <b>2 marks</b> <b>(CONC)</b></p>	<p>Clearly bringing the aspects discussed in the essay together in a final paragraph in own words.</p>	<p>An attempt to write a conclusion, but closely quotes the words of the question asked. Still shows linkage of the topic to their response.</p>	<p>No conclusion. Learner clearly stopped after the content paragraphs – no attempt to pull the ideas together.</p>
<p>Synthesis (10)</p>			

**QUESTION 4****INTRODUCTION GUIDELINE**

- Speaks about symmetry and external structures and why classification should occur.
- Does not repeat / reproduce wording of the question.

**Opinion (O)**

Open-ended question. Learner can agree or disagree. Allocate mark if opinion and motivation align. ✓ Second mark is for motivation. ✓

**Agree** e.g.

- They are informally referred to as fish so there must be a connection between them. ✓
- They both live in the ocean and have similar life functions so they are the same. ✓

**Disagree** e.g.

- They are morphologically different. ✓
- Their physiology differs substantially. ✓

Max (2)

**Symmetry (S)**

- Fish have bilateral symmetry. ✓
- Starfish have a bilateral form once they hatch and form part of the planktonic community. ✓
- Starfish then develop pentaradial symmetry for the remainder of their lives. ✓

Max (3)

**External structures (B)****Starfish(BS)**

- Starfish have skin that is covered by ossicles ✓
- made of calcium carbonate. ✓
- This is held together by elastic collagen fibres and muscles. ✓
- These can be contracted or relaxed to ✓
- make the skin rigid or flexible. ✓
- Typically they have (five) arms ✓
- On the oral surface of each arm there is a deep groove, called the ambulacral groove ✓
- They have spines on the aboral surface ✓
- The water-vascular system gives rise to muscular tubes that extend outwards through the skin. ✓
- These tube feet or podia ✓
- have suction cups at their ends, ✓
- The madreporite equalises (water) pressure. ✓
- Papulae/ small outward folds of the coelom extend through pores in the skin. ✓
- They have the ability to regenerate limbs ✓
- as a form of asexual reproduction / to repair their bodies. ✓
- Have eyespots ✓

Max (9)

Clownfish (BC)

- And generally (foldable) fins ✓
- with bony rays. ✓
- They have pectoral, pelvic, dorsal, anal and caudal fins (at least 3 for 1 mark) ✓
- Most are streamlined with an oval shape. ✓
- A lateral line organ runs along the lateral surface of the fish ✓
- They have different colours and stripes to blend into the environment. ✓
- Most have scales (of dermal origin). ✓
- These scales are covered by (glandular) skin. ✓
- This skin produces a mucus, ✓
- assisting in hydrodynamics / preventing infection. ✓
- Scale size increases as the fish size increases ✓
- but cannot be used as an accurate manner in calculating the age of the fish. ✓
- Clownfish have eyes ✓
- An operculum ✓ covers the gills

Max (9)

Organisms classify (E)

Open-ended segment

Learner can receive 2 marks if they give a reason (ER) ✓ and support the reason (ES). ✓

Important

- It is important to classify organisms accurately to increase the validity of ecological studies ✓
- It is important to prevent confusion ✓ when identifying different organisms.
- Allows communication between scientists. ✓
- Compare the similarities and differences between taxa ✓

OR

Not important

- It is not important because the general public will not have an extensive knowledge of these organisms. ✓
- Only scientists / academics classify animals. ✓

Max (2)

CONCLUSION GUIDELINES

- Ties symmetry and external structure of both clownfish and starfish together.
- Does not repeat / reproduce wording of the question

Synthesis	(10)
Content	(25)
Total	<b>[35]</b>

**QUESTION 5****INTRODUCTION GUIDELINE**

- Emphasis on osmoregulation and excretion in both organisms.
- Does not repeat / reproduce wording of the question.

**Echinoderms circulation (EC)**

- Make use of water-vascular system/ do not have blood. ✓
  - The water-vascular system (fluid-filled coelomic chambers and papulae) is lined with cilia ✓
  - and contain protein secretions ✓
  - as well as specialised phagocytic cells (called coelomocytes) ✓
  - The cilia circulate the fluid, ✓
  - which enables transport of substances within the body. ✓
  - The proteins and coelomocytes assist with excretion/ prevention of infection and other processes in the body. ✓
- Max (4)

**Fishes circulation (FC)**

- Fishes have a closed blood system ✓
  - with a two-chambered heart. ✓
  - The heart has an atrium, receiving blood through veins from the body, ✓
  - and a ventricle, which contracts to push blood through arteries to the body. ✓
  - This is referred to as a single circulation: ✓
  - from the heart, through the gills, to the body and back to the heart. ✓
  - The blood is red, containing large amounts of haemoglobin. ✓
- Max (4)

**Excretion/ osmoregulation echinoderms (EE)**

- Echinoderms have no specific excretory organs. ✓
  - Osmoregulation does not occur ✓
  - The coelomocytes are phagocytic and engulf foreign substances / waste until they are full. ✓
  - Then they pass out of the body via the papulae / the water-vascular system / the gut. ✓
  - (Metabolic) wastes can diffuse from body cells into the water-vascular system ✓
  - and then be excreted via the tube feet (or other exposed surfaces.) ✓
  - This is why echinoderms are only found in marine environments or fairly saline estuaries. ✓
  - If they are exposed to fresh water, osmosis into the body cells causes them to burst open and the animals die. ✓
  - Marine animals like echinoderms are referred to as stenohaline, ✓
  - which means that they cannot tolerate changes in the salinity of their environment. ✓
- Max (7)

**Excretion/ osmoregulation fishes (EF)**

- Fishes have kidneys to deal with most aspects of excretion, ✓
  - extracting any excess / unwanted substances / waste from the blood passing through them. ✓
  - Gills can also be excretory surfaces, ✓
  - giving off CO<sub>2</sub> ✓
  - As marine fishes will have lower cellular solute concentrations than the surrounding water (hypotonic to their surroundings), ✓
  - they tend to lose water to their surroundings (by osmosis). ✓
  - To counteract this, they ingest water constantly ✓
  - and excrete the salts via the kidneys / gills. ✓
  - Fishes that can live in sea water and fresh water environments can alter their kidneys' physiology to cope with either medium / euryhaline organisms can alternate between sea water and fresh water ✓
  - Urine is added to the faeces of fish ✓
  - and excreted via the cloaca. ✓
- Max (7)

**Critical description (C)**

- With more fresh water entering the ocean, ✓
  - The salinity will fluctuate (become diluted). ✓
  - Echinoderms are stenohaline ✓
  - Meaning they cannot tolerate salinity changes very well. ✓
  - Some marine fishes are euryhaline ✓
  - Meaning they can easily survive in a wider salinity range. ✓
- Max (3)

**CONCLUSION GUIDELINE**

- Emphasis on osmoregulation and excretion in both organisms. But includes population shift in both organisms.
  - Does not repeat / reproduce wording of the question.
- Synthesis (10)  
Content (25)  
Total [35]

**TOTAL SECTION C: 35**  
**TOTAL: 150**