



# basic education

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

## NATIONAL SENIOR CERTIFICATE

**GRADE 12**

**MARINE SCIENCES P1**

**NOVEMBER 2024**

**MARKING GUIDELINES**

**MARKS: 150**

**These marking guidelines consist of 20 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 Sciences 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 who will be consulted).

**17. Official marking guidelines**

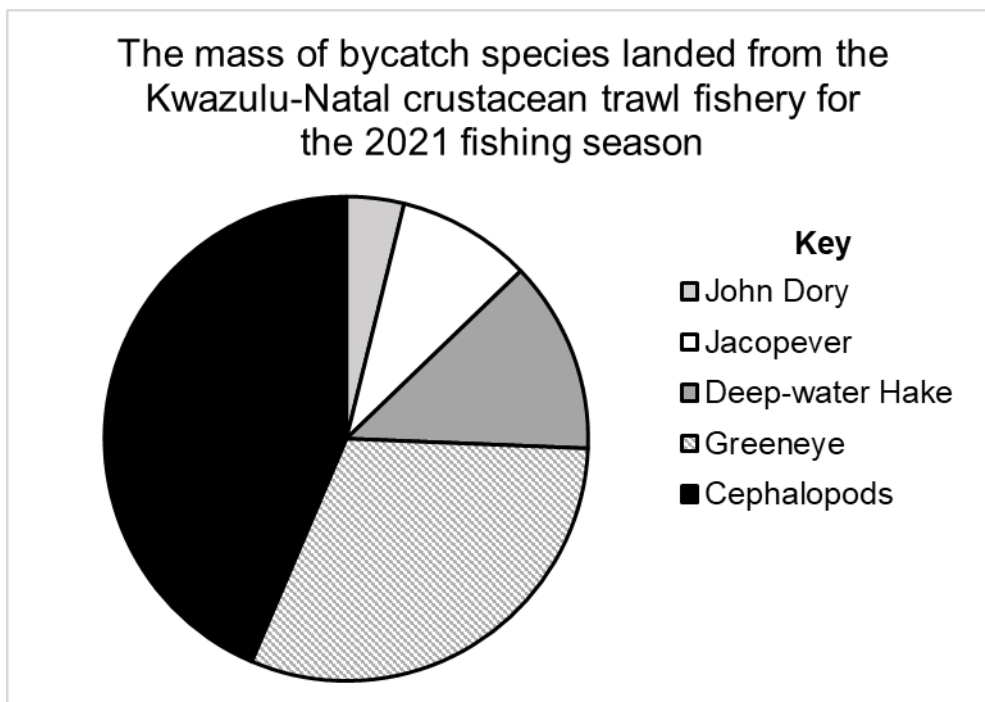
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

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

1.1	1.1.1	C ✓✓			
	1.1.2	C ✓✓			
	1.1.3	B ✓✓			
	1.1.4	D ✓✓			
	1.1.5	A ✓✓			
	1.1.6	B ✓✓			
	1.1.7	C ✓✓			
	1.1.8	B ✓✓			
	1.1.9	C ✓✓			
	1.1.10	B ✓✓			
				(10 x 2)	(20)
1.2	1.2.1	Climate ✓			
	1.2.2	Aerators ✓			
	1.2.3	Aragonite ✓			
	1.2.4	Raceway ✓			
	1.2.5	Fetch ✓			
	1.2.6	Climograph ✓ / Climate graph			
	1.2.7	Mitigation (measures) ✓			
	1.2.8	Brood stock ✓			
	1.2.9	Industrial revolution ✓ / Industrialisation / Industrial era			
	1.2.10	Wave height ✓			
				(10 x 1)	(10)
1.3	1.3.1	BOTH A AND B ✓✓			
	1.3.2	NONE ✓✓			
	1.3.3	BOTH A AND B ✓✓			
	1.3.4	A ONLY ✓✓			
	1.3.5	B ONLY ✓✓			
				(5 x 2)	(10)
TOTAL SECTION A:					40

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

2.1 2.1.1

**Calculations**

Bycatch species	Calculation	Degrees	Degrees rounded off
John Dory	$30/780 \times 360 =$	13,85	14
Jacopever	$70/780 \times 360 =$	32,31	32
Deep-water Hake	$100/780 \times 360 =$	46,15	46
Greeneye	$240/780 \times 360 =$	110,77	111
Cephalopods	$340/780 \times 360 =$	156,92	157

**MARKING GUIDELINES**

CRITERIA	MARK ALLOCATED
Type of graph (format), Pie Chart (T)	1
Descriptive heading above or below the graph (H)	$\frac{1}{2}$
Heading references that describe both variables by name: Bycatch species and mass (V)	$\frac{1}{2}$
For each correct calculation from data to degrees (C)	Any 4 x $\frac{1}{2}$
Draw and labelled correct segment (S)	Any 4 x $\frac{1}{2}$
Key / Label (K)	1

(7)

- 2.1.2 - **The fish stock will decrease ✓\* / negative effect / fisheries collapse**
- due to the species / genetic diversity of the fish stock will be compromised ✓
  - which enables the spread of disease ✓
  - The removal of big oversized / more mature females (BOFF) ✓
  - will result in lower reproductive output ✓
  - There will be too few adults to replace those that have been removed ✓
  - Eventually resulting in a population decrease ✓
- (Any logical relevant answer, marker discretion for insightful thinking) (3)  
(1 compulsory ✓\* and any pair)
- 2.1.3 - Size frequency of the fish caught in the samples ✓
- shows how successful the recruitment of the fish stock has been. ✓
  - The growth rate of the species measured ✓
  - shows the extent to which a fish stock has recovered from past overexploitation. ✓
  - The number of tagged fish caught as bycatch ✓
  - gives an estimate of the population size ✓
  - Abundance ✓
  - shows the conservation status of the species ✓ / the need for fisheries management
- (Mark first 2 pairs only)  
(2 x 2) (4)  
(14)

- |     |       |                                                                                                                                                                                                                                                                                                          |     |
|-----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 2.2 | 2.2.1 | South coast ✓                                                                                                                                                                                                                                                                                            | (1) |
| 2.2 | 2.2.1 | South coast ✓                                                                                                                                                                                                                                                                                            | (1) |
|     | 2.2.2 | Warm temperate region ✓                                                                                                                                                                                                                                                                                  | (1) |
|     | 2.2.3 | <ul style="list-style-type: none"> <li>- Due to the high rainfall ✓ / all year round</li> <li>- <b><u>(Afro)montane Forests</u> are found in the Knysna area ✓*</b></li> <li>- containing many species of trees such as yellowwoods / ironwoods ✓</li> <li>- undergrowth ✓</li> <li>- ferns ✓</li> </ul> |     |
|     |       | (1 compulsory + any 2)                                                                                                                                                                                                                                                                                   | (3) |
|     | 2.2.4 | (a)    -    It will result in habitat destruction ✓                                                                                                                                                                                                                                                      |     |
|     |       | OR                                                                                                                                                                                                                                                                                                       |     |
|     |       | -    The water quality of the lakes would decrease (as a result of sedimentation / dissolved pollutants) ✓                                                                                                                                                                                               |     |
|     |       | OR                                                                                                                                                                                                                                                                                                       |     |
|     |       | -    Increased tourism ✓                                                                                                                                                                                                                                                                                 |     |
|     |       | (Any logical relevant answer, marker discretion for insightful thinking)                                                                                                                                                                                                                                 | (1) |
|     |       | (Mark any 1)                                                                                                                                                                                                                                                                                             |     |
|     |       | (Mark first 1)                                                                                                                                                                                                                                                                                           |     |

- (b) - **The lakes might lose their Ramsar status ✓\***
- The biodiversity of the area would decrease ✓ due to
  - less food for organisms using the lakes ✓ / less shelter because of the habitat destruction
  - **Answer MUST link to QUESTION 2.3.4 (a)**

OR

- The biodiversity of the area would decrease ✓ due to
- increased sediment load ✓ / dissolved pollutants in the water
- **Answer MUST link to QUESTION 2.3.4 (a)**  
(Any logical relevant answer, marker discretion for insightful thinking)  
(1 ✓\* compulsory + 1 cause + 1 effect)

(3)  
(9)

- 2.3      2.3.1      Diameter (cm) of the opening ✓ (1)
- 2.3.2      - (same) salinity ✓ at 33 parts per thousand.  
- (same) temperature ✓ at 16 °C.  
- (same) amount of oil ✓ at 2 litres  
- (same) volume in the bath ✓ at 1 000 litres  
**Mark any 1, mark first 1** (1)
- 2.3.3      - They had a small sample size ✓ / Each aperture was only tested once  
- Only one device per diameter was used ✓ / The investigation was not repeated  
- Therefore, the results are not accurate ✓  
**(Mark any 2)** (2)
- 2.3.4      3:1 ✓ (1)
- 2.3.5      The larger the diameter of the opening, the higher / larger the ratio / volume of oil to water collected.  
**Both variables present 1 mark ✓**  
**Direction of conclusion 1 mark ✓** (2)
- 2.3.6      - Oil is a non-polar molecule ✓ / hydrophobic  
- Which does not dissociate in water ✓  
- (The oil tends to float on the water) as it has a lower density ✓  
**(Mark any 2)** (2)
- 2.3.7      - The 4 cm tube has larger diameter ✓ / aperture / opening  
- Collecting more water than oil ✓  
- because less oil will be found under the water surface ✓ / more oil will be found above the water surface  
**(Mark any 2)** (2)  
**(11)**  
**[34]**

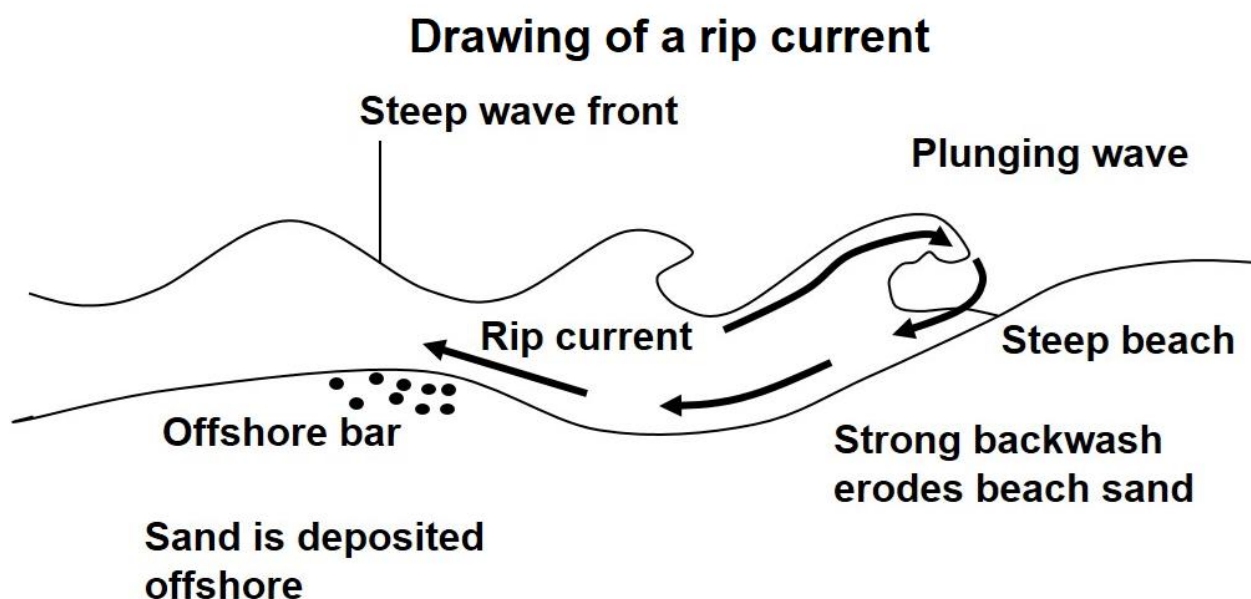


**QUESTION 3**

- 3.1 3.1.1 (a) Turbine ✓ generator (1)
- (b) A – warmer (surface) water ✓  
B – colder (deep) water ✓ (2)
- (c) - **The temperature gradient is large enough** ✓\*  
- to power the turbine ✓  
**(1✓\*Compulsory mark + 1)** (2)
- 3.1.2 (a) D ✓ (1)
- (b) - Greater / larger temperature difference ✓  
- between the surface water and the deep ocean water ✓ (2)
- 3.1.3 (a) Environmental cost ✓ (1)
- (b) - It reduces the use of non-renewable resources ✓ / fossil fuels  
- due to the use of recycled materials ✓  
OR  
- Reduces the amount of carbon dioxide emitted ✓  
- therefore lowers the carbon footprint ✓ / reduced contribution to enhanced climate change  
**(Mark any pair, mark first pair)**  
**(Any logical relevant answer, marker discretion for insightful thinking)** (2)
- 3.1.4 **IF YES**
- This would reduce the financial / environmental costs, therefore more companies will produce more renewable electricity, making it more accessible to the general public ✓
- IF NO**
- It would just mean that these companies make a greater profit, without reducing the cost of electricity for the general public ✓  
**(Mark only allocated for Yes or No if answer is motivated)**  
**(Any logical relevant answer, marker discretion for insightful thinking)** (2)  
**(13)**

## 3.2

MARKING GUIDELINES		
CRITERIA	ELABORATION	MARK ALLOCATION
Correct drawing (D)	Side view All features present (offshore bar, backwash eroding beach, steep wave front)	1
Suitable heading (H)	<u>Descriptive heading</u>	1
Drawing technique (T)	Drawing in pencil	½
	Drawing solid lines (not more than 45-55% shading – marker's discretion)	½
Annotations (A)	Mark any 3 <ul style="list-style-type: none"> <li>- Steep wave front</li> <li>- Plunging wave</li> <li>- Steep beach</li> <li>- Strong backwash</li> <li>- Accumulated water</li> <li>- Eroded beach sand / High sediment load</li> <li>- Offshore bar / Sand bar</li> <li>- Sand deposited offshore</li> <li>- Rip current</li> </ul>	3
Annotations linked (L)	Annotations in correct positions	1
Process direction (P)	Arrow(s) / movement of water	1
		8 (8)





3.5      3.5.1       $P_1 = 2.3 + 1$   
                                $= 3,3 \text{ bar}$   
                                $V_1 = X$

$P_2 = 1 \text{ bar}$   
 $V_2 = 2,5 \text{ litres}$

Temperature is constant

$$P_1V_1 = P_2V_2 \checkmark \quad \text{OR} \quad \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad \text{OR} \quad V_1 = \frac{P_2V_2}{P_1}$$

$$V_1 = \frac{(1 \text{ bar}) (2,5 \text{ l})}{(3,3 \text{ bar})} (\checkmark \text{ substitution})$$

$$= 0,76 \text{ l (✓ for correct answer and ✓ unit)} \quad (4)$$

### 3.5.2 The bends ✓ / Decompression sickness (1)

3.5.3

- As the waves move through the vertical water column ✓
- The water particles rise, move forwards, move down with the passing of the trough / crest and back again to the equilibrium surface ✓
- in an orbital or elliptical path or pattern ✓
- Particles in their orbit set in motion an orbit of half the diameter than the particles below that orbit ✓
- This continues for half the wavelength of the waves, which is 3 m ✓

(Mark any 4) (4)  
(9)  
[41]

**TOTAL SECTION B: 75**

**SECTION C**

*When marking essays, be aware of 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 points 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 clearly planned. One main aspect / idea 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 content is grouped in these paragraphs.</p>	<p>All content sections written as one paragraph.</p>
<b>RELEVANCE 2 marks (REL)</b>	<p>Sufficient information with many good points made, 50% or more of the content is relevant to the question asked.</p>	<p>An attempt to write on the topic, but only 26% to 49% of the content discussed in the essay is relevant to the question asked.</p>	<p>25% or less of the content that the learner addressed is relevant to the topic asked.</p>

<b>LOGICAL SEQUENCE 2 marks (LSEQ)</b>	Paragraphs show logical sequence and are demonstrably linked to each other.	Generally clear sequence but some facts not in place - content provided is correct but is meant to be in a different (relevant) paragraph. Essay poorly planned.	Very difficult to read the essay as no logical sequence. Many facts with no clear layout. Clearly unplanned.
<b>CONCLUSION 2 marks (CONC)</b>	Clearly bringing the aspects discussed in the essay together in a final paragraph in own words.	An attempt to write a conclusion, but closely quotes the words of the question asked. Still shows linkage of the topic to their response.	No conclusion. Learner clearly stopped after the content paragraphs – no attempt to pull the ideas together.

(10)

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

- Refers to coastal formation / possibility of increase in tourism
- Does not repeat / reproduce wording of the question

**STACK FORMATION (S)**

- At this rocky coastal formation, the rock was perpendicular ✓ / 90° to the coastline
- Erosive forces, such as hydraulic action ✓ / wind / waves / abrasion / attrition resulted in the formation of
- a notch at a weak point ✓
- and then the notch into a sea cave ✓
- The cave eroded into an arch ✓
- The type of arch that formed is dependent on the geomorphology ✓
- with more resistant rock on the roof of the arch ✓
- The roof became too heavy to be supported ✓
- and the arch collapsed ✓
- this process left behind a stack ✓ / vertical pillar of rock

Max (7)

**ENGINEERING PRINCIPLES (E)**

- Soft engineering ✓
- Example geotextile ✓
- Stimulate the formation of a 'walk way' towards the stack ✓
- Tends to be less noticeable/visual ✓
- Can place a row of materials under the water (such as tyres) below the low-tide mark ✓
- to break the energy of the wave action ✓
- to protect the public from wave action ✓
- This can reduce the erosive power of waves ✓
- Beach nourishment ✓ / adding of sand to new connection
- Bulldozing or trucking in sand ✓
- Hard engineering ✓
- Erection of solid/permanent structures ✓
- such as a seawall made from dolosse / revetment / breakwater ✓
- to prevent erosion ✓
- By reducing the flow of sediment along the coast ✓
- Groynes can be used ✓
- to slow down the movement of sediment along the beach ✓
- Sediment will accumulate on one side of the groyne ✓

Min 4

**COASTAL FORMATION: LONGSHORE DRIFT (FL)**

- Longshore drift occurs in the surf zone ✓
- Certain sandy coastal formations develop ✓
- Wind mostly blows at an angle (obliquely) to the beach ✓
- Swash approaches the shore at an angle ✓
- Gravity causes backwash ✓
- to flow perpendicular to the shore ✓
- Carries sediment (perpendicularly) back with it ✓
- Repeated actions of swash and backwash ✓
- The longshore drift movement of sediment travels along the shore / in a zigzag pattern ✓
- A spit develops when sediment is carried / deposited (and slowed down) by longshore drift ✓
- **Sand moved by longshore drift, will further be added on top of the engineered structure ✓\***

**(1 ✓\* compulsory + min 3)**

Min 4

Max (12)

**ENVIRONMENTAL IMPACT ASSESSMENT (A)**

- Allows a specialist to determine the impact that the structure will pose to the environment ✓
- and to the stack itself ✓.
- Recommendations can be made to minimise the impact ✓ of the type of engineering approach to be used
- Examples of impact: less sand reaching the other side of the walkway ✓ / impacts on sandy beach organisms / impacts beach formation / affects beach activities on the other side / any relevant example
- While still being able to meet the requirement of being able to withstand the erosive forces ✓ / strong wave action
- The EIA will identify potential mitigation measures that can reduce coastal risk ✓
- by maintaining the integrity of the natural beach site ✓.
- Natural coastal processes such as stack formations are sensitive to human interventions / structures / activities have to be protected / restored / enhanced ✓
- for their historical ✓ / economic / social / environmental values

**(Any logical relevant substantiating answer, marker discretion for insightful thinking)**

Max (4)



**LEARNER'S OPINION (J)**

**Learner receives a mark for agreeing with the statement, only if substantiated.**

**SHOULD INTERFERE**

- Coastlines are natural and dynamic features and humans should try to conserve them with new and improved technologies ✓
- Access to the stack will attract more tourist to the beautiful coastal formation ✓
- Increase income to the area and improve development ✓

**SHOULD NOT INTERFERE**

- Will cause problems and increase erosion on another part of the coastline ✓
- Coastlines are natural and dynamic features and humans should let nature run its course ✓
- Can be expensive ✓
- The construction of the walkway can be harmful for both the area where the sand was removed and where it has been placed ✓
- The walkway can be invasive to natural organisms on the beach ✓

**(Any logical relevant substantiating answer, marker discretion for insightful thinking)**

Max (2)

**CONCLUSION GUIDELINE**

- Link both coastal formations and engineering
- Does not repeat / reproduce wording of the question

Content: (25)  
Synthesis: (10)  
**[35]**

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

- Refers to global ocean circulation and mention the two countries / coastlines involved
- Does not repeat / reproduce wording of the question

**OCEAN BASIN (B)**

- **South Atlantic ✓\***
- Due to gyres ✓ (South Atlantic Ocean gyre)
- A series of interconnected circular surface currents ✓
- A circular / rotational pattern is created by the Coriolis effect ✓
- that is caused by the rotation of the Earth ✓
- Following an anti-clockwise route in the Southern Hemisphere ✓
- The flow of currents is not the same on all sides of the gyre ✓
- On the eastern side of the gyre (along South Africa's west coast) the flow is towards the equator ✓
- On the western side of the gyre (along Uruguay) flow is towards the poles ✓
- The eastern surface currents are wider and the western surface currents are narrower ✓
- The eastern surface currents are weaker / slower and the western surface currents are stronger / faster ✓

**(1 ✓\* compulsory + any 4)**

Max

(5)

**NUTRIENT FLOW – WEST COAST (NW)**

- **The reason for high fish abundance noted on the data is due Upwelling ✓\***
- Prevailing south-east wind drags the surface water ✓
- Surface water moves (westwards) offshore ✓ (due to Ekman transport)
- As surface water gets pushed offshore, it must be replaced from below ✓
- Resulting in an upward-moving current replacing the surface water ✓
- Nutrients from the depths are introduced to the surface ✓
- Supports an enormous amount of biological productivity ✓
- Generates valuable food supply for the food chains along the coast. ✓

**(1 ✓\* compulsory)**

Min 3

**NUTRIENT FLOW – EAST COAST (NE)**

- **Reason for low fish abundance noted on the data Downwelling ✓\***
- Prevailing winds blows onshore ✓
- Ekman transport forces water towards the coast ✓
- Water piles up ✓ and
- forms a downward current ✓
- resulting in less nutrients ✓
- Therefore, the area along the coast is less biologically productive ✓

**(1 ✓\* compulsory)**

Min 3

Max

(9)

**EKMAN TRANSPORT AND SPIRAL (E)**

- Wind at the surface has a frictional drag on the surface water ✓
- which sets the surface water in motion ✓
- The wind-driven surface water layer, drags underlying water with it ✓
- The movement of water is deflected from the wind direction ✓
- as a result of the Coriolis effect. ✓
- As a result of friction ✓
- each deeper layer of water moves more slowly ✓
- and shorter distance than the layer above ✓
- Each successive lower layer is deflected further ✓
- (At approximately 100-150 m below the surface), currents move in exactly opposite direction ✓ to currents moving on the surface
- Movement on the ocean surface is at 90° to the direction of the main body of water ✓
- Creates opportunity for nutrient-rich water to take up space left by less nutrient-rich water ✓ / upwelling

Max (6)

**SAFETY CONSIDERATIONS (S)**

- Crew must have valid sailing licenses ✓
- There must be enough PPE (personal protective equipment) like life jackets ✓
- and safety equipment / safety buoys / life raft / fire extinguishers any 1 example ✓
- Enough food ✓
- Enough drinkable water ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)

Max (3)

**OPINION (J)**

**Learner receives a mark for agreeing with the statement, only if substantiated.**

**IF YES**

- The more data are captured, the better our understanding of coastal regions ✓
- Positive relationships are created between citizens and researchers ✓
- Encouragement of ocean literacy / opportunity to educate the public ✓

**IF NO**

- Data collected might not be accurate as they are not qualified scientists ✓
- Data might not be accepted by the scientific community or fish managers, as they are not real scientists ✓
- Citizens take positions of qualified scientists on board these research vessels ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)

Max (2)

**CONCLUSION GUIDELINE**

- Link both global ocean circulation and different conditions along the coasts / citizen science
- Does not repeat / reproduce wording of the question

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

<b>TOTAL SECTION C:</b>	<b>35</b>
<b>GRAND TOTAL:</b>	<b>150</b>