



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARINE SCIENCES P1

NOVEMBER 2025

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 22 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 QUESTION 1.1 of 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 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.

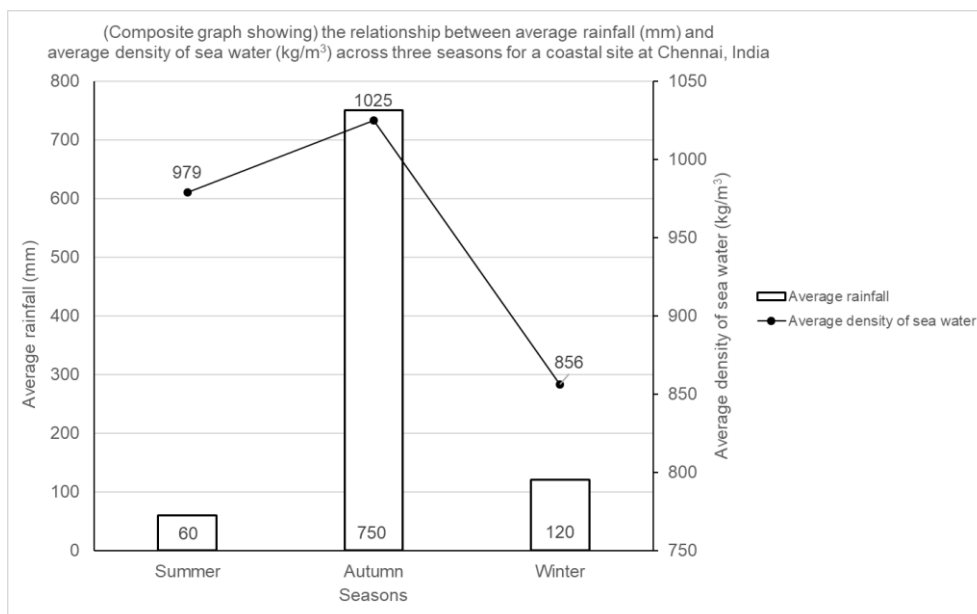
SECTION A**QUESTION 1**

1.1	1.1.1	C ✓✓		
	1.1.2	D ✓✓		
	1.1.3	A ✓✓		
	1.1.4	B ✓✓		
	1.1.5	C ✓✓		
	1.1.6	D ✓✓		
	1.1.7	B ✓✓		
	1.1.8	A ✓✓		
	1.1.9	A / C ✓✓		
	1.1.10	A ✓✓		
			(10 x 2)	(20)
1.2	1.2.1	Groynes ✓		
	1.2.2	Ripples ✓/capillary waves		
	1.2.3	(Marine) terrace ✓		
	1.2.4	Tombolo ✓		
	1.2.5	Interglacial periods ✓		
	1.2.6	Fish stock ✓/fish resource		
	1.2.7	Hydroponics ✓		
	1.2.8	Weather ✓		
	1.2.9	Oscillation (cycle) ✓		
	1.2.10	Embryo dune ✓		
			(10 x 1)	(10)
1.3	1.3.1	B only ✓✓		
	1.3.2	Both A and B ✓✓		
	1.3.3	A only ✓✓		
	1.3.4	None ✓✓		
	1.3.5	Both A and B ✓✓		
			(5 x 2)	(10)
TOTAL SECTION A:				40

2.1.2

MARKING GUIDELINES	
CRITERIA	MARK ALLOCATION
Descriptive heading (H)	$\frac{1}{2}$
Heading includes all variables (Seasons, rainfall and density) (V)	$\frac{1}{2}$
Types of graphs (Format): Bar graph (T₁)	$\frac{1}{2}$
Line graph (T₂)	$\frac{1}{2}$
Independent variable (I)	$\frac{1}{2}$
Dependent variables Y-axis ₁ (D₁)	$\frac{1}{2}$
Y-axis ₂ (D₂)	$\frac{1}{2}$
Label for X-axis: Seasons (XL)	$\frac{1}{2}$
Label for Y-axes YL ₁ : Rainfall (YL₁)	$\frac{1}{2}$
YL ₂ : Density (YL₂)	$\frac{1}{2}$
Unit of measurement of Y ₁ -axis (YM₁): (mm)	$\frac{1}{2}$
Unit of measurement of Y ₂ -axis (YM₂): (kg/m ³)	$\frac{1}{2}$
Formatting of bars: Bars width equal (BW)	$\frac{1}{2}$
Bars spaces equal (BS)	$\frac{1}{2}$
Appropriate scale on Y-axes: (YS₁) (Axes for bar graph must start at zero)	$\frac{1}{2}$
(YS₂)	$\frac{1}{2}$
Plotting Bar graph (PB)	3 x $\frac{1}{2}$
Line graph (PL)	3 x $\frac{1}{2}$

If 2 separate graphs, then the learners will not get the marks for type of graph (Format)



(11)

- 2.1.3
- Adsorption in ion exchange ✓
 - Spray ✓
 - Chemical precipitation ✓
 - Biological uptake ✓
 - Percolation into the seabed ✓/in ocean trenches
 - Evaporation forms salt crystals ✓

(Mark any 2, mark first 2) (2)

- 2.1.4 (a) Autumn ✓

(1)

- (b)
- **Autumn has the largest amount of rainfall ✓***
 - **The density of the sea water increased during autumn ✓***
 - as a result of more minerals/ions being transported into the sea water ✓
 - because more fresh water/run off flowing into the ocean ✓ during the rainy season

(Mark 2 compulsory ✓* and any 1) (3)

- 2.1.5
- The intensity of the Monsoons could increase resulting in a higher precipitation ✓ /rainfall
 - reducing salinity ✓/density

OR

- The Monsoons could bring less rain ✓/the dry periods could last longer
- the changes in the density of sea water between seasons will be smaller ✓ /less

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

(Mark any pair) (2)

(21)

2.2 2.2.1 Damage to the ears ✓/sinuses/lungs (1)

2.2.2 $P_1 = 3 + 1 = 4 \text{ bar}$
 $P_2 = 1 \text{ bar}$
 $T_1 = 7^\circ\text{C} + 273 = 280\text{K}$
 $T_2 = 27^\circ\text{C} + 273 = 300\text{K} \checkmark$ (Calculating Kelvin)
 $V_1 = 1 \text{ litre}$
 $V_2 = ?$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \checkmark$$

OR

$$V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$$

$$V_2 = \frac{(4 \text{ bar}) (1\,000 \text{ ml } \textbf{OR } 1 \text{ l}) (300\text{K})}{(280\text{K}) (1 \text{ bar})} \quad (\checkmark \text{ substitution})$$

$$= 4.29 \text{ l} / 4\,285.71 \text{ ml} \quad (\checkmark \text{ for correct answer and } \checkmark \text{ unit})$$

(5)
(6)

2.3 2.3.1 - The greenhouse effect is a process in which the greenhouse gases act as a blanket, keeping/trapping the sun's heat in the atmosphere ✓
 - With an increase in the greenhouse gases comes an increase in the heating of the atmosphere ✓/an increase in the transfer of energy.
 - Therefore, ice at the poles melt ✓ / rainfall increases
 - With less available ice, less sunlight is reflected into space, resulting in more ice melting ✓
 - and an increased volume of water in the ocean. ✓
(Mark any 3) (3)

2.3.2 (a) Tidal bores need the following conditions to develop:
 - River mouth ✓/narrow inlet
 - A large tidal range ✓
 - Large enough amount of incoming water enters through the narrow inlet ✓
(Mark any 2, Mark first 2) (2)

(b) Incoming tidal water is moving in the opposite direction of the river current. ✓✓
(1 mark for correct movement of the water)
(1 mark for mentioning both tidal water AND river current) (2)

- 2.3.3 - Tidal bores attract surfers from around the world ✓ / Tidal bore tourism
 - which could potentially improving the community's economy ✓
(Any logical relevant answer, marker discretion for insightful thinking) (2)

- 2.3.4 - By tracking spring high tides, local municipalities can warn citizens to stay clear of these areas during these times ✓
 - to prevent injury/loss of life. ✓

OR

- Allocating more funds to permanently relocate local households/businesses along the river ✓
 - to prevent future damage to infrastructure. ✓

OR

- Constructing a wall/barrier along the river ✓ / Hard engineering / soft engineering
 - to reduce the potential flooding along the river banks. ✓
(Mark any pair, mark first pair)
(Any logical relevant answer, marker discretion for insightful thinking) (2)

2.3.5 **IF BENEFICIAL**

- Tidal bores could bring in money for the local communities through tourism/surfers ✓
 - More tourism from international surfers, could provide opportunities for locals to improve and learn new skills in various economic sectors ✓

IF HARMFUL

- Tidal bores could cause damage to infrastructure ✓/could lead to loss of lives
 - Climate change could potentially cause sea levels to continue to rise, therefore, preventative measures may not work in the long term resulting in less money from tourism ✓/leading to a decline in development

(Mark only allocated for Beneficial or Harmful if answer is motivated)
(Any logical relevant answer, marker discretion for insightful thinking) (2)

(13)
[40]

QUESTION 3

- 3.1 3.1.1 Mesoscale eddies are:
- circular patterns of water ✓ / anticlockwise movement of water
 - temporary ocean current eddies ✓
 - larger than average sized eddies ✓ (100 km)
 - last up to a month ✓

(Mesoscale eddies from the Agulhas Current would be)

- warmer ✓ / distributing heat and
- more saline ✓ than surrounding waters.

**(minimum 1 mesoscale eddies,
minimum 1 Agulhas Current and any 1) (3)**

- 3.1.2 (Once the eddies dissipate, they could release)
- warm water which could be less dense than the surrounding waters ✓ therefore,
 - reducing overturn as the water does not sink downwards ✓

OR

- more saline water than the surrounding area which could increase the density of the water in the area, ✓ therefore,
- causing water to sink and therefore, increasing overturn ✓

**Density 1 mark ✓
Overturn 1 mark ✓
(Mark any pair, mark first pair) (2)**

- 3.1.3
- The gyres could potentially move southwards ✓/have a larger circulation
 - as there will be more area available for the circular movement of the gyre ✓

OR

- The Agulhas Current could potentially move further south ✓
- as the westerly wind belt no longer creates a barrier in that area to the flow of the current ✓

OR

- There will be more eddies entering the Atlantic Ocean ✓/moving north/south into the Atlantic Ocean
- as there will be more area available for eddies to escape the Agulhas Current. ✓

**(Mark any pair, mark first pair)
(Any logical relevant answer, marker discretion for insightful thinking) (2)**

3.1.4 IF 'YES'

- The eddies from the Agulhas Current affects the entire globe and therefore, international researchers would also benefit from supporting this research. ✓
- South Africa may have limited funding for the research and therefore, international funding may result in better equipment to conduct the research ✓

IF 'NO'

- South Africa already produces leading research on eddies in this area, without the support from international community ✓
- Should international researchers be involved, there may be debates on the ownership of the data collected ✓/intellectual property

(Mark only allocated for Yes or No if answer is motivated)
(Any logical relevant answer, marker discretion for insightful thinking)

(2)
(9)

3.2 3.2.1 (a) Ekman transport ✓

(1)

- (b)
- The wind at the surface has a frictional drag effect on the surface water ✓ and
 - sets the surface water in motion ✓/ creates a surface current/the kinetic energy is transferred from the wind to the water
 - **The movement of surface water is deflected from the wind direction** ✓*
 - as a result of the Coriolis effect. ✓
 - The surface water layer drags underlying water with it ✓/ kinetic energy is transferred to underlying water
 - Each deeper layer of water moves more slowly ✓
 - and at a smaller distance than the layer above it ✓ due to friction/a loss of kinetic energy at each layer to the left.
 - Each successive lower layer is deflected further ✓
 (until at approximately 100-150 metres below the surface, currents move in exactly the opposite direction to currents moving on the surface.)

(1 compulsory ✓* mark and any 3)

(4)

- 3.2.2
- The stronger the wind speed the more likely it is for a La Niña to develop. ✓✓
 - The weaker the wind speed the more likely it is for a El Niño to develop. ✓✓

(Mark relationship)
(Mark any 1)

(2)

3.2.3 (a) Weaker ✓ (1)

- (b)
- Between 2018–2019 the weaker winds resulted in an El Niño event ✓
 - causing less surface water moving offshore ✓ which
 - reduced the strength of the upward moving current ✓
 - as there was less surface water to replace ✓
 - resulting in a lower nutrient supply ✓

(Mark any 3) (3)

3.2.4 (a) (Stronger upwelling could cause):

- a decrease in sea surface temperature in the region ✓ which could result in
- reduced precipitation ✓ / colder temperatures than normal

(2)

(b) (Stronger upwelling could cause):

- an increased income for fishers ✓ of the local communities
- due to increased ocean productivity which brings in greater harvests ✓

OR

- improved food security ✓ for the local communities
- as fish are attracted to the increased productivity, allowing for more fish to be harvested ✓

(1 mark for impact and 1 mark for reason)

(Mark any pair, mark first pair)

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

(2)

3.2.5 **IF 'YES'**

- ENSO events tend to change every 2-3 years on average, therefore, the data could potentially be used to predict the following years. ✓

IF 'NO'

- ENSO events may last longer or shorter than observed and therefore, the data cannot be used to accurately predict ENSO events of future years. ✓

(Mark only allocated for Yes or No if answer is motivated)

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

(2)

(17)

3.3 3.3.1 (a) East ✓ coast (1)

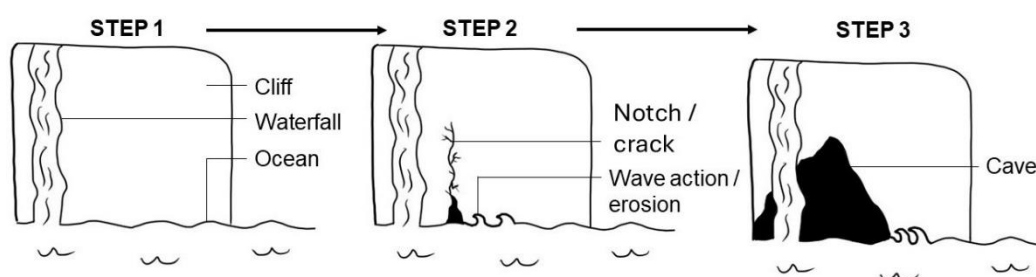
- (b)
- Yellowwood trees ✓
 - Sneezeewood trees ✓
 - (Prehistoric) cycads ✓
 - Aloes ✓
 - (Albany) thicket ✓
 - Any relevant vegetation example relevant to the Wild Coast ✓

(Mark any 1, mark first 1) (1)

- 3.3.2
- Erosion (e.g. Hydraulic action, abrasion, attrition, wave action, corrosion) ✓ of rock on a cliff
 - This creates a weak point ✓/notch/crack
 - with further erosion to form a cave ✓ over time
- (Mark any 2) (2)

3.3.3

Grotto Cave formation



MARKING GUIDELINES		
CRITERIA	ELABORATION	MARK ALLOCATION
Correct drawing (D)	Three of the features present (ocean/waves, waterfall, cliff, notch/crack, cave)	½
Suitable heading (H)	<u>Descriptive heading</u>	½
Drawing technique (T)	Drawing in pencil Drawing solid lines (not more than 45–55% shading – marker's discretion)	½
Annotations (A)	Mark any 2	2 x 1
Annotations linked (L)	Annotations linked to corresponding process/ Key system used	½
Process direction (P)	Arrow(s)/Clear formation shown from a notch to a cave	½

(5)
(9)
[35]

TOTAL SECTION B: 75

SECTION C**When marking essays:**

- Markers should indicate with the designated letter.
- Compulsory marks per section are indicated with ✓*.
- The breakdown of the synthesis marks is indicated for each question.
- Credit valid responses which may be provided by the candidate from other sources.
- Markers need to allocate a minimum of four marks per subsection.
- A maximum of two marks for the opinion.
- Excluding the opinion, the other seven marks may be awarded for any of the sections being discussed.

Important notice: more potential responses are given in these marking guidelines than marks allocated per question.

'/' means either the first or the following phrase provided in this marking guideline is allocated marks.

ASSESSING THE PRESENTATION OF THE ESSAY

MARK ALLOCATION	2	1	0
INTRODUCTION 2 marks (INTR)	<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>
USE OF PARAGRAPHS 2 marks (PAR)	<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>

RELEVANCE 2 marks (REL)	Sufficient information with many good points made, 50% or more of the content is relevant to the question asked.	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.	25% or less of the content that the learner addressed is relevant to the topic asked.
LOGICAL SEQUENCE 2 marks (LSEQ)	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.
CONCLUSION 2 marks (CONC)	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**

- Includes aquafarming practices and environmental impacts/Namibia's community
- Does not repeat/reproduce wording of the question

FINANCIAL CONSIDERATIONS (F)

- The number of operational staff (with appropriate skill levels) that will be required, in terms of salaries to be paid ✓ for the offshore and onshore aquaculture.
- The consumer demand for the salmon, the potential selling price and the return on investment. ✓
- The sites, whether to purchase or to rent. ✓
- Designing costs ✓
- One example: such as engineers ✓ and builders
- Infrastructure costs / Purchase costs / Construction costs of both the onshore and offshore facilities ✓
- Equipment costs ✓ / maintenance of equipment
- One example: water pumps, air pumps, water-quality testing equipment, mechanical filters, biological filters, cage costs, vehicles such as cars and boats, tanks, temperature control equipment. ✓
- Maintenance costs ✓
- One example: electricity, packaging, disease control, loan repayments, vet fees, repair of equipment, tanks, desalination for onshore operation ✓
- Operational activity costs ✓
- One example: such as husbandry facilities ✓, biocontrol chemicals, food for salmon pellets, quarantine, computers and software.
- The cost of buying brood stock. ✓

**(Any logical relevant substantiating answer, marker discretion for
insightful thinking)**
minimum 4

ONSHORE: FRESHWATER DAMS/ FISH CULTURE CAGES/FISH PENS (P)

- The culture cages use an existing, constant flow of water ✓
- to provide oxygen ✓ and
- to remove fish excrement/waste and carbon dioxide. ✓
- in order to prevent eutrophication ✓
- This is to prevent the build-up of micro-organisms ✓ / the spread of diseases and
- toxins and pollutants ✓ which may wash in from upstream
- They are made from flexible material ✓ such as nylon, hard plastic or wire netting
- so that they do not break under the water pressure ✓/to be re-used/more resilient to water damage.
- The culture cages are easy to stock with hatchlings, ✓
- this makes it is easy to supply the hatchlings with food/to harvest the fish for transport. ✓
- The stock density in culture cages ✓
- depends on the quality of the water required by the salmon hatchlings ✓/and the recommended biomass per unit volume being considered.
- Care must be taken not to overstock the cages ✓

- as large concentrations of fish increase their vulnerability to predators ✓/run the risk of spreading diseases more rapidly.
- Maintenance of cages/boats to prevent salmon from escaping ✓

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

minimum 4

OFFSHORE: ENVIRONMENTAL IMPACTS OF FARMING PRACTICE (D)

- Large sea cages with many salmon in results in large volumes of salmon excrement ✓ uneaten fish feed
- which sink through the cage to the seabed, ✓
- increasing the nutrient load in the water column. ✓
- This stimulates an algal bloom ✓
- resulting in eutrophication ✓
- and a depletion of oxygen levels in the water ✓/anoxic conditions.
- This oxygen depletion can lead to lifeless areas on the ocean floor ✓ a clear negative environmental impact on the marine ecosystems of Lüderitz.
- Sea cages concentrate the population of a single species into a small area, which can result in a rapid spread of pathogens and parasites. ✓
- The usual practice for dealing with pathogens and parasites is to use antibiotics and antiparasitic solutions, which in turn contaminate the water column. ✓
- High seas off the West coast could cause damage to infrastructure resulting in pollution ✓ /fish escaping

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

minimum 4

BENEFITS (B)

Ensure food security ✓*

- A growth in aquaculture results in increased availability and access to fish ✓
- which lowers the price compared to food items from other animal sources. ✓
- As salmon is farmed under controlled conditions, there will be a more consistent source of food. ✓

Improve nutrition ✓*

- Production of food from aquatic farming can elevate human health ✓ especially in rural areas where poverty and malnutrition are relatively common.
- In under-resourced regions such as Africa, aquaculture produces the main source of protein to address malnutrition ✓/boost the demand for nutritious proteins.
- Seafood has a high nutritional value ✓
- One example: rich in Vitamins (A, B and D)/Omega-3 fatty acids. ✓
- Fish are rich in minerals ✓ which are important for a balanced diet
- One example: calcium/phosphorus/iron/zinc ✓

Increase employment ✓*

- This salmon project has the potential to provide employment and income for the local communities ✓ as food for the growing human population is always in demand.

- It can increase income levels in adjacent communities ✓ as more locals will receive an income from the project.

Economic benefits ✓*

- This is particularly applicable in rural areas where it is less expensive than in urban areas to rent land to house facilities. ✓
- Profits can be spent on upgrading the infrastructure of Lüderitz, which can lead to more tourism, therefore improving the economic status of the town. ✓
- The sustainability status of the community will increase.

(Mark benefit and descriptors)

(Mark as pairs)

(Mark minimum 2 pairs)

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

minimum 4

OPINION (J)

1 mark if Opinion and motivation correlates

1 mark for motivation

If learner says 'Yes'

- Jobs will be created for Southern African citizens which can improve their socio-economic development ✓
- Salmon will be available at cheaper cost, allowing more Southern African citizens, including the less fortunate individuals to have access to a protein-rich diet ✓

If learner says 'No'

- Lots of waste products from the increase in numbers of fish, for example excrement and uneaten fish feed, can potentially lead to increased eutrophication, which could kill off the surrounding biodiversity ✓
- The setup and implementation of such a farming project is extremely expensive, and will take years to actually help the communities of Southern Africa. That money could rather be used to help Southern Africans immediately with alternative support like food banks ✓
- Inbreeding or interbreeding could negatively impact the genetic integrity of the fish species ✓

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

Max (2)

CONCLUSION GUIDELINE

- Includes aquaculture/Namibia's community
- Does not repeat/reproduce wording of the question

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

QUESTION 5**INTRODUCTION GUIDELINE**

- Includes coastal and land-based wind energy generation along the coast and communities/environmental impact of energy generation
- Does not repeat/reproduce wording of the question

WIND TURBINES (T)

- Wind turbines have enormous propeller blades ✓
- at the top of the wind turbine. ✓
- These blades are connected to (a turning hub in the middle and) a turbine ✓
- Coastal winds tend to be stronger. ✓
- Coastal areas have a higher frequency of wind. ✓
- The blades are driven by the wind. ✓
- The blades turn a mechanism with a gearing system ✓
- and the gearing system efficiently spins an electric generator. ✓
- The gears slow down the speed of the blades ✓
- to minimise the damage when they are spinning. ✓
- Mechanical energy can be transformed into electrical energy. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
minimum 4

BENEFITS FOR THIS COMMUNITY (B)

- The community will have more access to electricity ✓
- More locals will be employed at the fish factories ✓ and get an income.
- More locals will be employed at the wind farms ✓ and get an income to support their families.
- Plant management skills on the wind turbines can be learnt.
- More money for families means more children can get an education ✓, improving the literacy levels of the community.
- Electricity bills will be cheaper, ✓
- as households and businesses in the community move away from expensive fossil fuel generated electricity ✓/and towards cheaper renewable energy sources.
- It will result in a smaller carbon footprint, as less fossil fuel energy generation would be used ✓/and more renewable energy sources used.
- Environmental awareness could result in other sustainability initiatives. ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
minimum 4

FACTORS (F)

- Wind turbines are large, ✓
- therefore, large transport vehicles/vessels are required. ✓

- The ocean environment is dynamic, ✓
- therefore, construction equipment and materials need to be strong enough to withstand this environment ✓/strong winds/forceful storms/large waves/strong currents
- The ocean and its coastal areas are subjected to harsh, salt-corrosive and sand-abrasive environments, ✓
- therefore, the construction equipment used to implement the wind turbine needs to be made of non-corrosive material. ✓
- Implementing offshore wind turbines could potentially take a long time, ✓
- therefore, construction equipment needs to withstand the harsh conditions/ biofouling over long periods of time. ✓
- Implementation and planned maintenance costs will be high on the offshore wind turbines, ✓
- as marine organisms, such as barnacles, settle on any exposed surfaces and can prevent mechanisms from working efficiently. ✓
- Sea vessels and crew fares/salaries will be high, ✓
- as they will be needed to implement the offshore turbines over a long period of time. ✓

(mark minimum 2 pairs)

(Any logical relevant substantiating answer, marker discretion for insightful thinking)
minimum 4

SIMILARITIES (M) and DIFFERENCES (D)

Similarities (M)

- If flightpaths of migrating bird/bat species cross those of the turbine blades, it can lead to possible injury or death of birds/bats. ✓
- Wind turbines are an eye sore as they alter the natural beauty of the site on land and offshore. ✓
- Both cause habitat destruction of land-based and marine organisms in the area where the wind turbines are constructed. ✓
- Both need mechanisms, such as anti-fouling paint to withstand the erosive forces such as strong wave action/strong winds. These can be harmful/toxic to the environment. ✓

Differences (D)

Offshore

- Noise pollution can disturb marine organisms, especially those who uses echo-location for survival. ✓
- Wind turbines can disturb the habitat of fish, causing fishers to catch less fish. ✓
- Location of the turbines can disturb sea vessel routes, potentially leading to a disruption of income due to longer travelling times of alternative routes. ✓
- Implementation costs are higher than land-based due to extra fares, such as sea-going vessels. ✓

Land-based

- Noise pollution of the wind turbines can cause humans/animals to relocate to areas without turbines. ✓
- Farmers can potentially lose farming space, which can lead to less income due to less produce being sold. ✓
- Wind turbines could potentially disrupt paths of terrestrial animals migrating through the area. ✓
- Reflection of the light off the blades as they turn, could impact human health ✓

(Similarities minimum 2 mark ✓)
(Differences: offshore minimum 1 mark ✓ land based minimum 1 mark ✓)
(Any logical relevant substantiating answer, marker discretion for insightful thinking)
minimum 4
maximum

(23)

OPINION (J)**1 mark if Opinion and motivation correlates****1 mark for motivation**If learner says '**Land-based**'

- Cheaper construction, maintenance and operating costs due to easier access to wind farms when on land. ✓
- Farmers whose land is used to build these wind turbines on, could get an income from renting out their land. ✓
- It will be more difficult and more expensive to reach offshore sites, as you will need land vehicles as well as boats and drones to reach offshore locations. ✓
- Implementation and maintenance on offshore turbines will only be possible when there is fair weather, as it will be too dangerous for crew to reach the turbines. This can lead to short and long durations of no electricity generation or availability. ✓

If learner says '**Offshore**'

- Offshore-located wind farms leave more space on land for farming or development to take place. ✓
- Most direct onshore winds will blow against the turbines, as there will be no reduction in wind energy as on land due to other land forms (e.g. hills or mountains) blocking the wind. This will generate the most electricity for the community. ✓
- Community members can learn ocean specific skills and can be employed to maintain and fix any issues on the turbines, even in undesirable weather conditions. ✓

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

2

CONCLUSION GUIDELINE

- Includes coastal and land-based wind energy generation along the coast and communities/environmental impact of energy generation
- Does not repeat/reproduce wording of the question

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

TOTAL SECTION C: 35
GRAND TOTAL: 150