



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MARINE SCIENCES P1

NOVEMBER 2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 17 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	B ✓✓		
	1.1.2	C ✓✓		
	1.1.3	D ✓✓		
	1.1.4	A ✓✓		
	1.1.5	D ✓✓		
	1.1.6	B ✓✓		
	1.1.7	D ✓✓		
	1.1.8	C ✓✓		
	1.1.9	D ✓✓		
	1.1.10	C ✓✓		
			(10 x 2)	(20)
1.2	1.2.1	Culture media ✓ / Agar (plates)		
	1.2.2	Hatcheries ✓		
	1.2.3	Albedo ✓		
	1.2.4	Interglacial ✓ periods		
	1.2.5	Calcifiers ✓		
	1.2.6	Zenolith ✓ / Xenolith		
	1.2.7	Ekman transport ✓ / Ekman spiral		
	1.2.8	Spit ✓		
	1.2.9	Headland ✓		
	1.2.10	Eddies ✓		
			(10 x 1)	(10)
1.3	1.3.1	Both A and B ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	None ✓✓		
	1.3.4	B only ✓✓		
	1.3.5	None ✓✓		
				(10)
				[40]

TOTAL SECTION A: 40

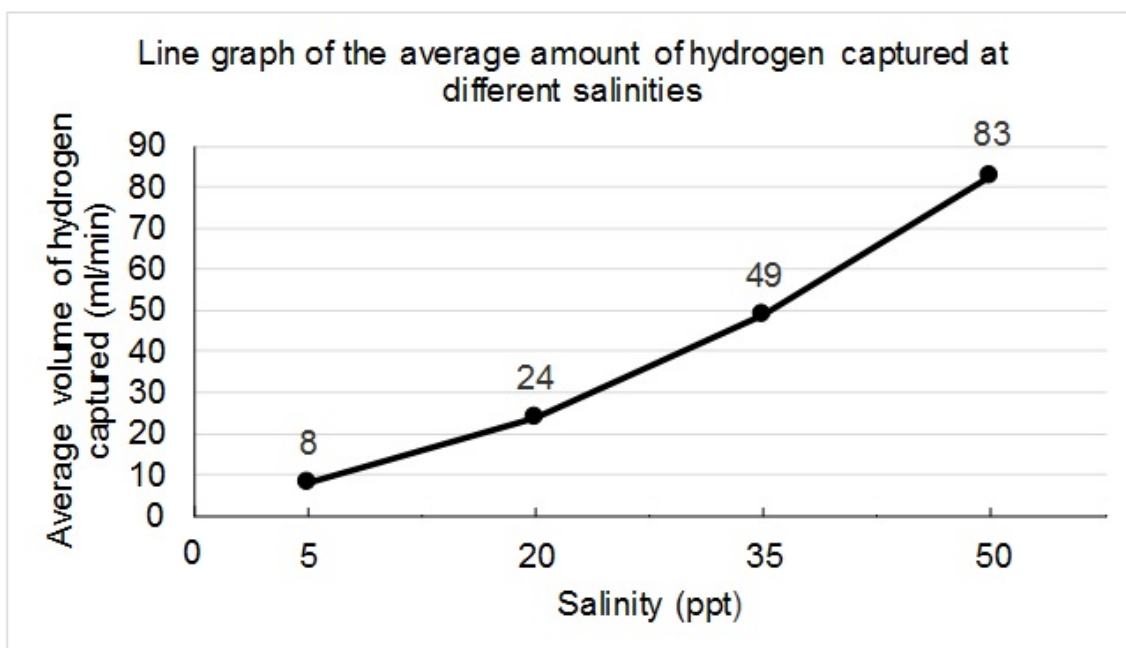
SECTION B

QUESTION 2

- 2.1 2.1.1 (Average) volume of hydrogen captured ✓ / rate of hydrogen production (1)
- 2.1.2 As the salinity increased the (average) volume of hydrogen production / captured increased.

Both variables present 1 mark ✓
 Direction of prediction 1 mark ✓
 Direction of prediction might vary as it is a hypothesis (2)

2.1.3



MARKING GUIDELINES	
CRITERIA	MARK ALLOCATED
Appropriately descriptive heading, above or below the graph (H)	½
Heading is appropriately descriptive (needs to have both variables: salinity and (average) volume of hydrogen captured) (V)	½
Type of graph. Line graph (T)	½
X-axis variable correct (I)	½
Y-axis variable correct (D)	½
X-axis label correct (XL)	½
Y-axis label correct (YL)	½
X-axis scale (XS)	½
Y-axis scale (YS) (needs zero)	½
Origin of line (O)	½
Plotting: for each correct plot (P)	4 x ½

(7)

2.1.4 Greater / higher /increase in salinity will lead to a greater / higher / increased amount / volume of hydrogen being produced / captured ✓✓

Must show the relationship between the variables (2)

- 2.1.5
- A water molecule is composed of two hydrogen atoms and one oxygen atom. ✓
 - The atoms are covalently bonded ✓ / hydrogen atoms shares its electrons with oxygen
 - Forms a dipole ✓ / polar molecule / bipolar
 - with the oxygen side being slightly / partially negative and hydrogen side being slightly positive. ✓
 - Resulting in a bent (-shaped) molecule ✓
 - Hydrogen and oxygen bond at an angle of 105° ✓

(Mark any 4) (4)

- 2.1.6
- More hydrogen produced with sea water than fresh water ✓
 - Sea water is abundant (about 70 % of earth is covered by sea water) ✓
 - Depletion of fossil fuels and a need to seek alternative energy sources ✓
 - Cleaner sources of energy are being sought and the ocean provides opportunities for renewable energy sources ✓

(Any logical relevant substantiating answer, marker discretion for insightful thinking) (1)

2.1.7 **If answer is YES**

- For the amount of sea water used you will get a large volume of hydrogen captured ✓
- Less greenhouse gasses will be released into the atmosphere ✓
- Sea water is more abundant than fresh water ✓
(concept of abundance)

If answer is NO

- When electricity is used to produce energy, it is counter productive ✓
- Salinity of sea water can be influenced by electrolysis ✓
- Using fossil fuels is detrimental to the planet as more carbon dioxide is released resulting in increased global warming ✓ / climate change
- Hydrogen is not a pollutant ✓
- Significant cost factors ✓

(Opinion and reasoning correlate 1 mark)

(Reasoning mark first 2)

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

(3)
(20)

2.2 2.2.1 Spilling ✓ wave (1)

2.2.2 The photograph ✓ / satellite image indicates a set of spilling waves illustrated by the large amounts of foam. ✓

OR

The side view ✓ shows that the area has a gradual gradient. ✓ (2)

- 2.2.3
- (As a wave approaches the shore)
 - the bottom part of the wave will be in contact with the sea floor ✓
 - resulting in friction ✓ / refraction occurring
 - the energy of the wave decreases / subsides ✓
 - which slows the wave down ✓

(Mark any 2) (2)

2.2.4 (a) Rip current ✓ (1)

- (b)
1. Waves accumulating on the shore ✓
 2. Resulting in water circulating around the surf zone ✓
 3. due to sand bars forming a channel ✓
 4. to areas where fewer waves break. ✓
- Point 4 has to be linked to point 2**
5. The water then returns out to sea (beyond the surf zone) ✓
 6. in a series of eddies ✓
 7. following the channel of least resistance. ✓

(Mark any 4) (4)

- (c) **YES**
- Students can practise safe surfing rules. ✓
 - Waves are not very big. ✓
 - Easier to reach the surf backline / rip currents take one beyond the breakers. ✓

OR

NO

- The water moving outward / seaward can sweep surfers / snorkelers out to sea. ✓
- No surfable waves. ✓
- At **B** the water will have a lot of sediment in it resulting in visibility not being good. ✓

**Only accept YES or NO if answer is substantiated
(Any logical relevant substantiating answer, marker
discretion for insightful thinking)** (2)

2.2.5 $P_1 = 1 \text{ bar}$
 $V_1 = 500 \text{ ml} / 0.5 \text{ l}$

$P_2 = 2.1 \text{ bar}$
 $V_2 = X$

$$P_1V_1 = P_2V_2 \checkmark \quad \text{OR} \quad \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad \text{OR} \quad V_2 = \frac{P_1V_1}{P_2}$$

$$= \frac{(1 \text{ bar})(500 \text{ ml OR } 0.5 \text{ l})}{(2.1 \text{ bar})} (\checkmark \text{ substitution})$$

$$= 238,10 \text{ ml OR } 0.24 \text{ l} (\checkmark \text{ for correct answer and } \checkmark \text{ unit})$$

(Accept 238,1 ml)

(4)

2.2.6 (a)

Causes

- This is also called decompression sickness. \checkmark
- Nitrogen build-up \checkmark in the tissue
- Nitrogen will not have enough time to diffuse out of the tissue \checkmark
- resulting in the development of bubbles in the tissue that collects at joints \checkmark

(Any 2)

Symptoms

- **severe pain** \checkmark^*
- **and they bend over (due to pain)** \checkmark^*

(Any 1 compulsory mark \checkmark^*)

(3)

(b)

- When less-experienced divers dive too deep for too long they may not allow enough time to slowly resurface \checkmark / do not allow time for decompression stops as they swim up to the surface.
- Less-experienced divers have a tendency to ascend rapidly \checkmark

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

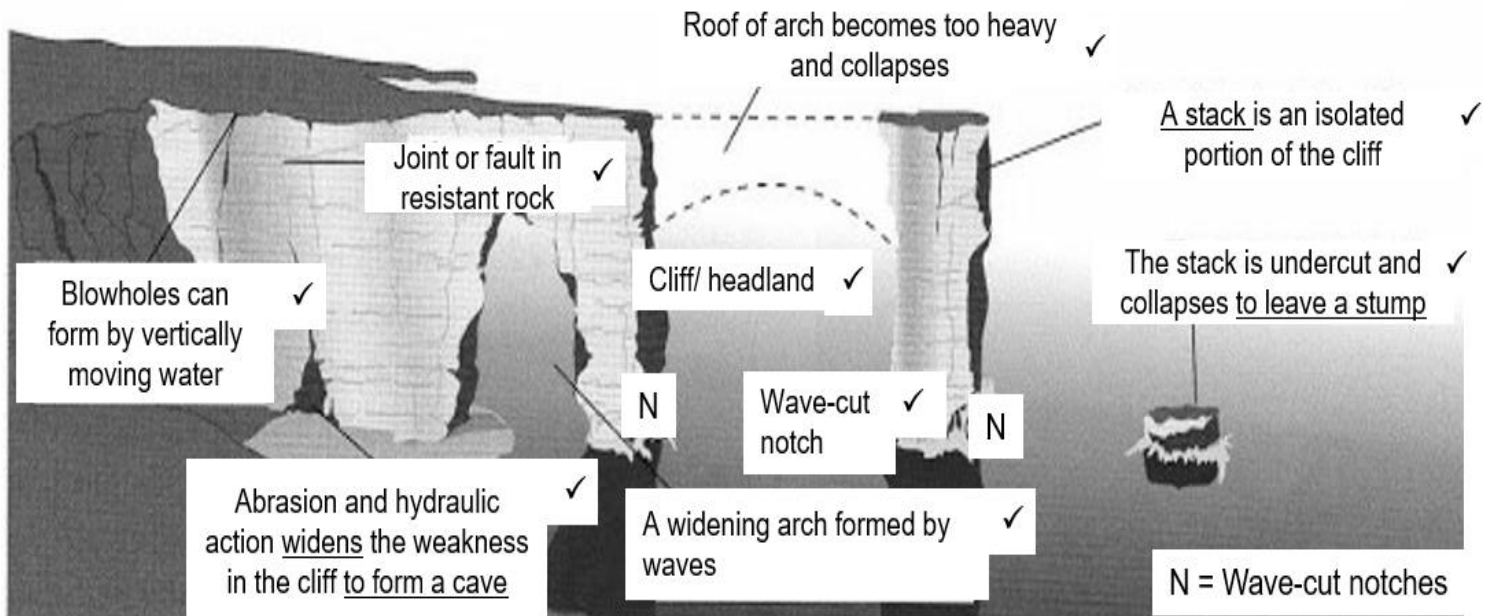
(1)
(20)
[40]

QUESTION 3

- 3.1 3.1.1
- Abundance of sediment ✓
 - Onshore wind ✓
 - Low-lying area to which sediment can be blown ✓
 - Enough time for the beach sand to dry between tides ✓
 - Obstacles / obstruction promotes accumulation of sand (to form a dune) ✓
- (Mark first 2)** (2)
- 3.1.2 (a)
- 1. Surface creep ✓***
 - the movement of sand along the ground ✓
 - 2. Suspension ✓***
 - the movement of sand that is light enough to float in the air ✓
 - 3. Saltation ✓***
 - a process that lifts the particles a short distance into the air before gravity forces them down. ✓
- (Compulsory mark ✓* and description) (2 x 2)** (4)
- (b)
- Sand will be blown away / washed away / going onto the road (movement of the sand) ✓
 - Therefore, dunes will not form ✓ / sand on road / damage infrastructure
- (Movement of the sand 1 mark)**
(Impact of sand movement 1 mark) (2)
- 3.1.3 (a) Soft engineering ✓ (1)
- (b)
- Reinstating dune profile with bulldozing ✓
 - Wind nets ✓
 - (dune-specific) plants ✓ / vegetation
- (Mark any 2)** (2)
- 3.1.4
- If answer is GOOD**
- It will allow the buildings / human built features to be protected from deteriorating ✓
- If answer is POOR**
- Humans should not interfere with nature as it might result in disturbing the ecological balance ✓
- Answer and reason correlating 1 mark ✓**
(Mark relevant reasoning 1 mark)
(Any logical relevant reason, marker discretion for insightful thinking) (2)
(13)

3.2

The step-wise process whereby a cliff is eroded to a stump/ step-wise erosion of cliffs



MARKING GUIDELINES		
CRITERIA	ELABORATION	MARK ALLOCATION
Correct drawing (D)	All features present (3 of Cliff, Arch, Stack or Stump)	1
Suitable heading (H)	<u>Descriptive</u> heading (Stack/ stump development)	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 5	5
Annotations linked (L)	Annotations linked to corresponding structure / Key system used	1
Process direction (P)	Arrow(s) / text illustrating the process of cliff degradation	1

(10)

- 3.3 3.3.1 (a) - Walker circulation ✓ / Walker cell (1)
- (b) - Warm moist air rises ✓
- on the western side ✓ of the Pacific Ocean basin / East Australian coast
- OR
- Cooler drier air sinks ✓
- on the eastern side ✓ of the Pacific / West Peruvian coast
- (Mark any pair)** (2)
- 3.3.2 **1.The SE trade winds weaken** ✓*
- pushing cooler surface water towards the western Pacific ✓
 - and causing less / weakened upwelling at the South American coast. ✓
- 2.Warmer surface waters** ✓*
- Lower amounts of cold water upwelled / moving to the surface ✓
 - Less upwelling. ✓
- 3.Lower amount of nutrients available** ✓*
- Less upwelling ✓
 - Less transport of nutrients ✓
- 4.Overlying low pressure storm (LPS) system over the South American coast** ✓*
- as a result of the surges of warmer water ✓
 - Reducing the temperature difference across the Pacific ✓
- (Mark condition ✓* and 2 descriptions. Mark first 2)** (6)
- 3.3.3 (a) Water temperature will decrease ✓ (1)
- (b) - Increase in rainfall ✓ / wetter climate
- Colder environment ✓ / decrease in temperature (2)
- (12)**
[35]

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

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)	<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>

<p>LOGICAL SEQUENCE 2 marks (LSEQ)</p>	<p>Paragraphs show logical sequence and are demonstrably linked to each other.</p>	<p>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.</p>	<p>Very difficult to read the essay as no logical sequence. Many facts with no clear layout. Clearly unplanned.</p>
<p>CONCLUSION 2 marks (CONC)</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>

(10)

QUESTION 4**INTRODUCTION GUIDELINE**

- Refers to renewable energy / tidal energy / smart cities
- Does not repeat / reproduce wording of the question

TIDAL ENERGY (T)

- Harvesting of tidal flows is only effective if there is an average tidal difference greater than 5 m ✓
- South Africa has a tidal range of 1.8 m ✓ / approximately 2 m at spring tide
- therefore, only using tides is not going to work ✓ / be effective
- The dam needs to trap the water at high tide and then trap the incoming water at low tide ✓
- The volume of the water flow is increased ✓
- resulting in a greater generating force ✓ / more energy extraction
- And therefore more cost effective ✓

Max (4)

HARVESTING: SALINITY GRADIENT POWER (S) ✓*

- This is generation of electricity using the natural difference between high and low water salinity. ✓
- At the mouth of the river there is discharging fresh river water ✓
- and deep saline ocean water ✓
- The two concentrations of water are separated by a semi-permeable membrane ✓ in the generator
- Sea water is pumped into a pressure chamber ✓
- where the salinity pressure is greater than in the fresh water chamber. ✓
- As a result of the osmotic pressure difference between the two solutions, ✓
- fresh water molecules diffuse through the membrane and dilute the sea water solution, increasing its volume. ✓
- Pressure is then reduced by the release of brackish water from the chamber through a turbine, ✓
- causing the turbine to spin ✓

1 ✓* compulsory + minimum 2**HARVESTING: WIND (W) ✓***

- The strong winds that are associated with parts of the coast ✓ / some areas are ideal for driving wind turbines ✓
- In order for the system to be cost effective the winds have to be consistent ✓
- The winds turn the (propeller) blades ✓
- which turns the generator. ✓
- The blades are made of lightweight ✓ / sturdy materials
- Wind is the most effective renewable producer of electricity associated with the ocean ✓
- The gearing needs to slow the blades, to prevent bird kills ✓

1 ✓* compulsory + minimum 2

HARVESTING: ELECTROLYSIS (E) ✓*

- Influenced by the sun's influence on surface winds ✓
- And the steady force of Earth's rotation ✓
- Particularly strong off the Southern African east coast / the Agulhas Current ✓
- These currents have the potential to drive generators ✓
- That are anchored to the sea bed ✓
- The shape of the coast line can force the water to speed up ✓
- Western Intensification – result of the spinning of the Earth ✓

1 ✓* compulsory + minimum 2**HARVESTING: WAVES (WA) ✓***

- Stronger/ more powerful winds/ more power is transferred from wind to waves ✓
- Mechanisms are designed with a piston-like tube ✓
- In which waves drive air through a tube ✓
- And generate fans/create a vacuum and pull air back into the piston ✓
- Constant supply of wind makes waves not as changeable/ making it more efficient ✓
- Structure needs to be flexible/durable for movement ✓
- Most movement is at the surface of the wave ✓
- (Any 3 different components to capture wave energy)**
- Up-and down movement/heaving ✓
- Forward-and back movement/surging ✓
- Rotational motion / pitching ✓

1 ✓* compulsory + minimum 2**HARVESTING: CURRENTS (C) ✓***

- Influenced by the sun's influence on surface winds ✓
- And the steady force of Earth's rotation ✓
- Particularly strong off the Southern African east coast / Agulhas Current ✓
- These currents have the potential to drive generators ✓
- That are anchored to the sea bed ✓
- The shape of the coast line can force the water to speed up ✓
- Western Intensification – result of the spinning of the Earth ✓

1 ✓* compulsory + minimum 2**(Mark first 2 harvesting methods only)**

Max

13

ACT (A)

- Managing our electricity supply ✓ / electricity footprint
- Lobbying politicians to include environmental costs ✓ in their decisions
- Stop tax relief ✓ for industries whose practices have long-term harmful environmental impact (such as coal fired power stations)
- (Urgently) develop renewable electricity generation equipment ✓ / fund research
- Putting more effort into making renewable energy sources cheaper ✓ / making it more affordable for the general public / provide tax incentives
- Using the real costs of fossil fuel ✓ / include environmental impact when making comparisons between renewable energy generators and generation from coal, oil, gas or nuclear

- Electricity generation needs to operate efficiently (work properly) ✓ / generate enough electricity / connect reliably to the national electricity grid
- Educate the public / businesses about the importance of renewable energy sources
- Provide tax relief for businesses who use renewable energy sources

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

Max (6)

PRIVATE INVESTMENT (O)

Learner receives a mark for stating for or against private investment, only if substantiated.

FOR PRIVATE INVESTMENT

- The costs are too great for government to bare on its own ✓
- The city will get built faster ✓
- International collaboration ✓ / exchange in international expertise of new technology or knowledge
- More job opportunities ✓

AGAINST PRIVATE INVESTMENT

- Corruption / bribery might take place ✓
- Corporations will have control over the smart city ✓
- Only the rich will benefit from the smart city ✓
- More foreigners will benefit from opportunities offered by international businesses rather than local businesses ✓

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

Max (2)

CONCLUSION GUIDELINE

- Discusses the need for renewable energy in smart cities
- Does not repeat / reproduce wording of the question

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

QUESTION 5**INTRODUCTION GUIDELINE**

- Refers to aquaculture / poverty alleviation / food security in the town/
reference to the town
- Does not repeat / reproduce wording of the question

AQUACULTURE (A)

- Aquaculture is the farming of fresh water / salt water organisms ✓
- in controlled or semi-controlled environments ✓
- called holding systems ✓
- The farmers manage the breeding ✓ / rearing / feeding / growing / harvesting of the organisms
- Through controlling the life cycles ✓
- and managing the nutrients ✓ / water quality (temperature / pH / salinity)

Max (4)

SOCIO-ECONOMIC PRINCIPLES (P)**1. Improve nutrition (PN)✓***

- Especially in rural areas where poverty / malnutrition are relatively common ✓
- In under-resourced regions ✓
- aquaculture produces the main source of food to address malnutrition ✓
- The nutritious value of seafood is that it is rich in Vitamins A, B and D as well as Omega-3 fatty acids ✓
- Fish is rich in minerals ✓ (such as Calcium / Phosphorus / Iron / Zinc / Iodine / Magnesium / Selenium / Potassium) / protein
- all important for a balanced diet ✓
- The consumption of seafood stimulates cognitive development ✓

(1 ✓* compulsory + minimum 3)**2. Increase employment (PE)✓***

- Provides income for residents, ✓
- Employment opportunities such as farmers ✓ / labourers / management / transport / processing / sales (an example of a job opportunity) / export of goods
- as food for the growing human population is always in demand. ✓
- The town's residents can get shares in the aquaculture facility ✓
- Adjacent residents can also benefit (income or employment opportunities) ✓
- For example materials needed for construction and maintenance of the infrastructure. ✓
- This is particularly applicable in rural areas ✓
- where it is less expensive to rent land to house aquaculture and processing facilities. ✓
- Provides skills / training / education centres ✓
- Improves the social statuses of the town ✓

(1 ✓* compulsory + minimum 3)

Max (12)

IMPACT ON FISH STOCK (I)

- Inbreeding ✓
- could impact the genetic integrity ✓ / genetic stock of species.
- This could seriously compromise the wild stock if such individuals were to escape into the wild. ✓
- Which would result in some progeny with deformed body structures ✓
- and compromised resistance to disease. ✓
- Removal of large numbers of fertile species to use as broodstock ✓
- could lead to a reduction in the wild seedstock ✓
- Carnivorous fish require high volumes of feed ✓
- this can lead to increased harvesting of wild-caught small fish to feed the larger fish ✓ / increase the costs of the production
- Releasing alien invasive species ✓ / their fertilised eggs, into the wild
- could significantly impact the biodiversity of a natural stock ✓ / outcompete indigenous species.
- Overstocking brings a higher chance of disease, ✓
- which could spread to wild stocks ✓
- Aquaculture will impact the local fishing industry ✓
- There will be less pressure on local fish stocks ✓

Max (7)

OPINION (O)

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

AGREE

- There would be more food available ✓
- and therefore more access to this food ✓

DISAGREE

- Companies need to make profit resulting the products being expensive ✓ / not affordable to the town
- Most of the products would be exported ✓

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

Max (2)

CONCLUSION GUIDELINE**IF YES**

- It will ensure economic stability ✓
- The town will have food security ✓ / nutrition

IF NO

- It will have a negative impact on the already strained fisheries ✓
- The town will not receive the food ✓

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

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

TOTAL SECTION C: 35
GRAND TOTAL: 150