



Cambridge Assessment
International Education

Specimen Paper Answers

Paper 1

Cambridge International AS & A Level
Marine Science 9693

For examination from 2022



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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge International AS & A Level 9693 01 and to show examples of very good answers. We have selected questions from Specimen Paper 1, Exercises 1 to 6 for examination from 2022. There are six exercises in Paper 1 and candidates must answer all of the questions and sub-questions in each exercise.

In this booklet, we have provided answers for Exercises 1 to 6 along with examiner comments. These exercises require candidates to demonstrate their knowledge and understanding of the curriculum content through applying their knowledge to new situations and through interpreting data and information supplied.

Each response is accompanied by a brief commentary explaining the strengths and weaknesses of the answers.

Each question is followed by an example of a high grade answer with an examiner comment on performance. Comments are given to indicate where and why marks were awarded, and how additional marks could have been obtained. In this way, it is possible to understand what candidates have done to gain their marks and how they could improve.

The mark schemes for the Specimen Papers are available to download from the School Support Hub at www.cambridgeinternational.org/support

2022 Specimen Paper 1 Mark Scheme

2022 Specimen Paper 1 Mark Scheme

Past exam resources and other teacher support materials are available on the School Support Hub www.cambridgeinternational.org/support

Assessment overview

Paper 1 – AS Level Theory

Written paper, 1 hour 45 minutes, 75 marks

Candidates may not use dictionaries.

There are six exercises in the question paper. The exercises have different mark allocations, and some exercises consist of a series of sub-questions. Candidates must answer all questions and sub-questions in each exercise.

The paper is an externally set assessment, marked by Cambridge.

Assessment

AO1 Knowledge and understanding – weighting 67%

AO2 Handling and applying information – weighting 33%

Paper 1 – Question 1

Question 1(a)

1 (a) The list shows some features of cartilaginous fish and bony fish.

gill slits caudal fin gills scales swim bladder
 dorsal fin denticles externally visible lateral line

Write each feature in the correct position in Fig. 1.1, to show which features are present in cartilaginous fish only, which are present in bony fish only, and which are present in both.

Write each feature only once.

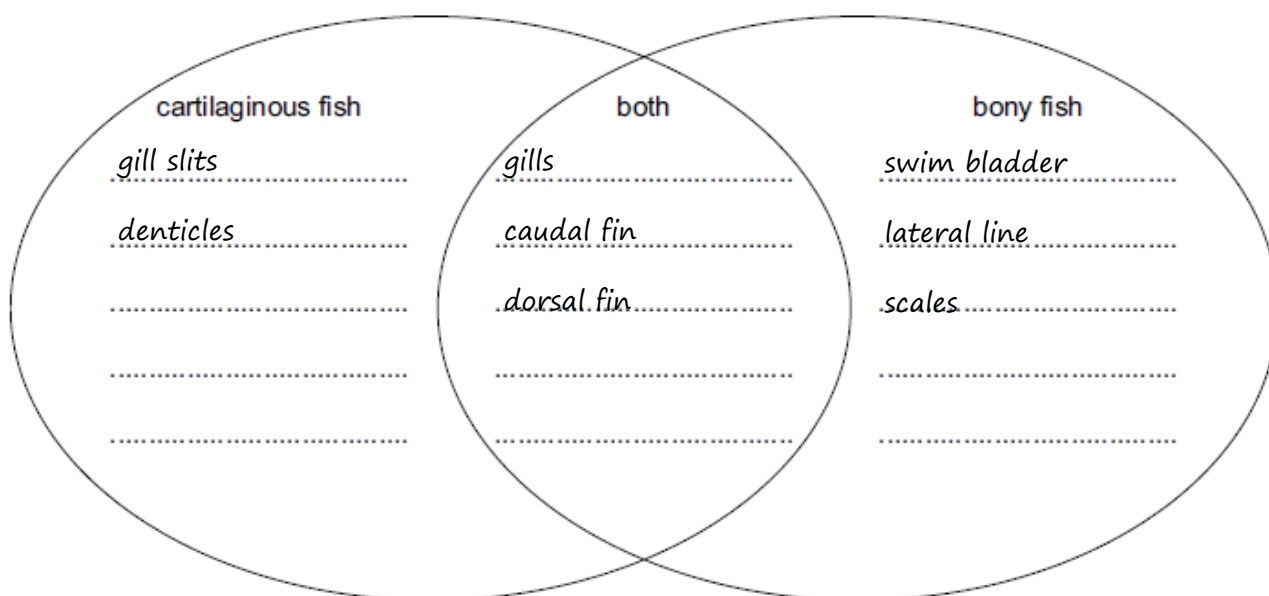


Fig.1.1

[3]

Examiner comment

This candidate clearly knows the features of each type of fish and achieves all mark points. 1 This level of knowledge would be expected for a high achieving candidate.

Total marks awarded = 3 out of 3

Common mistakes

Candidates may try to add their own ideas to the list. Weaker candidates may be unsure of the difference between gill slits and operculum (which is not on the list).

Question 1(b)(i)

(b) Fig. 1.2 shows a blue shark, *Prionace glauca*.



Fig. 1.2

(i) Label the anal fin on Fig. 1.2 .

[1]

Examiner comment

This candidate has a clear understanding of the fin location and achieves the mark point. 1

Total marks awarded = 1 out of 1

Common mistakes

Some candidates may mistake the anal fin for the pelvic fin on fish. Candidates need to be aware that the anal fin is an unpaired fin, while the pelvic fins are paired and located forward of the anal fin.

Question 1(b)(ii)

(ii) Table 1.1 shows the classification of the blue shark.

Complete the four spaces on the table to show how this species is classified.

Table 1.1

| domain | Eukarya |
|---------------------|-----------------------|
| kingdom | Animalia |
| phylum | Chordata |
| <i>class</i> | Chondrichthyes |
| order 1 | Carcharhiniformes |
| <i>family</i> | Carcharhinidae |
| genus | <i>Prionace</i> |
| species | <i>glauca</i> |

[2]

Examiner comment

This candidate shows a clear understanding of the nomenclature ¹ used in classification for biological specimens and how to apply this knowledge to a new situation, ² so receives full marks. They have used the species name given to identify the genus name and species name. They have included the capital letter for genus name.

Total marks awarded = 2 out of 2

Common mistakes

Candidates may not have learnt the order of domains for classification, using a pneumonic helps many candidates remember them in the correct order.

Question 1(b)(iii)

(iii) Blue sharks are an epipelagic species.

Explain the meaning of epipelagic.

The top part of the ocean, where there is sunlight and high productivity. ¹

..... [1]

Examiner comment

This candidate has a good understanding of the term. Although they have not stated that it receives the maximum or high light intensity, they do just achieve the mark as they state there is high productivity, ¹ which is a consequence of the sunlight, showing that the candidate is linking their knowledge. It could have been improved by using a comparative, i.e. region of highest productivity.

Total marks awarded = 1 out of 1

Common mistakes

Candidates are required to know about the different zones within the ocean, and be able to identify them, so may confuse some of these terms, or not mention the light penetration within the zones.

Question 1(c)(i)

(c) Fig. 1.3 shows a food chain for the blue shark.

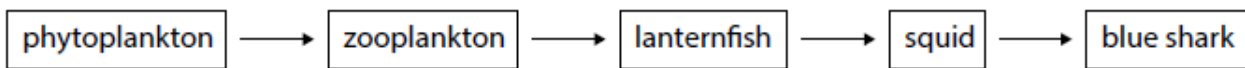


Fig.1.3

(i) State the trophic level of the blue shark in this food chain.

Level 5 1 [1]

Examiner comment

This candidate has a clear understanding of trophic levels and has correctly named trophic level 5 to achieve the mark. 1

Total marks awarded = 1 out of 1

Common mistakes

Some candidates either add the sun as first trophic level, so give an incorrect answer of 6, or count the number of arrows until they reach the blue shark, and give an incorrect answer of 4.

Question 1(c)(ii)

(c) Fig. 1.3 shows a food chain for the blue shark.

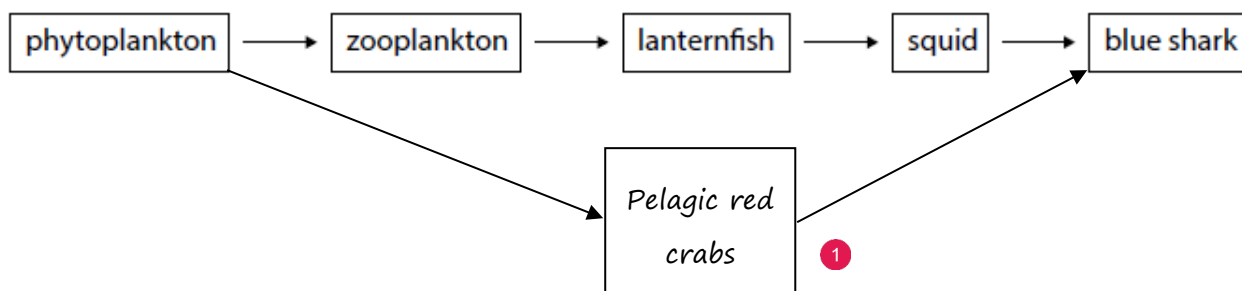


Fig.1.3

(i) State the trophic level of the blue shark in this food chain.

Level 5 [1]

(ii) Blue sharks also feed on pelagic red crabs, which feed on phytoplankton.

Add this information to Fig. 1.3. [2]

Examiner comment

This candidate understands how food webs and chains are constructed and has clearly added the information to the food chain, including arrows in the correct direction, demonstrating they understand the arrows show the direction of flow of energy, so achieves both mark points here. 1

Total marks awarded = 2 out of 2

Common mistakes

Candidates sometimes forget to add arrows or place them in the wrong direction. The arrows **must** show the direction of the flow of energy. It is worth noting that there are an increasing number of websites that show arrows in the incorrect direction.

Question 1(c)(iii)

(iii) Explain which food chain allows a greater percentage of the energy captured by the primary producers to reach the blue shark.

*The one with pelagic red crabs as it is the shortest, 1 so there is only 2 times
10% of the energy is lost. 2*

..... [2]

Examiner comment

The candidate has recognised which food chain is the shortest ¹ and applied the knowledge that this reduces the total energy lost between producers and the blue shark, although stated in a slightly clumsy way. ² This candidate achieves both mark points for this question.

Total marks awarded = 2 out of 2

Common mistakes

Weaker candidates may not recognise that fewer links means less energy loss along the chain and may not answer the second part of the question.

Paper 1 – Question 2

Question 2(a)(i)

2 Table 2.1 shows a section of a tide table for a sandy shore on 15 July.

There was a full moon on 15 July.

Table 2.1

| 15 July | |
|---------|--------|
| 00:53 | 0.26 m |
| 07:45 | 4.09 m |
| 13:11 | 0.42 m |
| 20:03 | 4.34 m |

(a) (i) Tidal range is defined as the difference between a high tide and the following low tide.

Use Table 2.1 to calculate the tidal range at this shore on 15 July.

$$4.09 - 0.42 = 3.67$$

3.67 ¹ m [1]

Examiner comment

The candidate has read the instructions carefully and completed the correct calculation as indicated to achieve the mark. ¹

Total marks awarded = 1 out of 1

Common mistakes

Candidates do not always read the question carefully and follow instructions given. Candidates have been told in the question how to calculate the tidal range correctly, however some may select the incorrect low tide or try to find the mean of the high tides and low tides for the calculation.

Question 2(a)(ii)

(ii) State **two** reasons why the actual tidal range at this location on 15 July could be greater than the predicted range.

1 *The wind was blowing onshore* ¹

2 *Air pressure* ²

[2]

Examiner comment

The candidate considered what factors cause a tide to be higher or lower than expected. They identified the wind blowing onshore, as a reason for the range to be different, so MP 1 would just be awarded, ¹ they should indicate that this would have the effect of increasing the height of the high tide for an excellent quality answer. The second mark point of 'air pressure' is too vague, ² they should indicate either low air pressure

(less force pushing the water down) at high tide, or high air pressure (more force pushing the water down) at low tide.

Total marks awarded = 1 out of 2

Common mistakes

The tidal range and tide height are often confused by candidates. If the tidal range has increased, candidates need to consider why high tide may be greater, or low tide may be lower and be precise in how they explain this.

Question 2 (b)

(b) The maximum tidal range at the same shore on 22 July was 2.47 m less than on 15 July.

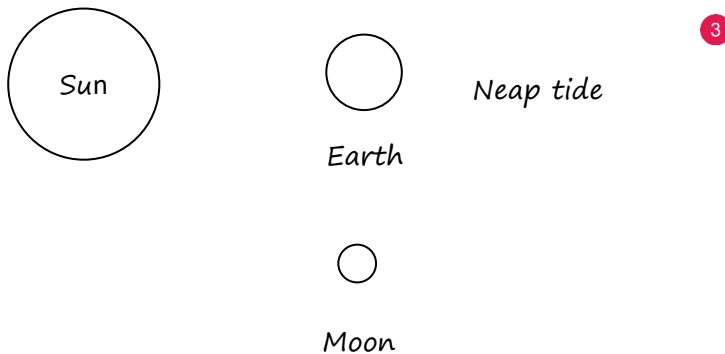
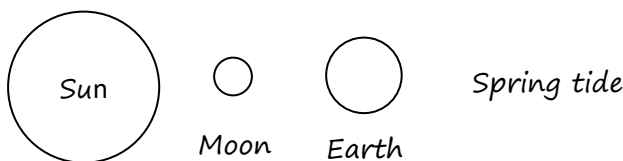
There was a quarter moon on 22 July.

Explain the reason for the difference in tidal range at this location, on these two dates.

You may use annotated diagrams in your answer.

15th July is a large tide, so is a spring tide. This occurs when the total gravitational pull of the sun and moon is greatest, because the sun and moon are in alignment with the earth.

On the 22nd July there is a neap tide, where tidal range is less, because the sun and moon are at right angles to the earth, so the total gravitational effect is less.



[4]

Examiner comment

This candidate has a clear understanding of what happens during a tidal cycle. They firstly identified when the tidal range was the greatest (although poorly expressed), ¹ and recognised that when there is a quarter moon (i.e. the moon has travelled a quarter of the way around the Earth), there is a neap tide and could explain what was happening with the moon and sun, and the effect of this on the total gravitational pull on the Earth. ² They also show they understand that the total gravitational force changes, but have not stated that they act together or act against each other, so have not quite done enough for MP's 4 and 7. ³ They achieve MP's 5, 1, 6, 2, and 3.

Total marks awarded = 4 out of 4

Common mistakes

Candidates need to ensure they refer to tidal ranges when asked about them, rather than high tides and low tides or just tides. Candidates also need a clear understanding of spring and neap tides and be able to name them. Whilst candidates often refer to the gravitational effect of the sun and moon, their answers often state that the gravitational pull changes over the course of the lunar cycle, which is not the case. The gravitational pull of each of the moon and the sun remains constant, but the cumulative effect changes, as the forces act in different directions. Candidates need to understand it is the resultant gravitational force of the moon and sun that affects the tidal range.

Paper 1 – Question 3

Question 3(a)

3 Sea water consists of many different elements and compounds.

(a) Fig. 3.1 shows sodium ions and chloride ions in part of a sodium chloride crystal.

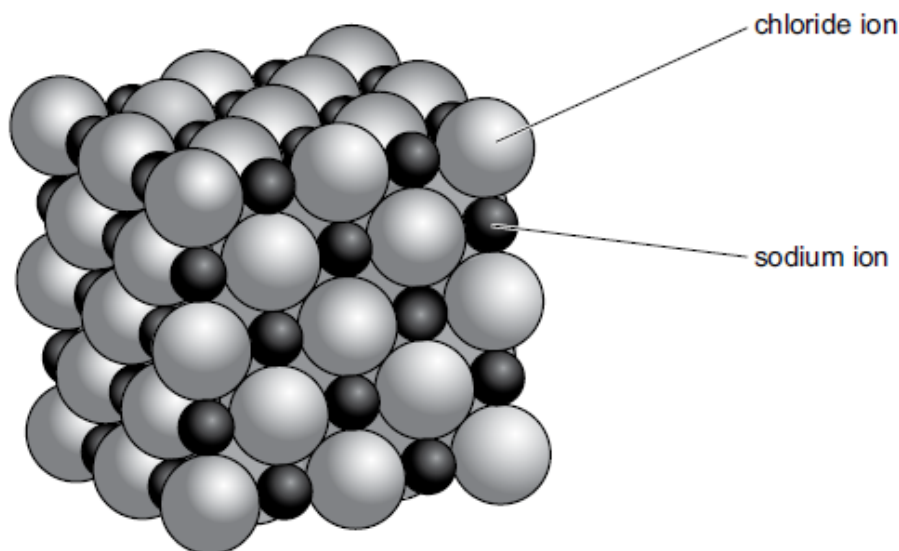


Fig. 3.1

Explain how this ionic structure forms from sodium atoms and chlorine atoms.

Electrons (a negative particle) move from one atom to another. This leaves the chlorine with a negative charge and the sodium with a positive charge. These charged particles are then attracted to each other to make a lattice. These are strong bonds.

[4]

Examiner comment

The candidate has recognised it is a four mark question, and attempted to make four separate points, but they have not provided the necessary detail. The candidate understands that it has something to do with electrons, but do not give an indication of which atom receives and loses the electron, so cannot achieve mark points 1 or 2. ¹They state chlorine has a negative charge, rather than chloride, which would not be sufficient to achieve MP 4. ²However, they do then state that sodium has a positive charge, which would allow MP 4 to be awarded. ³They do correctly state they are attracted due to the charges, so gain MP 5 for 2 marks total. ⁴

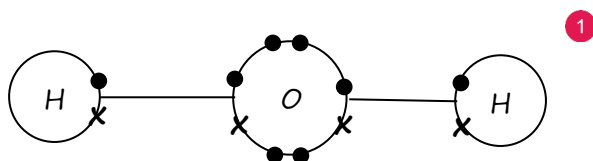
Total marks awarded = 2 out of 4

Common mistakes

Candidates are expected to understand the differences between an ion and an atom, in terms of bond formation, and name chloride as an ion rather than chlorine. Candidates may get the charges the incorrect way around, but need to remember that metals tend to lose electrons to become positively charged and non-metals tend to gain electrons to become negatively charged.

Question 3(b)

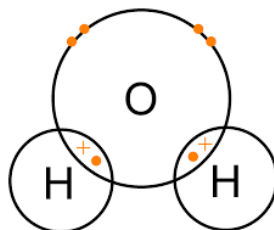
(b) Draw **one** molecule of water to show the electron sharing present between the atoms.



[2]

Examiner comment

This candidate achieves 1 mark for drawing the 1 atom of oxygen and 2 atoms of hydrogen with a bond between them. ① They have attempted a dot and cross diagram to show the electron sharing but have not quite done enough to correctly show the pattern of electron sharing. Their diagram should overlap the atoms, with the electrons shown only once. This diagram shows 2 electrons in each hydrogen shell, plus 8 in the oxygen shell, indicating there are a total of 12 electrons in the outer shells altogether rather than eight. A correct attempt is shown below.



Total marks awarded = 1 out of 2

Common mistakes

Candidates may draw a simple diagram to show 1 oxygen and 2 hydrogen atoms only and forget to show the electrons present and electron sharing. Weak candidates may not be able to represent the correct atoms being present.

Question 3 (c)

(c) Describe how sodium chloride dissolves in water.

Water is polar, ¹ so the +ve and -ve charges in the water attract the +ve and -ve ions of sodium chloride, so the sodium chloride breaks up.

[2]

Examiner comment

The candidate has demonstrated they understand that water is a polar molecule, for MP 1, ¹ but there is insufficient detail for a second mark to be awarded, as they do not know the positive and negative charges on each part of the water molecule for MP 2. They do not quite gain MP 3 as they do not mention either the ionic structure of the sodium chloride, nor state the ions as Na^+ or Cl^- .

Total marks awarded = 1 out of 2

Common mistakes

Candidates need to have a strong understanding of the charges on all the different particles, otherwise they may make errors or omissions.

Question 3(d)(i)

(d) Table 3.1 shows how salinity varies with depth in an estuary.

Table 3.1

| depth / m | salinity / parts per thousand |
|-----------|-------------------------------|
| 2 | 20.98 |
| 4 | 22.28 |
| 6 | 23.08 |
| 8 | 27.71 |
| 10 | 29.14 |
| 12 | 30.08 |

(i) State **and** explain the relationship between depth and salinity in this estuary.

Density decreases as depth decreases. ¹ The river water is less dense than the saline sea water, so it floats on the surface. ²

[2]

Examiner comment

This candidate has clearly expressed the relationship between density and depth, although expressed in the opposite way to the mark scheme it is considered a perfectly acceptable answer to achieve the first MP. ¹ In order to explain this statement, they have also made a correct comment regarding the comparative densities of river water and sea water, stating clearly that the river water will float. ² Total of 2 marks awarded.

Total marks awarded = 2 out of 2

Common mistakes

Some candidates give a relationship the wrong way around, for example, as salinity increases depth increases. This indicates that salinity affects the depth of the water, which is clearly incorrect. Candidates should be encouraged to identify the independent variable and place that first in their sentence. Candidates also need to ensure they are precise in their answers, using comparative terms about the fresh / sea water and their densities.

Question 3(d)(ii)

(ii) A fish may swim throughout the water column in this estuary.

Explain how changes in abiotic factors from increasing depth could affect the availability of oxygen for the fish.

Temperature drops as depth increases, cooler water holds more oxygen, but salinity is increasing, and more saline water holds less oxygen, ¹ so it should stay about the same. ²

[2]

Examiner comment

This excellent answer shows the candidate has a clear understanding of how abiotic factors change with depth in the water column and thought carefully about the problem. They have provided two fully valid answers, MP's 3, 4, 1 and 2, ¹ and provided a final suggestion as to the overall effect of both of these. ² This candidate achieves 2 marks.

Total marks awarded = 2 out of 2

Common mistakes

Some candidates may discuss a physical factor at the surface that affects oxygen levels, such as atmospheric dissolution, rather than considering the abiotic factors that change with depth, i.e. temperature, salinity and light.

Paper 1 – Question 4

Question 4(a)

4 The productivity of producers is dependent on many factors.

(a) Define productivity.

The rate of production of new biomass ¹.....

.....
.....
..... [2]

Examiner comment

Candidates are expected to know definitions within the specification. This candidate starts well, ¹ but forgot to add that it is linked to a given area as well. First MP is awarded for 1 mark total.

Total marks awarded = 1 out of 2

Common mistakes

Candidates are required to learn definitions from the specification. They do not need to rewrite them in their own words if they have learnt the definition from the specification.

Question 4(b)(i)

- (b) Table 4.1 shows the mean primary productivity, per m^2 per year, and the total primary productivity per year in different regions of the world oceans.

Table 4.1

| region | area / 10^6 km^2 | mean primary productivity / g per m^2 per year | total primary productivity / 10^9 tonnes per year |
|----------------------------------|----------------------------|---|---|
| tropical and subtropical oceans | 190.0 | 55 | 10.45 |
| temperate and subpolar | 100.0 | 206 | 20.60 |
| polar | 52.0 | 27 | 1.40 |
| continental shelf (no upwelling) | 26.6 | 290 | 7.71 |
| continental shelf (upwelling) | 0.4 | 1050 | 0.42 |
| coral reef | 0.1 | 1410 | 0.14 |

- (i) State which region has the lowest mean primary productivity and suggest a reason for this.

¹ Polar regions show the lowest mean primary productivity because it is dark for ² half of the year and colder than any of the other regions, ³ so photosynthesis rate is lower here.

[2]

Examiner comment

The candidate has carefully read the question and used the table to select the correct column to choose from, clearly gaining MP 1 for the polar region. ¹ The second point is less clear. They use their knowledge of the polar regions to state it is 'dark for half the year', but do not make any comment about the light intensity (all areas of Earth receive approximately the same number of hours of sunlight over a year), so this is not enough for the second mark point. ² However, their statement that 'it is colder than any of the other regions' (of those in the table), is using a comparative term and so does achieve the second mark point here. ³ This candidate was awarded both marks.

Total marks awarded = 2 out of 2

Common mistakes

Candidates need to ensure they use comparative terms when being asked to compare data. The candidates need to ensure they can select the correct column to choose from or they may then choose the incorrect region. However, if they did that, their answer would be coral reefs, which, if they think about their answer, should make them think twice.

Question 4(b)(ii)

- (ii) Explain why coral reefs are the region with the highest mean primary productivity.

Coral reefs exist where there are warm temperatures of 16–32°C, and large amounts of sunlight provided in clear water. The warmth and sunlight allows for a high level of photosynthesis to occur in the algae and zooxanthellae in the coral polyps.

[3]

Examiner comment

The candidate has thought about what is required for high productivity and supplied information on conditions that would allow for that, i.e. sunlight and appropriate temperature range, resulting in a high level of photosynthesis. However, they have not given an indication of why it is the highest. MP 1 is not awarded as they have mentioned the presence of zooxanthellae and algae, but have not stated there are large numbers of them present. ① They achieve MP's 2, ② 4 ③ and 6. ④ They would not have been awarded MP5, as they stated 'large amounts of sunlight' rather than the idea that the clear water allows the penetration of the sunlight to the coral polyps, or that they receive the maximum amount of light (compared to the others in the table). ⑤ The candidate scores three marks for this question.

Total marks awarded = 3 out of 3

Common mistakes

Candidates need to be clear that it is the zooxanthellae that photosynthesise rather than the coral polyps themselves. The question is asking about why corals have the highest level of productivity rather than a high level, so answers need to reflect this. Weaker candidates are likely to achieve MP 2, but need to have an understanding of what causes high levels of productivity.

Question 4(b)(iii)

- (iii) Explain why continental shelf regions with no upwelling have a higher total primary productivity than continental shelf areas with upwelling.

Because the area with upwelling is very small

[1]

Examiner comment

The candidate correctly identified information in the table that helps to answer this question for 1 mark.

Total marks awarded = 1 out of 1

Common mistakes

Some candidates may not look back at the table but try to come up with reason why this might be the case. Where data is available, candidates should be encouraged to check on the data when answering different question parts.

Question 4(c)(i)

(c) Some upwelling areas, such as the Benguela upwelling on the west coast of Africa, have the benefits of upwelling all year round.

(i) Explain how upwelling occurs.

Wind pushes the water away from the coast, leaving space for deep water to rise and fill the space.

.....

.....

.....

.....

..... [3]

Examiner comment

This candidate achieves MP 1 and 4, for the water being pushed offshore and water rising to take its place. Deep water is not quite enough for MP 3, as this could still be from water from the middle of the water column rather than from the sea bed, which is important as that is where the nutrients have accumulated prior to being upwelled to the surface. They have only made two separate points for a 3 mark question, so the candidate needs to check the mark allocation and ensure they have made the appropriate number of points.

Total marks awarded = 2 out of 3

Common mistakes

Candidates often state deep water rather than the sea bed, and may state 'nutrients' are being transported to the surface, rather than nutrients (dissolved) in the water.

Question 4(c)(ii)

(ii) Suggest the benefits to the local fisheries of year-round upwelling.

More nutrients are available as the deep water contains many nutrients. These come to the surface and are passed along the food chain from the phytoplankton to the fish, increasing productivity of the fish. This means there are more fish available for fishermen to catch, increasing their profits.

.....

..... [3]

Examiner comment

This candidate has considered why there may be an increased stock of fish for the fishermen to catch. At this point they realised the importance of nutrients from the upwelling, even though they had not mentioned them in i). They made a clear link for the transfer of the nutrients to the fish and the effect this has on the

fish population, 2 and included the benefit this has to the fishermen. 3 They have achieved MP 2, 3 and 4 for full marks.

Total marks awarded = 3 out of 3

Common mistakes

Some candidates may just state that the amount of fish increases, for MP3, without giving the effect on the fish of the upwelling. Weaker candidates often seem to think that the fish utilise nutrients directly from the water rather than the nutrients being passed along the food chain from primary producers to reach the fish. Candidates should be encouraged to explicitly state what the effect would be.

Paper 1 – Question 5

Question 5(a)

- 5 (a) Weathering and erosion affect the type and morphology of shorelines that develop in the littoral zone.

Explain how erosion can affect the morphology of the different types of shore. In your answer include reference to the **four** main types of erosion.

Sandy shores have more deposition than erosion¹, with fine muddy particles being washed away, leaving the bigger sand particles to settle.²

Rocky shores – the large rocks are pulled downwards towards the shore by gravity³. When they fall smaller bits fall off and these can be moved by water⁴. The larger pieces could be affected by freeze-thaw effect of water to break into smaller bits as well.

Muddy shores contain very fine sediments that have been washed in from rivers⁵, and these settle out where there is little current/wave action. The small particles could also have been carried by wind.⁷

[8]

Examiner comment

Candidates are asked to include all four types of erosion in their answer, as well as the different shore types. This candidate chose to organise their work around the different shore types they selected. In their sandy shores description the candidate shows their understanding that more deposition than erosion occurs for MP 11¹ and later states that the sand particles settle, for MP 9, with fine muddy particles being washed away, which just gets the erosion by water (MP2).²

In their rocky shores description they recognise that rocks fall due to gravity to achieve MP4,³ and again mention 'small bits being moved by water', but MP2 was already awarded.⁴ They did not mention the relative rate of erosion on the rocky shore. They give the effect of freeze – thaw, which is weathering rather than erosion.

In their final paragraph on muddy shores they again mention water erosion (MP 2 already awarded), ⁵ and demonstrated their knowledge that muddy shores consist of fine particles (MP13) ⁶ which can only settle in the calmest conditions, but needed to take that idea a little further to mention the flatness of the beaches causing a long residence time for the particles to settle from the water, to achieve MP14. They do mention wind erosion for MP3. ⁷ This candidate achieved 6 marks.

Total marks awarded = 6 out of 8

Common mistakes

When tackling a question like this, candidates need to consider how to structure their answer to the best effect. Organising their answer around either the types of erosion, or the shore types formed is helpful to them to be able to cover everything asked for. Candidates do need to be clear about the distinction between weathering and erosion and be able to discuss these using accurate terminology. With long answer questions of this nature it is also worthwhile checking back to the question to ensure they are answering what they are asked about and have not only focused on just one aspect.

Question 5(b)

- (b) Describe the features of a sandy shore ecosystem **and** outline how the organisms that live there are adapted to cope with the abiotic factors in this environment.

Sandy shores have a gentler slope¹, with similar size particles that can easily be
moved,² so it is an unstable environment. This means there is little firm substrate
to attach to,³ so organisms have to burrow to be safe.⁴ Because of few places for
attachment, there are few primary producers here, so organisms have to be
generalist feeders⁶ and occupy a wide ecological niche.⁵

[7]

Examiner comment

The candidate shows a good ⁵ understanding of this topic. They have considered the features that make a sandy shore, and correctly identified three features, gentle slope (MP7), ¹ particles easily moved (MP2) ² and lack of firm substrate for attachment (MP5). ³ They have then thought about how this would affect adaptations of the organisms living there, burrowing for safety (MP 12 and 13), ⁴ and needing to have a wide ecological niche (MP12). They have also stated there would be few primary producers present, which

is getting towards the mark for low productivity, but is not quite enough for MP8, however, it was considered to be just enough for the low food availability mark (MP9). ⁶The candidate scores full marks here.

Total marks awarded = 7 out of 7

Common mistakes

Candidates need to ensure they address all parts of a question; this asks for features of a sandy shore and adaptations of organisms, so candidates must make some points on both parts of the question in order to achieve full marks. There are a large number of possible mark points to score on, so by taking a few minutes to think about their answer, most candidates should score on some mark points. Candidates do need to be sure to include features that are only relevant to sandy shores, so stating the tide comes in and out is relevant to all shores, as desiccation is on rocky shores.

Question 5(c)

(c) Mangrove forests develop in the littoral zone of some tropical and subtropical coasts.

Explain how the red mangrove, *Rhizophora mangle*, is adapted to this environment.

They have prop roots that rise out of the water so they can get oxygen, because ¹the muddy sediment they grow in does not contain much oxygen. Their leaves have a thick epidermis forming a waxy cuticle that reduces water loss from the leaves. ²

[5]

Examiner comment

The candidate has considered what they know about these plants and their adaptations and made clear links. Although they have only mentioned two of the adaptations, they have explained how these adaptations help the plant in their environment. By stating the prop roots required to obtain oxygen, as the sediment is low in oxygen, they have achieved MP's 3, 5 and 6. ¹They do not achieve MP4 as they have not mentioned stability of the plant. They recognise that the leaves are thickened, and give a good reason for that. ²This candidate achieves full marks.

Total marks awarded = 5 out of 5

Common mistakes

There are four adaptations they could mention, so they do need to explain how at least one of these would benefit the plant. Some candidates will talk almost exclusively about the conditions for mangroves to grow in, mentioning 'adequate' light intensity, 'suitable' temperature and salinity, which is not addressing the question. Candidates could list some of the environmental factors that make it a challenging environment to live in and then state what adaptations the plants have to overcome these difficulties.

Paper 1 – Question 6

Question 6(a)

- 6 (a) Water is an unusual substance because its solid form, ice, floats on its liquid form.

Explain the importance of this to marine life.

Ice can act as a surface for animals like Penguins and Seals to live on, or escape from predators, such as whales.

When it covers a large area, it could kill animals as they can't reach the surface to get oxygen.

It's white so it reflects sunlight and makes the ocean heat up less.

[5]

Examiner comment

The candidate has recognised that the ice can provide a habitat for animals and achieved MP 1. ¹ They were just awarded MP2, as they mentioned the surface and named some large species which may reside on them for short or longer periods of time. ² They seem unsure of the topic and do not show an understanding of the importance of sea ice to marine life in colder areas of the oceans.

Total marks awarded = 2 out of 5

Common mistakes

Candidates may try to explain why ice floats on water rather than answering the question asked.

Question 6 (b)

- (b) Using examples, discuss the importance of maintaining **global** marine biodiversity in terms of the services it provides.

The oceans cover over 70% of the Earth, so are important. They may contain species that could provide medicines for people that haven't been discovered yet.

Phytoplankton are photosynthesisers, so absorb man-made CO₂ to make food for other organisms, so could help reduce effects of climate change.

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[5]

Examiner comment

The candidate has considered biodiversity and the services it provides, but not given many named examples as requested in the question. The candidate mentioned medicines to achieve MP 1, ¹ but has not given an example. They have applied their knowledge that carbon dioxide is absorbed by phytoplankton, and would be awarded MP8 and MP9 for climate control as they mention man-made carbon dioxide and reducing the effect of climate change. ² They would also be awarded MP3 for 'food source for organisms', even though this was rather vague, and they didn't name an example. ³ This candidate achieves 4 of the 5 marks. They need to provide some examples, as directed in the question, and could have achieved another mark if they had expanded on the phytoplankton making food for other organisms, by talking about the phytoplankton being eaten by fish which are harvested.

Total marks awarded = 4 out of 5

Common mistakes

Candidates need to ensure that they direct their answers to both the services provided and examples they know of in the marine environment. Some candidates may talk in vague terms about the importance of biodiversity by comments such as 'biodiversity is good to keep species alive and prevent them from going extinct', which is not linking to services provided by organisms. Some candidates may have little time left at this point and end up giving only a brief answer. Candidates need to ensure they manage their time well during the exam.

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