

Questions

Q1.

Since 2003, in France, people have been buying Siberian chipmunks as pets but then releasing them into the wild when they are no longer wanted.

They are now classified as an invasive species.

Figure 25 shows a Siberian chipmunk (*Tamias sibiricus*).



© 2011, Søren Brøndum Christensen

Figure 25

The black-legged tick (*Ixodes scapularis*) is a parasite that feeds on the blood of animals including Siberian chipmunks and humans.

The tick transmits the Lyme disease pathogen.

Figure 27 shows the number of cases of Lyme disease in humans in France in 2003 and 2015.

Number of cases of Lyme disease in humans in France	
2003	2015
9 500	27 000

Figure 27

(i) Calculate the percentage increase in the number of cases of Lyme disease in humans in France from 2003 to 2015.

(2)

..... %

(ii) Explain why there has been an increase in the number of cases of Lyme disease in humans in France.

(2)

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(Total for question = 4 marks)

Q2.

Figure 24 shows the world human population from 1800 to 2015.

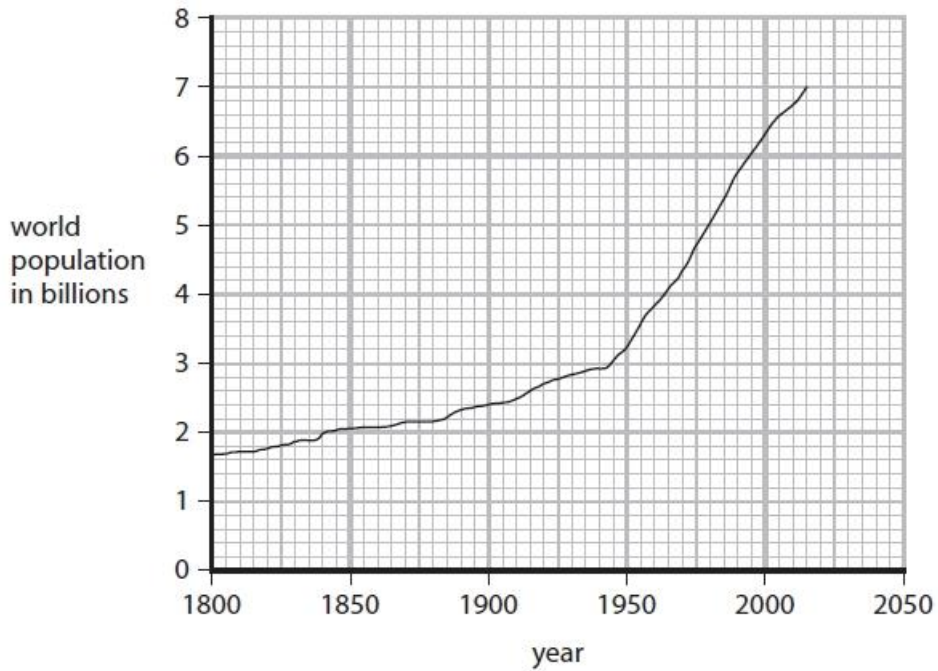


Figure 24

In 2015, 13% of the world human population were classified as malnourished.

Calculate, using Figure 24, how many people were classified as malnourished in 2015.

..... billion

(Total for question = 2 marks)

Q3.

Figure 8 shows the mass of meat eaten in the world from 1980 to 2010.

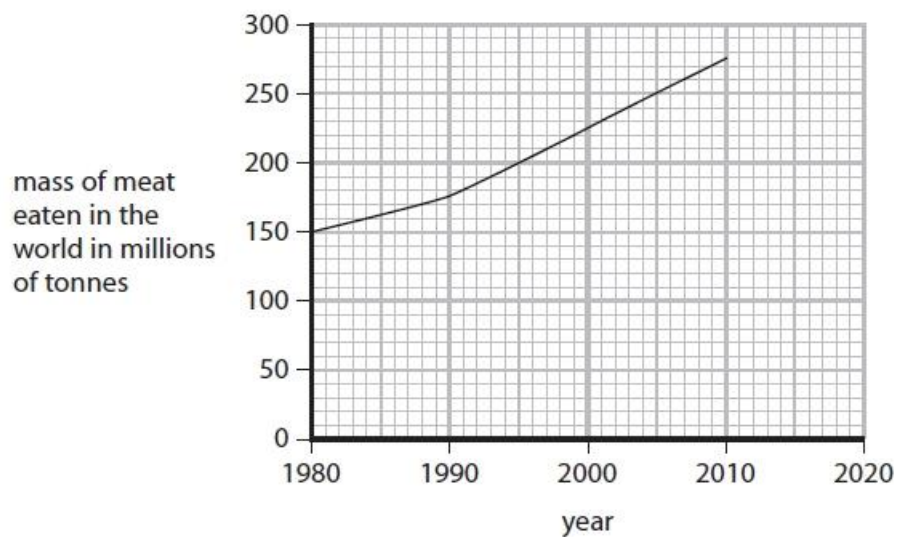


Figure 8

Calculate the rate of increase in the mass of meat eaten in the world from 2000 to 2010.

..... millions of tonnes per year

(Total for question = 2 marks)

Q4.

Figure 14 shows a field of a crop in one area of Africa.

The crop cannot be eaten by people.

The crop is used to produce biofuel.



(Source: © KAMBOU SIA/Stringer/Getty Images)

Figure 14

Describe the advantages and disadvantages of growing this crop to produce biofuel.

(6)

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(Total for question = 6 marks)

Q5.

(a) A group of students investigated the level of pollution in two different streams, A and B.

Figure 14 shows the student's results.

indicator species	total number in	
	stream A	stream B
Mayfly nymph	4	0
Caddis fly larva	29	0
Stonefly larvae	74	1
Water louse	34	4
Bloodworm	10	45
Sludge worm	2	100

Figure 14

Mayfly nymphs, caddis fly larvae and stonefly larvae are indicators of clean water.

(i) Calculate the percentage of organisms in stream A that are clean water indicators.

Give your answer to two significant figures.

(2)

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(ii) Use the results to explain which stream is more polluted.

(2)

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The students investigated a third stream, which is very slow flowing and runs through an area where intensive farming methods are used.

Figure 15 shows the thick layer of algae formed on top of this stream.



Figure 15

(b) Explain the effect of this algal growth on the organisms in the stream.

(4)

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(Total for question = 8 marks)

Q6.

Figure 26 shows an energy pyramid.

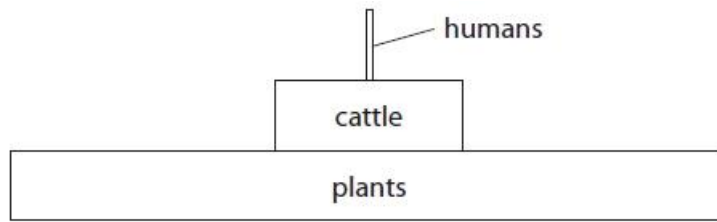


Figure 26

(i) Explain why the area labelled cattle is smaller than the area labelled plants.

(2)

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(ii) The World Health Organisation uses this definition of food security.

'When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life'

Explain how a large increase in the mass of meat eaten will decrease food security in the future.

(3)

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(Total for question = 5 marks)

Q7.

Increased nitrates can cause eutrophication in lakes.

Explain how eutrophication will affect the fish living in the lakes.

(3)

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(Total for question = 3 marks)

Q8.

In Ireland during the 19th century, a mould caused potato plants to rot.

Explain how this mould affected food security in Ireland.

(2)

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(Total for question = 2 marks)

Q9.

Figure 19 shows water lilies growing in a lake in Europe.



© lynn gladwell/123RF

Figure 19

(i) One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 19.

Explain why this non-indigenous plant now covers the whole surface of the lake.

(3)

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(ii) Explain how the water lilies will affect the biodiversity of this lake.

(3)

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(Total for question = 6 marks)

Q10.

This pond is affected by eutrophication.

Explain **one** possible cause of eutrophication.

(2)

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(Total for question = 2 marks)

Q11.

* (Reforestation has a beneficial effect on air composition and biodiversity.

Animal conservation projects can also have a beneficial effect on biodiversity.

Explain the beneficial effects of reforestation and animal conservation projects.

(6)

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(Total for question = 6 marks)

Q12.

Answer the questions with a cross in the boxes you think are correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

The population of native white-clawed crayfish in English rivers is decreasing due to an increasing population of American imported signal crayfish.

Figure 1 shows a white-clawed crayfish.

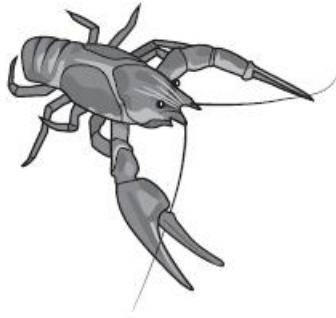


Figure 1

(i) Which term is used to describe the American imported signal crayfish now that it is living in English rivers? (1)

- A indigenous species
 B non-indigenous species
 C non-invasive species
 D pathogenic species

(ii) American imported signal crayfish may eat white-clawed crayfish.

Explain **one** other reason why the increasing population of American imported signal crayfish may have caused the decrease in white-clawed crayfish. (2)

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(iii) The Environment Agency is developing methods of increasing the population of white-clawed crayfish in English rivers.

Which term describes these methods? (1)

- A mutation
 B conservation
 C predation
 D mutualism

(iv) White-clawed crayfish cannot survive in rivers with a low concentration of oxygen.

Explain how eutrophication can cause the population of white-clawed crayfish to decrease.

(3)

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(Total for question = 7 marks)

Q13.

Figure 3 shows water lilies growing in a lake in Europe.



© lynn gladwell/123RF

Figure 3

One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 3.

Explain why this non-indigenous plant now covers the whole surface of the lake.

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(Total for question = 3 marks)

Q14.

The increasing human population is affecting farming and the habitats of animals.

Figure 12 shows the human population of the UK from 1960 to 2018.

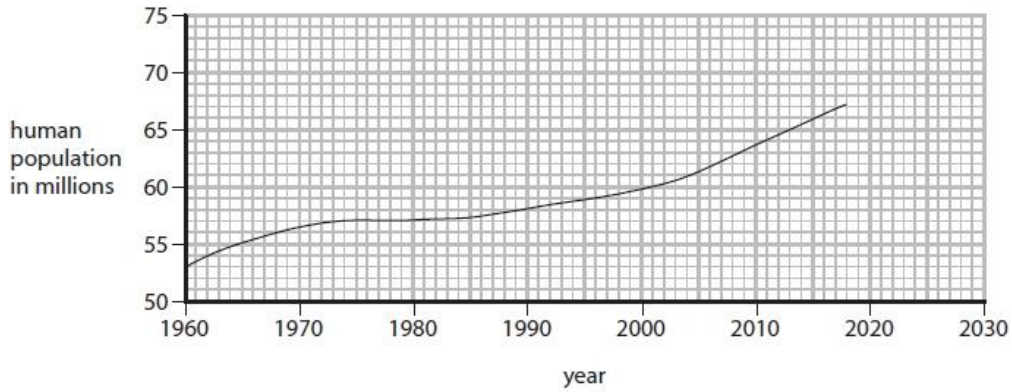


Figure 12

Extend the line to estimate the human population of the UK in 2030 if this trend continues.

(1)

..... million

(Total for question = 1 mark)

Q15.

(i) Excess fertilisers can cause a build-up of nitrates in the rivers and lakes.

State the name given to a build-up of nitrates in the lake.

(1)

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(ii) State why the build-up of nitrates is less likely to affect a river than a lake.

(1)

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(Total for question = 2 marks)

Q16.

Food security means that a population has enough safe and healthy food.

Which of these would improve food security?

(1)

- A** increased reforestation
- B** increased animal farming
- C** increased human population
- D** increased crop yield

(Total for question = 1 mark)

Q17.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

(i) Flatworms from New Zealand that eat slugs are now living in the UK.

Which term describes a species from one country that is living in another country?

(1)

- A pathogenic
- B non-pathogenic
- C indigenous
- D non-indigenous

(ii) Figure 5 shows tiny white animals called mites on the skin of a slug.

The mites feed on blood.

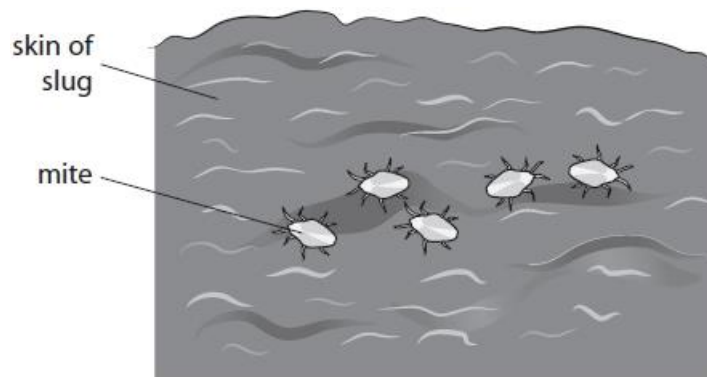


Figure 5

Explain why these mites are classed as parasites.

(2)

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(Total for question = 3 marks)

Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	Substitution $27\,000 - 9\,500 = 17\,500$ (1) Evaluation $(17\,500 \div 9\,500) \times 100 = 184.2 / 184$ (%)	award full marks for correct answer with no working accept answer to any number of decimal places rounded correctly from: 184.2105263158	(2) AO 2 1

Question number	Answer	Mark
(ii)	An explanation including the following: <ul style="list-style-type: none"> • (the number chipmunks in the wild have increased) {so the ticks have more food / there are more ticks} (1) • so humans are more likely to be bitten (and contract Lyme disease) (1) 	(2) AO 2 1

Q2.

Question number	Answer	Mark
	7 (billion) (1) 0.91 (billion)	(2) AO2.2 award full marks for answer without working accept 910 000 000 for 1 mark

Q3.

Question number	Answer	Additional guidance	Mark
	substitution (from graph) increase = $275 - 225 (= 50)$ (1) evaluation rate = $50 \div 10 = 5$	accept tolerance +/- 2 for graph readings accept values of 4.6 to 5.4 award full marks for answer without working	(2) AO2.1

Q4.

Question number	Indicative content	Mark												
*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <table border="0"> <thead> <tr> <th><u>Stated Advantage</u></th> <th><u>Details of advantage</u></th> </tr> </thead> <tbody> <tr> <td>• provides jobs / can sell biofuels</td> <td>• more money to spend /in local economy</td> </tr> <tr> <td>• carbon neutral</td> <td>• does not add to greenhouse gases / global warming</td> </tr> <tr> <td>• renewable / will not run out</td> <td>• Less dependent on fossil fuels / fossil fuels last longer</td> </tr> <tr> <td>• provides fuels locally</td> <td>• allows more local development /fuels are cheaper</td> </tr> <tr> <td>• less transport of (other) fuels</td> <td>• reduces fuel costs / pollution</td> </tr> </tbody> </table>	<u>Stated Advantage</u>	<u>Details of advantage</u>	• provides jobs / can sell biofuels	• more money to spend /in local economy	• carbon neutral	• does not add to greenhouse gases / global warming	• renewable / will not run out	• Less dependent on fossil fuels / fossil fuels last longer	• provides fuels locally	• allows more local development /fuels are cheaper	• less transport of (other) fuels	• reduces fuel costs / pollution	(6) AO2.1
<u>Stated Advantage</u>	<u>Details of advantage</u>													
• provides jobs / can sell biofuels	• more money to spend /in local economy													
• carbon neutral	• does not add to greenhouse gases / global warming													
• renewable / will not run out	• Less dependent on fossil fuels / fossil fuels last longer													
• provides fuels locally	• allows more local development /fuels are cheaper													
• less transport of (other) fuels	• reduces fuel costs / pollution													

	Stated Disadvantage	Details of disadvantage	
	<ul style="list-style-type: none"> costs to set system up machinery used uses land to grow biofuel crop high water demand (to irrigate) loss of habitat /deforestation leaves are poisonous 	<ul style="list-style-type: none"> may end up being controlled by outside organisation may prevent starting growing biofuels may offset savings/ cause pollution less food crops grown /food shortages / less food security less water for drinking / irrigation (for other crops) reduction in biodiversity / extinction of species reduce biodiversity 	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. Presents a description with some structure and coherence.
Level 2	3-4	Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. Presents a description that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. Presents a description that has a well-developed structure which is clear, coherent and logical.

Q5.

Question number	Answer	Additional guidance	Mark
(a)(i)	<ul style="list-style-type: none"> $107 \div 153$ (1) $0.699\ 3464 \times 100 = 70\%$ (1) Answer to 2 significant figures	award full marks for correct numerical answer without working	(2)

Question number	Answer	Additional guidance	Mark
(a) (ii)	<p>An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark):</p> <ul style="list-style-type: none"> stream B is more polluted than stream A (1) <p>Plus one from:</p> <ul style="list-style-type: none"> (because) stream A contains stonefly larvae/mayfly larvae/caddis fly larvae (which are indicators of clean water) (1) (because) stream B contains larger numbers of blood worm and sludge worm (which are indicators of polluted water) (1) 	<p>accept other correct indicators from the table.</p> <p>accept higher oxygen levels in place of clean water</p> <p>accept lower oxygen levels in place of polluted water</p>	(2)

Question number	Answer	Mark
(b)	<p>An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (3 marks):</p> <ul style="list-style-type: none"> plants growing on the bottom of the stream will be unable to receive sunlight due to the thick layer of algae (1) these plants will not be able to photosynthesise and will die and start to decompose (1) the microorganisms decomposing the plants will respire, removing oxygen from the water (1) the stream will become anoxic/oxygen depleted and other respiring organisms (plants and animals) will not be able to survive so biodiversity will be reduced (1) 	(4)

Q6.

Question number	Answer	Additional guidance	Mark
(i)	<p>An explanation including two from:</p> <ul style="list-style-type: none"> there is less energy in the cattle than in the plants (1) not all of the energy from the plants is passed on to the cattle (1) because not all plant material is digested / eaten (1) and some energy is used for respiration / movement / metabolism (1) 	<p>accept plants are eaten by cattle</p> <p>accept excretion</p>	(2) AO2.1

Question number	Indicative content	Additional guidance	Mark
(ii)	<p>An explanation linking three of the following:</p> <ul style="list-style-type: none"> • there will be less food for people to eat (1) • farming meat does not produce as much food (per acre as arable farming) (1) • so more land used for {meat farming / animal feed} (1) • means less {arable land / food (crops) grown for humans} (1) 	<p>accept a diet including a large amount of meat has health implications e.g. high cholesterol (1)</p>	<p>(3) AO2.1</p>

Q7.

Question Number	Answer	Mark
	<p>An explanation linking:</p> <ul style="list-style-type: none"> • nitrates cause algal bloom / {rapid / excessive / over} growth of algae (1) • algae / water plants (lower in the water) are deprived of light (1) • these algae / water plants die (1) • oxygen concentration in water decreases (due to decomposition) / less photosynthesis (1) • so fish die (1) 	<p>(3) AO1 1</p>

Q8.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation including two from:</p> <ul style="list-style-type: none"> • food security will have decreased (1) • (because there was) less food / a reduced variety of food (1) • because {food / potatoes} {did not develop / could not be harvested / food could not be obtained from other countries} (1) 	accept other valid reasons to explain why food security is reduced	(2) AO2.1

Q9.

Question number	Answer	Mark
(i)	<p>An explanation linking three from the following:</p> <ul style="list-style-type: none"> • because {conditions / named conditions} are suitable for {growth / photosynthesis} / conditions similar to native conditions / it is adapted to the conditions (1) • it outcompeted the natural plants (1) • therefore, it {grows / reproduces} (1) • as no natural herbivores {eat it / restrict it} (1) 	(3) AO2.1

Question number	Answer	Mark
(ii)	<p>An explanation linking three of the following:</p> <ul style="list-style-type: none"> • biodiversity is reduced / fewer {plants / plant species} / reduced number of {animals / animal species} (1) • (fewer plants because) less light reaches the water (1) • so less photosynthesis in plants below lilies (1) • lower oxygen concentration in water / oxygen is used up by decomposers (1) • (fewer animals because) less food for animals (1) 	(3) AO2.1

Q10.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation linking two from:</p> <ul style="list-style-type: none"> • leaching / run off / fertilisers / dead organic matter (1) • (causes) a build up of nitrates / nitrates in the water (1) 	<p>accept {sewage / mineral ions}</p> <p>accept phosphates ignore nutrients</p>	(2) AO1

Q11.

Question number	Indicative content	Mark
*	<p style="text-align: center;">AO1 6 marks</p> <p>Reforestation</p> <ul style="list-style-type: none"> • reforestation is planting of trees • trees take up water from the soil • prevents erosion and reduces flooding • trees can be used for renewable resources • provides habitats • increases the rate of photosynthesis • removes carbon dioxide and releases oxygen • reduces greenhouse gases / global warming • provides a source of medicines / food for consumers <p>Animal conservation</p> <ul style="list-style-type: none"> • increase numbers of endangered species / prevent extinction • through controlled breeding programmes /reduction in poaching /maintaining habitats • generating income to fund conservation projects through zoos / animal parks / ecotourism • improves the number of animals / range of species • maintains the food web • maintains genetic diversity • allows re-introduction of animals into the wild 	(6)

Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> • no rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	<ul style="list-style-type: none"> • demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	<ul style="list-style-type: none"> • demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. • presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1-2	<ul style="list-style-type: none"> • A brief explanation of either the benefits of reforestation OR animal conservation projects. • The response refers to changes in atmospheric gases OR photosynthesis OR HOW animal conservation improves biodiversity
Level 2	3-4	<ul style="list-style-type: none"> • A brief explanation of the benefits of reforestation AND animal conservation projects • The response refers to changes a named atmospheric gas OR photosynthesis OR HOW animal conservation improves biodiversity
Level 3	5-6	<ul style="list-style-type: none"> • A detailed explanation on the benefits of reforestation and animal conservation projects • The response refers to changes in both named atmospheric gases AND HOW animal conservation improves biodiversity including why endangered species are preserved or the impact on food webs

Level	Marks	Possible responses
Level 1	1	<ul style="list-style-type: none"> • Animal conservation protects endangered species / reforestation provides habitats for animals
	2	<ul style="list-style-type: none"> • Reforestation is planting trees which take in carbon dioxide / reforestation provides habitats for animals and reduces greenhouse gases
Level 2	3	<ul style="list-style-type: none"> • Animal conservation protects endangered species and reforestation provides habitats for animals / Animal conservation protects endangered species from hunting. Reforestation is the planting of trees which provides habitats for animals.
	4	<ul style="list-style-type: none"> • Animal conservation protects endangered species so the numbers increase and reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats for animals
Level 3	5	<ul style="list-style-type: none"> • Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats and food source for animals.
	6	<ul style="list-style-type: none"> • Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees release oxygen and take in carbon dioxide. They also provide habitats and food source for animals.

Q12.

Question Number	Answer	Mark
(i)	<p>B non- indigenous species</p> <p>The only correct answer is B</p> <p><i>A is not correct because the species is not native</i></p> <p><i>C is not correct the species is invasive not non-invasive</i></p> <p><i>D is not correct because pathogens are disease causing organisms</i></p>	<p>(1)</p> <p>AO1 1</p>

Question Number	Answer	Additional guidance	Mark
(ii)	<p>An explanation linking:</p> <ul style="list-style-type: none"> • competition between species (1) • for resources / named resources (1) <p>OR</p> <ul style="list-style-type: none"> • signal crayfish may carry {microorganisms / parasites} (1) • which causes disease in the indigenous population (1) 	<p>accept for food / habitat</p> <p>accept signal crayfish have a disease</p>	<p>(2)</p> <p>AO2 1</p>

Question Number	Answer	Mark
(iii)	<p>B conservation</p> <p>The only correct answer is B</p> <p><i>A is not correct because mutation is a change in DNA</i></p> <p><i>C is not correct because predation is eating other animals</i></p> <p><i>D is not correct because mutualism is two organisms working together for mutual benefit</i></p>	<p>(1)</p> <p>AO1 1</p>

Question Number	Answer	Additional guidance	Mark
(iv)	<p>An explanation linking three from:</p> <ul style="list-style-type: none"> • eutrophication causes oxygen levels to decrease (1) • because nitrates levels in the water are increased (1) • causing an overgrowth of algae (1) • which blocks sunlight from the plants in the water (1) • plants in the water die and are decomposed (1) • by microorganisms for respiration (1) 	<p>ignore nitrogen</p> <p>accept plants on the surface for algae</p> <p>accept plants die because they can't photosynthesise</p> <p>accept decomposers for microorganisms</p>	<p>(3)</p> <p>AO2 1</p>

Q13.

Question number	Answer	Mark
	<p>An explanation including three of the following:</p> <ul style="list-style-type: none"> • because {conditions / named conditions} are suitable for {growth / photosynthesis} /conditions similar to native conditions /it is adapted to the conditions (1) • it outcompeted the natural plants (1) • therefore, it {grows / reproduces} (1) • as no natural herbivores {eat it / restrict it} (1) 	<p>(3)</p> <p>AO2.1</p>

Q14.

Question number	Answer	Additional guidance	Mark
	72 million	Accept any number between 68 and 73 million.	(1) AO3.2b

Q15.

Question number	Answer	Additional guidance	Mark
(i)	eutrophication / nitrification accept phonetic misspellings		(1) AO1.1

Question number	Answer	Additional guidance	Mark
(ii)	water is moving (so the nitrates are moved away) (1)	accept the water in lakes is still/not moving	(1) AO2.1

Q16.

Question number	Answer	Mark
	<p>D increased crop yield</p> <p>The only correct answer is D</p> <p><i>A is not correct because increased reforestation would not improve food security.</i></p> <p><i>B is not correct because increased animal farming would not improve food security.</i></p> <p><i>C is not correct because increased human population would not improve food security.</i></p>	(1) AO 1.1

Q17.

Question Number	Answer	Mark
(i)	<p>D non-indigenous</p> <p>The only correct answer is D</p> <p><i>A is not correct because pathogenic means disease causing</i></p> <p><i>B is not correct because non-pathogenic means does not cause disease</i></p> <p><i>C is not correct because indigenous means that the slugs have not come from another country</i></p>	<p>(1)</p> <p>AO1.1</p>

Question Number	Answer	Additional guidance	Mark
(ii)	<p>An explanation including:</p> <ul style="list-style-type: none"> • parasites live in / on their host (1) • parasites feed off their host (1) 	<p>accept (because the mites) live on the slug / the slug is the host (for the mites)</p> <p>accept (because the mites) feed on the slug / suck the slug's blood.</p>	<p>(2)</p> <p>AO2.1</p>