1(a). In some areas of the UK, dogwhelk numbers are decreasing. This reduces biodiversity.

Give **two** benefits of maintaining biodiversity.

1 _____

_____

2 _____

_____

[2]

(b). Sea anemones can reproduce asexually.

Give **one** advantage and **one** disadvantage of this method of reproduction.

Advantage _____

_____

Disadvantage _____

_____

[2]

(c).

(i) Sea anemones are mainly found in rock pools.

During the summer the water temperature in a rock pool can increase to a level which can be dangerous for a sea anemone.

Put a tick (✓) in the box that best explains why this temperature increase is a problem.

Enzyme catalysed reactions will speed up. ☐

Enzyme catalysed reactions will slow down. ☐

Enzymes will be killed. ☐

Enzymes will become denatured. ☐

[1]

(ii) When it rains, the concentration of the sea water in a rock pools decreases.

What effect will this change in concentration have on a sea anemone's cells?

Put a tick (✓) in the box next to the correct answer.

Some cells may burst. ☐

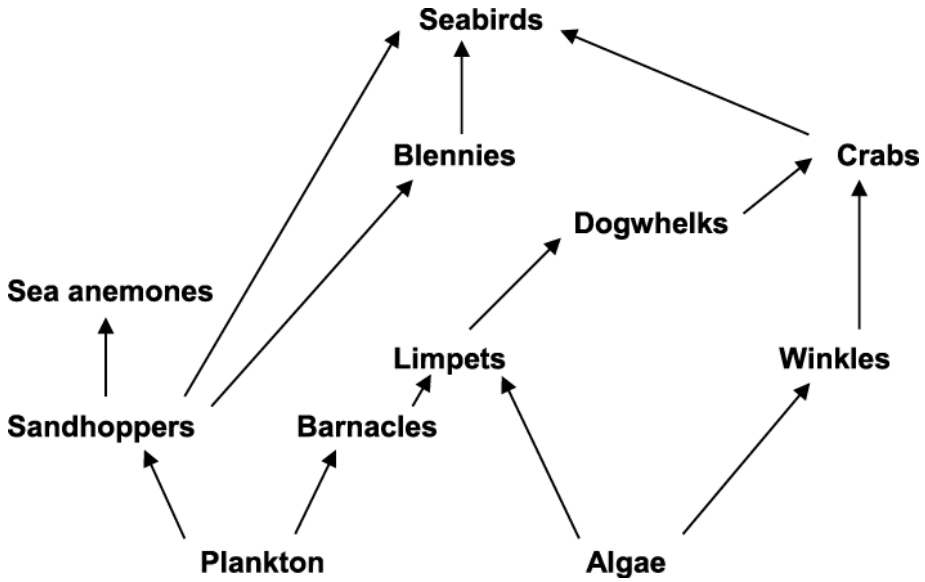
Some cells may shrink. ☐

There will be no change to the cells. ☐

Some cells will burst, others will shrink. ☐

[1]

(d). This is a food web for the species that can live on a rocky shore.



Explain the impact of an increase in the number of dogwhelks on one species in this food web.

---

[2]

2. The Neanderthal species is now extinct.

Explain what could have caused the Neanderthals to become extinct.

The quality of written communication will be assessed in your answer.

[6]

3. Which of the following statements are possible consequences of using nanotechnology in the food industry?

Put ticks (✓) in the boxes next to the **two** correct answers.

It reduces demand for food. ☐

More shops can sell the food. ☐

Farmers need less equipment to produce food. ☐

It increases the shelf life of food. ☐

It makes food taste worse. ☐

It detects contaminants in food. ☐

[2]

4(a). During the last 100 years, the area of England's natural woodland has been getting smaller.
The trees are being used as timber and the land converted to farmland.

Suggest what this is doing to biodiversity.

---

[1]

(b). Suggest how English woodland could be made sustainable.

---

[2]

5. Rafael is a farmer living in the Brazilian rainforest.

Rafael wants to manage his farming in a sustainable way.

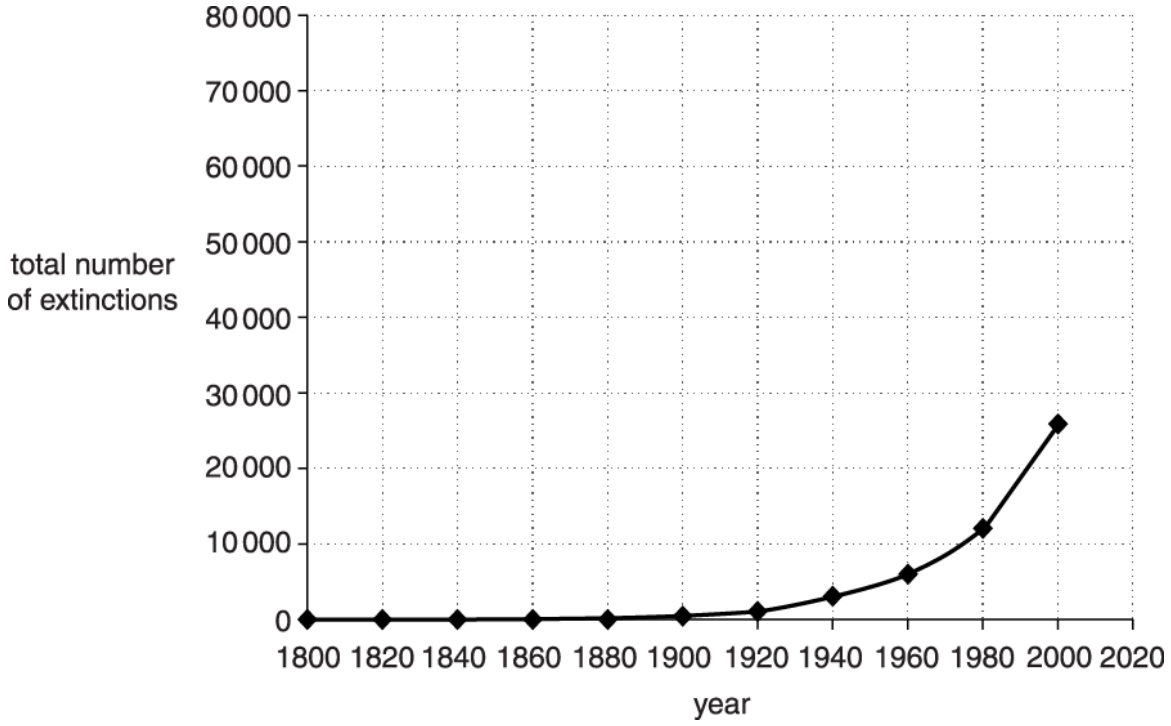
Explain how Rafael can do this.

---

[2]

6(a). Species that no longer exist are said to be extinct.

The graph shows the estimated total number of extinctions worldwide since 1800.



(i) Describe the pattern shown by the graph.

_____

_____

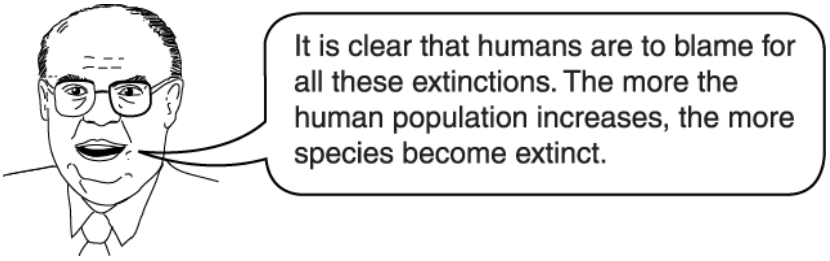
_____

_____ [2]

(ii) Continue the line on the graph to predict how many species are likely to have become extinct by 2020.

number of extinct species by 2020 = _____ [1]

(b). Boris says:



(i) Explain one reason why species extinctions increase as the human population increases.

---

[2]

(ii) Suggest and explain which part of Boris' conclusion is likely to be incorrect.

---

[1]

(c). Scientists try to prevent species becoming extinct.

Which of the following are reasons why scientists do this?

Put ticks (?) in the boxes next to the **two** best reasons.

Preventing extinctions is easy to do.	☐
Many plants and animals are dangerous.	☐
Biodiversity is important for sustainability.	☐
Scientists always work together in teams.	☐
Some plants and animals provide us with vital resources.	☐

[2]

7. A way to control insect pests is to use biological control.

Biological control is when a farmer releases a new predator that kills the insect pest.

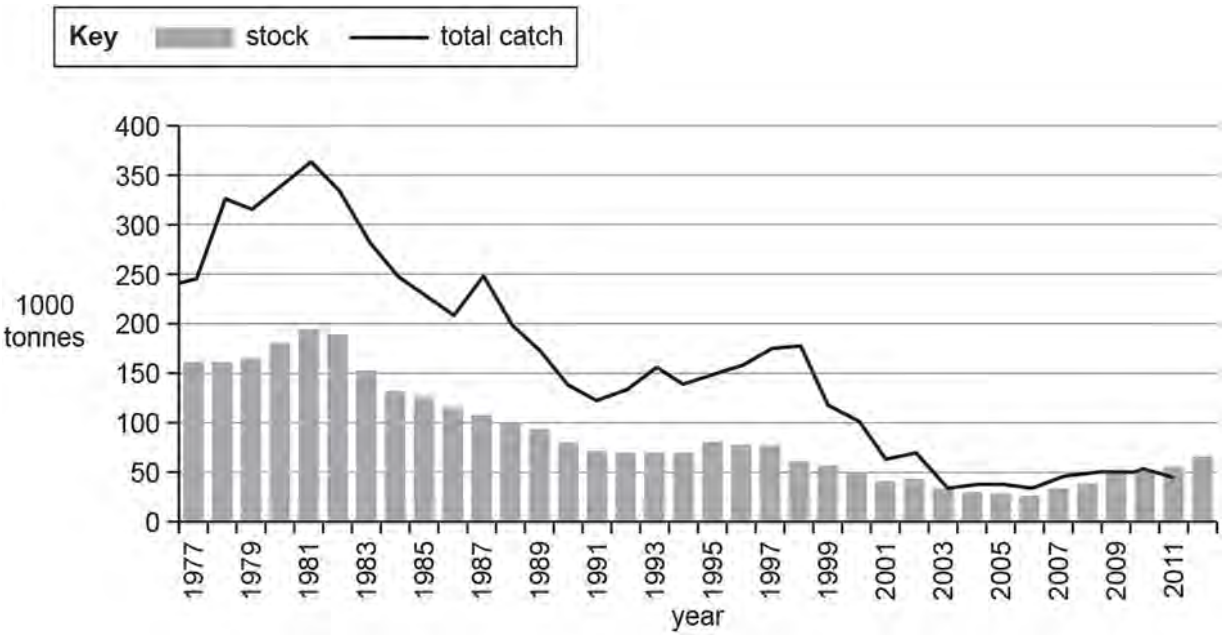
Describe **three** possible ways that releasing a new predator to kill the pests could affect the food web.

---

[3]

8. Cod is a type of fish that is served in fish and chip shops. Much of the cod sold in fish and chip shops is caught in the North Sea.

The graph shows the stocks of cod in the North Sea off the coast of Britain and the amount of cod caught (total catch).



(i) Describe and explain the trend shown in the graph.

---

[3]

(ii) In 2002 very little cod was served in fish and chip shops, instead haddock was used.

Use the graph to explain why cod was removed from the menu.

---

[1]

(iii) Human activities are having an impact on the biodiversity of the Earth.

Explain why it is important to conserve biodiversity.

---

[2]

(iv) Fish such as cod reproduce sexually.

Give one advantage of cod reproducing sexually.

---

[1]

9. Insecticides called neonics are widely used by farmers.

Neonics kill insect pests that live on crop plants.

Explain why a farmer would want to use neonics to kill insects that live on their crops.

---

[2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1	a		**Any two from** 1. Idea of interdependence ✓ 2. Example of interdependence e.g. food / shelter / reproduction ✓ 3. Maintaining genetic diversity ✓ 4. May be required in the future for medicines ✓ 5. Maintains the stability of the food web ✓	2	MP3 **IGNORE** 'genetic variation'
	b		1. Advantage: (can be) fast / no need to find a mate ✓ 2. Disadvantage: lack of genetic diversity / are all genetically identical ✓	2	MP2 **ALLOW** 'are clones' **DO NOT ALLOW** 'are all identical'
	c	i	Enzymes will become denatured ✓	1	If more than one box is ticked, do not award the mark even if the correct box is also ticked
		ii	Some cells may burst ✓	1	If more than one box is ticked, do not award the mark even if the correct box is also ticked
	d		Limpets will decrease in numbers ✓ As more are eaten ✓ **OR** Crabs will increase in numbers ✓ As more food ✓	2	**ALLOW** any correct species with correct explanation
			Total	**8**	
2			**[Level 3]** Answer includes causes AND explanations including a level 3 adaptation explanation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer includes several causes and a level 2 explanation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]**	6	**This question is targeted at grades up to C** **Indicative scientific points may include**: **Causes** *environmental conditions:* • environmental conditions changed / natural disaster • example of environmental change (e.g. change in temperature) • example of consequences of environmental change (e.g. different vegetation, affecting diet) • idea that the change was long-term (i.e. not just seasonal/temporary) *introduction of:*

Question	Answer/Indicative content	Marks	Guidance
	Answer includes only causes OR explanations. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		• a new competitor of the Neanderthals/example • a new predator of the Neanderthals/example • a new pathogen/disease/example **accept** increase in number of competitors/predators/pathogens *disappearance of another species:* • another species disappeared/died out/declined • idea that the Neanderthals ate/depended upon this species **Explanations**: **Level 1/2** • the Neanderthals could not reproduce (successfully) • not enough food • conditions too cold / too hot for them **Level 3** • the Neanderthals were not well **adapted** to the new conditions • the Neanderthals (species) did not **adapt** quickly enough **ignore** 'suited' for adapted **Use the L1, L2, L3 annotations in Scoris; do not use ticks**. **Examiner's Comments** This was the final of the six-mark extended writing questions and was the crossover question with the higher paper. This proved a challenging question in which to gain full marks and as a result fewer candidates were seen to score Level 3. A significant number of candidates took this question as a follow on from 6d, and tried to use the same arguments to answer

Question			Answer/Indicative content	Marks	Guidance
					this question. Using a food web perspective alone limited their ability to gain marks. Those candidates that approached the question from a more general perspective did better. The most common correct answers included the identification that Neanderthals had a lack of food or were unable to reproduce. For those candidates who did identify the causes of extinction, the most common answers included environmental change or natural disasters. Many candidates stated reasons such as competition or disease, but failed to identify that the competitor or disease was a new threat. Only a small number of candidates recalled that extinction is linked to an inability to adapt. Many students wrote that Neanderthals became extinct as a result of modern humans and linked this to road building, loss of habitat, being hunted for their fur or to be used in medicine. This could have been partly avoided if candidates had read the information at the start of the question more carefully. Centres could address these issues through discussion of a wide range of species that have become extinct and the reasons without focusing on the human factors.
			Total	6	
3			Increase shelf life Detect contaminants	2	**Examiner's Comments** This objective 'tick box' question part was well answered.
			Total	2	
4	a		Idea of reducing it	1	
	b		Whatever is taken is replaced	2	**Accept** descriptions e.g 'Planting new trees for every one used' = 2 marks
			Total	3	

Question			Answer/Indicative content	Marks	Guidance
5			Any two from: Use a quota; Restock; Replant; Don't use more than is replaced naturally;	2	Ignore 'will not run out' **Examiner's Comments** This area of the specification was poorly answered last year and although slightly better answered this year it still indicates that candidates are still unsure about open and closed loop ecosystems.
			Total	2	

<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>a</td><td>i</td><td>flat / no increase initially (1)
increases later (1)</td><td>2</td><td>do not allow if candidates refer to number of animals instead of number of extinctions
ignore positive correlation

Examiner's Comments

The majority of candidates scored one mark for this question, correctly identifying that the number of extinctions was increasing. Fewer candidates correctly identified that there was no initial increase.</td></tr>
<tr><td></td><td></td><td>ii</td><td>40 000 or above</td><td>1</td><td>Examiner's Comments

The vast majority of candidates scored the mark for this question, those failing to gain the mark frequently gave the number of extinctions as just below 40,000.</td></tr>
<tr><td></td><td>b</td><td>i</td><td><table><tr><th>Consequence of increased human population</th><th>Resulting impact on species</th></tr><tr><td>need for food / medicines / clothes</td><td>plants / animals killed / overhunting</td></tr><tr><td>need for housing / roads / farming land</td><td>destruction of habitats/specific example e.g deforestation</td></tr><tr><td>pollution/specific example of pollution</td><td>poisoning / kills animals / plants / destruction of habitats</td></tr><tr><td>humans introduce new species</td><td>kill others animals /plants / disrupt food webs</td></tr></table></td><td>2</td><td>one mark for correct consequence or impact
two marks only if these are in the same row of the table (as consequence and impact need to be linked)

do not allow vague reference to damage to a species

Examiner's Comments

The majority of candidates gained one mark for this question for correctly identifying a consequence of increased population. A good range of answers were observed, demonstrating candidates' knowledge of the consequences of an increasing population. Many candidates went on to develop this answer providing a result of the consequence identified. Some candidates lost the second marking point for stating two consequences rather than developing one.</td></tr>
</table>

Question			Answer/Indicative content	Marks	Guidance
		ii	not **all** extinctions caused by humans / some by natural causes e.g. natural predators, floods, disease	1	**Examiner's Comments** Many candidates lost the mark for this question for simply identifying the section of Boris' statement that was incorrect. Although this in part was correct they failed to develop the answer and explain why this was the case and as a result could not be awarded the mark.
	c		<table><tr><td>Preventing extinctions is easy to do.</td><td></td></tr><tr><td>Many plants and animals are dangerous.</td><td></td></tr><tr><td>Biodiversity is important for sustainability.</td><td>✓</td></tr><tr><td>Scientists always work together in teams.</td><td></td></tr><tr><td>Some plants and animals provide us with vital resources.</td><td>✓</td></tr></table>	2	**Examiner's Comments** The vast majority of candidates scored both marks for this question, correctly identifying why biodiversity is important.
			Total	8	
7			any three from predator kills other species / other insects; predator becomes new food source; pest is no longer available as a food source; competition between new predator & existing predators; existing predators will eat other animals; usual predators of pest not available as a food source (for tertiary consumers)	3	**ignore** extinctions **ignore** reference to pest eating other animals / insects **accept** idea of interfering with existing predators or example, eg birds which eat insects would leave **ignore** predator may eat crops **Examiner's Comments** This question was testing the candidates' ability to apply their knowledge to a new situation. Many knew that adding a new predator into a food web would disrupt it, however, the majority of candidates who gained marks wrote about competition between the new predator and existing predators. Centres would be advised to remind candidates that in such questions where there are several marks available and where a number in emboldened, in this case 3, it is important for them to write a sufficient number of different points.
			Total	3	

Question			Answer/Indicative content	Marks	Guidance
8		i	**Any two from:** correlation between amount of cod caught and stock size✓ (catch and stock) increased from 1977 to 1981 ✓ catch dropped from 1981 to 2003 ✓ stock fell from 1981 to 2006 ✓ catch and stock remained at low levels from 2003 to 2006 ✓ (catch and stock) starts to increase from 2006/7 ✓	3 (AO 3.1a × 2)	**ALLOW** as the stock levels fall so does the catch **ORA** **IGNORE** as the catch falls the stock falls / the lower the catch the lower the stock **IGNORE** over time both values decreased **ALLOW** catch was highest in 1981 and lowest in 2003 **ALLOW** stock was highest in 1981 and lowest in 2006 **If no other mark awarded allow** for 1 mark the idea that the number of fish increased then decreased
			Any one from: due to over fishing / lots of fish caught so numbers dropped ✓ they were catching fish faster than they were reproducing ✓	(AO 3.2b)	<u>Examiner's Comments</u> Candidates found this AO3 question very challenging and two thirds of them did not score any marks. There were three problem areas. Firstly, candidates did not start to describe the trend from the beginning of the graph, starting instead around 1981 and therefore saying just that the numbers of fish decreased (without linking this to appropriate dates in the graph). Secondly, candidates were distracted by the fluctuations in the graph with some describing almost every rise and fall. Finally, many candidates used up most of the answer space describing the graph with very few realising that they also had to explain the trend. Candidates that did attempt to explain the trend were confused by the term stock. Many believed that the stock meant that on shop shelves and that

Question			Answer/Indicative content	Marks	Guidance
					it was dependant on the catch. They explained at length how catching less fish meant that there was less stock to sell.
		ii	Any one from stocks were too low ✓ if fishing had continued stocks would have dropped further cod stocks so low that the species could have gone (locally) extinct if fishing continued ✓	1 (AO 3.2a)	ALLOW so cod stocks could increase IGNORE because cod stocks had decreased IGNORE because they weren't able to catch as much cod / it was difficult to get hold of cod / less cod was being caught / the catch was too low ALLOW so cod didn't go extinct <u>Examiner's Comments</u> Again, candidates misunderstood the word "stock" in this AO3 question which led to answers suggesting cod was removed because there wasn't enough being caught, and therefore "in stock" in the shops.

Question			Answer/Indicative content	Marks	Guidance
		iii	Any two from idea of interdependence ✓ example of interdependence e.g. food / shelter / reproduction ✓ maintaining genetic diversity ✓ may be required in the future for medicines / industrial materials ✓ ecosystems (with high biodiversity) are more stable / able to adjust to changing conditions ORA ✓	2 (AO 1.1 × 2)	ALLOW so food chains aren't affected IGNORE to protect living things/keep the planet safe / so species survive ALLOW species are less likely to become extinct ALLOW ecosystems with high biodiversity are more attractive e.g. for recreation or tourism Examiner's Comments This AO1 question discriminated between higher and lower ability candidates. Some were able to express ideas about interdependence and mentioned the link with finding new medicines. Other candidates seemed to have only a limited understanding of what the term biodiversity means. Candidates lost marks because their answers focused on how biodiversity can be conserved rather than why is should be. Answers were often vague and referred to pollution and other human influences on the environment, global warming and protecting habitats, ecosystems and species. Few referred to genetic diversity.
		iv	greater genetic variation in population✓	1 (AO 1.1)	ALLOW more genetic diversity Examiner's Comments Candidates misinterpreted this AO1 question, not realising the main advantage of sexual reproduction is causing genetic variation. Candidates often believed that this type of reproduction would quickly replace cod.

Question			Answer/Indicative content	Marks	Guidance
			Total	7	
9			Any two from: to protect them from pathogens/diseases carried by the insects ✓ to protect them from damage caused by insects / protect the crop from being eaten by insects ✓ to protect human food supply ✓ to protect farmer's livelihood / prevent loss of income/sales ✓ to prevent loss of crop / reduced yield ✓	2 (AO 1.1 × 2)	<u>Examiner's Comments</u> Higher ability candidates were able to answer this synoptic question well, by linking ideas about insects spreading plant diseases (B2.1.3) and the effects pests and pathogens can have on food security (B6.4.3).
			Total	2	