Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

STEM | Exam Builder

Human influences on ecosystems

Time allowed: 1 hour 25 minutes

Subject code **0610**

Biology

Questions from Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 89

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 89 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 **(a)** Modern technology has increased food production.

The boxes on the left show types of modern technology.

The boxes on the right show how modern technology has improved production.

Draw **five** lines to link the type of modern technology with the way in which it has improved food production.

modern technology	improvement in food production
agricultural machinery	able to use larger areas of land
chemical fertiliser	improve desired features in crops and livestock
herbicide	kills animal pests that damage crops
insecticide	provides nutrients to increase yield
selective breeding	reduce competition with weeds

[4]

(b) Describe **two** negative impacts to an ecosystem of intensive livestock production.

1 .....

.....

2 .....

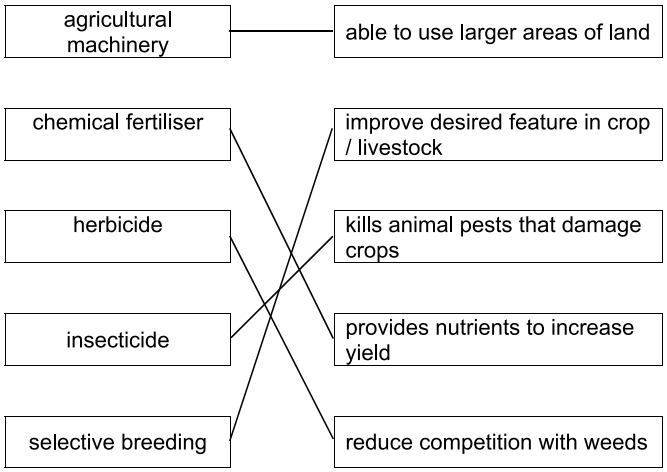
.....

[2]

[Total: 6]

Food supply Click for more variations

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1(a)		**4**	5 correct = 4 marks 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark
1(b)	loss of biodiversity ; reduction in genetic variation ; production of, (named) greenhouse gases / global warming ; water pollution / AW ; habitat destruction ;	**2**	

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2 Fig. 8.1 shows an area of land where the trees have been cut down.



Fig. 8.1

(a) (i) List **three** undesirable effects of deforestation.

1 .....

2 .....

3 .....

[3]

(ii) Deforested land may be used for growing monocultures of crop plants.

Describe the negative impacts to an ecosystem of large-scale monocultures of crop plants.

.....

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.....

..... [2]

(b) Replanting trees in deforested areas can help to conserve endangered species.

Describe **two** other ways that endangered species can be conserved.

1 .....

.....

.....

2 .....

.....

.....

[2]

[Total: 7]

Habitat destruction and deforestation Click for more variations

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2(a)(i)	*any three from:* habitat destruction ; loss of biodiversity / extinction ; loss of soil / soil erosion / desertification ; flooding / drought ; increased carbon dioxide in the atmosphere ;	**3**	
2(a)(ii)	*any two from:* loss of biodiversity / extinction of species ; *idea of* disease / pests, transferring to wild populations ; disruption of food chains / described ; loss of habitats ; pollution / described ; less water available / AW ;	**2**	
2(b)	*any two from:* ref. to seed banks ; captive breeding (programmes) / AW ; education ; idea of legislation ; keeping them in, zoos / parks / reserves ; protecting / preserving, habitats; monitoring, species / habitats ; protecting species / described ;	**2**	e.g. preventing / limiting, hunting / collecting / poaching

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3 Giant tortoises are an endangered species living on the Galapagos Islands, 600 miles from the coast of South America.

Fig. 7.1 shows a giant tortoise.



Fig. 7.1

(a) For over 300 years sailors hunted the slow-moving giant tortoises as a source of food.

They also left goats on the islands to provide food for sailors to eat in the future.

Giant tortoises and goats are both herbivores.

Use this information to suggest and explain **two** reasons why giant tortoises became an endangered species.

1 .....

.....

.....

2 .....

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.....

[4]

(b) Outline **two** ways that an endangered species can be conserved.

1 .....

.....

2 .....

.....

[2]

(c) The loss of one species can affect other organisms living in the same environment.

Suggest how the loss of one species of secondary consumer from a food web might affect other organisms in the same food web.

.....

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.....

.....

.....[2]

[Total: 8]

Conservation Click for more variations

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3(a)	*any four from:* slow and easy to catch; not enough left to reproduce; not enough grow to breeding age AW; hunting drove them out of their natural habitats; difficult to find mates; competition for food / not enough food; introduction of disease; destruction of habitat; (goats) damaged their eggs / hatchlings;	**max 4**	
3(b)	*any two from:* captive breeding program; zoos / reserves / national parks; ban hunting; conserve / protect, habitat AW; remove predators / competitors; educate / awareness / research; idea of ecotourism;	**max 2**	
3(c)	*any two from:* more, primary consumers / herbivores / prey; fewer producers; increase in the numbers of other secondary consumers; fewer, tertiary consumers;	**max 2**	
		Total: 8	

STEM | Exam Builder

4 Humans have increased food production over time.

(a) Fig. 5.1 shows how rice production increased from 1960 to 2010 in one country.

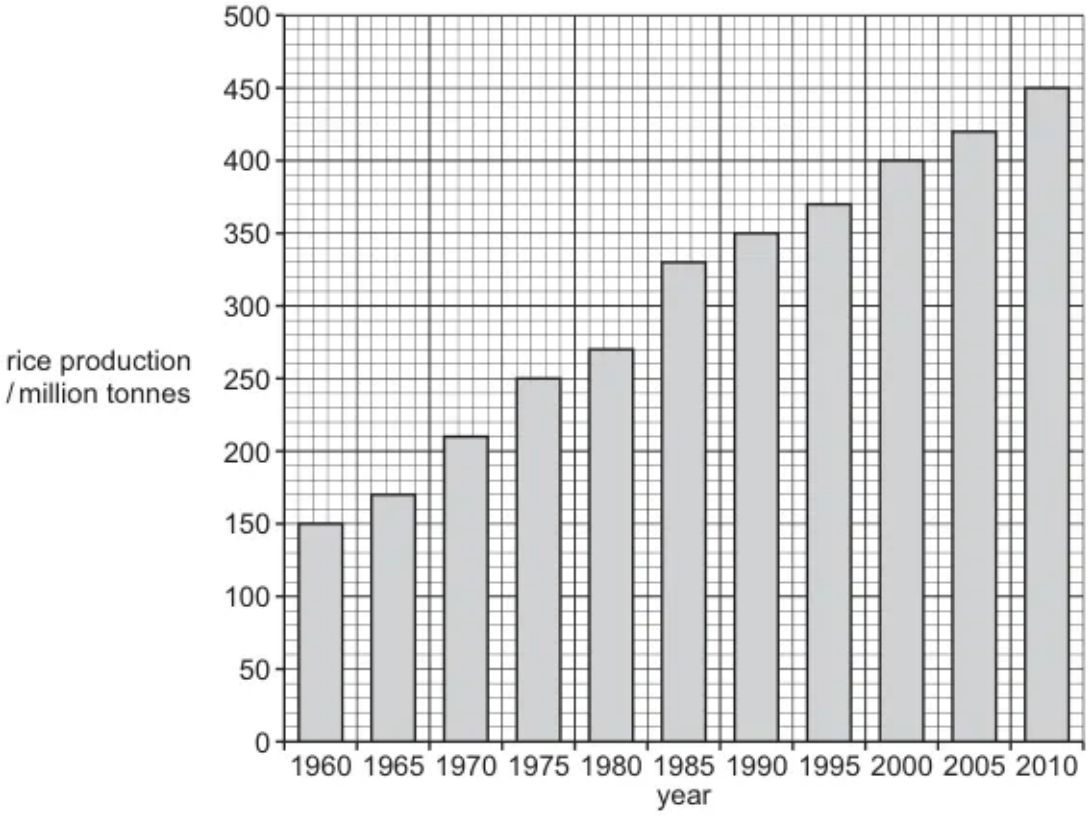


Fig. 5.1

(i) Using the information in Fig. 5.1, state the five-year period which shows the greatest increase in rice production.

from ..... to ..... [1]

(ii) Using the information in Fig. 5.1, calculate the percentage increase in rice production from 1960 to 1990.

Give your answer to the nearest whole number.

Space for working.

.....%
[3]

(b) State **three** methods that humans use to increase crop plant production.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Fig. 5.2 is a photograph of intensive farming of sheep.



Fig. 5.2

(i) Describe the advantages of intensive farming of livestock.

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..... [3]

(ii) One of the disadvantages of intensive farming of livestock is that untreated sewage from the animals can enter aquatic ecosystems.

State **two** effects of untreated sewage on aquatic ecosystems.

1 .....

.....

2 .....

.....

[2]

[Total: 12]

Measurements, tables, graphs and conclusions Click for more variations

Reduced to 77% to fit the page (wider than A4).

4(a)(i)	1980 to 1985 ;	**1**	
4(a)(ii)	133 (%) ;	**3**	MP1 correct readings from graph MP2 correct value calculated to any number of decimal places i.e. ((200 ÷ 150) × 100 =)133.33 recurring MP3 evidence of correct rounding to a whole number **ecf** from previous step
4(b)	*any three from:* fertiliser use ; herbicide use ; insecticide use ; selective breeding ; use of agricultural machinery ; monoculture ; genetic modification ; **AVP** ;	**3**	e.g. clear more land / irrigation
4(c)(i)	*any three from:* less energy used, for movement / maintain body temperature ; (so) more energy used for growth / AW ; increased yield / more product / more people able to be fed ; more profit / cheaper product ; less land needed (for livestock) / more land available for other uses ; *idea of* easier to care for animals ; use, technology / machinery, so less manual labour needed AW ; protection from predators ; **AVP** ;	**3**	
4(c)(ii)	*any two from:* pollution ; fish / other aquatic life, die (due to lack of oxygen) ; decreased biodiversity ; food chains / webs, are affected / described ; spread / cause, of disease / pathogen ; habitat destruction ; **AVP** ;	**2**	e.g. less oxygen in the water

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5 **(a)** State **one** source of methane gas.

..... [1]

(b) Fig. 8.1 is a graph showing the estimated change in methane concentration in the atmosphere over a thousand-year period.

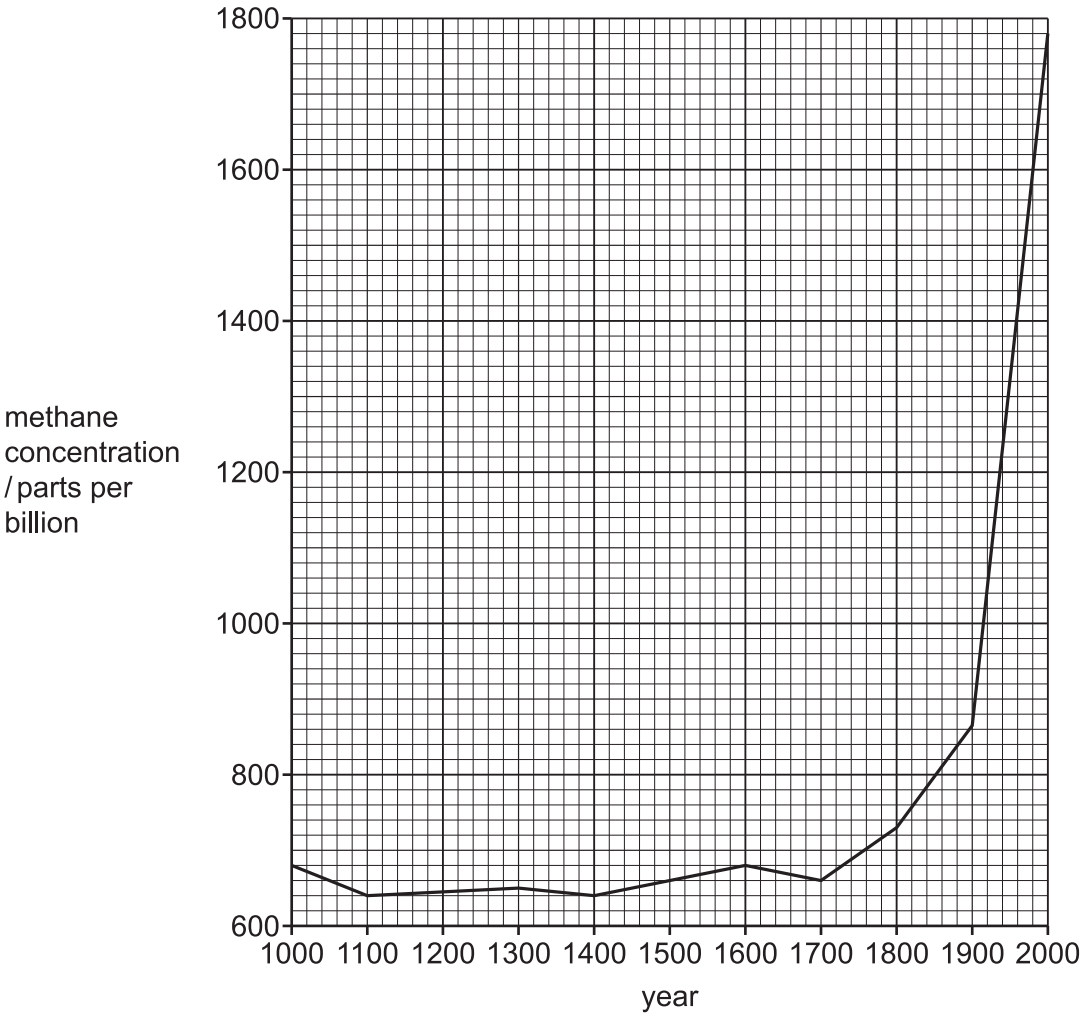


Fig. 8.1

Complete the sentences to describe the changes in methane concentration shown in Fig. 8.1.

The general trend is for methane concentration to ..... .

The concentration of methane was the same in the year 1000 and in the year ..... .

Over the thousand-year period shown in the graph, the concentration of methane has increased by ..... parts per billion.

[3]

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(c) **(i)** State **one** process, other than respiration, that releases carbon dioxide into the atmosphere.

..... [1]

(ii) State **two** effects on the environment of increasing carbon dioxide and methane concentrations in the atmosphere.

1 .....

2 .....

[2]

(iii) State **one** natural process that removes carbon dioxide from the atmosphere.

..... [1]

(d) Yeast can be used to produce ethanol for use as a biofuel.

(i) State the name of the process used by yeast to produce ethanol.

..... [1]

(ii) Large amounts of ethanol are required as a biofuel.

Maize is a food plant that is also used to produce ethanol as a biofuel.

Maize grown for ethanol production is grown in large-scale monocultures.

Describe the **disadvantages** of growing crop plants such as maize in a large-scale monoculture.

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..... [3]

[Total: 12]

Measurements, tables, graphs and conclusions Click for more variations

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5(a)	*any one from:* rice fields / wetlands ; cattle / livestock ; AVP ; e.g., melting permafrost / termites / wildfires / (burning) fossil fuels / natural gas / fracking	**1**	
5(b)	increase ; 1600 / 1720 ; 1100 ;	**3**	 **A** value in range 1720 to 1730 **A** value in range 1080 to 1100
5(c)(i)	combustion ;	**1**	**A** decomposition / decay
5(c)(ii)	*any two from:* enhanced greenhouse effect ; climate change / global warming / global heating ; large scale changes in weather patterns / extreme weather events ; sea level rising / ice caps melting ; reduction in biodiversity / extinction ;	**2**	
5(c)(iii)	photosynthesis / AVP ;	**1**	
5(d)(i)	anaerobic respiration / fermentation ;	**1**	
5(d)(ii)	*any three from:* reduces nutrient level in soil / requires more use of fertilisers ; encourages pests / requires more use of pesticides ; (leads to) increased pesticide resistance ; requires more water / irrigation ; contamination of water / increased run-off / pollution ; increases soil erosion ; lack of biodiversity ; loss of habitats / deforestation ; less land available for food crops ; AVP ; e.g., requires more fossil fuel energy	**3**	

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6 Wetlands are internationally important ecosystems. The spoon-billed sandpiper, *Calidris pygmaea*, is an endangered species.

Fig. 6.1 shows a spoon-billed sandpiper feeding in a wetland ecosystem. The wetland is a stopover on the bird's long migration from north-east Russia to south-east Asia.

The smaller photograph is a close-up of the bird's legs to show that it has been ringed.



Fig. 6.1

Spoon-billed sandpipers stop to feed at the Rudong mudflats near Shanghai, China.

Putting one or more rings on a bird's leg is a common way to identify individual birds. Spoon-billed sandpipers ringed in Russia have been seen at the Rudong mudflats.

(a) Suggest why scientists put leg rings on birds, such as the spoon-billed sandpiper.

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..... [2]

STEM

(b) Explain why it is important to conserve ecosystems, such as wetlands.

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..... [5]

[Total: 7]

Conservation Click for more variations

6(a)	1 ringing allows <u>monitoring</u> of, species / population; 2 to check on (population) numbers; 3 find out about life span; 4 to find out where they go (during migration) / to track their position; 5 find out how far birds travel; 6 to find out when they migrate; 7 allows checks on, health of birds / survival rates; 8 breeding success; 9 do not harm the birds / do not make them obvious to predators; 10 AVP; e.g. information from ringing is used in conservation	**2**	I 'to track them' unqualified
6(b)	1. to prevent <u>extinction</u>; 2. maintain biodiversity; 3. provide feeding grounds for animals / ref. to disruption of <u>food, chains / web</u>; 4. provide, breeding grounds / places for breeding; 5. provide, habitats / shelter; 6. vulnerable to the effects of, development / drainage / AW; 7. ref to flooding / natural disasters; 8. ref to nitrogen cycle; 9. ref to maintenance of water cycle; 10. ref to carbon cycle; e.g. greenhouse gas / carbon storage / carbon sink 11. waste disposal; 12. provide, resources / food / fuel / drugs / raw materials; 13. idea of areas for, recreation / (eco)tourism / education; 14. ethical reasons / aesthetic reasons / AW; 15. AVP; e.g. soil erosion	**5**	I food chain (singular)
		Total: 7	

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7 Fig. 6.1 shows the Calayan rail, *Gallirallus calayanensis*, a flightless bird that inhabits Calayan Island in the Philippines. This species of bird was discovered in 2004.



Fig. 6.1

(a) State the name of the genus of the Calayan rail.

..... [1]

Many bird species are threatened by deforestation.

(b) Suggest three reasons why deforestation occurs.

1 .....

2 .....

3 ..... [3]

(c) Suggest the likely effects of deforestation on populations of bird species.

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..... [3]

(d) Some species of birds, such as the Calayan rail, are endangered.

Outline the reasons why it is important to conserve species.

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..... [2]

[Total: 9]

Habitat destruction and deforestation Click for more variations

7	**(a)**		*Gallirallus* ;	[1]	**R** *Galliralus calayanensis*
	(b)		*(clearing land for)* agriculture ; roads / transport ; housing ; fuel ; timber qualified ; e.g. for building material AVP ; e.g. mining / industrialisation	[max 3]	**A** furniture manufacture / paper
	(c)		*decrease* habitat loss ; fewer nesting sites ; less reproduction ; ref to, camouflage / exposed to predation ; less food / food chain disrupted ; more competition ; higher temperature / more exposure to storms / AW ; *increase* fewer predators ; more food ; fewer competitors ; simpler food web ;	[max 3]	**No credit for** 'decrease' / 'extinction' / 'increase' without qualification
	(d)		*Question asks for reasons why conserving species is important – answers must be in this context* *ecological* ref to food chain / food web ; interdependence / AW ; *aesthetic* species are unique / AW ; (eco)tourism ; ref to biodiversity ; retain genes / maintain gene pool / AW ; qualified potential use for humans ; AVP ; e.g. ethical considerations for future generations to appreciate	[max 2]	**R** 'become extinct' without further qualification **A** maintain / balance ecosystem **A** 'knock-on' effects / possible example / AW
			[Total: 9]		

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8 Marine conservationists are concerned that fish stocks in the sea are decreasing. Drastic measures will have to be taken to stop the extinction of many fish species.

Fig. 5.1 shows a marine food web. Tuna are large carnivorous fish that are an important human food. Dolphins may be caught in fishermen's nets and die.

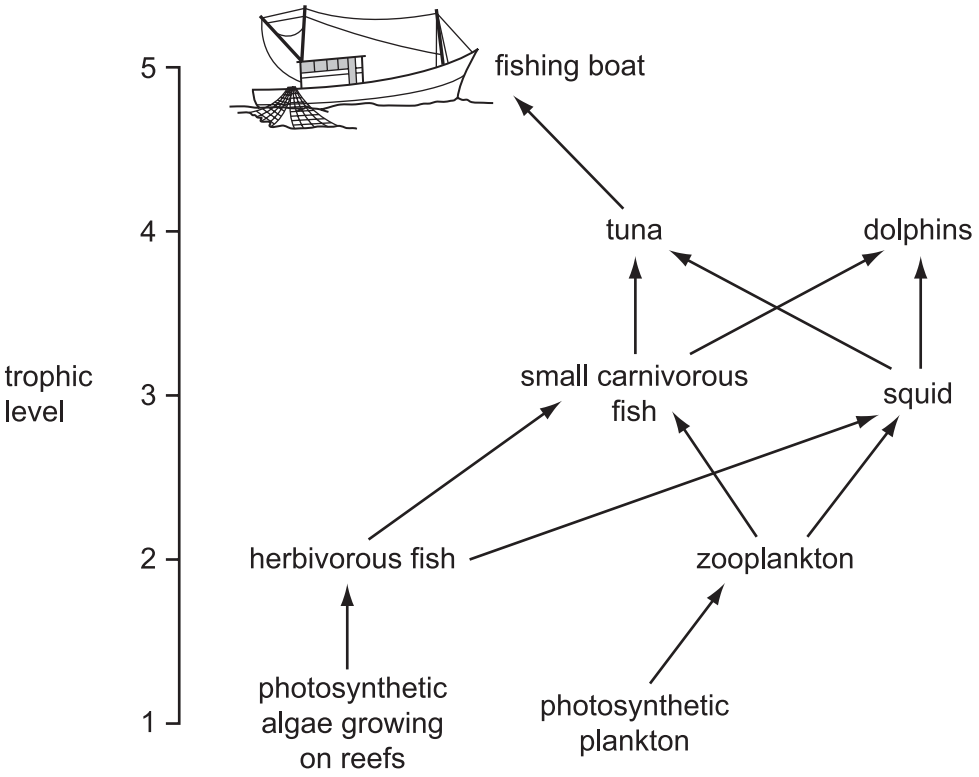


Fig. 5.1

(a) State the names given to trophic levels **1** and **3**.

1 .....

3 ..... [2]

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(b) Explain why it is more energy efficient for humans to eat herbivorous fish rather than tuna.

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..... [3]

(c) Explain why it is necessary to conserve animals, such as tuna and dolphins, which are at trophic level 4.

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..... [4]

(d) Many seas are polluted by non-biodegradable plastics.

Suggest the likely effects of this pollutant on the marine environment.

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..... [2]

[Total: 11]

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Conservation Click for more variations

8 **(a)**	**1** – producer ; **2** – <u>secondary</u> / <u>2nd level</u> / <u>2nd order</u> , consumer ;		[2]	
(b)	**1** **2** **3** **4** **5** **6** **7** **8**	*idea that* energy is lost, along the food chain / at each trophic level / between trophic levels ; *idea that* 90% lost between trophic levels / 10% passed on ; respiration / movement / heat loss / metabolism ; excretion ; food not eaten / food not digested / ref. to egestion / AW ; tuna / top carnivores, are in smaller numbers ; more energy available in, trophic level 2 / herbivorous fish, than in, level 4 / tuna or dolphins ; AVP ;	[max 3]	
(c)	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11**	*idea that* if not conserved they would become extinct ; ref. to, maintaining numbers of other species in food web / disruption of food web / maintaining balance in food web ; maintaining (bio)diversity ; so increase in number of, carnivorous fish / squid / trophic level 3 ; reduction in, herbivores / herbivorous fish / zooplankton / tropic level ; less food available for, consumers / AW ; would be less, tuna / food, for humans ; aesthetic reason (for conserving) / AW ; economic reason (for conserving) / AW ; AVP ; AVP ;	[max 4]	**A** ‘extinguished’
(d)	**1** **2** **3** **4**	persists / not broken down / does not decay ; eaten by animals ; fish / turtles / mammals, get entangled / trapped / suffocate ; AVP ;	[max 2]	

[Total: 11]	

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9 There are three species of rhinoceros in Asia. Fig. 4.1 shows an Indian rhinoceros, *Rhinoceros unicornis*, in a national park being observed by tourists who are riding on an elephant.



Fig. 4.1

The International Union for Conservation of Nature (IUCN) collects data on animal species and places them into categories based on estimated numbers.

Table 4.1 summarises the conservation status of the three species of rhinoceros, as available in 2020.

Table 4.1

species	location	approximate number in the wild	approximate number in captivity	IUCN category
Indian rhinoceros *Rhinoceros unicornis*	national parks in south Nepal and north India	3588	160	vulnerable
Javan rhinoceros *Rhinoceros sondaicus*	one national park in Java, Indonesia	72	0	critically endangered
Sumatran rhinoceros *Dicerorhinus sumatrensis*	national parks in Sumatra and Borneo in Indonesia	<80	7	critically endangered

STEM

(a) Outline the reasons why large mammals, such as some species of rhinoceros, are endangered.

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..... [5]

(b) In 2013, Cincinnati Zoo in the USA announced that they were hoping to breed together rhinoceros that were brother and sister as part of their captive breeding programme.

(i) Discuss the problems that using such closely related animals might have for the conservation of rhinoceros.

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..... [2]

STEM | Exam Bu

(ii) Captive breeding programmes often use artificial insemination.

Outline the process of artificial insemination.

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..... [3]

[Total: 10]

Conservation Click for more variations

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9(a)	*any five from:* **1** habitat loss / deforestation ; **2** large mammals need large amounts of space ; **3** (named example of) climate change ; e.g. desertification *use of land for* **4** land developed for agriculture ; **5** land developed for, housing / transport / factories / AW ; **6** land used for extraction of (named) material(s) ; **7** competing with humans for space ; **8** idea that populations are isolated ; **9** hunt / trophies / high value / poaching ; **10** laws are not enforced to protect from hunting ; **11** lack of education ; **12** poisoning / pollution ; **13** need a large quantity of food / lack of food sources / starvation ; **14** slow reproduction rate / hard to breed in captivity ; **15** AVP ;	**5**	
9(b)(i)	*any two from:* inbreeding / AW ; reduce (genetic) variation ; (reduced variation) less able to respond to, environmental changes / disease ; increase in homozygosity / described in terms of alleles ; increase chance of genetic disease(s) / birth defects ; any example ; e.g. lameness increase chance of infertility ;	**2**	
9(b)(ii)	*any three from:* **1** collect semen / sperm *(implied by context)* ; **2** freeze semen / sperm, / use sperm bank / use sperm collected, far away/ long ago ; **3** selecting / washing / screening, of sperm / AW ; **4** use hormones for (super)ovulation ; **5** determine when female is about to ovulate ; **6** insert, semen / sperm, into female (vagina / uterus) ;	**3**	

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10 Fish are an important part of a balanced diet for many people.

(a) Fish are a good source of vitamin D.

State **one** effect of a diet that is deficient in vitamin D.

.....

.....

..... [1]

(b) Many fish stocks have declined.

Marine ecologists considered the three topics shown in Fig. 6.1 when they discussed the decline of fish stocks.

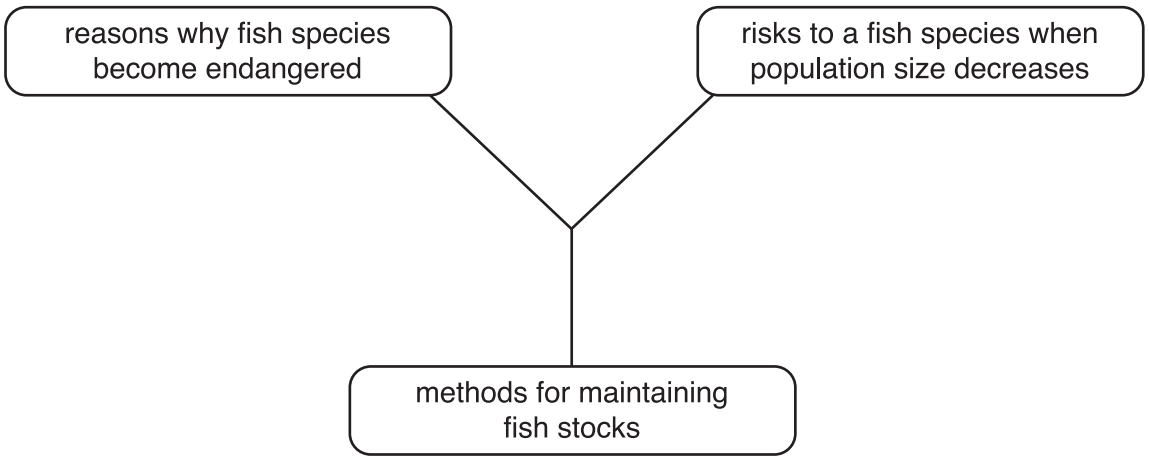


Fig. 6.1

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Describe the key points for each of the three topics shown in Fig. 6.1.

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..... [6]

[Total: 7]

Conservation Click for more variations

STEM | Exam Builder

10(a)	poor absorption of calcium / weak bones / weak teeth / depression / fatigue / muscle pain / joint pain / rickets / osteomalacia / AVP ;	**1**	
10(b)	*reasons why endangered:* (described) overfishing / hunting ; food chain disrupted (described); overconsumption (by humans) ; (named) pollution ; introduced diseases / species ; habitat destruction ; climate change ; *risks if populations drop:* reduced variation ; reproduction rate is lower / harder to find a mate ; extinction ; AVP ; *how to maintain fish stocks:* education ; quotas ; no-catch zones / nursery zones / seasonal fishing / protected areas / MPAs / Marine Protected Areas ; fines ; restocking ; fish farms ; method of fishing (described) ; AVP ;	**6**	

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