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4177683219

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 2025**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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[Turn over

1 Fig. 1.1 shows the movement of particles through an epithelial cell in the small intestine.

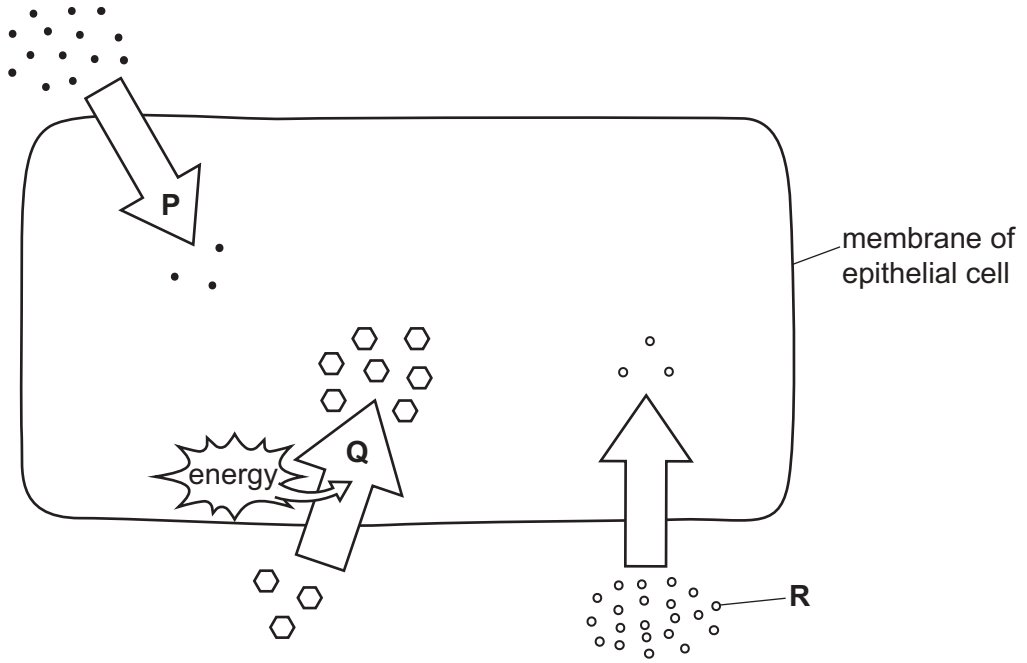

Fig. 1.1

(a) In Fig. 1.1, arrow **P** represents the diffusion of oxygen molecules.

(i) Describe what is meant by the term diffusion.

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..... [2]

(ii) State the type of energy needed for diffusion.

..... [1]

(b) Carbon dioxide molecules also move by diffusion.

(i) State the name of the process in human cells that produces carbon dioxide.

..... [1]

(ii) On Fig. 1.1, draw an arrow to show the direction of diffusion of carbon dioxide molecules. [1]

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(c) In Fig. 1.1, arrow **Q** represents another type of particle movement.

Identify the type of particle movement represented by arrow **Q**.

Explain your answer.

type of movement .....

explanation .....

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..... [3]

(d) In Fig. 1.1, particle **R** moves from the lumen of the small intestine into the epithelial cell.

Suggest why particle **R cannot** be starch.

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..... [2]

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(e) Fig. 1.2 is a photomicrograph of red onion cells.

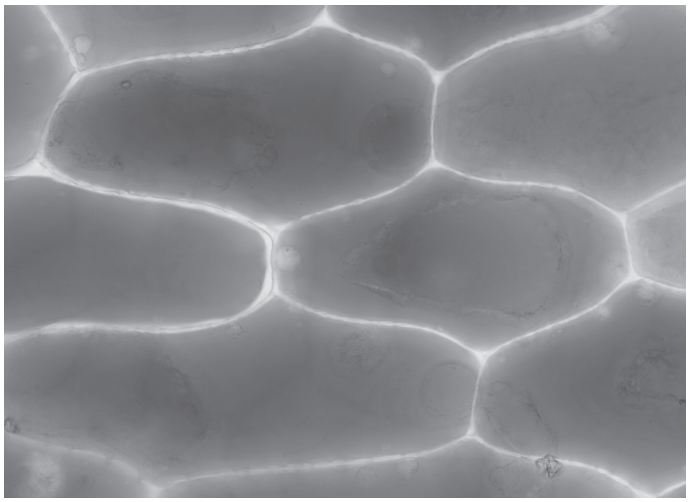

Fig. 1.2

Fig. 1.3 is a photomicrograph of the same red onion cells after being immersed in a salt solution.

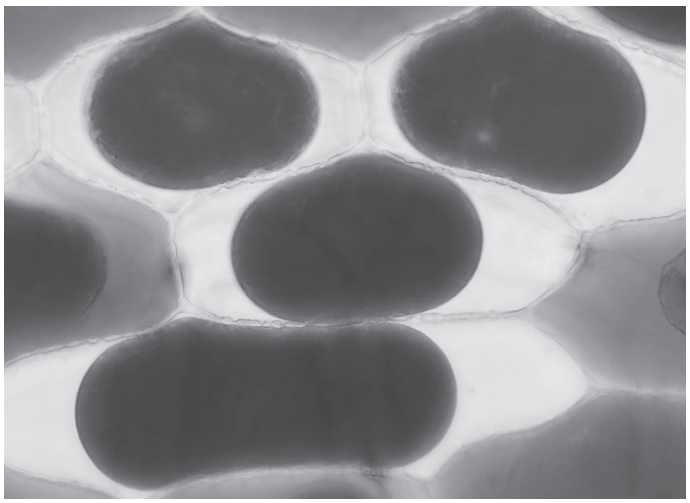

Fig. 1.3

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Using Fig. 1.2 and Fig. 1.3, describe **and** explain the difference in appearance of the cells before and after immersion in salt solution.

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..... [6]

[Total: 16]

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2 **(a)** The internal body temperature of a person was recorded.

Fig. 2.1 shows the results.

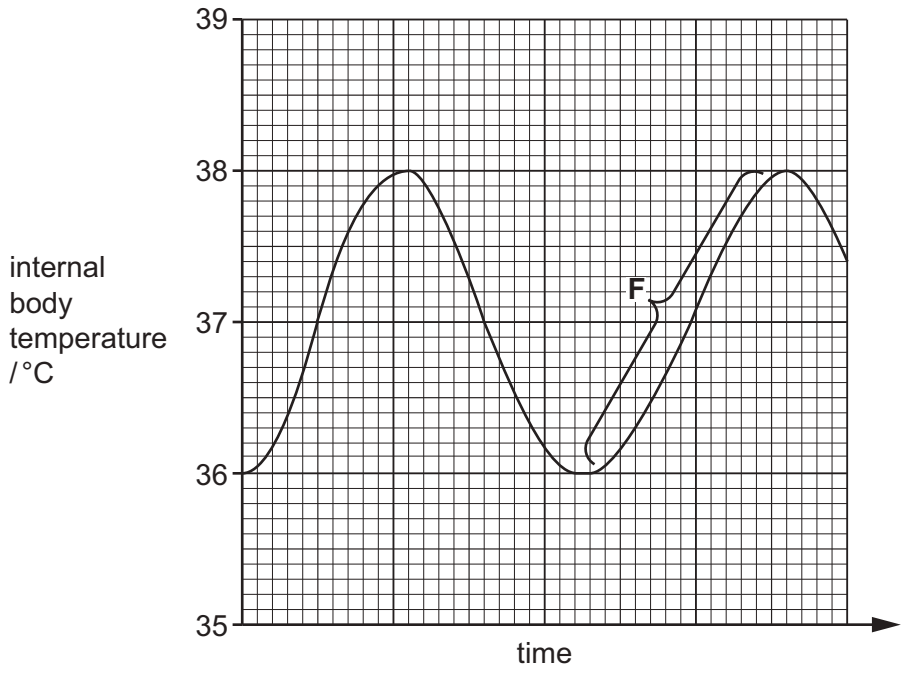

Fig. 2.1

(i) Using the information in Fig. 2.1, calculate the temperature range for the internal body temperature of the person.

State the units.

..... [1]

(ii) On Fig. 2.1, draw a line to show the set point for the internal body temperature of the person. [1]

(iii) The maintenance of internal body temperature is an example of homeostatic control.

State the name of the mechanism for homeostatic control.

..... [1]

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(iv) On Fig. 2.1, region **F** shows a change in body temperature.

Explain how the body causes the change in body temperature shown.

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(b) Fig. 2.2 shows a cross-section of human skin.

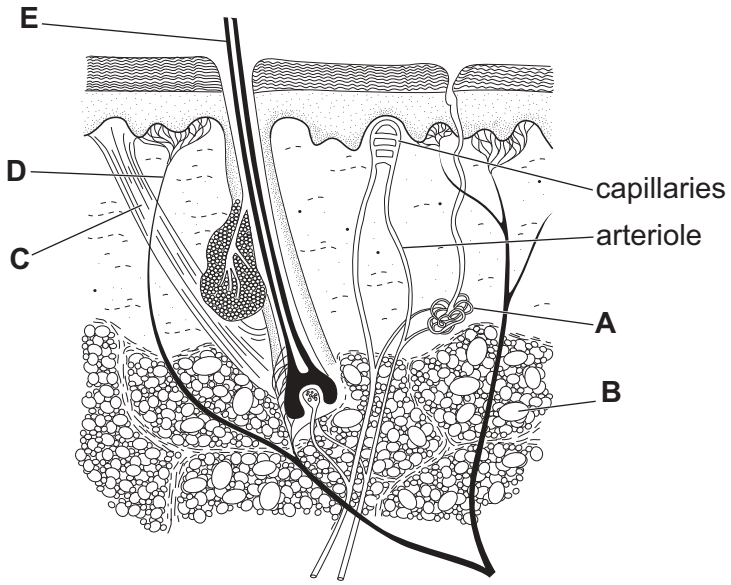

Fig. 2.2

(i) State the letter of the structure shown in Fig. 2.2 that produces sweat.

..... [1]

(ii) State the names of structures **C** and **D** shown in Fig. 2.2.

C .....

D .....

[2]

[Total: 11]

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3 **(a)** Fig. 3.1 shows the percentage of water in different structures of the human body.

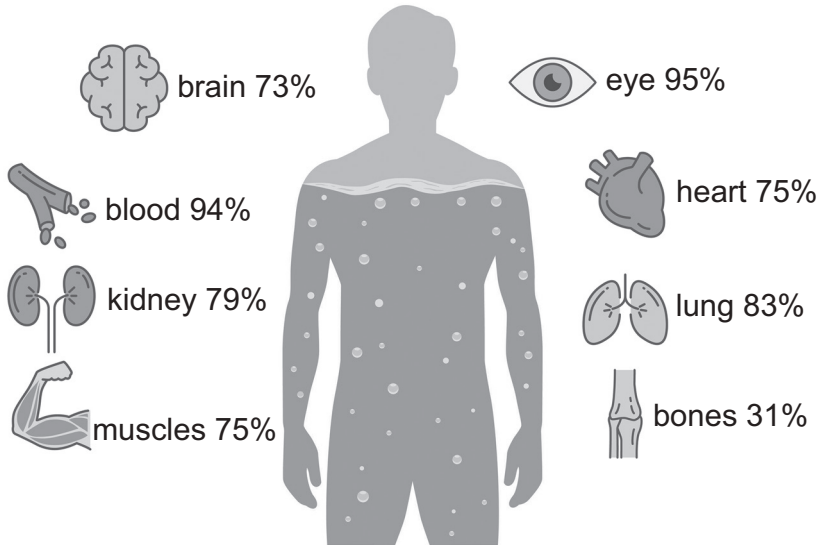

Fig. 3.1

(i) The mean mass of a human eye is 28 g.

Using information from Fig. 3.1, calculate the mass of water in a human eye.

Give your answer to **two** significant figures.

..... g
[2]

(ii) Describe the importance of water in the human body.

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(b) Cholera is a disease caused by a pathogen in contaminated water.

Fig. 3.2 is a diagram of the cholera pathogen.

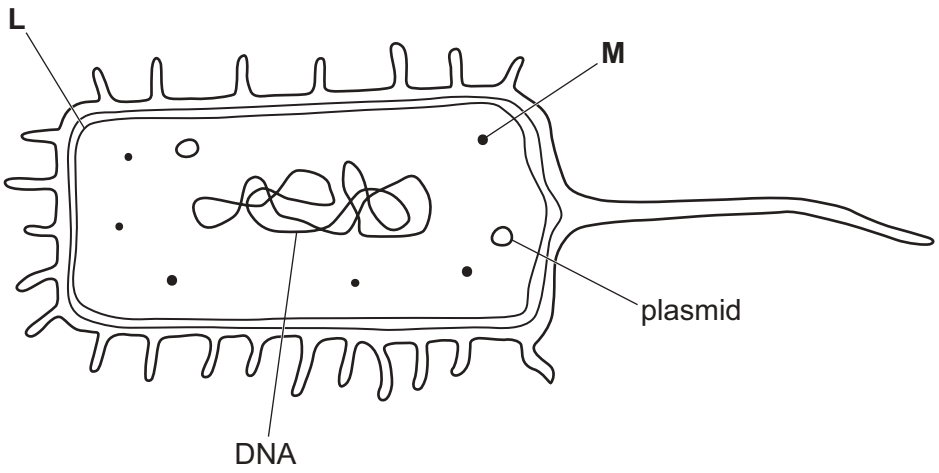

Fig. 3.2

(i) State the name of structures **L** and **M** shown in Fig. 3.2.

L .....

M .....
[2]

(ii) Identify **two** features shown in Fig. 3.2 that are typical of prokaryotes.

1 .....

2 .....
[2]

(iii) State the type of pathogen that causes cholera.

..... [1]

(iv) The scientific name for the pathogen that causes cholera is *Vibrio cholerae*.

State the genus name for this pathogen.

..... [1]

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(v) Explain how the cholera pathogen causes dehydration of the human body.

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..... [3]

(vi) Complete the sentences about the use of plasmids in genetic modification.

During genetic modification, human DNA and plasmid DNA are cut with a restriction enzyme. This creates ..... which are joined together using an enzyme called ..... . The modified plasmid containing the human gene is called a ..... plasmid.

[3]

[Total: 17]

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4 **(a)** Fig. 4.1 shows part of a human placenta and umbilical cord. The arrows show the direction of blood flow.

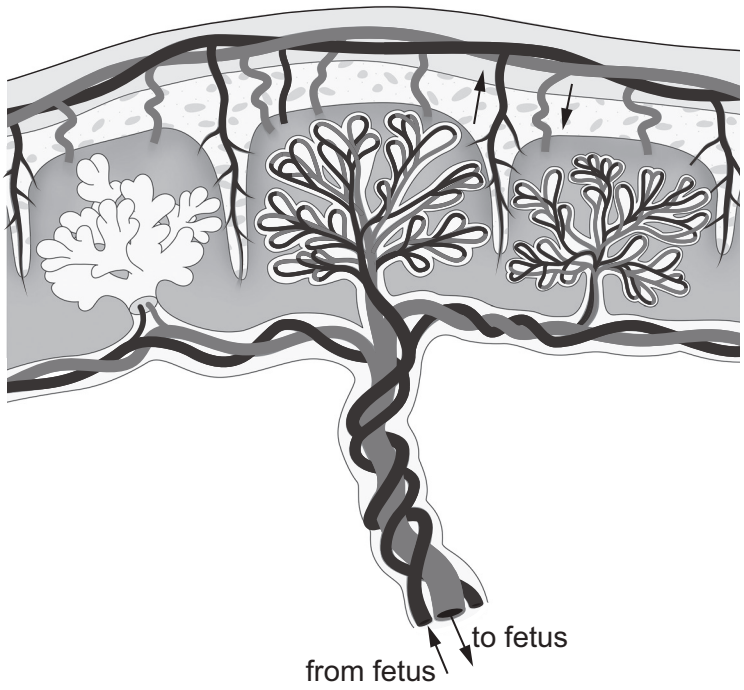

Fig. 4.1

(i) Describe the functions of the placenta and the umbilical cord shown in Fig. 4.1.

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(ii) A fetus develops inside an amniotic sac.

Describe the functions of the amniotic sac and amniotic fluid.

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..... [3]

(b) Syphilis is a sexually transmitted infection (STI) that can be passed from a mother to her fetus.

(i) State the name of **one** other STI that can be passed from mother to fetus.

..... [1]

(ii) State **two** ways to control the spread of STIs.

1 .....

2 .....
[2]

[Total: 10]

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5 **(a)** Fig. 5.1 shows a cross-section of a leaf.

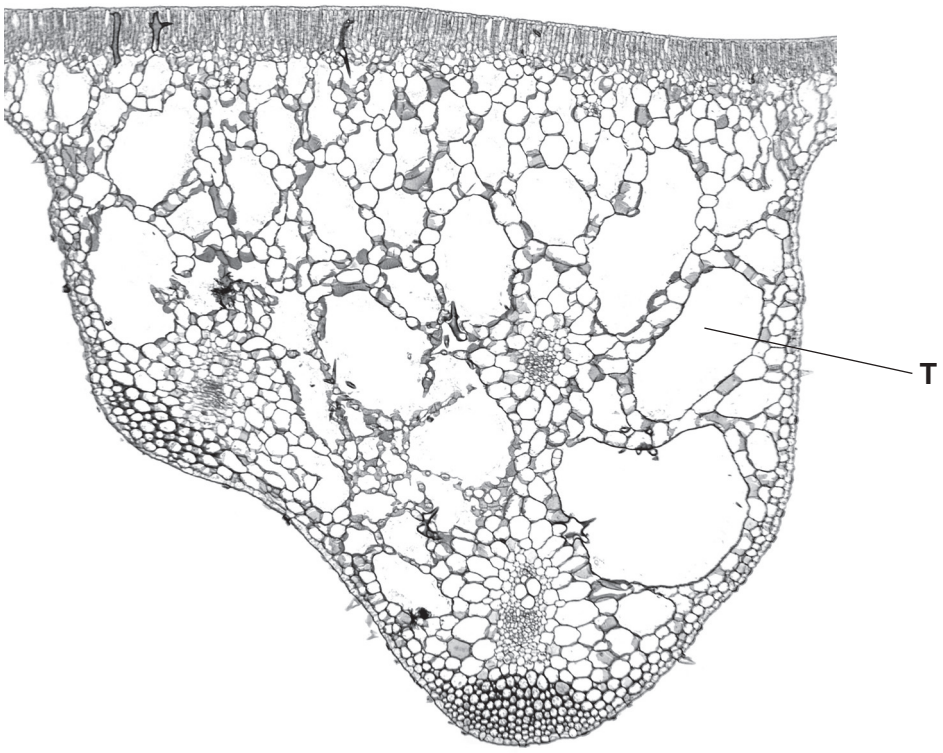

Fig. 5.1

(i) On Fig. 5.1, draw a circle around **one** vascular bundle. [1]

(ii) On Fig. 5.1, draw a label line and the letter **X** to identify the palisade mesophyll tissue. [1]

(iii) State the name of the cell structure in palisade mesophyll cells where photosynthesis occurs.

..... [1]

(iv) Describe the functions of the tissues in a vascular bundle in a leaf.

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..... [4]

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(b) The leaf shown in Fig. 5.1 is from an aquatic plant adapted to live in water. The leaves float on the surface of the water.

(i) State the term used to describe plants that are adapted to live in water.

..... [1]

(ii) Identify feature **T** shown in Fig. 5.1 **and** explain how this feature adapts the leaf to float on the surface of the water.

feature **T** .....

explanation .....

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[2]

(iii) Explain **one** other adaptation of this group of aquatic plants.

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..... [2]

[Total: 12]

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6 **(a)** Microplastics are pieces of plastic with a diameter less than 0.5 cm.

Fig. 6.1 shows the mass of microplastics in the oceans between 2000 and 2040. The data between 2000 and 2020 is an estimate. The data after 2020 is a prediction.

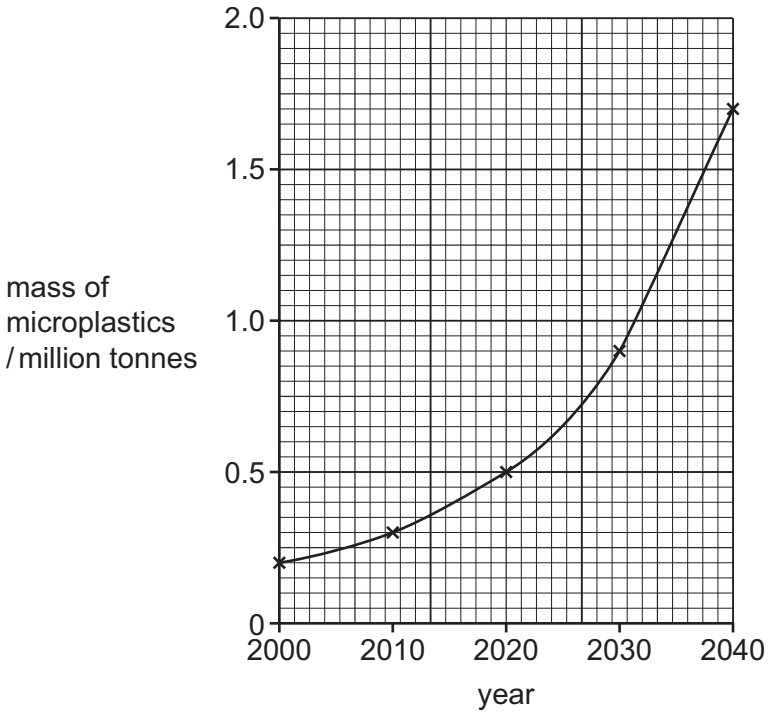

Fig. 6.1

(i) Suggest why the mass of microplastics between 2000 and 2020, shown in Fig. 6.1, is an estimate.

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(ii) Using Fig. 6.1, calculate the predicted percentage increase in the mass of microplastics in the oceans between 2000 and 2040.

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[2]

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(b) Phytoplankton are producers found in the ocean. Phytoplankton absorb microplastics into their cells.

(i) Describe what is meant by the term producer.

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..... [2]

(ii) Fig. 6.2 shows a shearwater bird.

Shearwater birds feed on fish in the ocean.

Fig. 6.2

Suggest how microplastics can end up in consumers such as shearwater birds.

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..... [2]

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(iii) The population of shearwater birds is decreasing.

Describe **three** ways the population of shearwater birds can be conserved.

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3 .....

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[3]

(iv) Explain the risks to a population if its population size decreases.

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