Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME: Solved by Anubha Roberts

CENTRE NUMBER | CANDIDATE NUMBER

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.

[Turn over

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

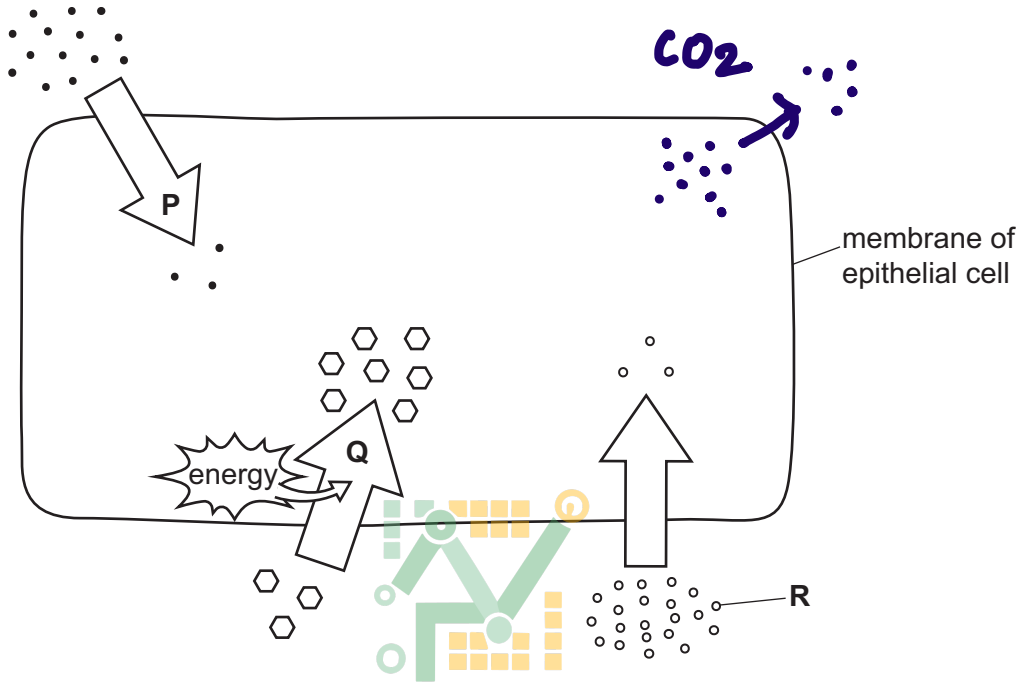

Fig. 1.1

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

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

→ Random movement of particles
→ from a region of higher concentration to a region of lower concentration.

[2]

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

Kinetic energy [1]

(b) Carbon dioxide molecules also move by diffusion.

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

Aerobic respiration. [1]

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

(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 ..... Active transport. .....

explanation ..... It requires energy from respiration and carrier protein to transport from low to high concentration. ..... [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.

..... Starch is too big to diffuse or move through membrane .....

..... Starch is digested by enzymes amylase and maltase to glucose. ..... [2]

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

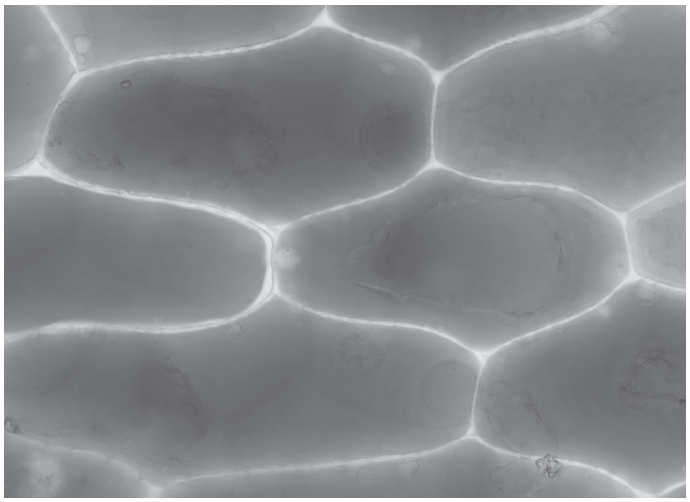

Fig. 1.2

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

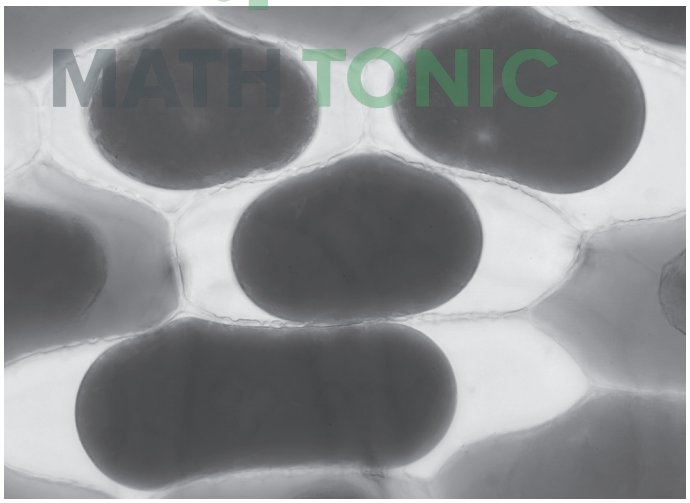

Fig. 1.3

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.

→ In 1.2, the cells are turgid as the vacuole swells up, the
→ cytoplasm swells up, cells enlarge in size. Cell membr-
→ ane and cytoplasm apply pressure on cell wall called turgor pressure.
→ In 1.3, the cells are flaccid,
→ vacuole loses water,
→ cytoplasm and cell membrane move away from cell wall.
→ Cytoplasm shrinks as the water molecules move out
→ by osmosis from high water potential to lower water inside the salt solution. [6]

[Total: 16]

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

Fig. 2.1 shows the results.

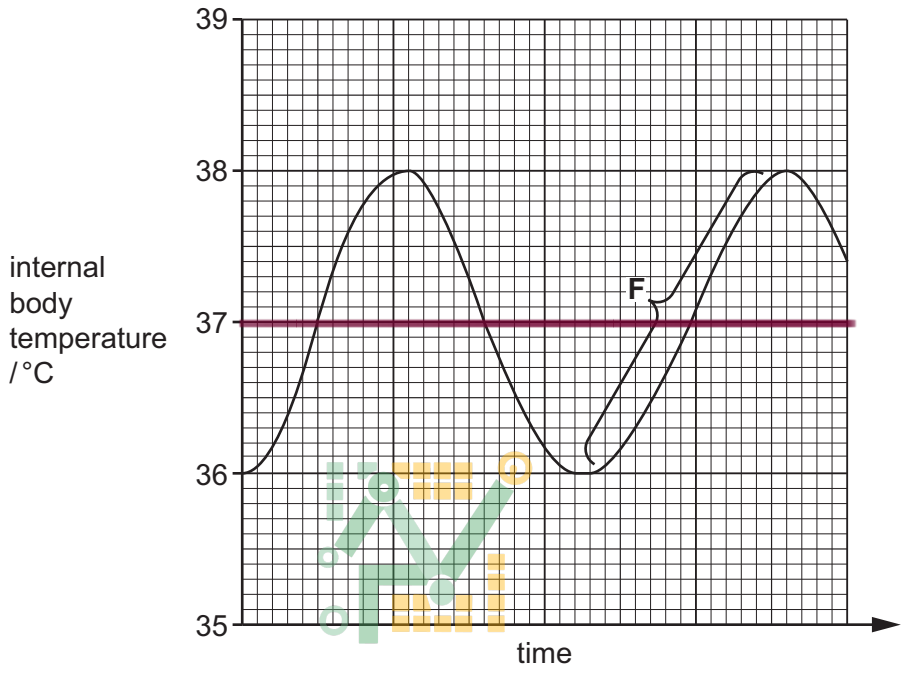

Fig. 2.1

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

State the units.

..... 2°C ..... [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.

..... Negative feedback. ..... [1]

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

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

- when the body temperature decreases to 36°C
- Detected by the brain, the brain sends impulses to hair erector muscles to contract to form a layer of insulation of air near to skin.
- Vasoconstriction of arterioles. and less blood flows to skin surface capillaries to prevent heat loss from blood. Shivering of muscles to produce heat and raise body temperature. [5]

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

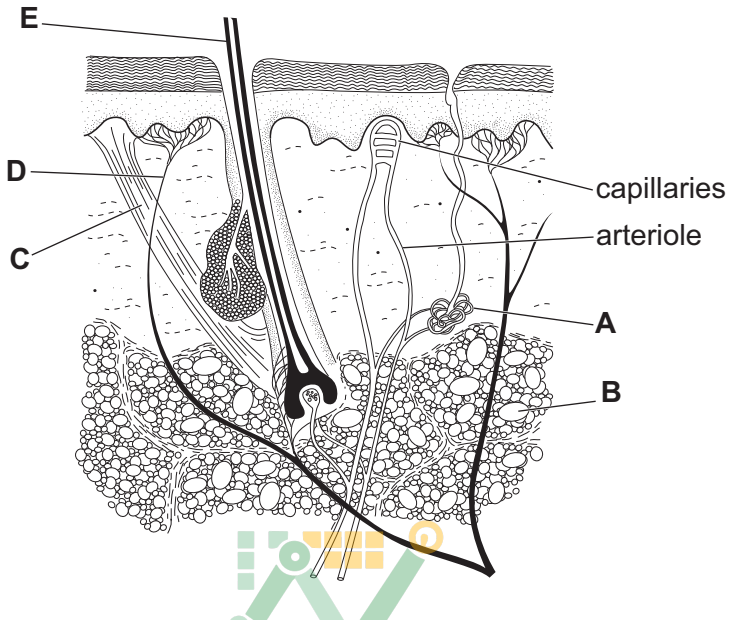

Fig. 2.2

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

A ..... [1]

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

C Hair erector muscle.

D Sensory neurone.

[2]

[Total: 11]

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

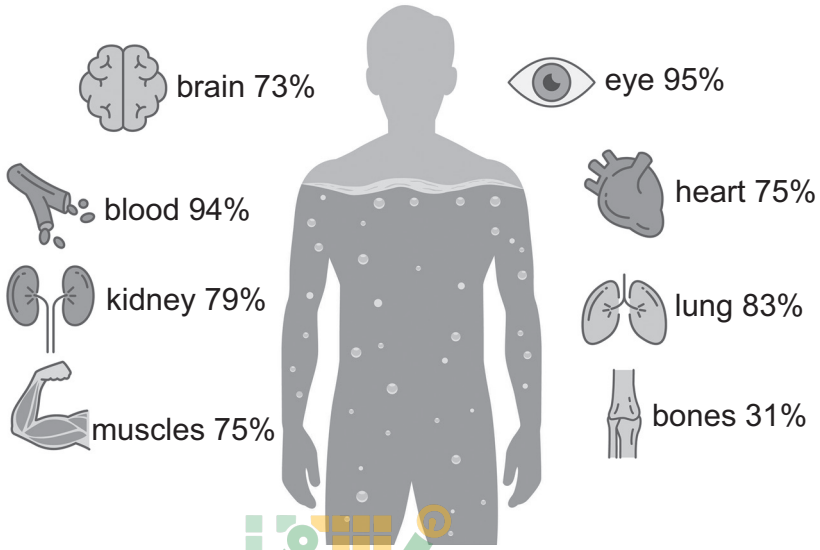

Fig. 3.1

(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.

Eye = 95% of 28

$\frac{95 \times 28}{100} = 26.6$

$= 27$

..... g
[2]

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

→ Water acts as solvent to transport glucose in the blood plasma.

→ Water is constituent of cytoplasm and site of metabolic reactions.

→ used to excrete urea in urine. [3]

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

Fig. 3.2 is a diagram of the cholera pathogen.

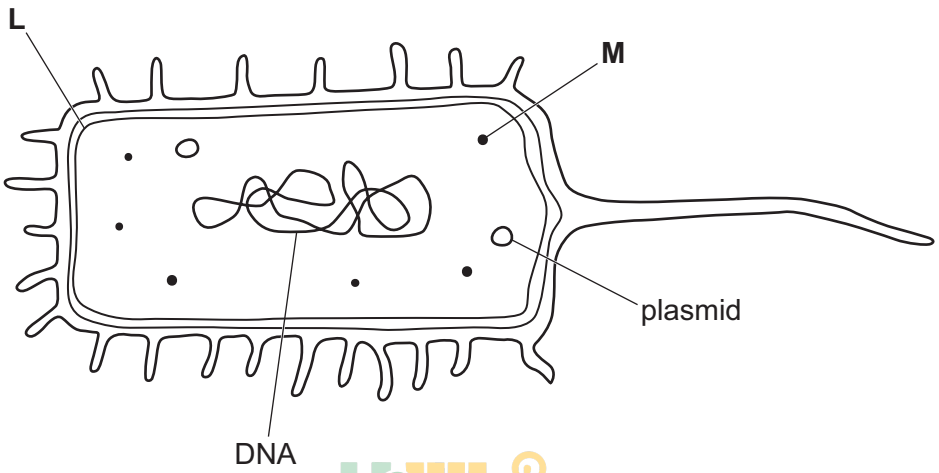

Fig. 3.2

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

L Cell membrane

M ribosome

[2]

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

1 No nucleus

2 plasmid.

[2]

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

bacteria [1]

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

State the genus name for this pathogen.

Vibrio [1]

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

- Cholera toxin causes Cl^- ions to move in lumen of intestine.
- This decreases the water potential in lumen and water moves in lumen by osmosis.
- This results in watery faeces and causes dehydration. [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 sticky ends which are joined together using an enzyme called restriction enzyme. The modified plasmid containing the human gene is called a recombinant DNA plasmid.

[3]

[Total: 17]

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

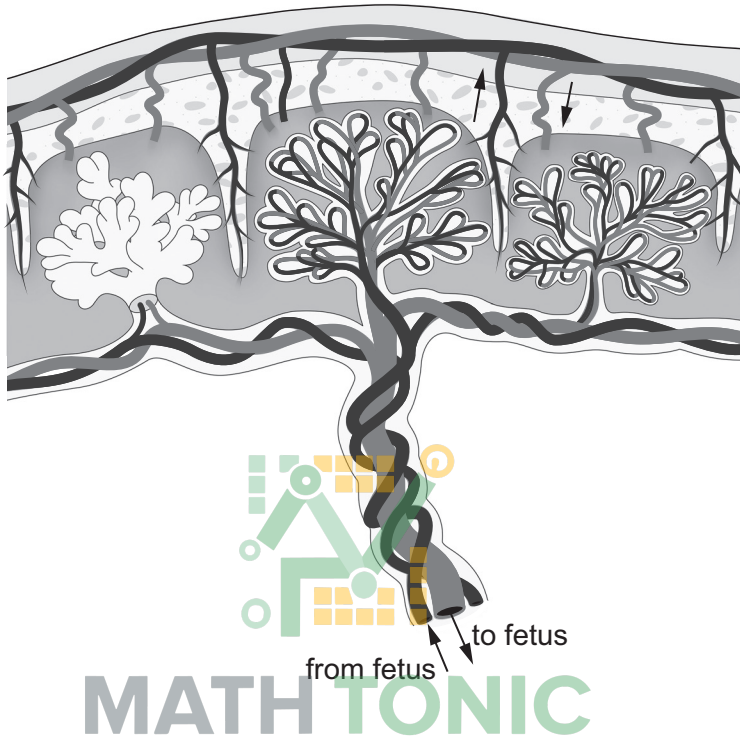

Fig. 4.1

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

→ Oxygen from mother's blood diffuses in baby's blood. CO_2 and urea diffuses out of mother's blood.

→ These processes take place in placenta.

→ Estrogen is released by placenta.

→ Umbilical cord has umbilical vein which carries nutrients like O_2 and glucose to the cells of baby. [4]

(ii) A fetus develops inside an amniotic sac.

Describe the functions of the amniotic sac and amniotic fluid.

→ Amniotic sac acts as cushion to fetus to protect it from mechanical injur

→ Amniotic fluid helps to maintain temperature.

→ Amniotic sac helps fetus to move and grow. [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.

HIV [1]

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

1 Using condoms

2 Avoiding sexual contact with unknown partners. [2]

[Total: 10]

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

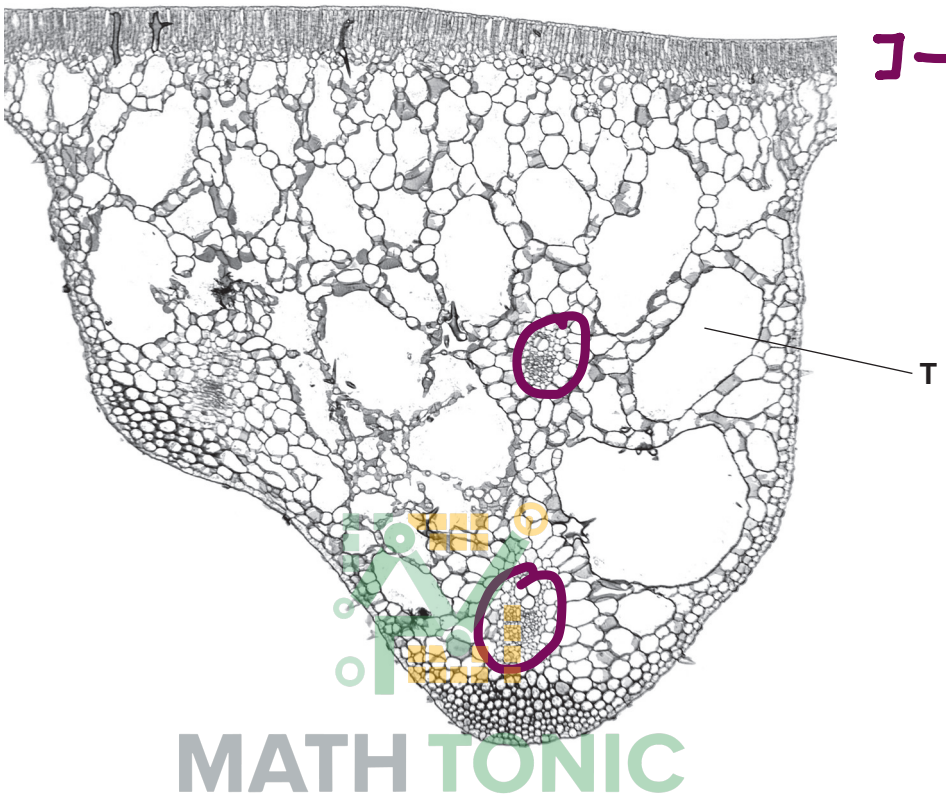

Fig. 5.1

(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.

chloroplast ..... [1]

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

→ vascular bundle has xylem and Phloem.

→ xylem transports water and mineral ions from roots to aerial parts. xylem also provides support.

→ Phloem transports sucrose and amino acids from source (leaves) to sink (roots) in bidirectional manner. ..... [4]

(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.

Hydrophytes. [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** Air spaces

explanation provides bouyancy for the plant to floa t.

[2]

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

Stomata on the upper epidermis to absorb CO_2 for photosynthesis. [2]

[Total: 12]

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.

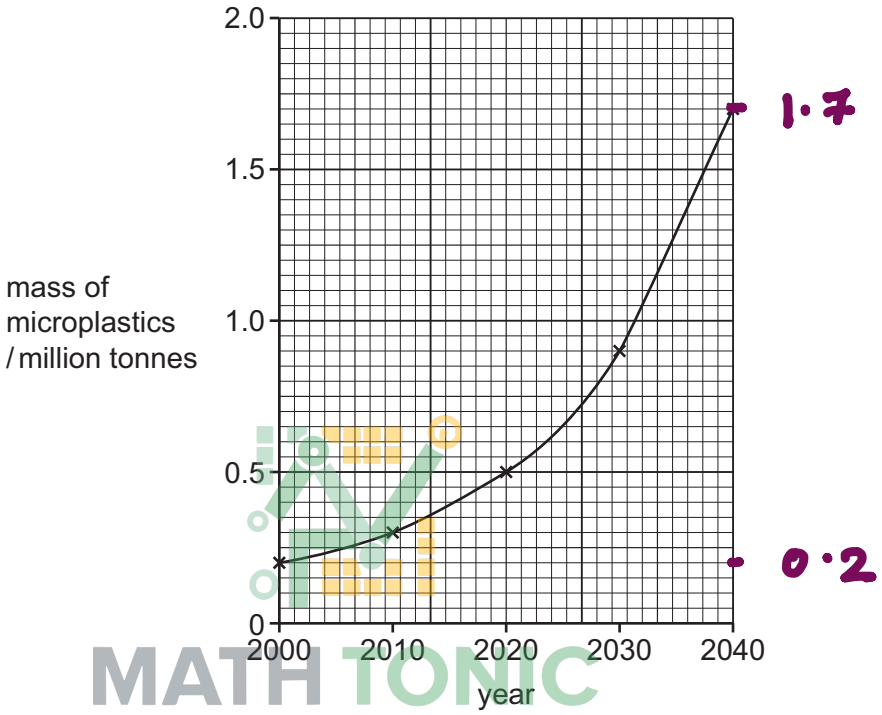

Fig. 6.1

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

→ Not all area of oceans were explored to collect plastics

→ Not all plastics have same mass. [2]

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

Space for working.

$\frac{1.7 - 0.2}{0.2} \times 100 = \frac{1.5}{0.2} \times 100$

750 %

[2]

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

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

Producer are plants which do photosynthesis to make glucose using sunlight and CO_2 with water.

They provide food to primary consumer. [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.

Fish live and consume water with microplastics.

These plastics in fish are transferred to Shea water birds when feed on fish. [2]

(iii) The population of shearwater birds is decreasing.

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

1 Increasing nest sites for birds.

2 Implementing laws on the hunting or fishing.

3 Keeping them captive breeding programme.

[3]

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

→ Genetic diversity decreases

→ Increased risk of extinction

→ decreased resistance to diseases.

[3]

[Total: 14]

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