IGCSE Cambridge Topical Past Papers

COMBINED SCIENCE

0653 | Paper 4

2020 — 2025

1 – (0653/41_Summer_2025_Q3) – *B2. Cells, B11. Organisms And Their Environment, B1. Characteristics Of Living Organisms*

(a) Fig. 3.1 is a diagram showing a cross-section of a bacterial cell.

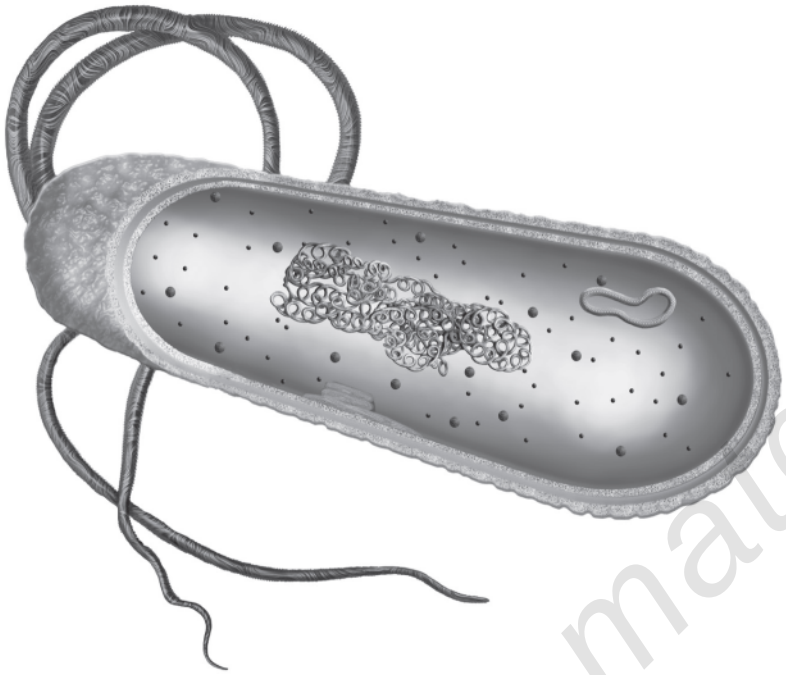

Fig. 3.1

(i) Draw a label line and the letter **P** to identify a plasmid in Fig. 3.1. [1]

(ii) Plasmids are one structure found in bacterial cells that are **not** found in plant cells.

Identify **two** structures visible in Fig. 3.1 that **are also** found in plant cells.

1 .....

2 .....

[2]

(b) Some bacteria are pathogens that infect the human body.

(i) Bacterial infections are treated with antibiotics.

Explain why antibiotics should only be used when essential.

..... [2]

(ii) The body can develop active immunity after infection by some bacteria.

Describe what is meant by active immunity.

..... [1]

(c) Some bacteria gain energy from waste organic material in sewage.

(i) Name the type of organism that gains energy from waste organic material.

..... [1]

(ii) Sewage treatment is one way to control the spread of disease.

State **one** other way to control the spread of disease.

.....

..... [1]

[Total: 8]

2 – (0653/42_Summer_2025_Q3) – *B1. Characteristics Of Living Organisms, B11. Organisms And Their Environment*

(a) A person is infected by a pathogen. A few months later they are infected again by the same pathogen.

Fig. 3.1 shows how the number of antibodies in the body of the person changes after each infection.

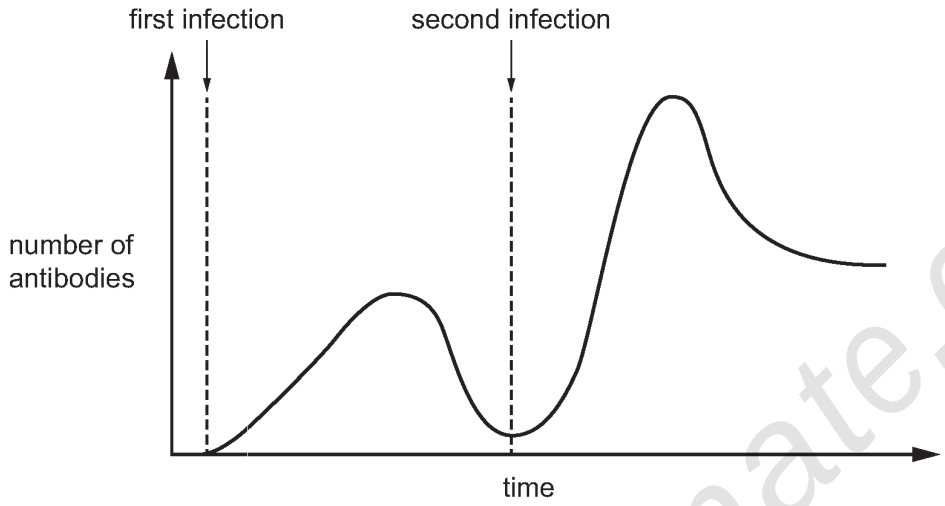

Fig. 3.1

(i) Describe how Fig. 3.1 shows evidence that the body of the person has gained active immunity to the pathogen.

..... [2]

(ii) State **one** other way the body gains active immunity to a pathogen.

..... [1]

(b) Explain why a clean water supply is important in controlling the spread of diseases.

.....

..... [1]

(c) Some bacteria and viruses are pathogens.

A virus has a diameter of 0.4 μm.
A bacterial cell has a diameter of 0.001 mm.

(i) Calculate how many times larger the diameter of the bacterial cell is compared to the virus.

..... × [2]

(ii) Give **two** reasons why someone infected with a virus should **not** be given antibiotics.

1 .....

.....

2 .....

.....

[2]

(iii) One structural feature of a virus is that it contains genetic material.

State **one** other structural feature of a virus.

..... [1]

[Total: 9]

ANSWERS

1 – (0653/41_Summer_2025_Q3) – *B2. Cells, B11. Organisms And Their Environment, B1. Characteristics Of Living Organisms*

(a)(i)	plasmid labelled ;	**1**
(a)(ii)	*any **two** from:* cell wall ; ribosomes ; cell membrane ; cytoplasm ;	**2**
(b)(i)	*idea that* it helps prevent antibiotic resistance **in bacteria** ; *idea that* antibiotic becomes less effective (due to over use) / owtte ;	**2**
(b)(ii)	(defence against a pathogen by) production of antibodies ;	**1**
(c)(i)	decomposer ;	**1**
(c)(ii)	*any **one** from:* hygienic food preparation ; personal hygiene / good hygiene ; clean water supply ; waste disposal ; AVP, e.g. vaccination ;	**1**

2 – (0653/42_Summer_2025_Q3) – *B1. Characteristics Of Living Organisms, B11. Organisms And Their Environment*

(a)(i)	*any **two** from:* second infection results in higher number of antibodies (compared to first infection) ; less time to release antibodies in second infection / faster response to second infection ; antibody number remains high(er) after infection ;	**2**
(a)(ii)	vaccination ;	**1**
(b)	(clean water contains) no **pathogens** (to transmit diseases) ;	**1**
(c)(i)	converts units to match **or** bacteria diameter ÷ virus diameter (seen) ; 2.5 (×) ;	**2**
(c)(ii)	antibiotics, have no effect on virus / only kill bacteria ; (excessive use / misuse, of antibiotics) results in **bacteria** with antibiotic resistance ;	**2**
(c)(iii)	protein coat ;	**1**