

AQA – Genetic information, variation and relationships between organisms – AS Biology P1

1. No.3

03.1

Describe how viruses are replicated.

[4 marks]

03.2

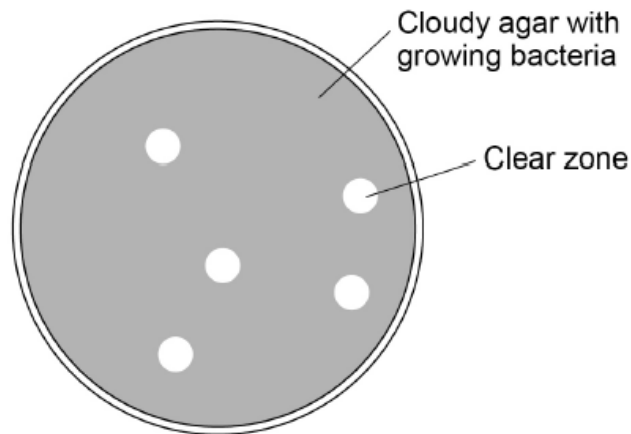
A scientist investigated the effect of a virus species on a bacterial culture.

The scientist:

- mixed a diluted sample of the virus with a bacterial culture in liquid agar
- poured the liquid agar into a Petri dish and let the agar set
- incubated the virus-bacterial culture at 30 °C for 24 hours.

Figure 3 shows the appearance of the Petri dish after 24 hours.

Figure 3



Explain why clear zones are present in Figure 3.

[1 mark]

03.3

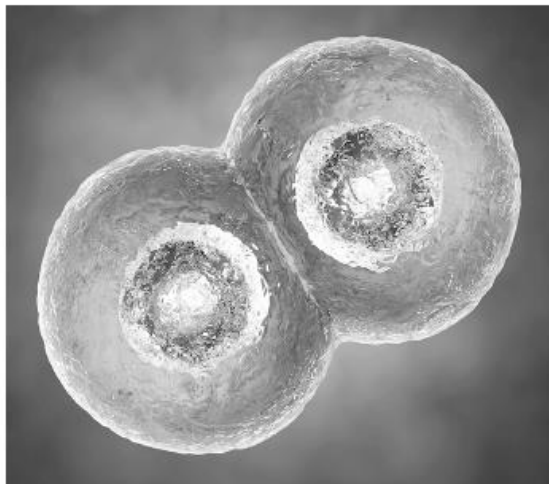
Predict the appearance of the Petri dish if the incubation was extended by a few more hours.

[1 mark]

0 3 . 4 Animal cells replicate during the cell cycle.

Figure 4 shows one animal cell at a stage of the cell cycle.

Figure 4



Identify the stage of the cell cycle shown in **Figure 4**.

Explain the appearance of the cell shown in **Figure 4**.

Do **not** refer to organelles in your answer.

[2 marks]

Identity of stage _____

Explanation _____

2. No.4

0 4 . 1

Complete **Table 3** to show whether the feature of DNA is associated with the DNA molecule found in each of these locations.

Tick (✓) the appropriate boxes.

[3 marks]

Table 3

Feature of DNA	Location of DNA molecule		
	Prokaryotic cell	Nucleus	Chloroplast
Is circular			
Contains four different types of nucleotide			
Is associated with histones			

Some strains of the bacterium, *Escherichia coli*, are known to be resistant to antibiotics.

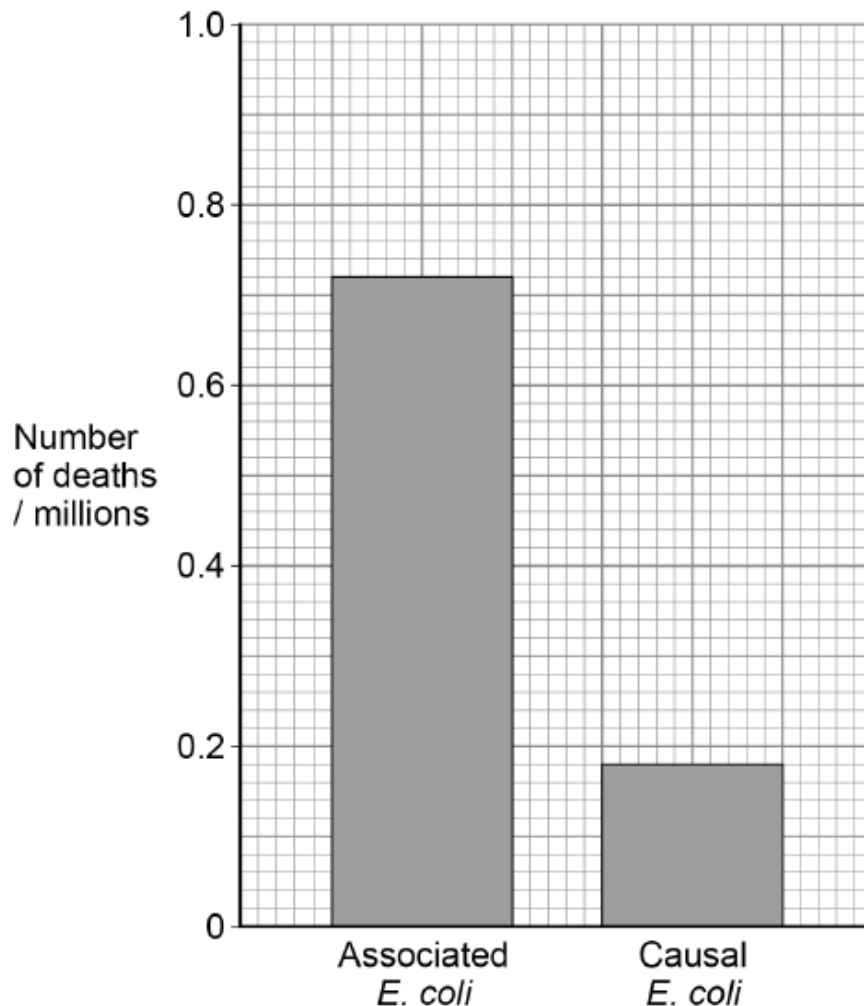
Scientists analysed data recording the deaths of people in hospitals across the world during 2019.

They used the data to find how many of the bodies of people who died in hospitals contained antibiotic-resistant *E. coli* bacteria and whether the *E. coli* were:

- not the cause of death (**associated *E. coli***)
- the cause of death (**causal *E. coli***).

Figure 5 shows their results.

Figure 5



0 4 . 2

Using **Figure 5**, a student calculated that out of all the people who died when antibiotic-resistant *E. coli* were present, 25% of those deaths involved **causal** *E. coli*.

The student's calculation is **incorrect**.

Use **Figure 5** to calculate the correct percentage of deaths involving **causal** *E. coli* in people who died when infected with antibiotic-resistant *E. coli*.

Identify the mathematical step the student performed incorrectly in their calculation.
[3 marks]

Correct answer _____ %

Incorrect mathematical step _____

0 4 . 3

Which method is most likely to be successful in **decreasing** the frequency of antibiotic-resistant bacteria in populations of people?

Tick (✓) **one** box.

[1 mark]

Give people lower doses of antibiotics to treat disease.

☐

Test more people to determine if they are infected with antibiotic-resistant bacteria.

☐

Vaccinate more people to reach herd immunity against bacteria that cause diseases common in human populations.

☐

[5 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

0 5 . 2

The student wanted to present the results for the distribution of plant heights in a histogram.

Figure 6 shows the outline of a results table.

Use Figure 6 to design a suitable results table the student should use for a histogram of plant height measurements ranging between 60 cm and 120 cm.

[2 marks]

Figure 6

0 5 . 3

A student investigated biodiversity in a community of bee species in a field of wild flowers.

The student trapped and identified the bee species in the field over 6 months.

Table 4 shows some of the student's results.

Table 4

Bee species	Total number of trapped bees after 6 months
Cuckoo bee	250
Domestic honeybee	800
Clover bee	200

The index of diversity in a community of organisms is determined using the formula

$$d = \frac{N(N-1)}{\sum n(n-1)}$$

where N = total number of organisms of all species
and n = total number of organisms of each species.

Use the formula and information in **Table 4** to calculate the index of diversity in this community of bee species.

[2 marks]

Answer _____

0 5 . 4

In a different investigation, the student found that:

- the species richness of plants in a field of wild flowers is greater than the species richness of plants in a field of wheat
- the species richness of **bees** in a field of wild flowers is greater than the species richness of **bees** in a field of wheat.

Suggest **one** reason why the species richness of bees in a field of wild flowers is greater than the species richness of bees in a field of wheat.

Explain your answer.

[2 marks]

4. No.6

06.1

Give **two** roles of phosphate ions in cells.

[2 marks]

1 _____

2 _____

06.2

Diseased lungs can cause carbon dioxide to build up in the blood plasma. This leads to an increase in hydrogen ion concentration in the plasma.

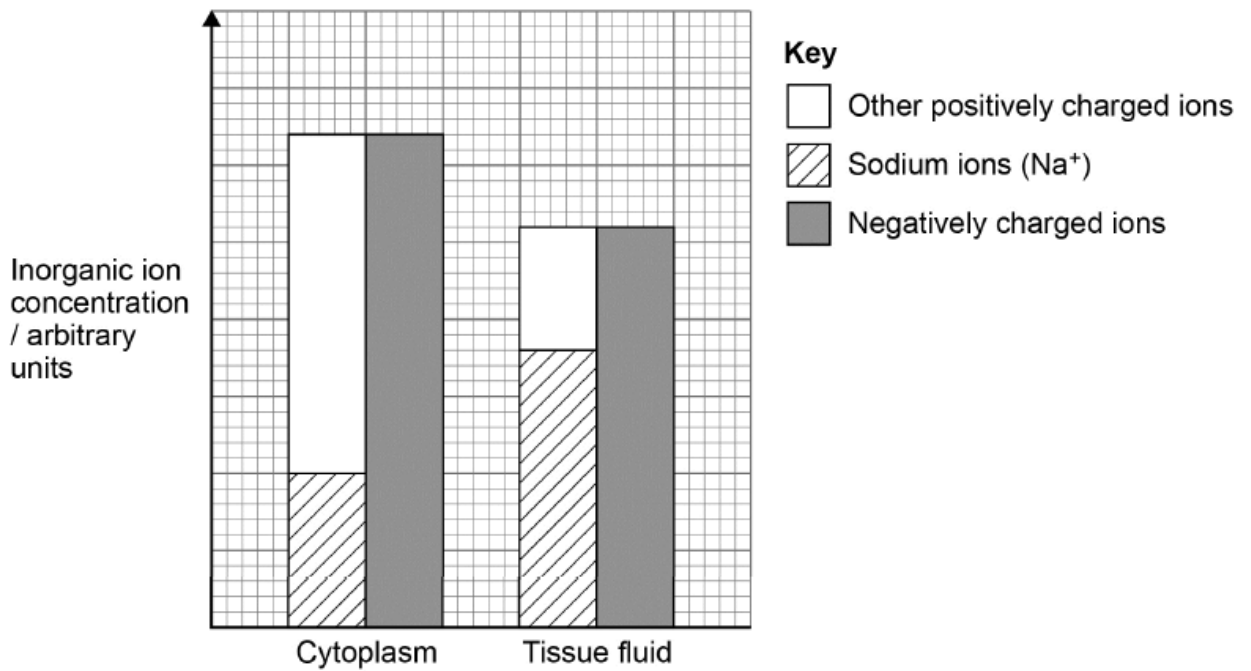
Describe the **effect** this increase in hydrogen ion concentration has on the plasma **and** on the proteins in the plasma.Do **not** refer to the Bohr effect.

[2 marks]

Scientists measured the concentration of inorganic ions in the cytoplasm of mammalian cells and in the tissue fluid surrounding those cells.

Figure 7 shows their results.

Figure 7



0 6 . 3

Use Figure 7 to describe **two** patterns shown in the **total** concentrations of positively and negatively charged ions in the cytoplasm and in tissue fluid.

[2 marks]

1 _____

2 _____

0 6 . 4

In these mammalian cells, the:

- cell-surface membrane is permeable to sodium ions
- sodium ion concentration does not increase in the cytoplasm over time.

Use this information and **Figure 7** to suggest and explain the ion transport mechanisms involved in the transport of sodium ions.

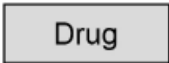
[2 marks]

5. No.7

07.1

A drug is delivered to diseased body cells by a monoclonal antibody. The monoclonal antibody is attached to a drug to form an antibody–drug complex (ADC).

Figure 8

A rectangular box with a black border and a light gray fill, containing the word "Drug" in black text.

Complete **Figure 8** to show a monoclonal antibody attached to the drug.

Label **one** structural feature of the monoclonal antibody in your drawing of the ADC.

[2 marks]

07.2

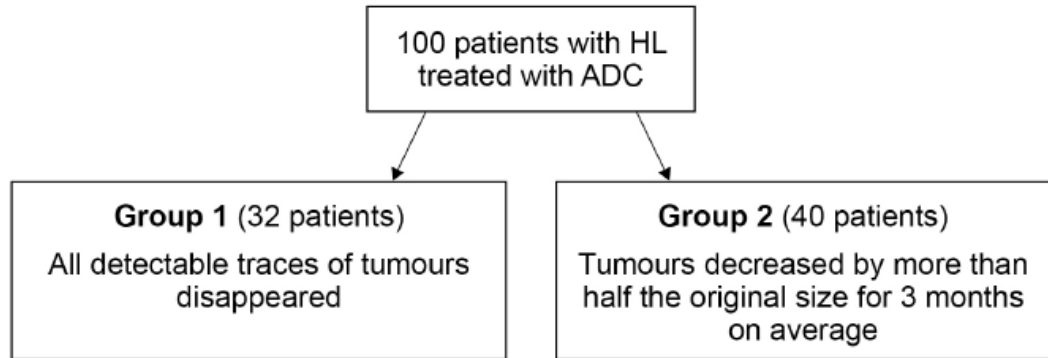
Scientists used a clinical trial to test an ADC designed to treat people diagnosed with the cancer, Hodgkin lymphoma (HL).

In the clinical trial, the patients with HL:

- were selected at random
- had tumours of a similar size at the start of the trial
- received identical doses of the ADC.

Figure 9 shows some of the results from the clinical trial.

Figure 9



Use all the information to evaluate the effectiveness of the ADC in treating people with HL.

Do not refer to statistical tests in your answer.

[4 marks]

6. No.9

0 9

Read the following passage.

DNA is a stable molecule but, even under normal cell conditions, spontaneous changes occur to the DNA nucleotide sequence. One example of a spontaneous change occurs when a cytosine base in a guanine–cytosine nucleotide pair is changed to a uracil base. This produces a guanine–uracil nucleotide pair in the DNA molecule. Scientists estimate this type of spontaneous change occurs to 100 guanine–cytosine nucleotide pairs in the genome of healthy human cells every day.

5

In healthy cells, enzyme-controlled processes repair these spontaneous changes in the DNA molecule by changing uracil bases back to cytosine bases. If these repairs do **not** happen, the uracil DNA nucleotide attracts an adenine DNA nucleotide when the DNA is replicated in the cell cycle. A mutation of the original DNA has now occurred.

10

Healthy cells with damaged DNA produce enzyme **X**. This enzyme slows the cell cycle by delaying the start of DNA replication. People with the disease ataxia telangiectasia (AT) do not produce functional enzyme **X**. Mutations occur at a higher rate in people with AT.

15

Use the information in the passage and your own knowledge to answer the following questions.

0 9 . 1

Give **one** similarity in structure between a guanine–cytosine nucleotide pair and a guanine–uracil nucleotide pair in a DNA molecule (lines 3–5).

Do **not** refer to guanine in your answer.

[1 mark]

0	9	.	3
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09.4

Suggest and explain why 'mutations occur at a higher rate' in people with AT (lines 15–16).

[3 marks]
