Topical Past Papers IGCSE (9-1) Edexcel

BIOLOGY

PAPER 2B, 2BR 2019 - 2023

1 – (4BI1/2B_Summer_2019_Q3) – *The Nature And Variety Of Living Organisms, Structure And Functions In Living Organisms, Ecology And The Environment*

Bags made from starch are better for the environment than plastic bags made from fossil fuels.

Bags made from starch are decomposed by microorganisms such as soil fungi.

(a) (i) Which of these is a feature of fungi?

(1)

- ☐ **A** chloroplasts in the cytoplasm
- ☐ **B** starch stored in the cytoplasm
- ☐ **C** thread-like hyphae
- ☐ **D** walls made of cellulose

(ii) The soil fungi release an enzyme called amylase that digests the bag.

What is the product of this digestion?

(1)

- ☐ **A** amino acids
- ☐ **B** fatty acids
- ☐ **C** glycerol
- ☐ **D** maltose

(iii) Amylase is a protein.

Describe how protein is made in a cell.

(5)

(b) A student investigates the effect of soil pH on the decomposition of bags made from starch.

She uses this method.

- cut two small squares from a bag
- measure the mass of each small square
- place one square in a beaker of soil with a pH of 7.0
- place the other square in a beaker of soil with a pH of 9.0
- after 10 days, remove the squares and measure their mass again

The table shows the student's results.

pH of soil	Mass of square in g		Percentage loss in mass (%)
	at start	after 10 days	
7.0	2.00	1.00	50.0
9.0	2.10	0.62	

(i) Calculate the percentage loss in mass shown by the square in pH 9.0 soil.

(1)

percentage = ...

(ii) Calculate the difference between the percentage loss in mass for the two squares.

(1)

difference = ...

(iii) Explain how the student could improve her method so that she can obtain more accurate results.

(4)

(Total for Question 3 = 13 marks)

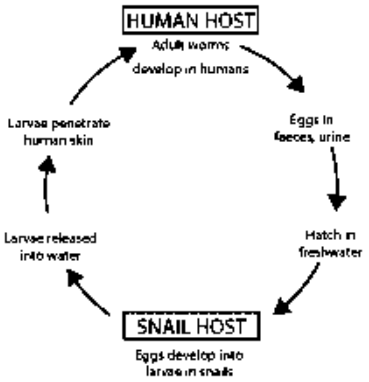
2 – (4BI1/2B_Summer_2020_Q1) – *Structure And Functions In Living Organisms, The Nature And Variety Of Living Organisms*

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Schistosomiasis

Schistosomiasis is an infection caused by a parasitic worm called a schistosome. The immature or larvae of the worm live in rivers and lakes in tropical parts of the world.

The diagram shows the life cycle of the schistosome worm.



Some people in tropical parts of the world use water from these rivers and lakes for their daily lives. These people risk infection because the larvae burrow into their skin. The larvae are then transported to other parts of the body where they damage organs such as the kidneys, intestines, lungs and brain. The larvae develop into adult worms.

The adult worms lay eggs in the human body. Some of these eggs are destroyed by the immune system, but most eggs survive. These eggs can get into water if faeces or urine from infected people pass into rivers or lakes. In the water, the eggs develop into small larvae which grow inside freshwater snails. Larvae are released from the snails and infect any person they contact. These larvae develop into adult worms inside the human body.

Doctors diagnose schistosomiasis when they find eggs in the faeces or urine of infected people. Infected people also have blood cells in their urine and antibodies for the pathogen in their blood.

At present, the drug praziquantel is used to kill the worms. A dose of 0.040 g per kg of body mass is usually effective. With no treatment, affected organs can be permanently damaged, leading to death. It is estimated that 240 million people (in the world) have schistosomiasis. Every year 8×10^{-4} per cent of infected people die from the disease.

A vaccine is being developed using a plasmid. The plasmid has DNA inserted that makes a protein found on the body surface of the adult schistosome worm.

In one investigation, a vaccine made using the DNA plasmid was given to a group of infected people. The results showed a mean number of 21.53 worms per person in this group. In the control group, a mean number of 40.53 worms per person was found.

(a) Which process is affected if kidneys are damaged (line 8)?

(1)

- ☒ **A** digestion
- ☒ **B** mutation
- ☒ **C** ultrafiltration
- ☒ **D** vaccination

(b) Suggest three ways to reduce the risk of being infected by schistosomes.

(3)

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(c) Name two different blood cells that would be found in the urine of infected people (line 17).

(2)

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(d) An infected person has a body mass of 120 kg.

What dose of drugs would be effective for this person (lines 19 to 20)?

(1)

- ☒ **A** 0.04 mg
- ☒ **B** 4.8 mg
- ☒ **C** 40 mg
- ☒ **D** 4800 mg

(e) Using the estimated number of people in the world who have schistosomiasis (lines 21 to 22), calculate the number of people who die each year from schistosomiasis.

(2)

number = ...

(f) Which of these is the correct description of a plasmid?

(1)

- ☒ **A** a circle of DNA
- ☒ **B** a circle of mRNA
- ☒ **C** a circle of protein
- ☒ **D** a circle of tRNA

(g) Explain how a vaccine could protect people from schistosomiasis (lines 24 to 25).

(3)

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(h) (i) Suggest what is given to the control group (lines 27 to 29).

(1)

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(ii) A scientist claims that the investigation proves the vaccine is effective against schistosomiasis (lines 27 to 29).

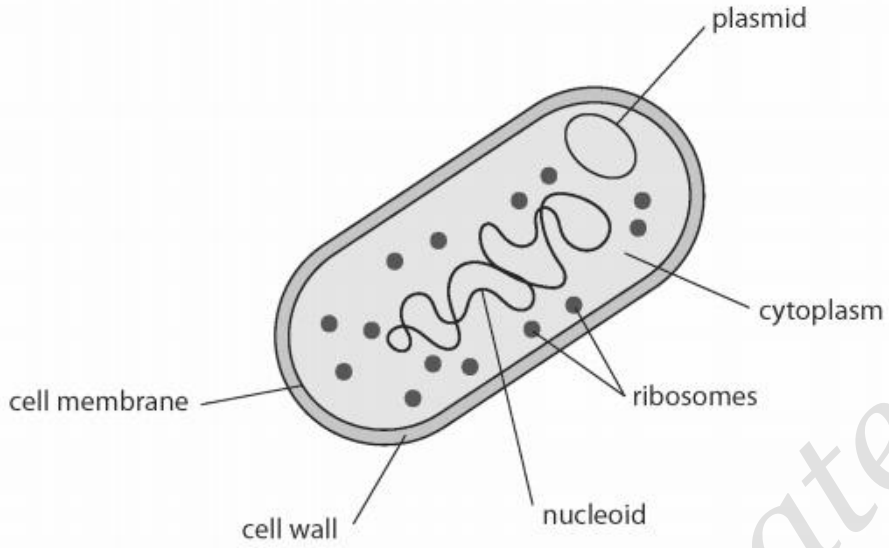
Comment on this claim.

(3)

3 – (4BI1/2B_Summer_2021_Q2) – *The Nature And Variety Of Living Organisms, Structure And Functions In Living Organisms*

P. multocida is a bacterium that causes cholera in chickens.

The diagram shows the bacterium.



(a) Give two structures in this bacterium that are also found in all eukaryotic cells.

(2)

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(b) Scientists investigated the survival of chickens injected with normal *P. multocida* or with weakened *P. multocida*.

The table shows the scientists' results.

Type of injection	Result
normal *P. multocida*	chickens die
weakened *P. multocida*	chickens stay alive

(i) What is a correct conclusion about *P. multocida* from these results?

(1)

- ☒ **A** they are decomposers
- ☒ **B** they are pathogens
- ☒ **C** they are microscopic
- ☒ **D** they are non-living

(ii) The scientists took the living chickens that had been injected with weakened *P. multocida* and then injected them with normal *P. multocida*.

The chickens did not die, as they were now immune.

Explain why these chickens did not die.

(4)

4 – (4BI1/2B_Winter_2022_Q2) – *The Nature And Variety Of Living Organisms*

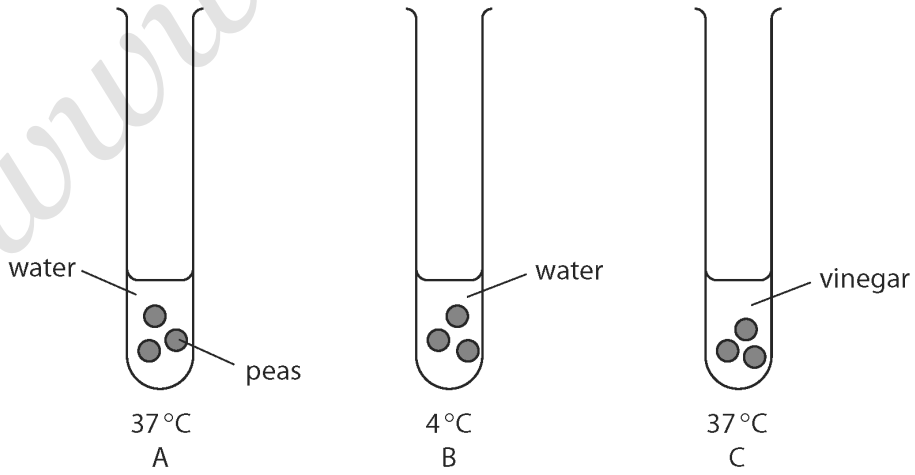
Food items can often be spoiled if saprotrophic microorganisms such as mould fungi grow on them.

(a) Describe how a saprotrophic fungus such as mould obtains its food.

(3)

(b) A student uses this method to investigate ways of preventing peas from being spoiled.

- place three peas in each of three test tubes as shown in the diagram
- cover the peas in test tube A with water and keep at 37 °C
- cover the peas in test tube B with water and keep at 4 °C
- cover the peas in test tube C with vinegar, which is a weak acid, and keep at 37 °C
- leave the peas for 24 hours



The student observes the level of cloudiness of the solution to determine how spoiled the peas have become.
The level of cloudiness can be used as a measure of fungal growth.

The table shows the student's results.

Test tube	Conditions peas are kept in	Level of cloudiness
A	water at 37 °C	very cloudy
B	water at 4 °C	slightly cloudy
C	vinegar at 37 °C	no cloudiness

(i) Suggest a problem with using the level of cloudiness of the solution to determine how spoiled the peas have become.

(1)

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(ii) Explain the appearance of the peas in water at 4 °C.

(2)

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(iii) Explain the appearance of the peas in vinegar at 37 °C.

(2)

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ANSWERS

1 – (4BI1/2B_Summer_2019_Q3) – *The Nature And Variety Of Living Organisms, Structure And Functions In Living Organisms, Ecology And The Environment*

(a)(i)	The only correct answer is C thread-like hyphae *A is incorrect because fungi lack chloroplasts* *B is incorrect because fungi do not store starch* *D is incorrect because fungi walls are made of chitin*	**1**
(a)(ii)	The only correct answer is D maltose *A is incorrect because amino acids are products of protease digestion* *B is incorrect because fatty acids are products of lipase digestion* *C is incorrect because glycerol is a product of lipase digestion*	**1**
(a)(iii)	A description that makes reference to five of the following points: • transcription / transcripts / transcribes (1) • mRNA/messenger RNA **and** leaves nucleus / mRNA/messenger RNA **and** enters cytoplasm (1) • ribosomes (1) • tRNA/transfer RNA (brings) attached amino acids (1) • codons / anticodons / complementary bases (1) • translation / translated / translates / amino acid chain / polypeptide chain (1)	**5**
(b)(i)	70.475 to 70.5	**1**

(b)(ii)	(70.5 – 50 =) 20.5	Allow (answer from 3(b)(i) – 50) eg: 70.4 – 50 = 20.4	**1**

(b)(iii)	An answer that makes reference to four of the following points: • same surface area / mass / thickness / area / size (1) • remove soil from square (before weighing) (1) • control <u>temperature</u> / oxygen / moisture / water (1) • (soil) same mass / same amount / same volume / same type / same soil / decomposers / bacteria / fungi (1) • repeat / use more squares / obtain average / remove anomalies (1) • increase range of pH / use different pHs / more pHs (1)	Ignore more time Mp3 Ignore light / carbon dioxide Mp4 Ignore sterile soil	**4**

2 – (4BI1/2B_Summer_2020_Q1) – *Structure And Functions In Living Organisms, The Nature And Variety Of Living Organisms*

Question Number	Answer	Mark
(a)	C ultrafiltration *A is incorrect because digestion is not a process in the kidneys* *B is incorrect because mutation is not a process in the kidneys* *D is incorrect because vaccination is not a process in the kidneys*	**1 comp**

Question Number	Answer	Additional guidance	Mark
(b)	An answer that makes reference to three of the following points: • stay out of water / wear waterproof clothes / eq (1) • treat drinking water / boil water (before drinking) / do not drink water / drink bottled water / eq (1) • sanitation / no faeces in water / no urine in water /eq (1) • remove snails /eq (1) • vaccination (1)	**Allow** do not go in infected rivers or lakes / cover skin when in water / avoid contact with affected water / only wash in clean water **Allow** filter water / do not drink river water / lake water **Allow** use sewage treatment system / use toilet with septic tank **Allow** don't touch snails	**3 exp**

Question Number	Answer	Mark
(c)	An answer that makes reference to two of the following points: • red blood cells / rbc (1) • white blood cells / wbc (1) • lymphocytes (1) • phagocytes / macrophages (1)	**2 grad**

Question Number	Answer	Mark
(d)	D 4 800 *A is incorrect because it is the wrong value* *B is incorrect because it is the wrong value* *C is incorrect because it is the wrong value*	**1 comp**

Question Number	Answer	Additional guidance	Mark
(e)	• $8 \times 10^{-4} = 0.0008$ • x 240 million = 192 000 ÷ 100 = 1920 (2)	**Allow** 1 mark for: 19200000 / 1920000 / 192000 / 19200 / 192 / 19.2 / 1.92 / 0.192 / 0.0192 Award full marks for correct numerical answer without working	**2 grad**

Question Number	Answer	Mark
(f)	A a circle of DNA *B is incorrect because it is not RNA* *C is incorrect because it is not a protein* *D is incorrect because it is not RNA*	**1 comp**

Question Number	Answer	Mark
(g)	An explanation that makes reference to three of the following points: • antigen (1) • memory cells / lymphocytes (1) • (secondary) immune response (1) • more antibodies / antibodies made sooner / faster / faster immune response / eq (1)	**3 exp**

Question Number	Answer		Mark
(h)(i)	• (a treatment with) no plasmid / no protein / only water / saline / eq (1)	**Allow** placebo vaccine / a placebo / plasmid with no gene / plasmid with no DNA / different DNA	**1 exp**

Question Number	Answer	Additional Guidance	Mark
(h)(ii)	An answer that makes reference to three of the following points: • reduced numbers / eq (1) • by 19 or by 47% / about 50% • schistosomes / worms, still present in body (1) • no idea of group size / needs to be repeated (1) • no idea of age / sex / health (1)	**Allow** reduces numbers of worms / worms decrease / lower number of worms after vaccine **Allow** more worms in control group **Allow** does not completely get rid of them **Allow** more testing / more people tested	**3 exp**

3 – (4BI1/2B_Summer_2021_Q2) – *The Nature And Variety Of Living Organisms, Structure And Functions In Living Organisms*

Question Number	Answer	Mark
(a)	An answer that makes reference to two of the following points: • cytoplasm (1) • ribosomes (1) • cell membrane (1) • DNA (1)	**2**

Question Number	Answer	Mark
(b)(i)	The only correct answer is B bacteria are pathogens *A is not correct because it is not possible to conclude that the bacteria are decomposers* *C is not correct because it is not possible to conclude that the bacteria are microscopic* *D is not correct because it is not possible to conclude that the bacteria are non-living*	**1**

Question Number	Answer	Mark
(b)(ii)	An answer that makes reference to two of the following points: • vaccination / inoculated (1) • (same) antigens / (same) protein (on bacteria) (1) • secondary immune response (1) • memory cells (1) • (make) large numbers antibodies / (make) antibodies produced fast / soon / eq (1)	**4**

4 – (4BI1/2B_Winter_2022_Q2) – *The Nature And Variety Of Living Organisms*

Question Number	Answer	Additional guidance	Mark
(a)	A description that makes reference to three of the following: • enzymes (1) • (feed on) dead / decaying organisms (1) • for <u>extracellular digestion</u> (1) • absorb the digested food / nutrients (1)	**Accept** named nutrients **Accept** broken down food	**3**

Question Number	Answer	Additional guidance	Mark
(b)(i)	A description that makes reference to one of the following: • judgement of cloudiness is subjective / is qualitative / not quantitative / cloudiness cannot be accurately measured / cannot be repeated by other people / eq (1)	**Accept** cloudiness is judged by eye **Accept** cannot see small differences / it is imprecise **Accept** cannot measure difference in cloudiness	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to two of: • less kinetic energy / lower collision frequency / not at optimal temperature for enzymes / eq (1) • less fungal growth / less mould / only slight fungal growth (1) • less respiration (1)	**Accept** fewer E-S complexes formed **Accept** microbes / bacteria for fungi **Accept** less decay / less spoilage / less digestion	**2**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An explanation that makes reference to two of: • enzymes denature (in acid / low pH / vinegar) (1) • active site shape changes / enzymes do not bind with substrate / eq (1) • fungal growth decreases (1)	**Reject** enzymes denature due to **high temperature** **Accept** fungi killed / less spoilage / less decomposition / less respiration **Accept** bacteria / microbes for fungi	**2**