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1791825526

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **May/June 2020**

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. Blank pages are indicated.

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[Turn over

1 **(a)** State **three** uses of energy in the human body.

1 .....

2 .....

3 .....

[3]

(b) Fig. 1.1 shows part of the digestive system of a human.

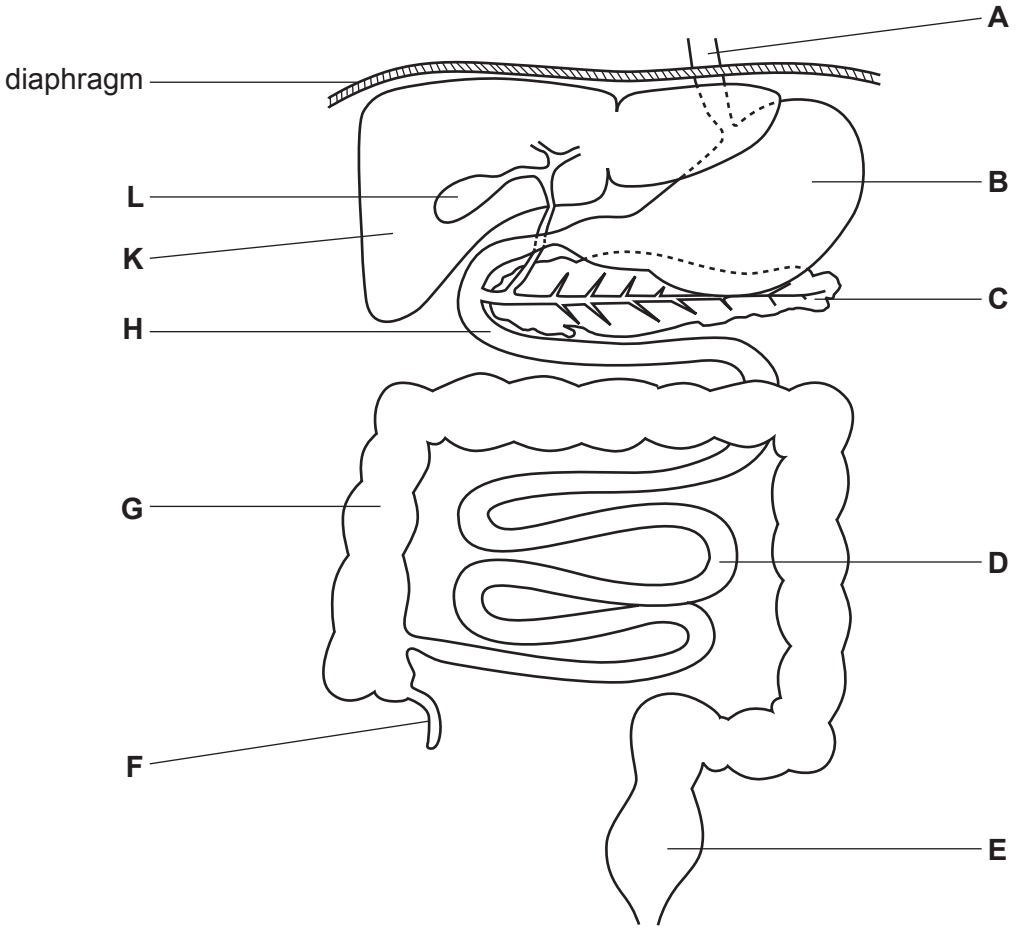


Fig. 1.1

Complete Table 1.1. One row has been done for you.

Table 1.1

function	name of structure	letter from Fig. 1.1
pushes food to the stomach	oesophagus	**A**
assimilation of amino acids to produce plasma proteins		
storage of bile		
secretion of insulin		
absorption of fatty acids and glycerol		
secretion of pepsin		
digestion of starch		

[6]

(c) Describe the role of the liver in the recovery from oxygen debt after strenuous exercise.

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..... [2]

(d) Alcohol is a drug.

Define the term drug.

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..... [2]

(e) **(i)** State **two** immediate effects of excessive alcohol on the body.

1 .....

2 .....
[2]

(ii) State **two** long-term effects of excessive alcohol on the body.

1 .....

2 .....
[2]

(f) Pregnant women are advised not to drink alcohol as it may have harmful effects on the fetus.

(i) Outline these harmful effects.

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..... [2]

(ii) State **two** harmful substances **other than alcohol** that can cross the placenta.

1 .....

2 .....
[2]

[Total: 21]

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2 **(a)** Fig. 2.1 shows the human population of a country between 1910 and 2020.

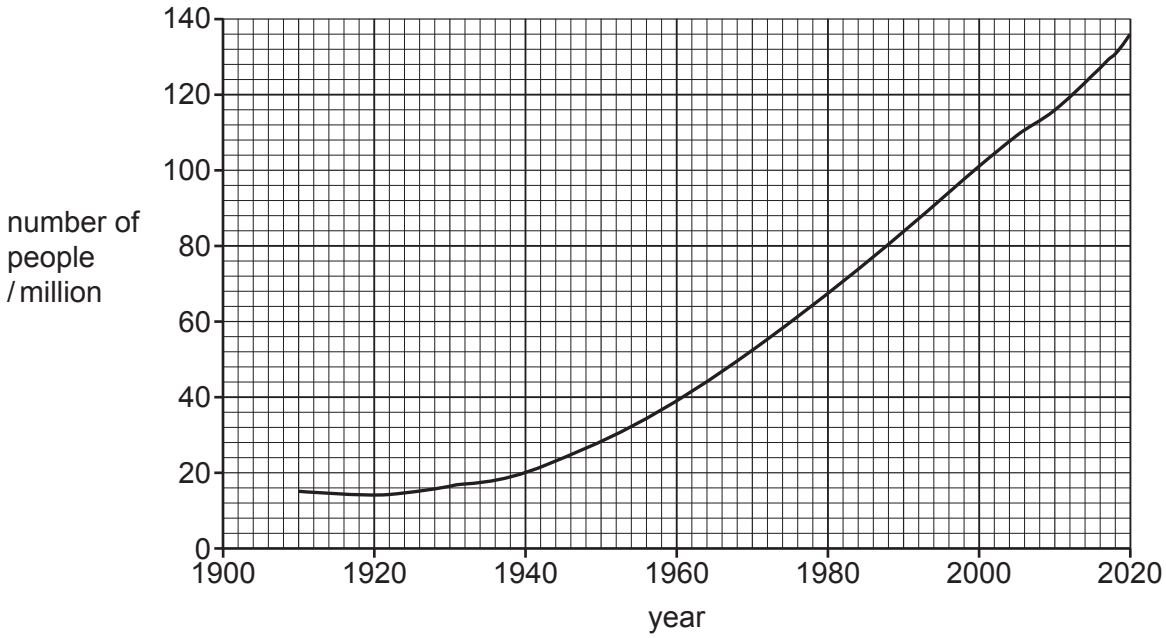


Fig. 2.1

(i) Calculate the percentage increase in the population of the country between 1940 and 2020.

Space for working.

.....%
[3]

(ii) Describe the factors that could cause the change in the population size between 1940 and 2020, shown in Fig. 2.1.

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..... [3]

(b) Some countries have invested in biofuels such as ethanol, biomass and biodiesel.

(i) Describe how ethanol can be made by microorganisms.

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..... [2]

(ii) Some countries use large areas of land to grow maize plants. This crop plant can be used to produce biofuels.

Discuss the negative impact on the **environment** of growing large-scale monocultures of crop plants such as maize.

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..... [4]

[Total: 12]

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3 The American writer Ernest Hemingway lived on the island of Key West in Florida, USA in the 1930s. During this time he was given a male cat by a sea captain.

The cat had more toes than usual. This inherited condition is called polydactyly. The allele for polydactyly is dominant.

(a) Define the term inheritance.

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..... [1]

(b) Fig. 3.1 is part of a pedigree diagram for Hemingway's cats.

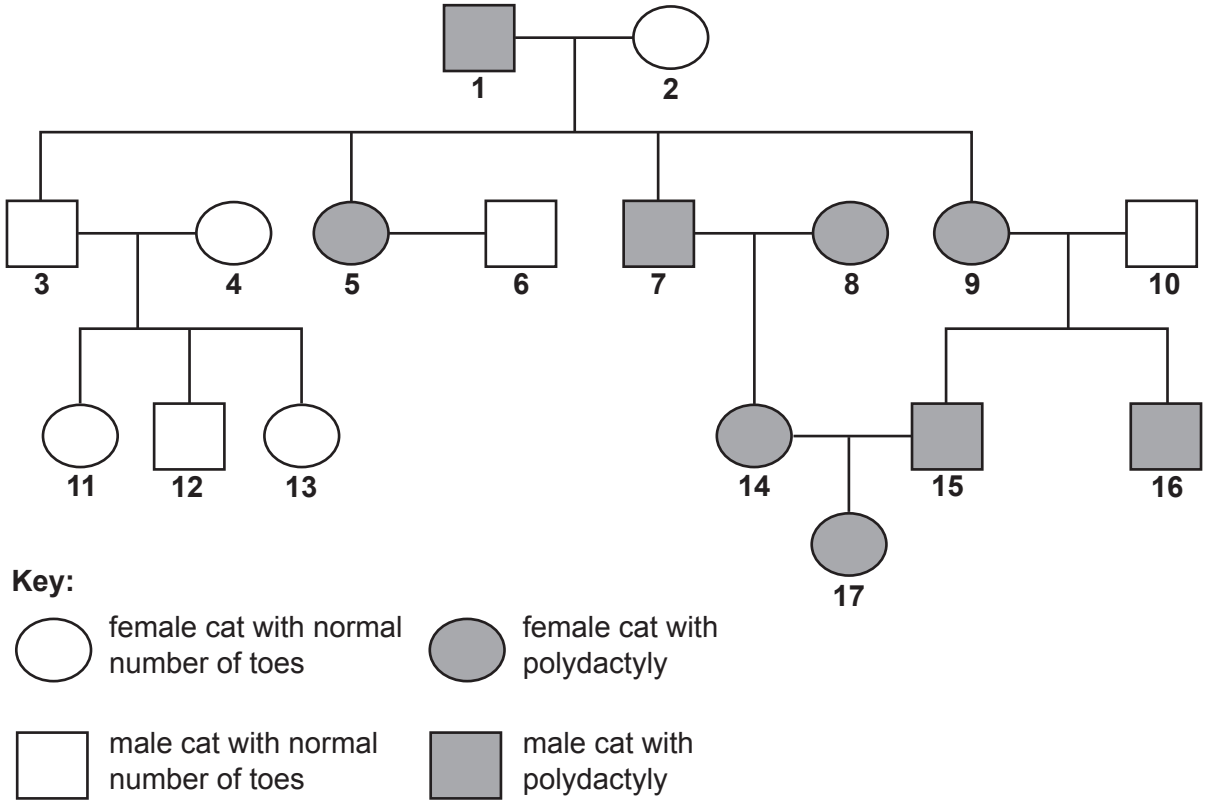


Fig. 3.1

(i) State the genotypes of cats **5**, **6** and **14** in the pedigree diagram in Fig. 3.1.

Use the letters **T** and **t**.

cat **5** .....

cat **6** .....

cat **14** .....

[3]

(ii) Explain why none of the offspring of cats **3** and **4** have inherited polydactyly.

Use the information in Fig. 3.1 in your answer.

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..... [1]

(c) Scientists published the results of an investigation into the DNA of cats with and without polydactyly. They compared the base sequence from a particular region of DNA that controls the development of the limbs.

Table 3.1 shows the base sequences.

Table 3.1

cats without polydactyly	AGACACAGAAATGAG
Hemingway's cats with polydactyly	AGACACGGAAATGAG
cats with polydactyly from Oregon and Missouri in the USA	AGACACGGAAATGAG
cats with polydactyly from the UK	AGACACAGTAATGAG

(i) Describe how the base sequences of the cats with polydactyly differ from the base sequence of cats without polydactyly.

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..... [2]

(ii) State the name of the process by which base sequences in DNA are changed.

..... [1]

(iii) The base sequences in Table 3.1 provide evidence that indicates which country the male cat given to Hemingway in the 1930s came from.

Suggest which country this cat came from **and** give a reason for your choice.

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..... [2]

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(d) Fig. 3.2 shows part of a DNA molecule from a chromosome of a cat.

Complete Fig. 3.2 by writing the letters for the base sequence of the other strand of the DNA molecule.

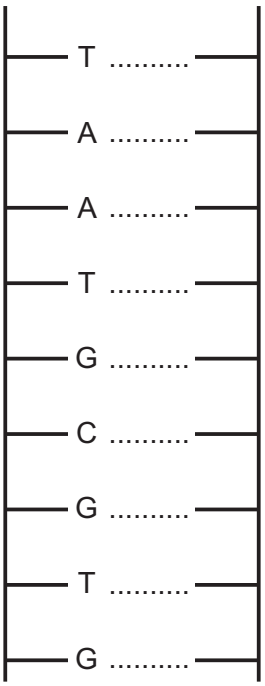


Fig. 3.2

[1]

(e) Explain why polydactyly is an example of discontinuous variation.

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..... [2]

[Total: 13]

4 Xerophytes grow in habitats with low rainfall and soils that often have high concentrations of salts.

Fig. 4.1 shows the xerophyte *Yucca treculeana* growing on salt flats.



Fig. 4.1

(a) (i) Explain how xerophytes, such as *Y. treculeana*, are adapted to absorb sufficient water in the conditions in which they live.

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(ii) Explain how xerophytes are adapted to reduce water loss to the atmosphere.

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..... [3]

(iii) Xerophytes often have many defence mechanisms that reduce or prevent herbivores eating them.

Suggest how xerophytes protect themselves against herbivores.

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(b) Forest ecosystems can be affected by acid rain.

Describe how the production of acid rain **and** its effects on forest ecosystems can be reduced.

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..... [4]

[Total: 13]

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5 Bacteria are classified in the Prokaryote kingdom.

(a) State **two** features of animal **and** plant cells that are **not** found in prokaryotes.

1 .....

2 .....
[2]

(b) Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of bacterium that is resistant to some antibiotics.

Fig. 5.1 shows how a population of bacteria may develop antibiotic resistance and how the antibiotic resistance can be passed from one strain of bacterium to another.

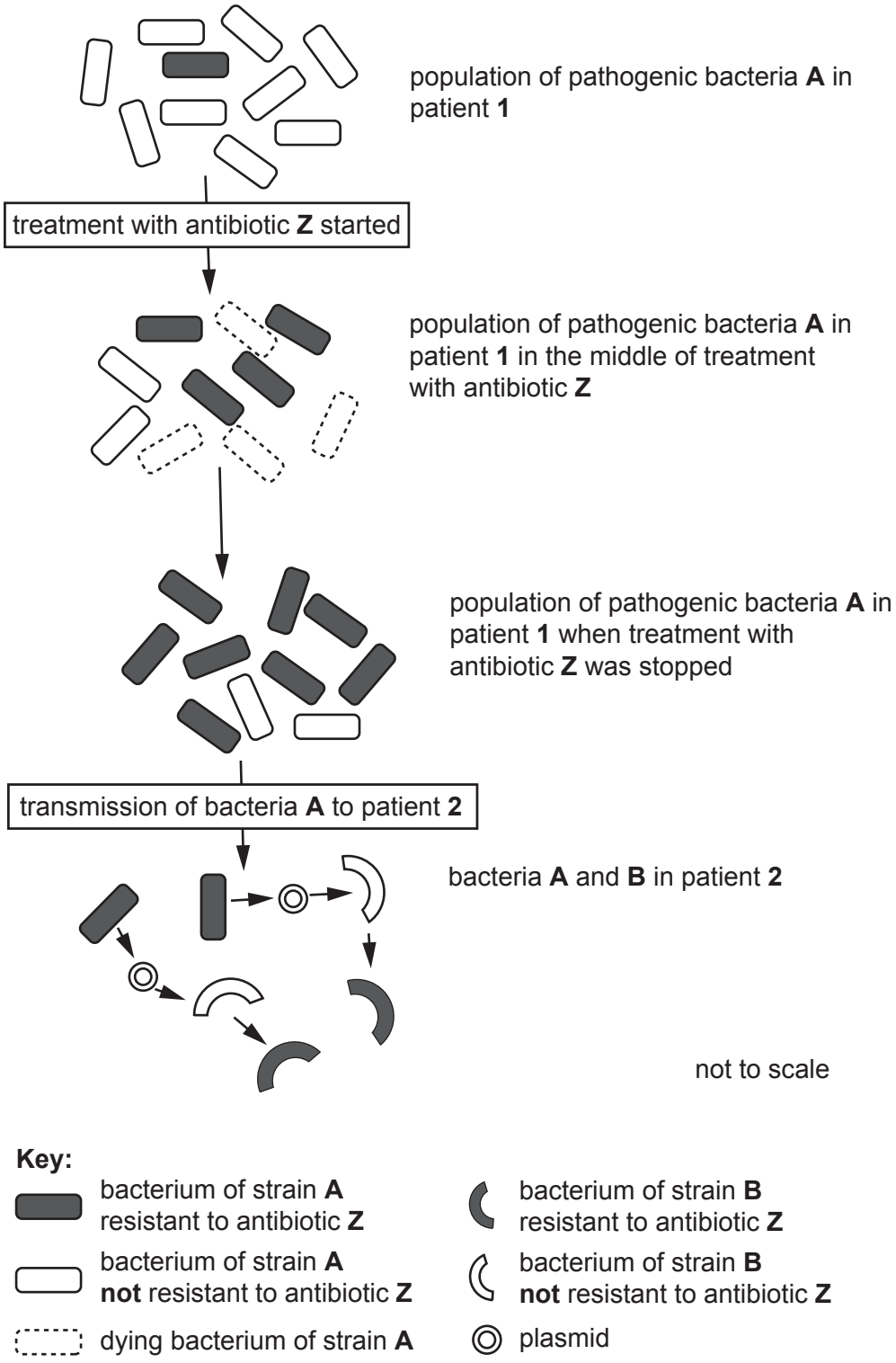


Fig. 5.1

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Explain how resistance to an antibiotic develops in a population of bacteria and spreads in the human population.

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(c) Explain how the development of resistant bacteria, such as MRSA, can be minimised.

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..... [3]

[Total: 11]

6 In many parts of the world dairy cattle are kept in large barns and reared intensively, as shown in Fig. 6.1.



Fig. 6.1

(a) Food for cattle that are reared intensively includes cereals, such as maize and barley.

Ecologists have calculated that it is more energy efficient to grow crops for human consumption than for food for livestock.

Explain why intensive rearing of livestock is **not** an efficient use of crops.

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..... [3]

(b) The urine and faeces from cattle kept in barns is removed and treated in the same way as human sewage to avoid polluting the aquatic environment.

Outline the effects of **untreated waste** from cattle on the aquatic environment.

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..... [4]

(c) Intensive livestock production could be one way of preventing famine.

Describe the causes of famine.

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[Total: 10]

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