Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

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.

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

1 protein synthesis .....

2 transport in the phloem .....

3 nerve impulses .....

[3]

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

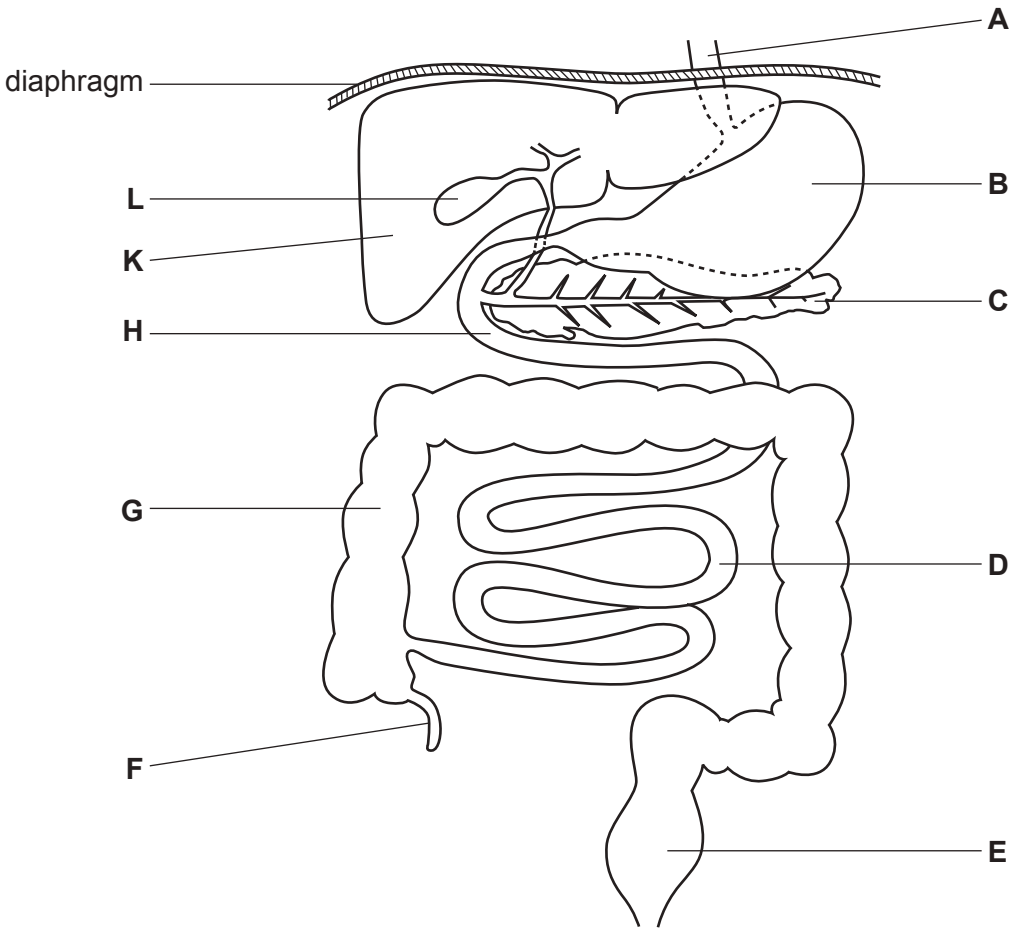

Fig. 1.1

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	Liver	K
storage of bile	Gall bladder	L
secretion of insulin	Pancreas	C
absorption of fatty acids and glycerol	Small intestine	D
secretion of pepsin	Stomach	B
digestion of starch	Small intestine	H

[6]

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

Lactic acid is produced in muscles during exercise by anaerobic respiration. Liver absorbs lactic acid from the blood and oxidizes it to carbon dioxide and water .

..... [2]

(d) Alcohol is a drug.

Define the term drug.

Any substance taken into the body modifies affects chemical reaction in the body .

..... [2]

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

1 depressant

2 reduces self control

[2]

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

1 Addiction

2 Liver damage

[2]

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

(i) Outline these harmful effects.

a) miscarriage

b) low birth weight

c) addiction

[2]

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

1 Nicotine

2 Pathogens

[2]

[Total: 21]

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

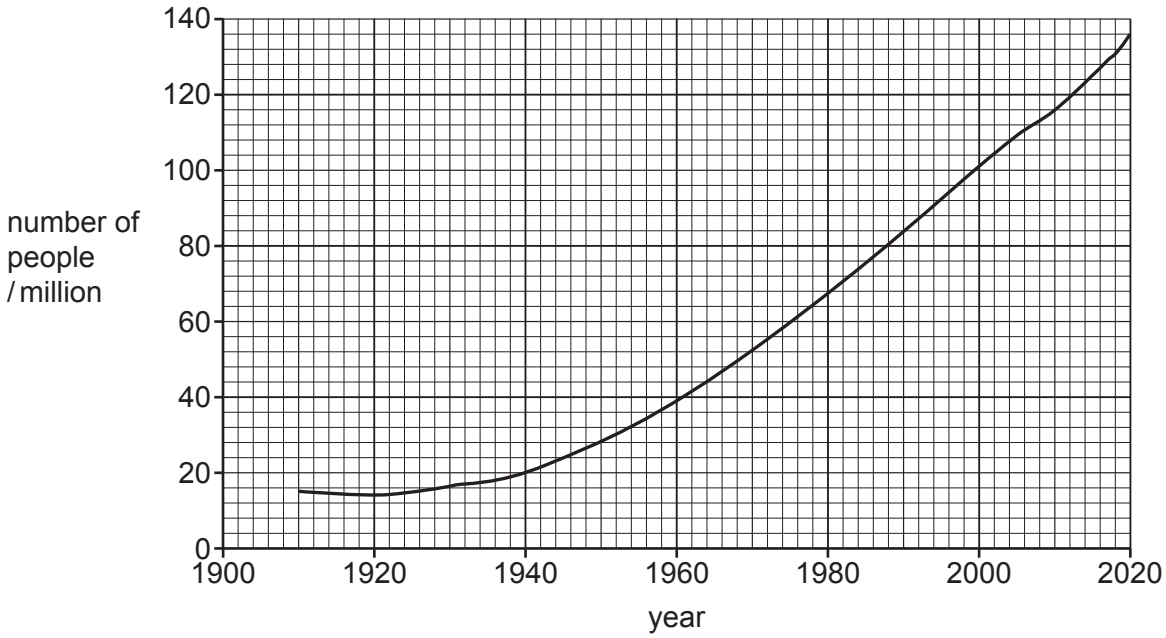

Fig. 2.1

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

Space for working.

$$\frac{\text{(Population in 2020-population in 1940)}}{\text{population in 1940}} \times 100\% = \frac{136-20}{20} \times 100\% = (116 / 20) \times 100\% = 580\%$$

580

.....%

[3]

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

a) Increase in birth rate

.....

b) Decreased death rate

.....

c) Immigration

.....

d) Increased food supply

.....

e) Reduced poverty

.....

f) Improved standard of living

.....

..... [3]

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

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

Ethanol can be made by yeast using anaerobic respiration.

[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.

a) Deforestation

b) Loss of habitat

c) Disruption of food chance

d) Loss of biodiversity

e) Disrupted nutrient cycling

f) Soil eroison

g) Outbreak of crop diseases

h) Killing of non - target species

i) Overuse of pesticides and herbicides .

[4]

[Total: 12]

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.

Transmission of genetic information from generation to generation.

..... [1]

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

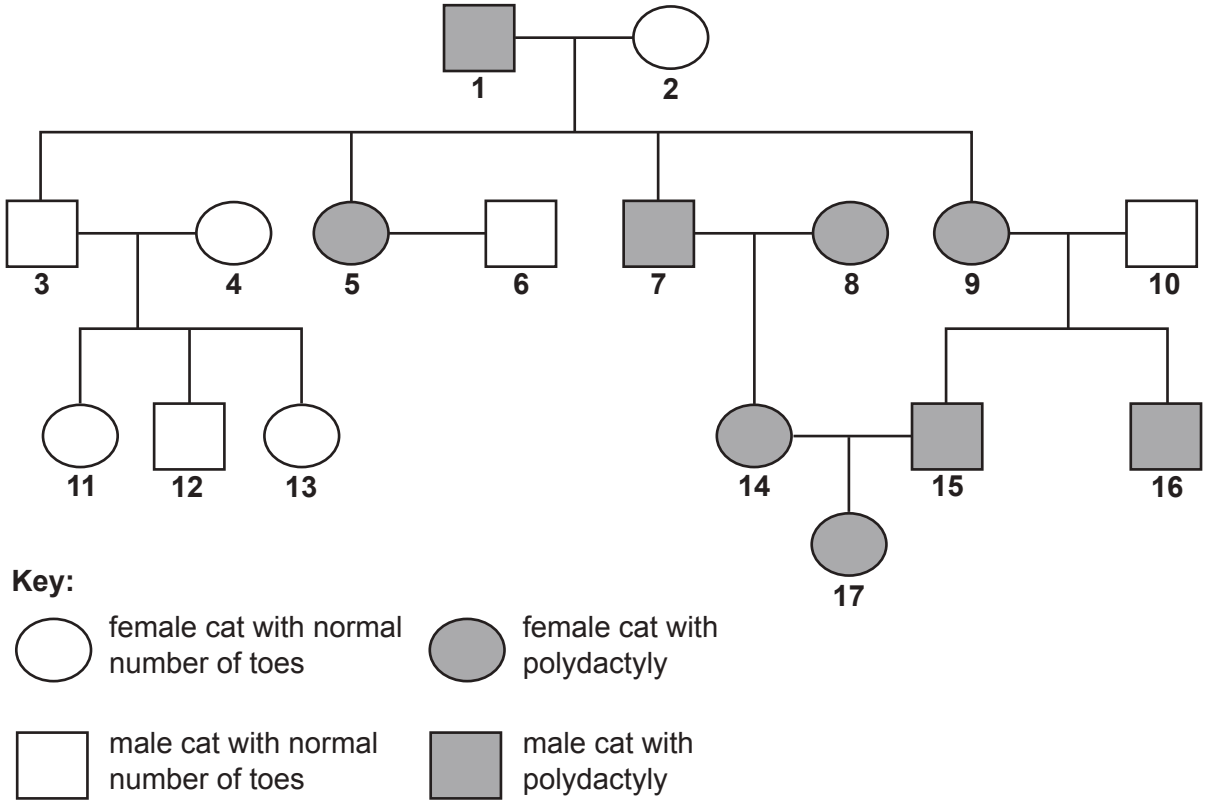

Fig. 3.1

(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** TT .....

cat **6** tt .....

cat **14** Tt .....

[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.

Cats 3 and 4 are homozygous recessive . .....

.....

..... [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	AGA CAC AGA AAT GAG
Hemingway's cats with polydactyly	AGA CAC GGA AAT GAG
cats with polydactyly from Oregon and Missouri in the USA	AGA CAC GGA AAT GAG
cats with polydactyly from the UK	AGA CAC AGT AAT GAG

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

a) Cats with normal number of toes have AGA for bases 7,8 and 9

b) Cats with polydactyly have GGA or AGT .

..... [2]

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

Mutation ..... [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.

Origin of cat was USA . Base sequence is the same as the other cats from the USA .

..... [2]

(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.

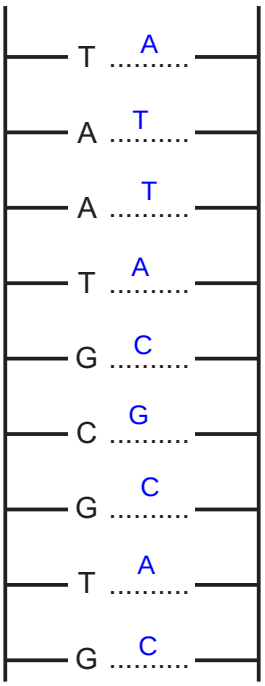

Fig. 3.2

[1]

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

It produces distinct phenotypes. Also there are no intermediates on a continuous scale

.....

.....

.....

.....

..... [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.

They have deep roots which are long and spread out below the surface to absorb water from the water table . The roots have many root hair and the root cells have low water potential which promotes water absorption . Roots absorb water by osmosis from a very salty soils .

..... [4]

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

a) They have low stomatal density

b) Stomata closes during the day and open at night

c) They have sunken stomata

d) Rolled leaves

..... [3]

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

Suggest how xerophytes protect themselves against herbivores.

a) They produce the resins that trap insects

b) Thick inedible leaves

..... [2]

(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.

a) Reduce air pollution

b) Reduce emissions of sulphur dioxide

c) Use filters or scrubbers on chimneys

d) Add lime to soils to raise their pH

e) Use alternative sources of power

..... [4]

[Total: 13]

5 Bacteria are classified in the Prokaryote kingdom.

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

1 Nuclear membrane .....

2 Nuclear envelope .....

[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.

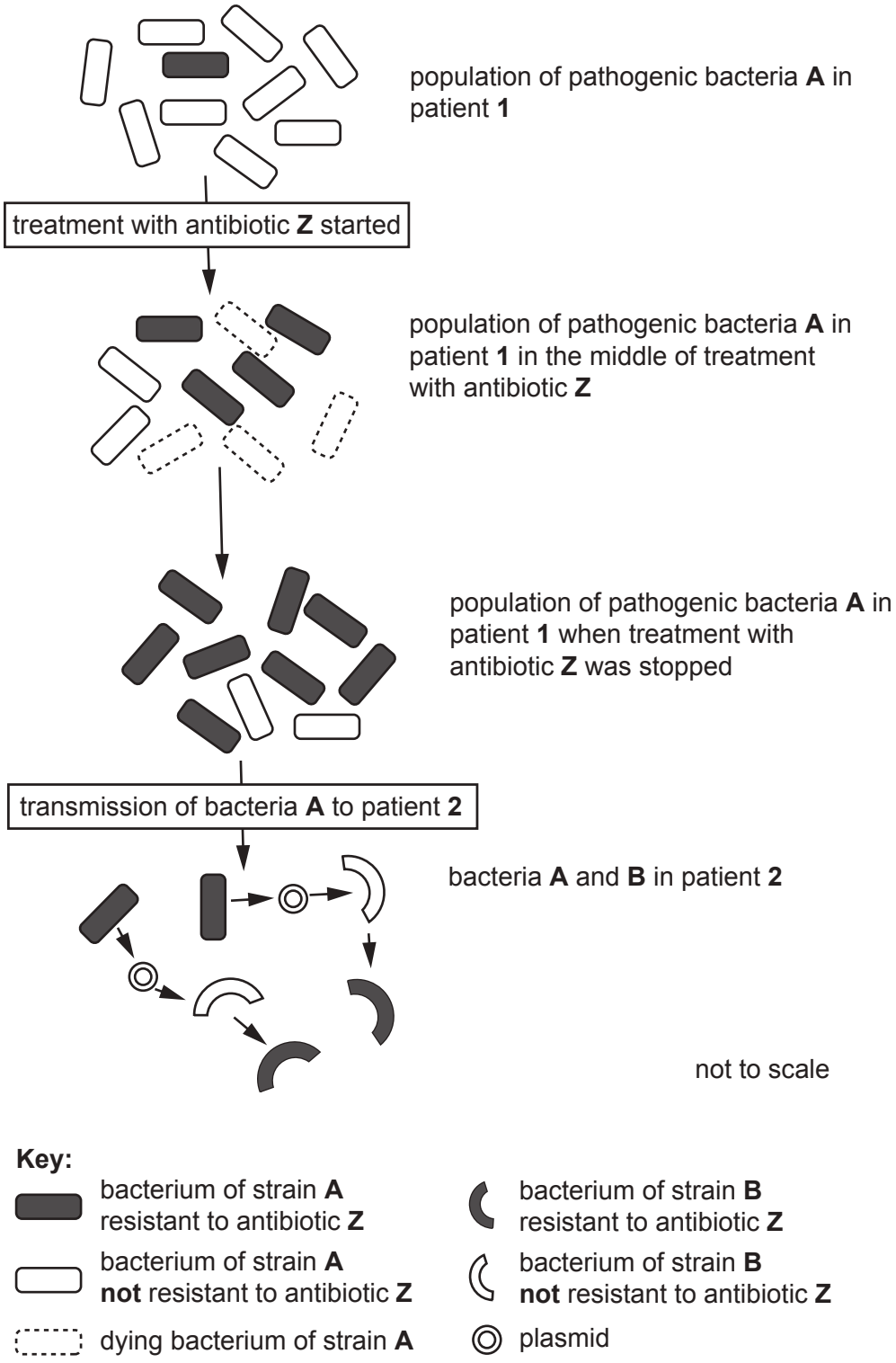

Fig. 5.1

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

Continuous use of the antibiotics by the population leads to development of resistant in bacteria . Resistant arises by mutation in small number of bacteria . Antibiotics kill bacteria that do not have mutation . Resistant bacteria have no competition and continuously reproduce . They pass on their gene for resistance . Antibiotics kill or inhibit the growth of susceptible bacteria. Sometimes one of the bacteria survives because it has the ability to neutralize or escape the effect of the antibiotic; that one bacterium can then multiply and replace all the bacteria that were killed off. Exposure to antibiotics therefore provides selective pressure, which makes the surviving bacteria more likely to be resistant. In addition, bacteria that were at one time susceptible to an antibiotic can acquire resistance through mutation of their genetic material or by acquiring pieces of DNA that code for the resistance properties from other bacteria. The DNA that codes for resistance can be grouped in a single easily transferable package. This means that bacteria can become resistant to many antimicrobial agents because of the transfer of one piece of DNA.

..... [6]

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

a) Less prescription of antibiotics

b) Do not use antibiotics for viral and fungal infections .

c) Isolation of patients with antibiotic - resistant infections

d) Maintenance of good hygiene

e) Development of new antibiotics .

..... [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.

Energy is lost at each trophic level in the food-chain . 90 % of energy is lost and only 10 % of energy is pass on the another trophic level . Cattle lose energy during metabolic process such as digestion and respiration . Therefore, less energy is available to humans .

..... [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.

a) Visual pollution

b) Increased risk of water - borne diseases

c) Increased organic content of rivers and lake

d) Increased growth of bacteria

e) Eutrophication

[4]

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

Describe the causes of famine.

a) Lack of food supply

b) Wars and sudden immigration

c) Drought and floods

d) Poverty

[3]

[Total: 10]