FORM TP 2018045

TEST CODE **01207020**

MAY/JUNE 2018

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in TWO sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated with diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

"*"Barcode Area"*"
Sequential Bar Code

SECTION A

Answer ALL questions in this section.

1. (a) Scientists, interested in studying the survival of organisms living at high temperatures, identify some microorganisms living in a desert habitat where the average daily temperatures exceed 50 °C. They extract an enzyme, protease, that facilitates the digestion of proteins from these organisms, and investigate the effect of temperature on the action of this enzyme.

(i) State TWO precautions that they should take in carrying out this experiment.

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(2 marks)

(ii) The results of their experiment are presented in Table 1. On the grid provided in Figure 1 on **page 5,** draw a graph to represent the results presented in Table 1.

(4 marks)

TABLE 1: RESULTS OF EXPERIMENT INVESTIGATING THE EFFECT OF TEMPERATURE ON ENZYME ACTIVITY

Temperature (°C)	5	10	30	45	50	55	60	65
Time Taken for Protein to Disappear (minutes)	60	60	45	25	18	15	60	60

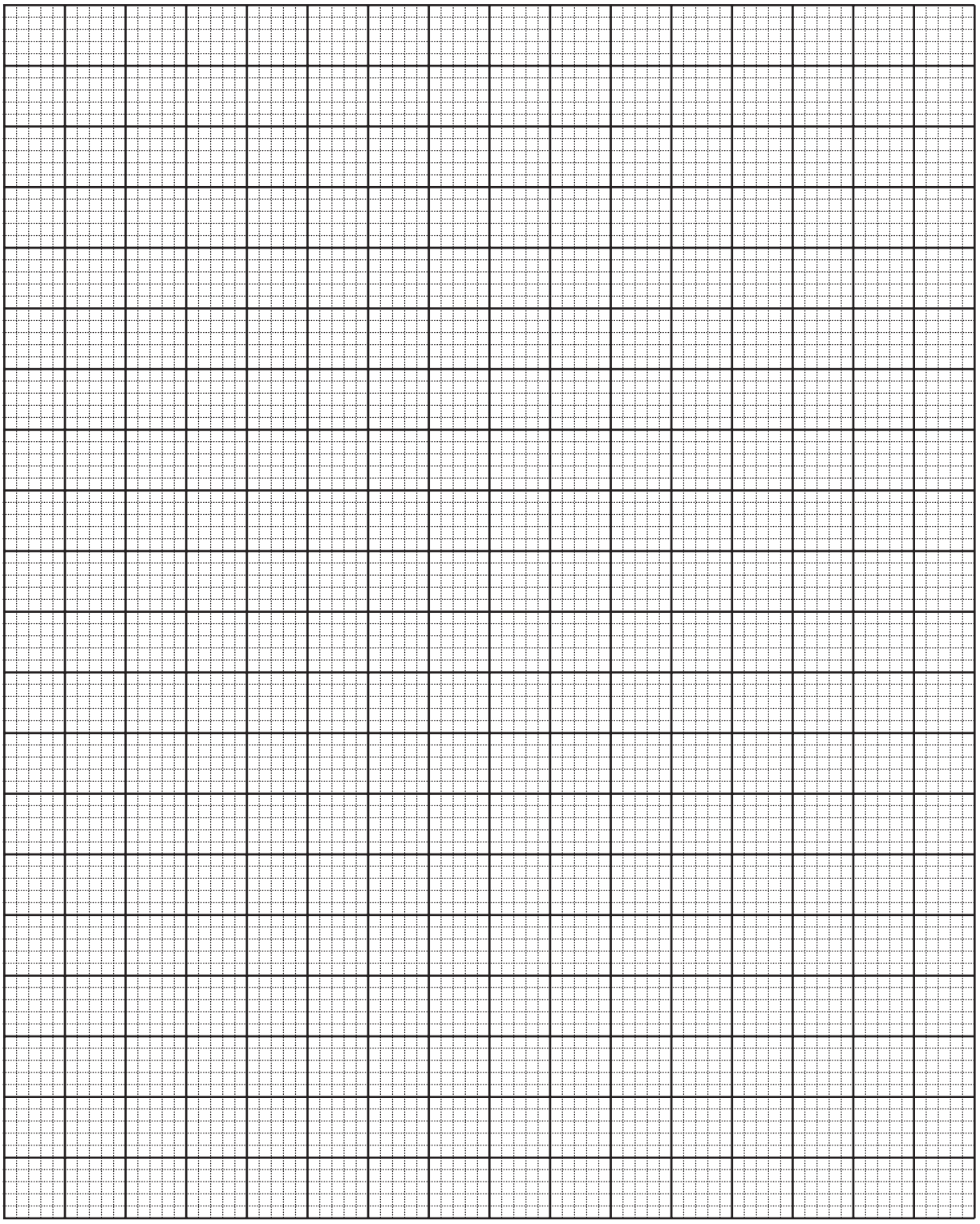

Figure 1. Results of experiment

(iii) From the graph in Figure 1, identify the optimum temperature for the protease activity.

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(1 mark)

(iv) Suggest ONE reason for the shape of the graph at less than 10 °C, TWO reasons for the shape of the graph between 10 and 55 °C, and ONE reason for the shape of the graph at more than 55 °C.

Less than 10 °C

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10–55 °C

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More than 55 °C

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(4 marks)

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(v) Describe a suitable procedure that the scientists could use to investigate the effect of pH on the activity of the protease enzyme.

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(3 marks)

(b) The human skin shown in Figure 2 is an organ which helps humans to regulate their body temperature.

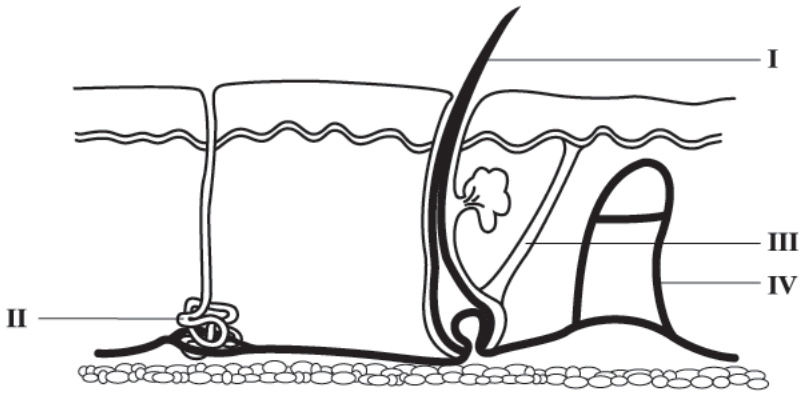

Figure 2. Vertical section through human skin

(i) Name the parts labelled I, II, III and IV in Figure 2.

I .....

II .....

III .....

IV .....

(4 marks)

(ii) Describe how the structures named in (b) (i) help humans to regulate their body temperature.

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(4 marks)

(c) Explain how changes in the epidermal cells of leaves help plants to conserve water during high temperatures.

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(3 marks)

Total 25 marks

2. (a) Figure 3 shows three different types of cells, A, B and C.

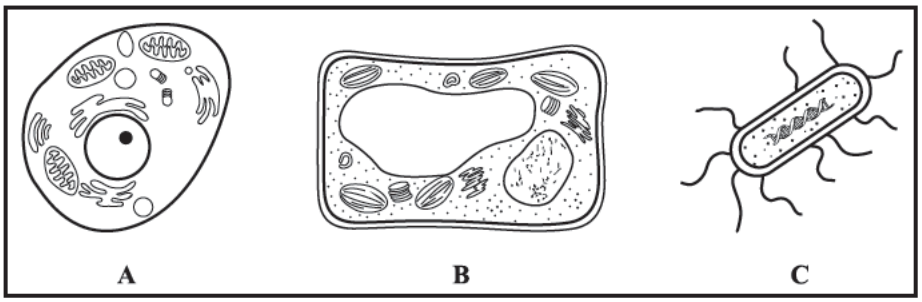

Figure 3. Diagram showing three different types of cells

(i) Name the types of cell labelled A, B and C in Figure 3.

A .....

B .....

C .....

(3 marks)

(ii) Name TWO structures that are common to the three types of cell.

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(2 marks)

(iii) State TWO differences between the type of cell labelled A and the type of cell labelled C.

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(2 marks)

(b) Tissues made up of Type B cells are placed in a container of concentrated salt solution and left for one hour.

Describe THREE changes in the appearance of the cells after one hour in the concentrated salt solution, and give an explanation to account for these changes.

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(4 marks)

(c) Tissues made up of Type A cells and Type B cells are placed in a container of distilled water and left for one hour.

Describe how the appearance of Type A cells is expected to differ from that of Type B cells and give an explanation for this difference.

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(4 marks)

Total 15 marks

3. (a) Figure 4 shows a section through the human eye.

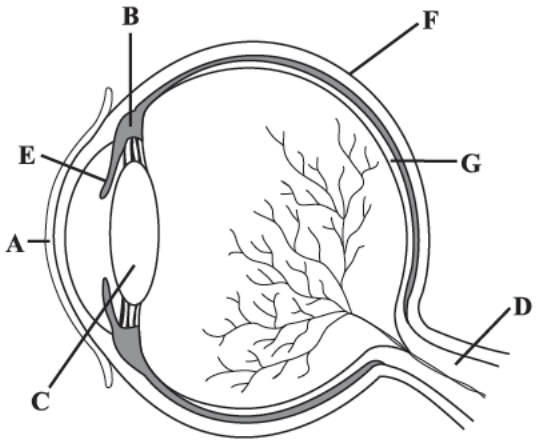

Figure 4. Section through the human eye

Table 2, which is incomplete, shows structures in the human eye labelled in Figure 4 and their related functions.

Complete the table by matching EACH labelled part of the eye to its function. Write the letter and the name of the part. The first row has been completed for you.

TABLE 2: FUNCTIONS OF THE PARTS OF THE EYE

Letter	Structure	Function
A	Conjunctiva	The membrane that protects the cornea
		Transmits nerve impulses to the brain
		Becomes more or less convex to focus light on the retina
		Controls the amount of light passing through the pupil
		Contracts and relaxes to alter the shape of the lens
		Protects and keeps the shape of the eye
		Converts light energy to nerve impulses

(6 marks)

(b) Name ONE type of light sensitive cell found in the retina.

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(1 mark)

(c) Explain why colours are seen less clearly in dim light than in bright light.

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(2 marks)

(d) A colour-blind woman mates with a man who has normal colour vision. Determine the probability of this couple having a colour-blind daughter by completing the genetic diagram below.

Parents' phenotypes: Normal colour vision man × colour-blind woman

Parents' genotypes: $X^C Y$ × X^cX^c

Gametes:

Fertilization cross:

Gametes → ↓		

Probability of colour-blind daughter .....

(6 marks)

Total 15 marks

SECTION B

Answer ALL questions.

4. (a) Figure 5 is a diagram of the human respiratory system. Name the parts labelled A, B, C, D, E and F in the space provided.

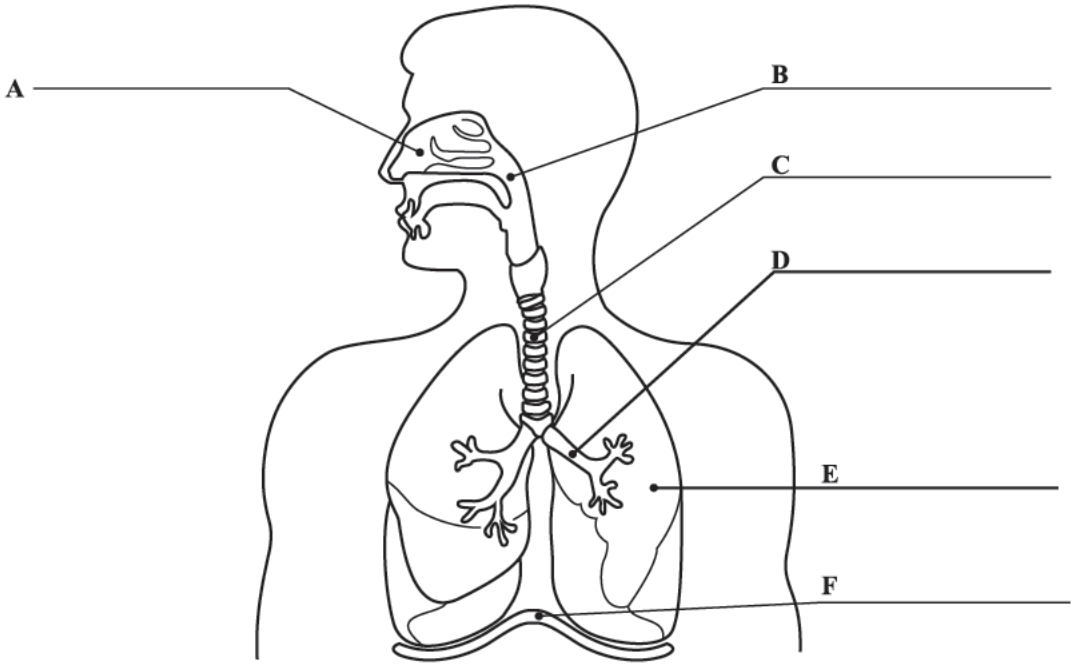

Figure 5. Diagram of human respiratory system

(6 marks)

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(b) State TWO characteristics that the respiratory surface used for gaseous exchange in human beings has in common with the respiratory surface used in flowering plants. Explain how EACH characteristic makes the respiratory surface suitable for gaseous exchange.

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(4 marks)

(c) Advertisements for electronic cigarettes promise to supply nicotine to the body without the harmful effects of cigarette smoke. These cigarettes are promoted as a healthier alternative to smoking regular cigarettes.

(i) Outline the effects of THREE named components of cigarette smoke, **other** than nicotine, on the human body.

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(3 marks)

(ii) Outline TWO ways in which the use of nicotine in electronic cigarettes may be harmful to the human body.

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(2 marks)

Total 15 marks

5. (a) Name THREE components of human blood that are important in protecting the body against pathogenic diseases and state the function of EACH.

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(6 marks)

(b) Marianne, a one- month-old baby acquires immunity from her mother through breastfeeding. Marianne's father accidently punctures his finger with a nail but does not need a tetanus antiserum injection because he received a tetanus vaccine the previous year.

Explain how the type of immunity that Marianne acquired from breastfeeding differs from the type of immunity that her father acquired from his vaccine. In your explanation, state the name of EACH type of immunity.

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(5 marks)

(c) The authorities prevent children who are not immunized from registering in public schools.

Suggest TWO reasons why some parents may have a valid concern about immunizing their children and TWO reasons why the authorities maintain their position on preventing the entry of unvaccinated children.

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(4 marks)

Total 15 marks

6. (a) Describe how the process of mitosis results in the production of identical cells in **asexual** reproduction.

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(6 marks)

(b) Plants that reproduce **sexually** have some advantages compared to those that reproduce only asexually. Outline TWO advantages and THREE disadvantages of sexual reproduction.

Advantages

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Disadvantages

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(5 marks)

(c) (i) Scientists have successfully cloned animal species. Suggest TWO reasons why humans may choose to clone animals.

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(2 marks)

(ii) Outline TWO ethical issues related to the cloning of humans.

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(2 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.