Name: _____ **Class:** _____ **Index Number:** _____

ST JOSEPH'S INSTITUTION

PRELIMINARY EXAMINATION 2017
SECONDARY 4 (O LEVEL PROGRAMME)

BIOLOGY

5158/02

Paper 2 Theory

16 August 2017

1 hour 45 minutes

Candidates answer on the Question Paper

(1100 hr – 1245 hr)

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on the cover page of this Question Paper and all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.

Section A
Answer **all** questions.

Section B
Answer THREE questions in this Section in the lined spaces provided.

The first two questions are compulsory questions; one of which is a data-based question. The last question is in the *either/or* form.

The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	/ 50
Section B	/ 30
Total	/ 80

This document consists of **16** printed pages including this cover page.

[Turn over]

Section A: 50 marks
Answer ALL questions in the spaces provided.

1 Differentiate between:

a a polypeptide and a protein. [2]

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b glycogen, glucagon and glycerol. [3]

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[Total: 5]

2 **Fig. 2.1** shows the effect of temperature on the rate of an enzyme catalysed reaction in an aquatic green plant *Elodea*.

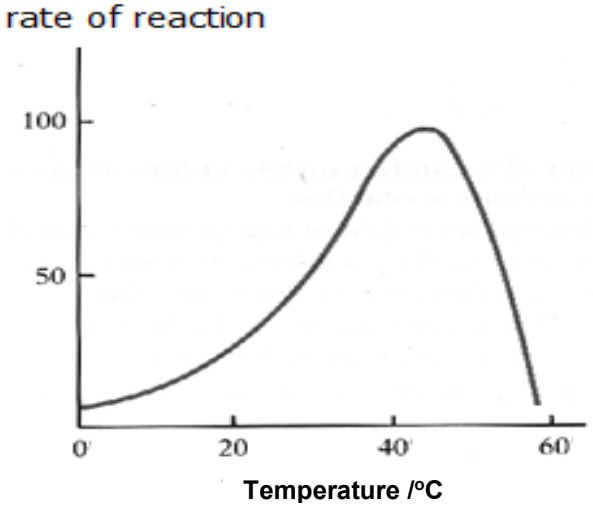

Fig. 2.1

a Sketch, on **Fig. 2.1**, the graph showing the rate of carbon dioxide absorbed by *Elodea* from its surrounding over the same range of temperature, when light intensity is reduced 50% from before. [1]

b Explain the relationship of the two graphs at temperature 50°C. [2]

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c Explain, using the 'lock and key' hypothesis, the increase in rate of enzyme activity between 20°C and 30°C. [2]

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[Total: 5]

3 In the lungs, the alveoli are the site of gas exchange.

a A large number of small alveoli is more efficient in gas exchange than a smaller number of larger alveoli. Explain why. [2]

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b Figure 3.1 shows part of an alveolus and a capillary.

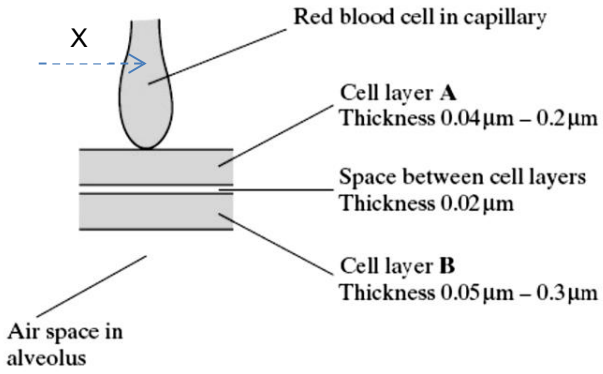

Fig. 3.1

(i) Name the ion X in the blood plasma which enters the red blood cell and the enzyme involved to catalyse the formation of carbon dioxide which will diffuse into the air space in the alveolus. [2]

X: …… Enzyme: ……..

(ii) State the common adaptive feature of both cell layers **A** and **B** to increase efficiency of gas exchange. [1]

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(iii) What is the minimum distance a molecule of carbon dioxide diffuses from the blood plasma to the air space in the alveolus? [1]

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c The diffusion of carbon dioxide depends on the difference in its concentration between the blood and the lungs. Exhalation results in lowering the concentration of carbon dioxide of the lungs. Describe and explain the roles played by diaphragm and internal intercostal muscles to bring about exhalation of the gas. [4]

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[Total: 10]

4 Figure 4.1 shows two different cells involved in the defence of the human body.

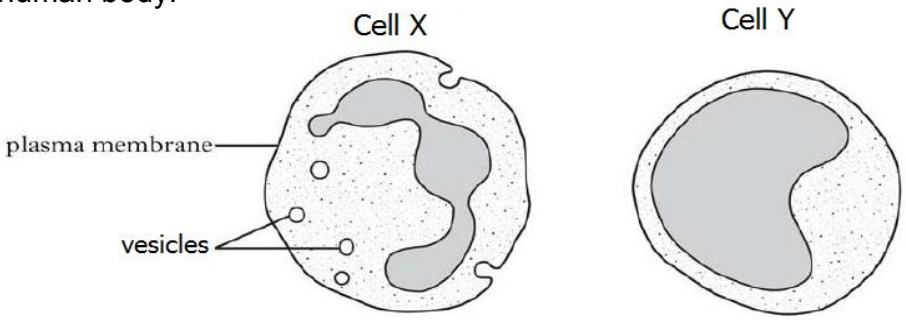

Fig 4.1

a Explain how cell X and Y may work together to prevent infection after an operation. [2]

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b Blood clot also protects infection by forming a plaque on the wound. Briefly explain how blood platelets help to form blood clot. [2]

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[Total: 4]

5 In Vitro Fertilisation (IVF) is a medical procedure whereby egg is fertilised by sperms elsewhere outside the body. Figure 5.1 below shows a diagrammatic flow of the treatment.

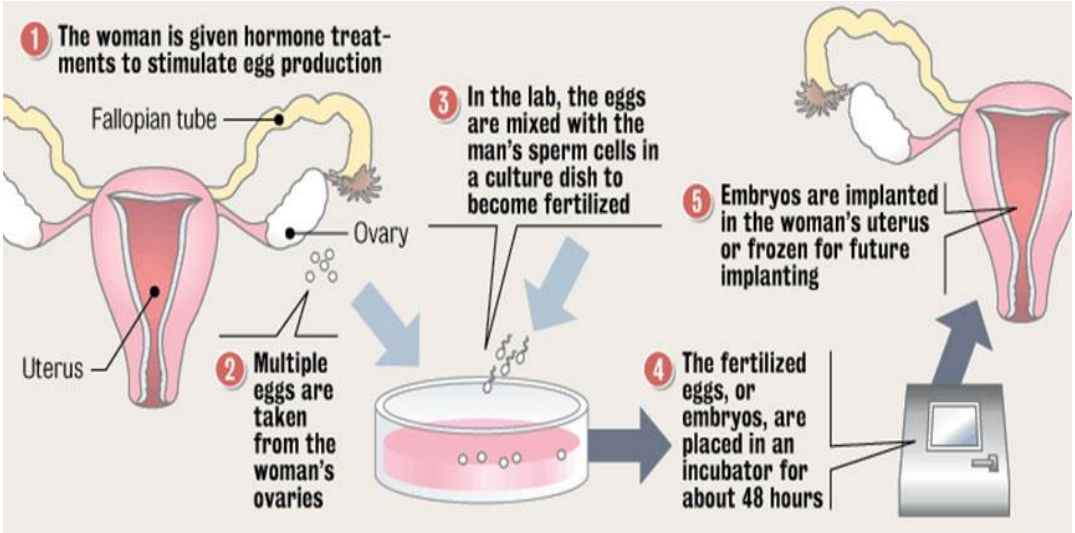

Fig. 5.1

a State the part of the female reproductive organ where fertilisation normally occurs instead of culture dish in IVF. [1]

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b Explain why the embryos formed using IVF are not clone of their parents. [1]

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c Briefly explain why the embryo has to be implanted into the uterus during IVF. [3]

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[Total: 5]

6 The food chain below shows the amount of biomass transferred to humans from 1000 g of plant plankton.

1000 g		500 g		40 g		5 g
plant plankton	→	animal plankton	→	mackerel	→	human

a Draw and label a pyramid of biomass for the food chain above. [1]

b If the population in the second trophic level of the food chain is decreased, what effects on the populations of the other trophic levels may result? [2]

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c Mercury was accidentally released from a nearby factory into a water body where the plant plankton lives. Suggest how this might be harmful to human beings as part of the food chain above. [2]

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[Total: 5]

7 Fig. 7.1 shows a family tree and the blood group phenotype of each individual.

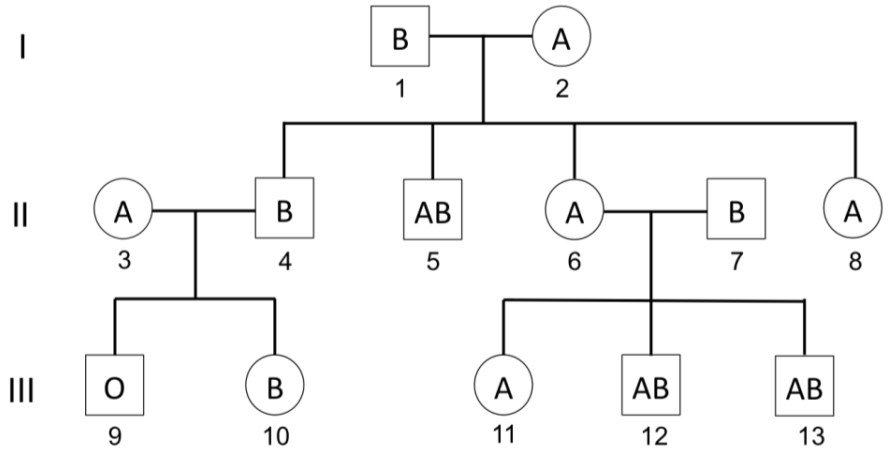

Fig. 7.1

a During blood transfusion in human, **blood group O** is considered universal donor. Explain why there is no coagulation in the recipient with **blood group AB** even though **blood group O** contains both antibodies **a** and **b**. [1]

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b State the number of heterozygous individuals in *Generation II*. [2]

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c Is it possible for individuals **6** and **7** to have produced an offspring with **blood type O**? Construct a full genetic diagram in the space below to justify your answer. [3]

[Total: 6]

8 *Dicerorhinus sumatrensis, or the Sumatran rhinoceros, is the* only rhino species that has two horns. Cells at the base of the horns continually divide by mitosis. Figure 8.1 below shows the chromosomes from the epidermal horn cell of a female rhinoceros at **prophase** of mitosis.

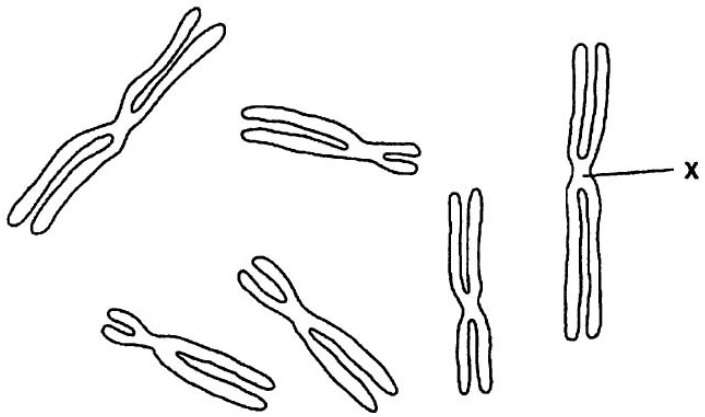

Fig. 8.1

a State the diploid chromosome number of the female Sumatran rhinoceros. [1]

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b State the roles of **X** in mitosis. [1]

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c On Figure. 8.1, **shade clearly** any one pair of homologous chromosomes. [1]

d *In the space below,* draw the chromosomes of Figure 8.1 as it would appear during ***prophase II*** of one of the cells if meiosis had occurred. [2]

e Figure 8.2 shows two different species of temperate frogs.

R. *variabilis*

R. *imitator*

Figure 8.2

R. *variabilis* species is toxic but R. *imitator* species is non-toxic. Such is an example of Batesian mimicry in nature.

(i) Suggest why most predators would avoid preying on R. *imitator*. [2]

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(ii) Suggest an explanation, in terms of natural selection, for the pattern on the body of R. *imitator*. [3]

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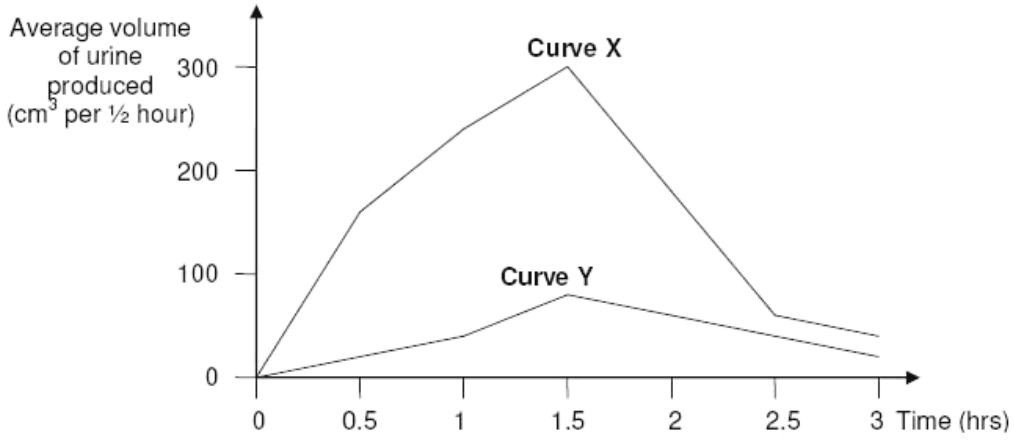
[Total:10]

Name: _____ ( ) Class: _____ /30

Section B (30 marks)
Answer three questions in the lined spaces provided for each question.
***Question 11** is in the form of an **Either/Or** question. Only one part should be answered.*

9 The graphs below show urine output of two groups of healthy adult males.

Group A: after drinking 1 dm^3 of water; and
Group B: after drinking 1 dm^3 of 0.96% sodium chloride solution.



a Define *hormone.* [1]

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b State one important precaution that should be carried out by these men at the start of the experiment to increase the reliability of the experiment. [1]

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c(i) Which curve represents the effects of drinking 1 dm^3 of sodium chloride solution? [1]

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c(ii) Explain your answer, in terms of the effects of a named, appropriate hormone and the target excretory organ involved. [3]

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d Name another organ through which sodium chloride could also have been eliminated. [1]

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e Define the term excretion and explain its importance to our body. [3]

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[Total:10]

10 **a** Describe the structure of DNA. [4]

b Outline how human insulin can be mass-produced using bacteria in medical biotechnology. [6]

11 **Either**

a Explain the non-cyclic flow of energy in the ecosystem and suggest why having a short food chain is more efficient in energy transfer. [5]

b Describe how the carbon in a glucose molecule in the body of an animal is cycled in an ecosystem. [5]

Or

a With reference to the vascular tissues in roots, stems and leaves, describe the movement of essential materials within a plant. [6]

b When the rate of water loss from a plant is greater than the rate of water uptake, the stomata closes. Explain [4]

(i) how stomata close, *and*

(ii) how this closing is an advantage and disadvantage to the plant under these conditions.

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11. Either / Or (please circle your choice)

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