INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL EXAMINATION: AUGUST 2015 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Complete the table below to show the differences between epithelial tissues.

Type of tissue	Structure	Function	Location
(i)	Thin and flatten.	(ii)	(iii)
(iv)	(v)	Absorption/ secretion	Intestine
(vi)	Like a cube.	(vii)	Kidney

(7 marks)

(b) Imagine that you have just taken a bowl of rice (assuming it is mostly carbohydrate). Explain what happens in each structure which the food passes in its journey through the digestive system.

(6 marks)

(c) Fig. 1.1 shows a vertical section of the left side of the heart of a mammal.

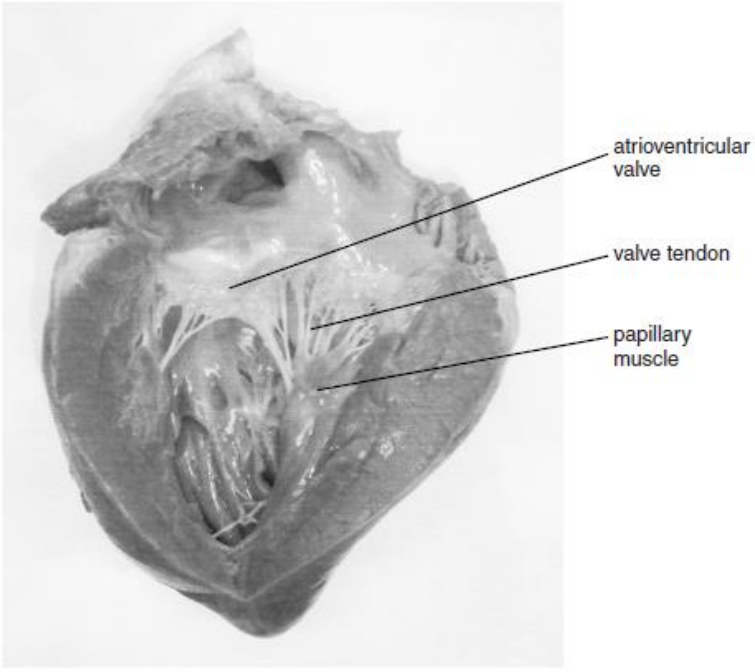

Fig. 1.1

(i) Explain the difference in the thickness of the left ventricle and the left atrium.

(2 marks)

(ii) Explain how the structures labelled on Fig. 1.1 ensure that blood flows in the correct direction.

(3 marks)

(iii) During one cardiac cycle, blood is pumped from the heart into the pulmonary and systemic circulations. Explain how the contraction of the **FOUR (4)** chambers of the heart are **coordinated and controlled** to enable blood to be pumped simultaneously into both the pulmonary and systemic circulations.

(7 marks)

Question 2

(a) B-lymphocytes respond to the presence of a **non-self** antigen by dividing as shown in Fig. 2.1.

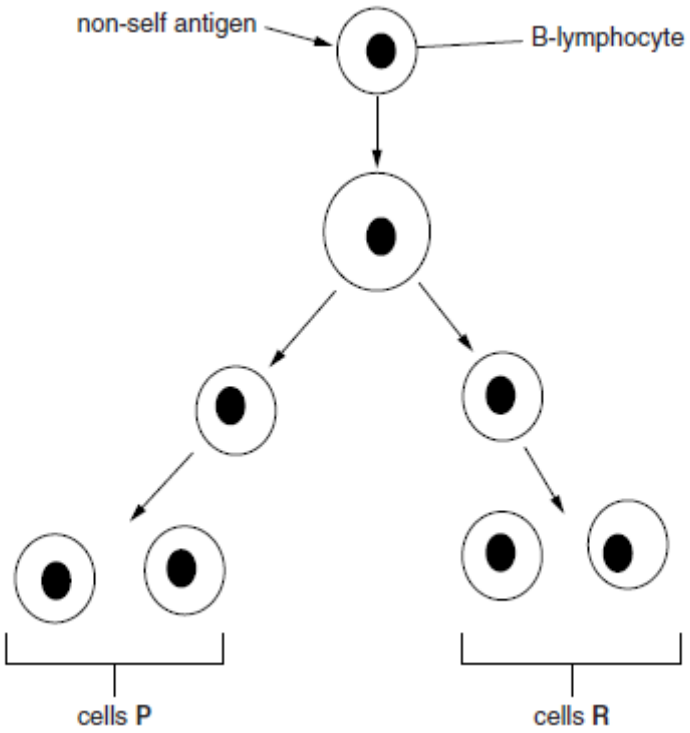

Fig. 2.1

(i) Explain what is meant by the term **non-self** antigen.

(2 marks)

(ii) Outline how B-lymphocytes recognize **non-self** antigens.

(2 marks)

(iii) The cells labelled R on Fig. 2.1 divide to give more cells that do not differentiate into plasma cells. These cells have an important role in the immune system. Explain the role of these cells.

(6 marks)

(b) Samples of blood group of Adam and Mary have been tested to determine the blood type.

Table 2.1

Name	Blood type	Type of serum		
		Anti-A serum	Anti-B serum	Anti-D serum
Adam	O+	(i)	(ii)	(iii)
Mary	AB-	(iv)	(v)	(vi)

(i) Complete the Table 2.1 to show the results of the testing. Use tick (√) for agglutination and cross (X) for no agglutination.

(3 marks)

(ii) To whom could Mary donate blood?

(1 mark)

(iii) Could Adam give blood to Mary? Why?

(3 marks)

(c) Figs 2.2 and 2.3 show the concentration of glucose and insulin in blood plasma before and after a glucose drink.

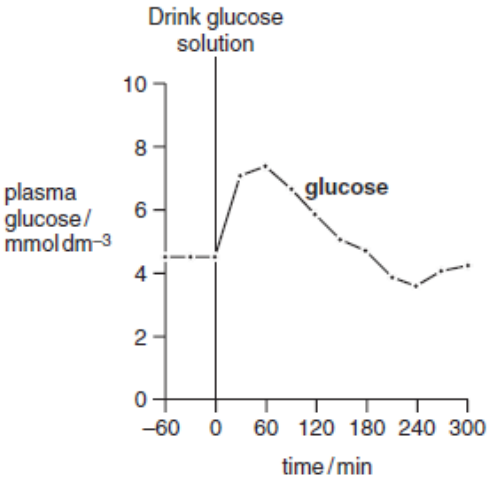

Fig. 2.2

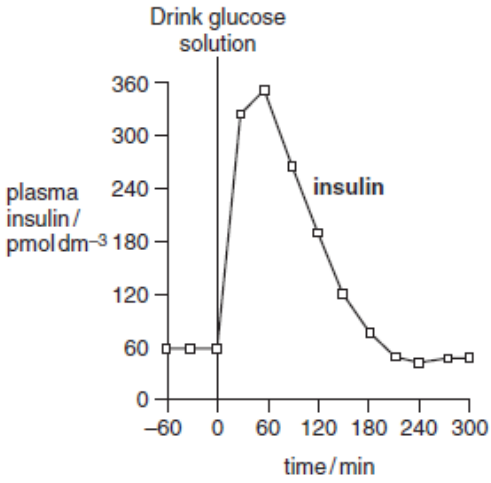

Fig. 2.3

(i) With reference to Fig. 2.2, describe the changes in blood glucose concentration after the glucose drink.

(2 marks)

(ii) With reference to Fig. 2.2 and Fig. 2.3 explain how the changes in blood glucose cause an increase in the concentration of insulin in the plasma.

(2 marks)

(iii) With reference to Fig. 2.2 and Fig. 2.3 explain how the changes in blood glucose cause a subsequent fall in the concentration of insulin in the plasma.

(2 marks)

(iv) Describe the role of the hormone glucagon in maintaining the concentration of blood glucose.

(2 marks)

Question 3

(a) Table 3.1 shows a comparison of the contents of various solutes in the blood plasma entering the kidney, glomerular filtrate and urine.

Table 3.1

Solute	Concentration of solute (g/liter)		
	Blood plasma	Glomerular filtrate	Urine
Glucose	2.0	2.0	0
Protein	80.0	0	0
Sodium ions	4.0	4.0	4.0
Potassium ions	0.20	0.20	1.5
Urea	0.30	0.30	20.0

(i) Name the process by which dissolved nutrients in blood plasma enter the Bowman's capsule.

(1 mark)

(ii) Describe how the process occurs.

(2 marks)

(iii) Explain why glucose is not found in the urine excreted.

(2 marks)

(iv) Explain why protein is not found in the glomerular filtrate.

(2 marks)

(v) State **ONE (1)** characteristic of the proximal tubule that enhances the efficiency of active reabsorption of most of the solutes from glomerular filtrate.

(2 marks)

(b) Fig. 3.1 shows the development of an ovarian follicle. Identify the structures labeled A, B, C and process labeled M.

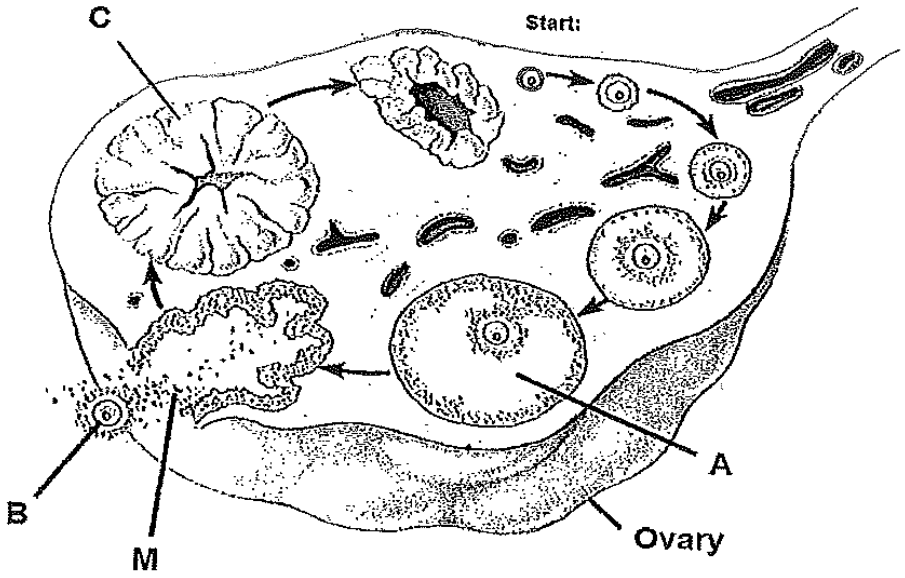

Fig. 3.1

(4 marks)

(c) Fig. 3.2 shows the relative level of progesterone in the blood of a woman during one menstrual cycle.

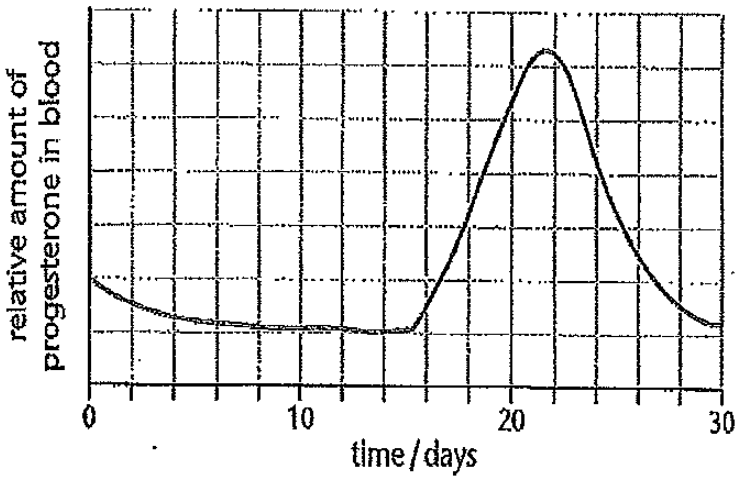

Fig. 3.2

(i) State precisely the name of the structure that produced the progesterone.

(1 mark)

(ii) Was the woman pregnant? Give a reason for your answer.

(2 marks)

(d) Fig. 3.3 below shows the structure of a synapse.

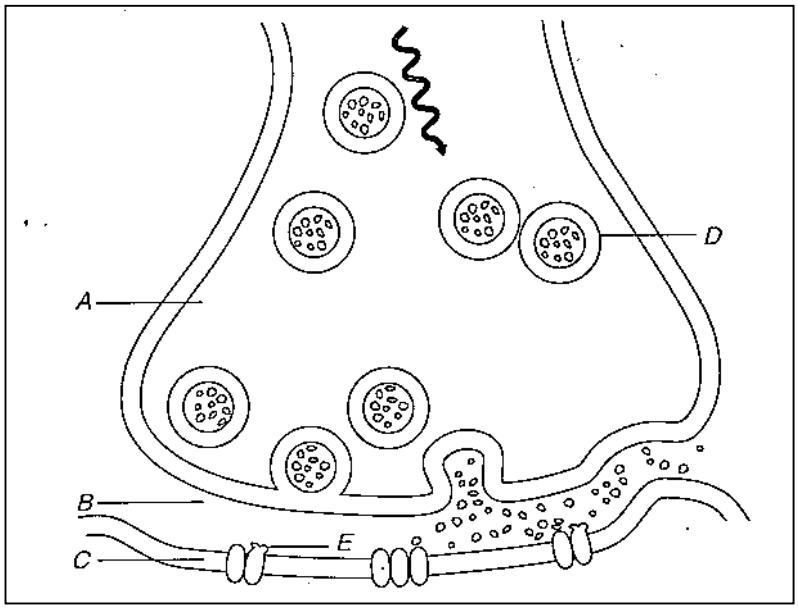

Fig. 3.3

(i) Identify the structures labeled A, B, and C as shown in Fig. 3.3.

(3 marks)

(ii) Identify the structure labeled D. Name the chemical substances found inside it.

(2 marks)

(iii) Name an organelle which can be found in structure A. suggest a reason for its presence.

(2 marks)

(iv) Why is synaptic transmission slow compared to the transmission of impulse along an axon of a neuron?

(2 marks)

Question 4

(a) List down **THREE (3)** types of tissues that comprise the ground tissue system and state their functions respectively.

(6 marks)

(b) Fig. 4.1 shows the pathway taken by water as it enters the root of a flowering plant.

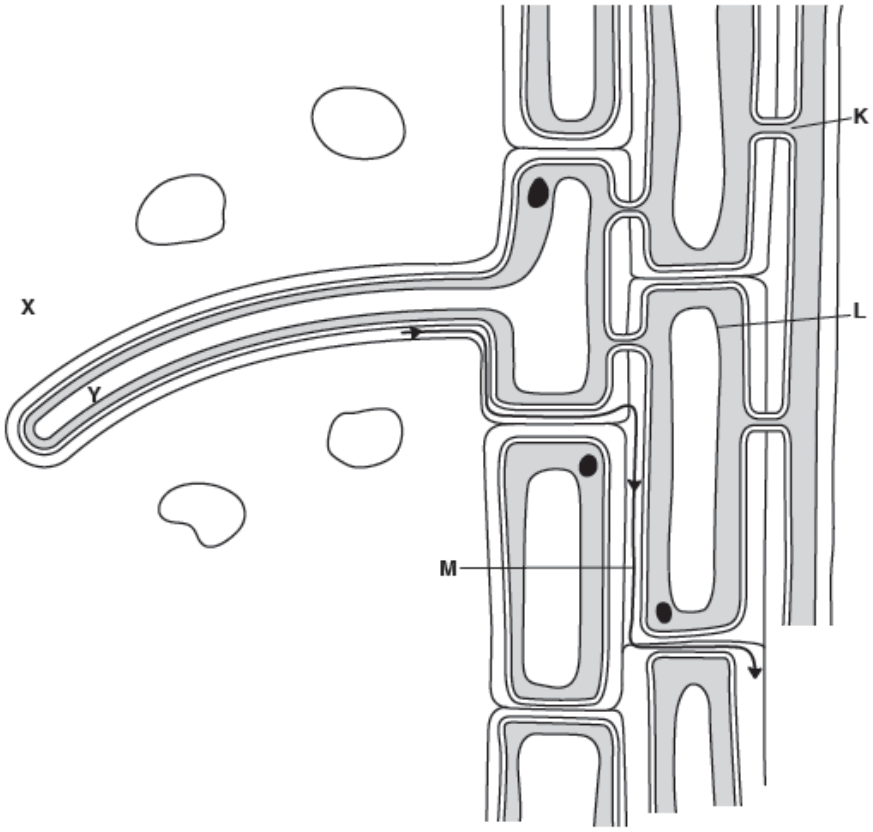

Fig. 4.1

(i) Explain how water passes from X to Y.

(3 marks)

(ii) Identify structures labeled K and L.

(2 marks)

(iii) Explain the pathway labeled M on how water enter xylem.

(3 marks)

(c) *V. faba* is a legume. Roots of legumes often have swellings at intervals known as nodules. Cells within the nodules contain nitrogen-fixing bacteria.

(i) Explain the role of nitrogen fixation in the nitrogen cycle.

(2 marks)

(ii) Explain how legumes can increase the nutrients in the soil.

(4 marks)

(d) Fig. 4.2 shows the exposure of plant species Z to various periods of light (unshaded bars) and dark (shaded bars). In some cases the dark period was interrupted by periods of light. The effect on flowering is shown in each case. Critical night length for the plant is 12 hours.

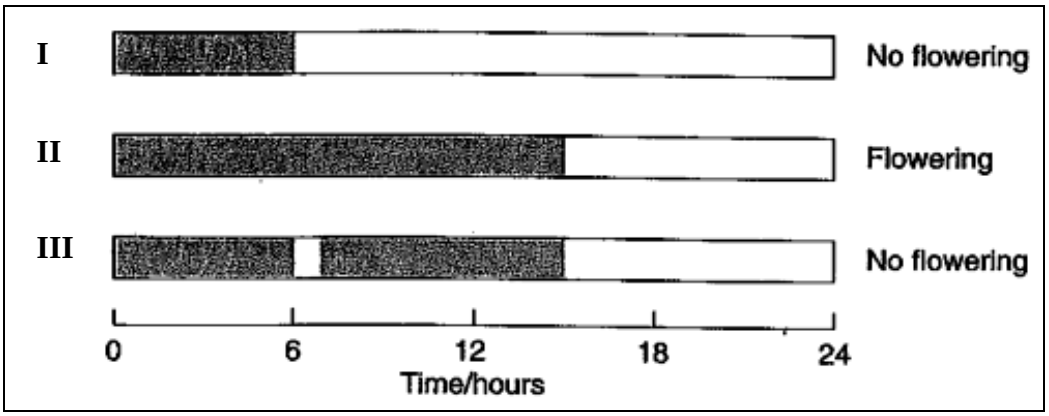

Fig. 4.2

(i) To which photoperiodic group does the plant belong? Why?

(2 marks)

(ii) Explain the result of treatment labeled II and III.

(3 marks)

Question 5

(a) The tiger, *Panthera tigris*, is classified as an endangered species by the International Union for the Conservation of Nature and Natural Resources (IUCN). The IUCN publishes an annual list of endangered species called the Red List. Fig. 5.1 shows the number of tigers in the wild between 1900 and 2010.

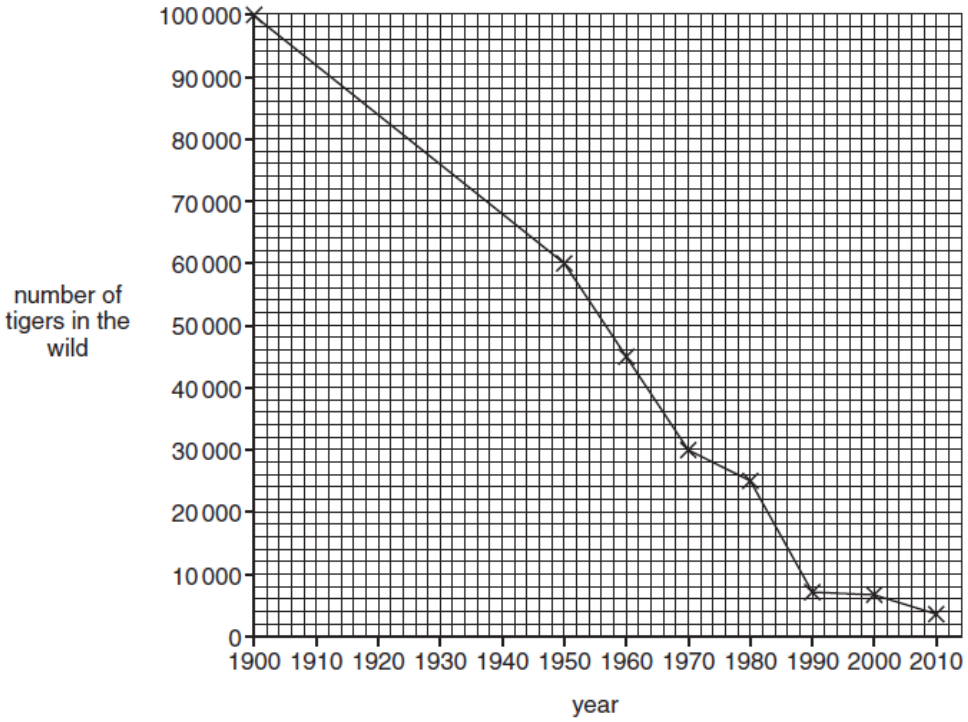

Fig. 5.1

(i) Calculate the overall rate of decrease in number of tigers between 1900 and 2010 (110 years).
Give your answer to the nearest whole number.

(2 marks)

(ii) Suggest **FIVE (5)** reasons why a named species has become endangered.

(5 marks)

(b) Fig. 5.2 shows a three-toed sloth, *Bradypus variegatus*, that lives in forest ecosystems in Central America. The sloths living in these forests form part of the community. Sloths feed mainly on the leaves (rich in cellulose) of many different tree species that grow in the under canopy in the forest.
There are bacteria and other microorganisms in the stomachs of sloths. The main predators of sloths are jaguars, harpy eagles, snakes and humans.

Fig. 5.2

With reference to the information above,

(i) State the trophic level occupied by the sloth in the food chain.

(1 mark)

(ii) Suggest **ONE (1)** advantage to the sloth of having bacteria and other microorganisms in its stomach;

(2 mark)

(iii) Suggest why there are few predators, such as jaguars and harpy eagles, in the forest ecosystem even though there are many producers, such as trees.

(4 marks)

(c) Fig. 5.3 shows a flower of *Rafflesia arnoldii*. The plant, *R. arnoldii* which grows in the jungles of South East Asia, is noted for producing the largest flower of all plants.
• The flower is reddish-brown and can grow up to one meter in diameter.
• The flower gives off a smell similar to rotting flesh to attract flies, which then pollinate it. *R. arnoldii* is classified as an endangered species.

Fig. 5.3

(i) Suggest **FOUR (4)** reasons *R. arnoldii* has become an endangered species.

(4 marks)

(ii) Suggest **FOUR (4)** ways to protect *R. arnoldii.*

(4 marks)

(d) List **THREE (3)** probable effects of global warming.

(3 marks)

-THE END-

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