

FINAL
Alternative Assessment

(COVER PAGE)

Session : August 2021

Programme : Foundation in Science (CFSI)

Course : BIO1204: Biology 2

Date of Examination : 10 December 2021 (Friday)

Time : 9:00am – 11:30am Reading Time : Nil

Duration : 2 hours + 30 minutes (uploading time)

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL FOUR (4)** questions.

All questions carry equal marks.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Nil

Examiner(s) : Ms. Ooi Saik Huey

Chief Moderator : Dr. Ramani Poosporagi

This paper consists of 15 printed pages, including the cover page.

FOUNDATION IN SCIENCE (CFSI)
 BIO1204: BIOLOGY 2
 FINAL ALTERNATIVE ASSESSMENT: AUGUST 2021 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Question 1

- (a) (i) You are looking at a sample of epithelial tissue under a microscope. What would you look for to determine the type of epithelium that you are viewing. (2 marks)
- (ii) State the type of epithelial tissue shown in Figure 1.1 is a stratified tissue.

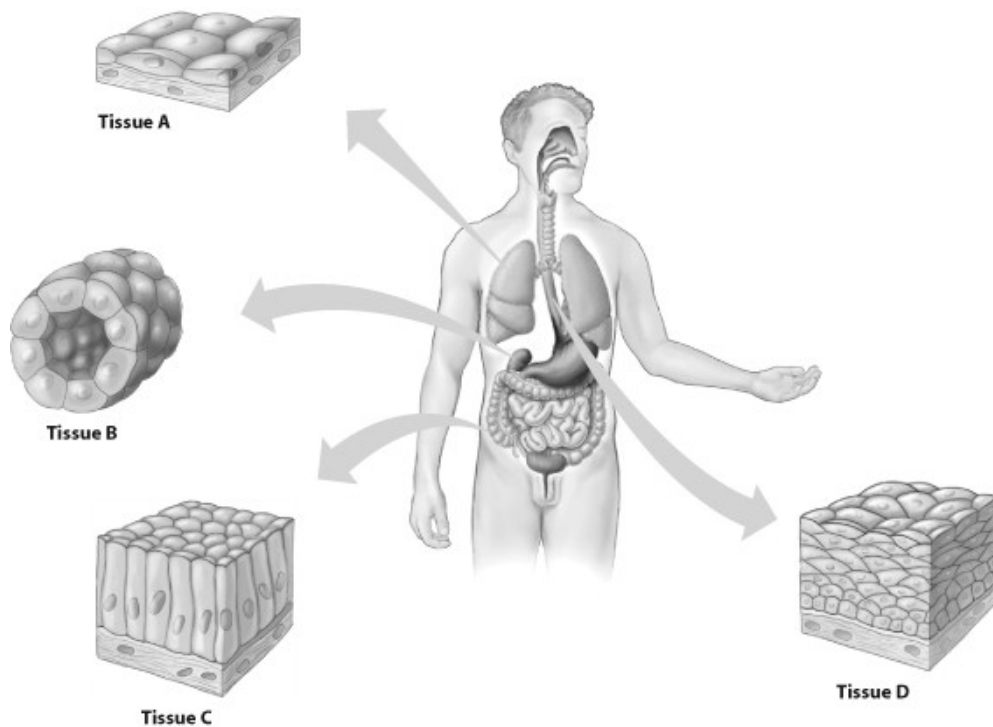


Figure 1.1

(1 mark)

- (b) Define homeostasis and explain by using **ONE (1)** example of negative feedback to explain the mechanism of homeostatic. (4 marks)

- (c) Figure 1.2 shows the location of structure *A* villi. The photomicrograph shows an enlargement of part of an epithelial cell that lines the villus. Figure 1.3 indicates the location of structure *B* in an epithelial cell.

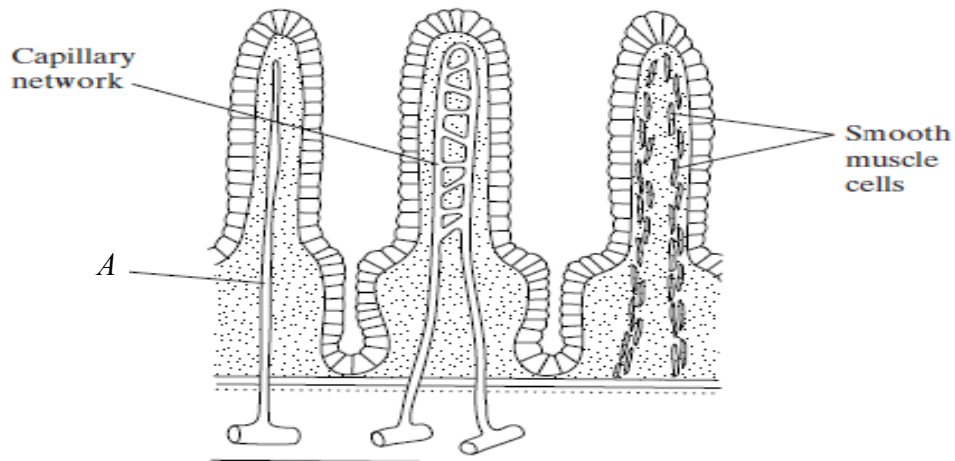


Figure 1.2

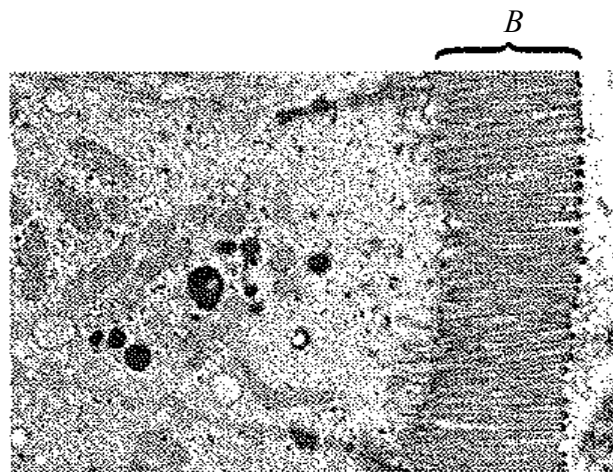


Figure 1.3

- (i) State **ONE (1)** function of part *A*. (1 mark)
- (ii) Suggest **ONE (1)** advantage of having muscle cells in the villi (1 mark)
- (iii) State **ONE (1)** reason why the presence of single layer of epithelial cells enables a villus to absorb nutrients effectively. (1 mark)
- (iv) State **ONE (1)** reason why the presence of the many projections shown in structure *B* enables a villus to absorb nutrients effectively. (1 mark)

- (d) (i) State **TWO (2)** classes of nutrient **DO NOT** provide energy. (2 marks)
- (ii) State of **ONE (1)** vitamin and **ONE (1)** mineral are involved with the formation or maintenance of bones and teeth. (2 marks)
- (e) Figure 1.4 shows the passage of red blood cells through a capillary in muscle tissues:

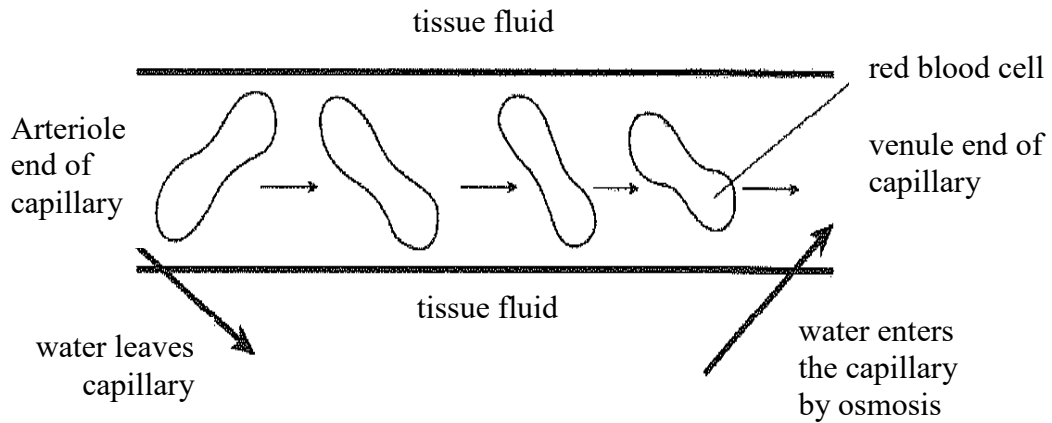


Figure 1.4

- (i) Water leaves the capillary at the arteriole end. Water enters the capillary at the venule end by osmosis. Explain why water enters the capillary at the venule end by osmosis. (2 marks)
- (ii) State **TWO (2)** ways in which the composition of the blood at the arteriole end of the capillary differs from the composition of the blood at the venule end of the capillary. (2 marks)
- (f) Figure 1.5 shows the cardiac cycle of an adult human.

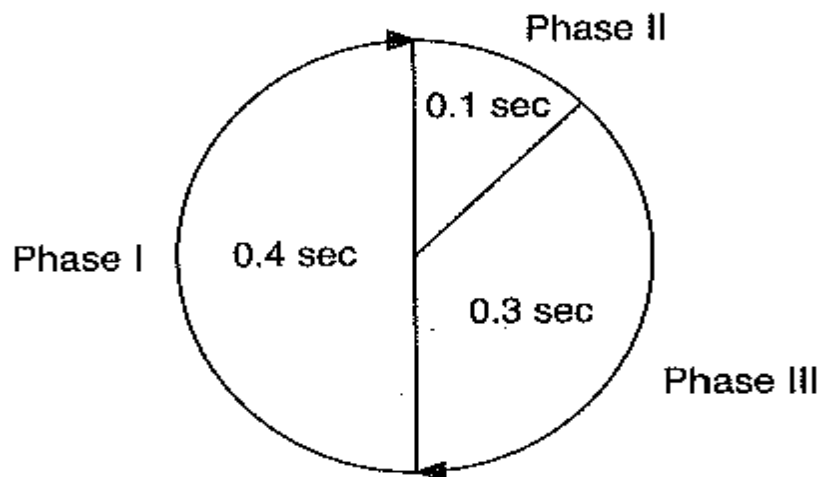


Figure 1.5

- (i) Based on Figure 1.5, what is the time taken to complete the cardiac cycle. (1 mark)
- (ii) The cardiac cycle can be divided into three phases. State the events of each phase. (3 marks)
- (g) State **TWO (2)** main functions of the inflammatory response. (2 marks)

Question 2

- (a) Figure 2.1 shows three different B lymphocytes (*K*, *L* and *M*) and the clonal selection of B cells that correspond to an immune response when exposed to an antigen.

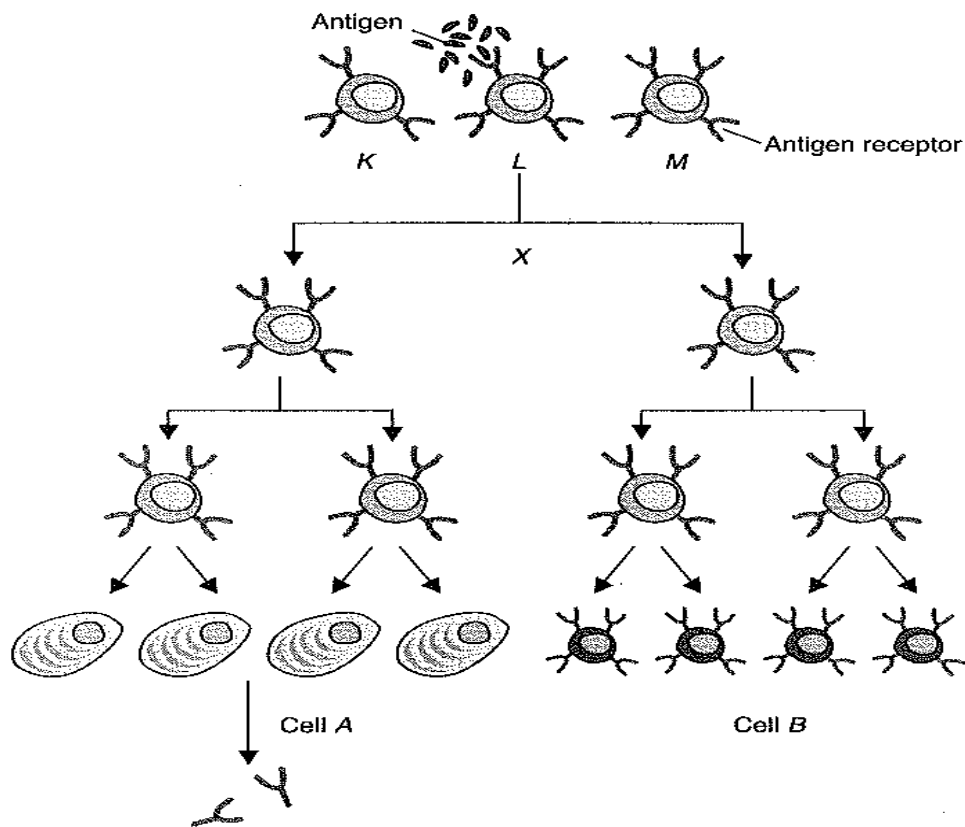


Figure 2.1

- (i) State the type of nuclear division that occurs at *X*. (1 mark)
- (ii) Explain why B lymphocyte *L* responded to the antigen but not B lymphocytes *K* and *M*. (1 mark)
- (iii) The clonal expansion of the *B* cells resulted in the production of two pools of cells, cell *A* and cell *B*. Identify cell *A* and cell *B* AND explain **ONE (1)** function for both cell *A* and cell *B*. (4 marks)

- (b) The Figure 2.2 shows a comparison of the contents of various solutes in the blood plasma entering the kidney, glomerular filtrate and urine.

Solute	Concentration of solute (g/litre)		
	Blood plasma	Glomerular filtrate	Urine
Glucose	1.0	1.0	0
Protein	70.0	0	0
Sodium ions	3.0	3.0	3.0
Potassium ions	0.15	0.15	1.5
Urea	0.25	0.25	20.0

Figure 2.2

- (i) Name the process by which dissolved nutrients in blood plasma enter the Bowman's capsule. (1 mark)
- (ii) Describe how the process occurs. (1 mark)
- (iii) Explain why glucose is not found in the urine excreted. (1 mark)
- (iv) Explain why protein is not found in the glomerular filtrate. (1 mark)
- (v) Explain why the solute content in the glomerular filtrate is not the same as that of the blood plasma entering the kidney. (1 mark)
- (vi) State **ONE (1)** characteristic of the proximal convoluted tubule that enhance the efficiency of active reabsorption of most of the solutes from glomerular filtrate. (1 mark)
- (c) Most fishes can either live in freshwater or live in saltwater habitats, but not in both. If you move a marine fish from the ocean to a lake, it will quickly die, and vice versa. However, a small number of fish species are capable of moving between the two environments. Salmon are osmoregulators that hatch in rivers, spend most of their lives in the ocean, and return to the river where they were born in order to breed.
- (i) When a salmon moves from the ocean to a freshwater environment, you would expect its urine volume to _____ and its rate of salt absorption to _____. (1 mark)

- (ii) When a salmon leaves the river and moves out to sea, you would expect _____ to leave its body by osmosis and that excess _____ would need to be pumped out.

(1 mark)

- (d) The Figure 2.3 shows the action of hormone *X* on its target cell.

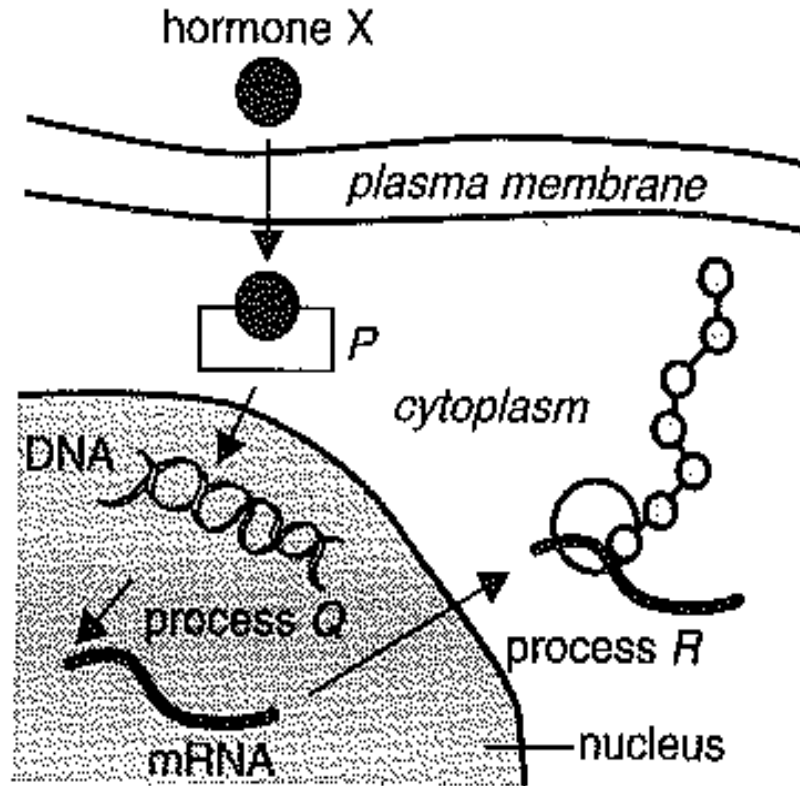


Figure 2.3

- (i) State the type of hormone *X* and give **ONE (1)** example. (2 marks)
- (ii) Give **ONE (1)** characteristic of hormone *X* which enables it to enter the target cell. (1 mark)
- (iii) Based on the Figure 2.3, explain the mechanism of hormone action. (4 marks)

(e) Use Figure 2.4 below (letter *A*, *B*, *C*, *D*) to answer the questions that follow.

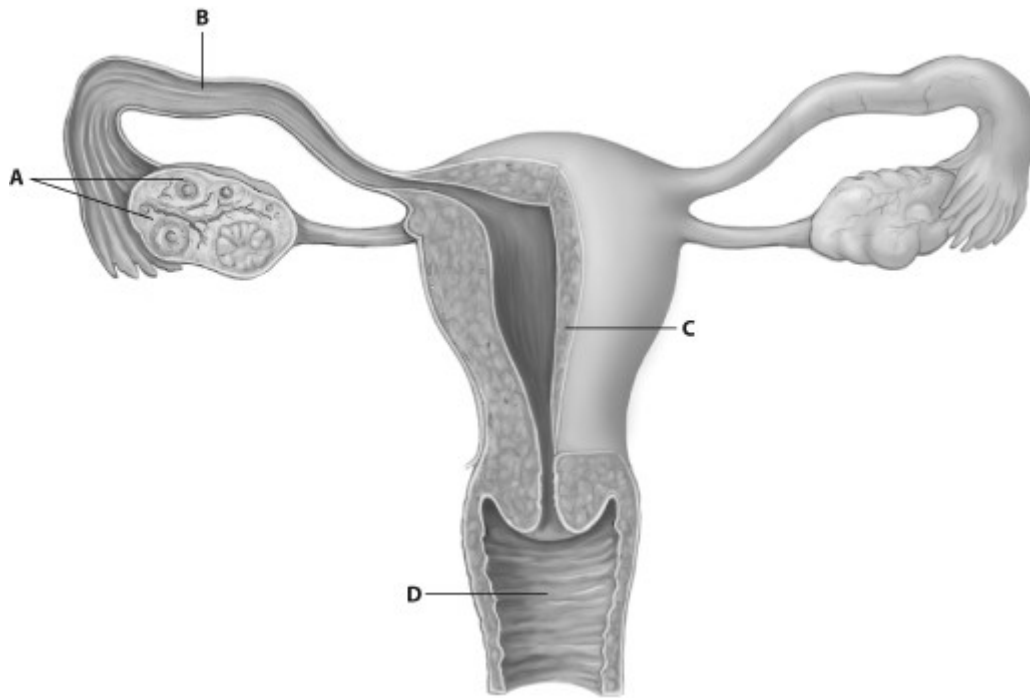


Figure 2.4

- (i) State the letter of the human female reproductive system that fertilization normally take place. (1 mark)
- (ii) State the letter of the human female reproductive system that a spermicide be placed. (1 mark)
- (iii) State the letter of the human female reproductive system which sterilization be performed. (1 mark)
- (iv) State the letter of the human female reproductive system which implantation normally take place. (1 mark)

Question 3

- (a) Figure 3.1 shows the concentration of two hormones, oestrogen and progesterone, in a woman's blood during one menstrual cycle.

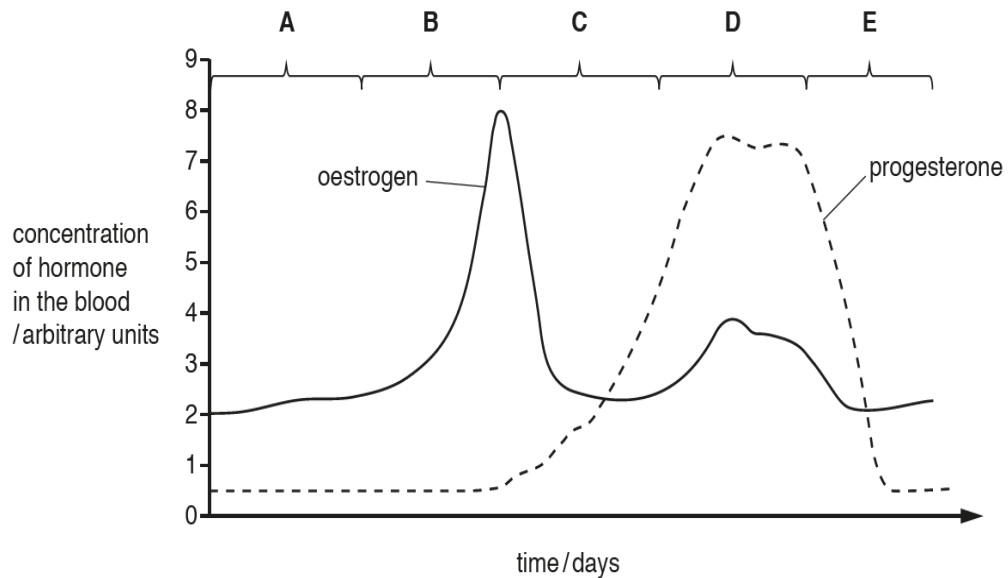


Figure 3.1

- (i) With reference to Figure 3.1, state the letter of the stage of the cycle during which ovulation occurs. (1 mark)
- (ii) State how Figure 3.1 shows that the woman did not become pregnant during this cycle. (1 mark)
- (iii) Name the ovarian structure that secretes progesterone after ovulation. (1 mark)
- (iv) State the role of progesterone during stage **D**. (1 mark)

(b) Figure 3.2 shows the structure of synapse.

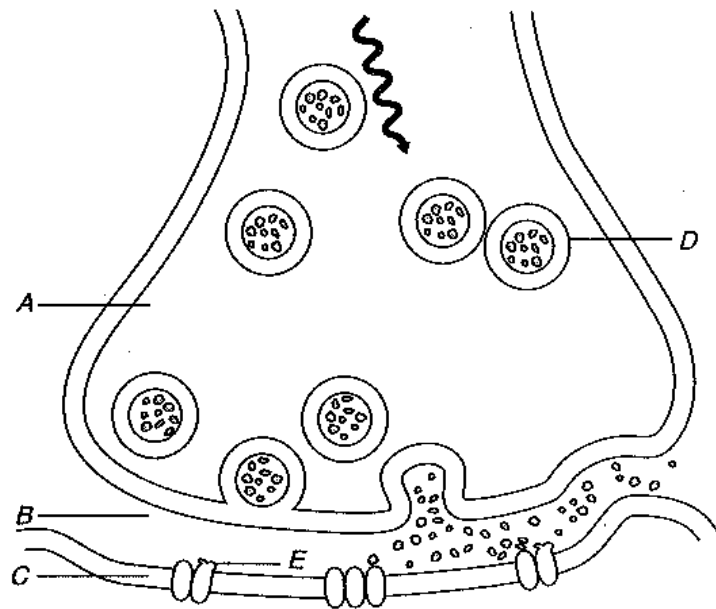


Figure 3.2

- (i) Identify the structure labelled *A*, *B* and *C* as shown in Figure 3.2. (3 marks)
 - (ii) Identify the structure labelled *D*. Name the chemical found inside it. (2 marks)
 - (iii) Name **ONE (1)** organelle which can be found in structure *A*. Suggest a reason for its presence. (2 marks)
- (c) Figure 3.3 shows part of a summer squash, *Cucurbita pepo*. Figure 3.4 is a high power drawing of an area of phloem from a transverse section of the stem of *C. pepo*.

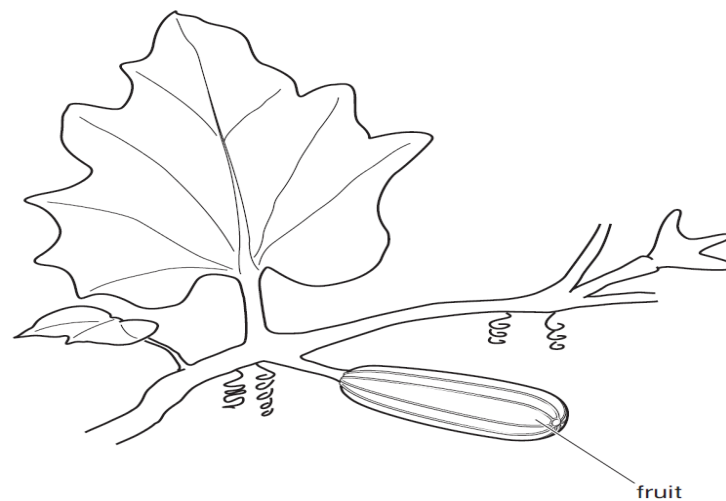


Figure 3.3

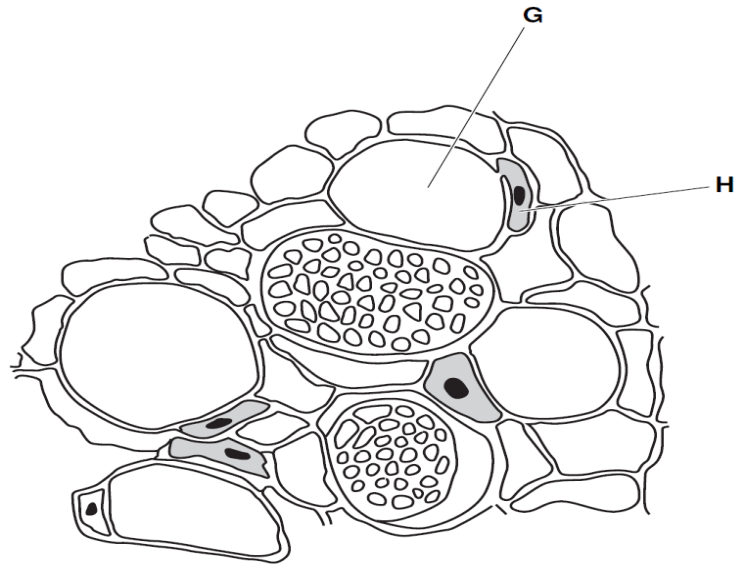


Figure 3.4

- (i) Name **G** and **H**. (2 marks)
- (ii) Describe **THREE (3)** ways in which the structure of a xylem vessel differs from the structure of cell **G**. (3 marks)
- (d) Identify the labeled zones in Figure 3.5 and briefly state the function for each zone.

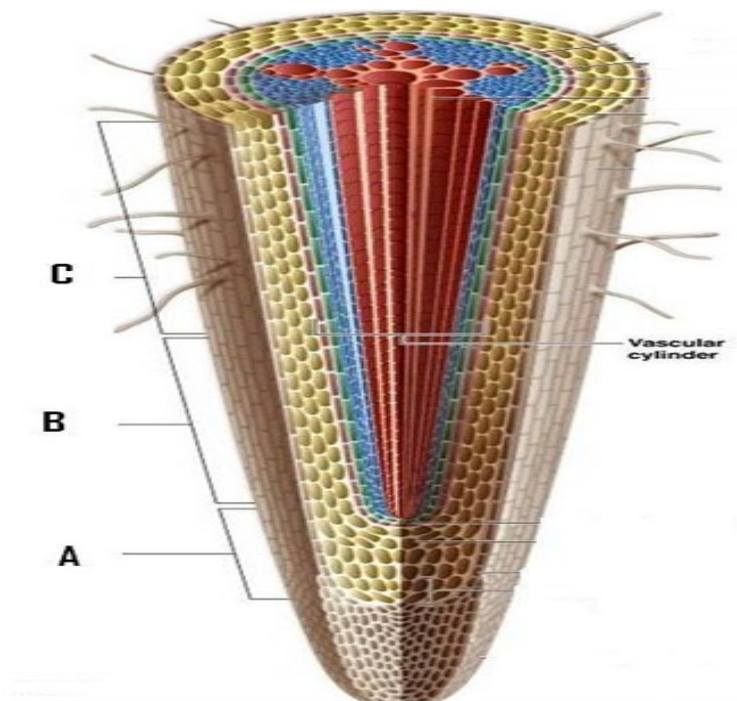


Figure 3.5

(3 marks)

Question 4

- (a) Sample of short-day plant species were exposed to two ranges of light and dark treatment as shown in the Figure 4.1 Shaded bars indicate periods of darkness and unshaded bars indicate periods of light.

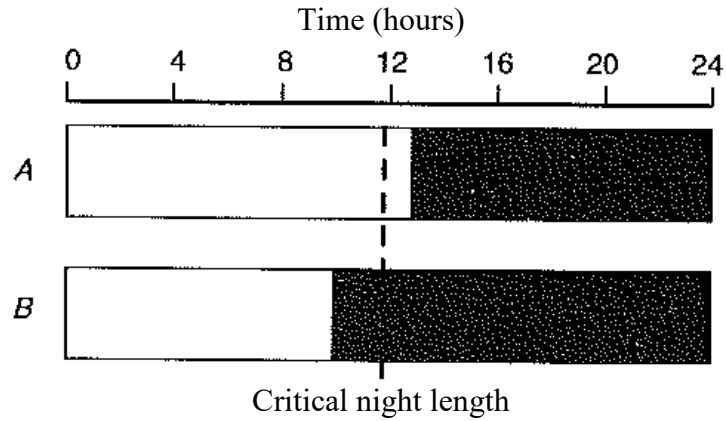


Figure 4.1

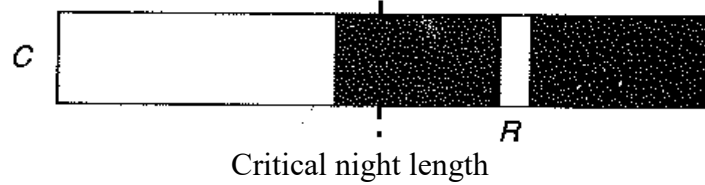


Figure 4.2

- (i) Define short-day plants. (1 mark)
- (ii) State the form of phytochrome that is required by short-day plants. (1 mark)
- (iii) Which treatment would you expect to trigger a flowering response. Explain your answer. (2 marks)
- (iv) The dark period of treatment **B** was the interrupted with a flash of red light as shown in Figure 4.2. Explain the flowering response of treatment **C**. (3 marks)

- (b) Figure 4.3 below the changes that occur in the population numbers of adult plant bugs from January to December in a temperature forest. These plant bugs pierce the phloem of plants and suck the sap.

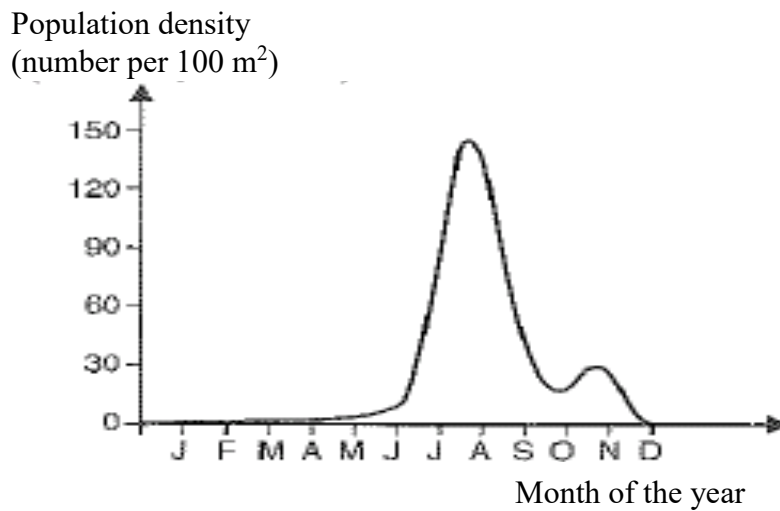


Figure 4.3

- (i) Name the type of population growth curve in graph. (1 mark)
- (ii) Name the phase of the population growth during July and August. (1 mark)
- (iii) Suggest **TWO (2)** possible reasons for the decline in the number of bugs from September onwards. (2 marks)
- (iv) Suggest **ONE (1)** factor might limit the carrying capacity of the forest this plant bug. (1 mark)
- (v) If a population of mice shows a $(K-N)/K$ value of 1, what type of growth is it showing? (1 mark)

(c) The food web shown in the Figure 4.4 illustrates a feeding in a pond.

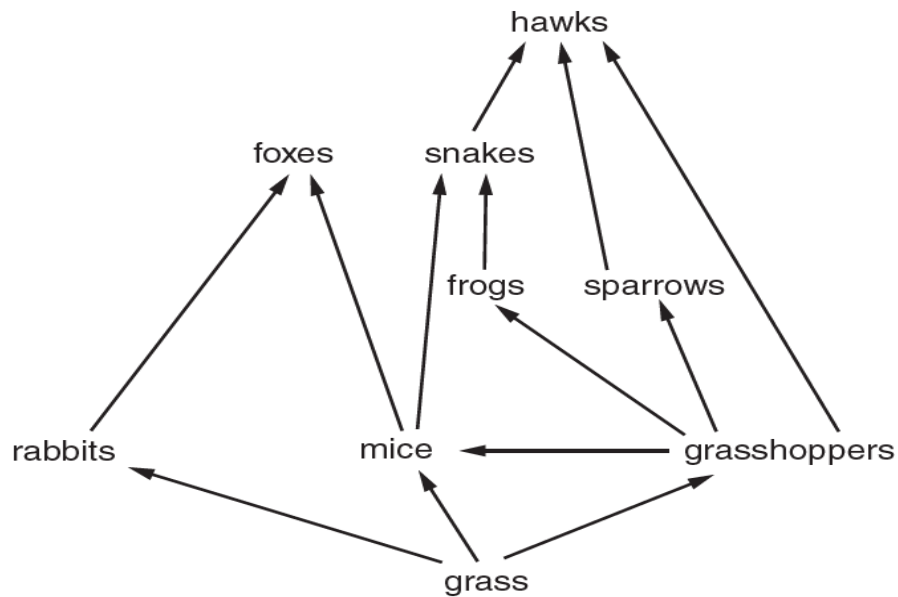


Figure 4.4

From the food web in Figure 4.4, name:

- (i) the producer. (1 mark)
 - (ii) an organism feeding only as a primary consumer. (1 mark)
 - (iii) The hawks are top predators.
Name **one other** top predator shown in Figure 4.4. (1 mark)
- (d) Name the processes in the nitrogen cycle in which the following changes occur:
- (i) nitrate ions \longrightarrow nitrogen gas (1 mark)
 - (ii) ammonium ions \longrightarrow nitrate ions (1 mark)
 - (iii) nitrogen gas \longrightarrow ammonium ions. (1 mark)
- (e) Name the three levels of biodiversity. For each level, give **ONE (1)** example of how the loss of diversity would impact humans. (6 marks)