

**FINAL**  
Alternative Assessment

(COVER PAGE)

Session : August 2021

Programme : Foundation in Science (CFSI)

Course : BIO1203: Biology 1

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 :

Nil

Materials provided :

Nil

Examiner(s) : Dr. Marisa Khoo Kim Gaik

Chief Moderator : Ms. Tan Ai Lian

*This paper consists of 10 printed pages, including the cover page.*

FOUNDATION IN SCIENCE (CFSI)  
 BIO1203: BIOLOGY 1  
 FINAL ALTERNATIVE ASSESSMENT: AUGUST 2021 SESSION

**Instructions:** This paper consists of **FOUR (4)** questions. Answer **ALL FOUR (4)** questions in a separate answer sheet. All questions carry equal marks.

**Question 1**

**Question:** Which fertilizer will produce the greatest number of tomatoes when applied to the plant?

**Prediction and hypothesis:** If I apply different brands of fertilizer to tomato plants, the most tomatoes will be produced from plants applied with Brand A fertilizer because Brand A advertises that it produces twice as many tomatoes as other leading brands.

**Experiment:** Purchase 10 tomato plants of the same type from the same nursery. Pick plants that are similar in size and age. Divide the plants into two groups of 5. Apply Brand A to the first group and Brand B to the second group according to the instructions on the packages. After 10 weeks, count the number of tomatoes on each plant.

Figure 1.1

- (a) Passage in Figure 1.1 provides details on an experiment to test the efficacy of fertilizer using tomato plants. Based on the information provided in Figure 1.1, identify:
- (i) The independent and dependent variables: (2 marks)
  - (ii) **FOUR (4)** controlled variables: (4 marks)
- (b) State the importance of having a control group in an experiment. (1 mark)
- (c) Table 1.1 below includes statements about the roles of water
- in living organisms
  - as an environment for living organisms.
- (i) Copy and complete the table by indicating with a **TICK (√)** which one of the properties of water is responsible for each role. You should put only **ONE (1)** tick (√) in each row.

	Properties of water			
	High specific heat capacity	Strong cohesive forces between water molecules	High heat of vaporization	Solvent for polar molecules and ions
Transport medium in blood plasma and phloem				
Surface for small insects to walk on				
Major component of sweat used in heat loss				
Transpiration pull in xylem				
Preventing wide variations body temperature				

Table 1.1

(5 marks)

(ii) Explain why ice (solid) floats on water (liquid).

(2 marks)

(d) Describe how a peptide bond is formed between two amino acids during polypeptide production.

(2 marks)

(e) Figure 1.2 shows the structure of monomer that make up of nucleic acid DNA and RNA.

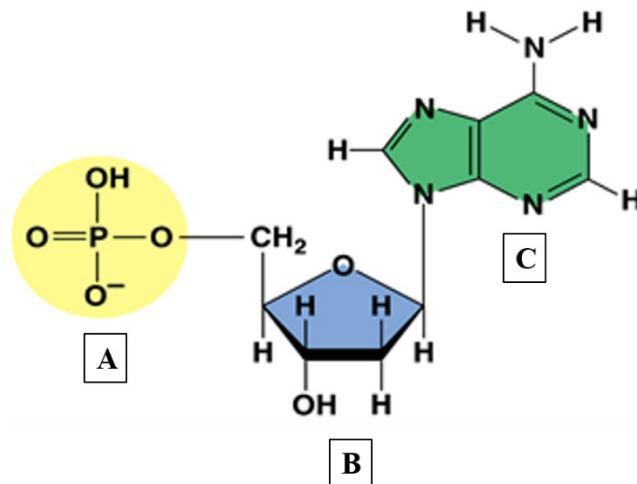


Figure 1.2

(i) Name the components labeled A, B and C in Figure 1.2.

(3 marks)

(ii) Describe **TWO (2)** differences between DNA and RNA.

(2 marks)

- (f) Function of the cell surface membrane is to control the entry and exit of substances. Complete Table 1.2 to show the transport mechanisms across cell surface membranes and examples of materials transported.

transport mechanism across cell surface membrane	example of material transported across membrane
active transport	sodium ions
(i)	oxygen molecules
(ii)	bacteria
exocytosis	mucin (for mucus)
facilitated diffusion	(iii)
osmosis	(iv)

Table 1.2

(4 marks)

**Question 2**

- (a) State the model that is used to describe cell membrane's structure. (1 mark)
- (b) Outline **TWO (2)** examples of movement across cells membrane that use ATP. (2 marks)
- (c) Figure 2.1 shows transmission electron micrograph of two organelles found in living cells.

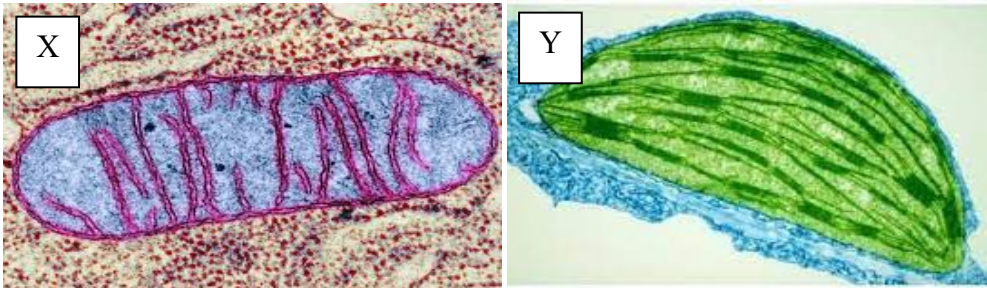


Figure 2.1

- (i) Identify organelle X and Y. (2 marks)
- (ii) State the functions of organelle X and Y. Compare their function in terms of energy conversion. (4 marks)
- (iii) Explain how the structure of X is linked to its function. (4 marks)
- (d) Define substrate-level phosphorylation (1 marks)

(e) Figure 2.2 shows part of a mitochondrial inner membrane.

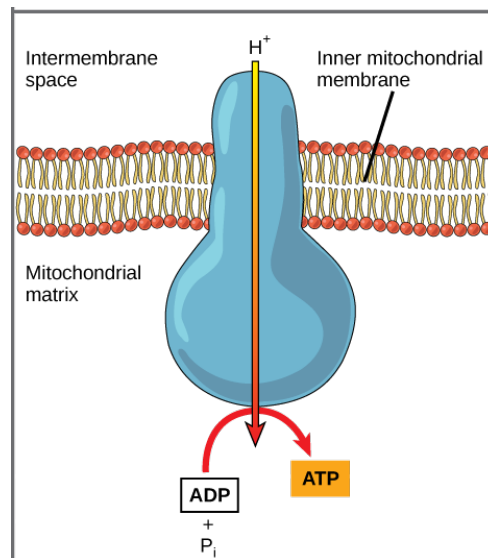


Figure 2.2

Base on Figure 2.2:

- (i) Name the process on how  $H^+$  move across the inner mitochondrial membrane into the matrix. (1 mark)
- (ii) Name **TWO (2)** components that made up the inner mitochondrial membrane. (2 mark)
- (iii) Explain why ATP is regarded as the universal energy currency in organisms. (5 marks)
- (iv) Explain how ATP is synthesized in the mitochondria. (3 marks)

**Question 3**

(a) Figure 3.1 outlines some of the events in the process of photosynthesis in a chloroplast.

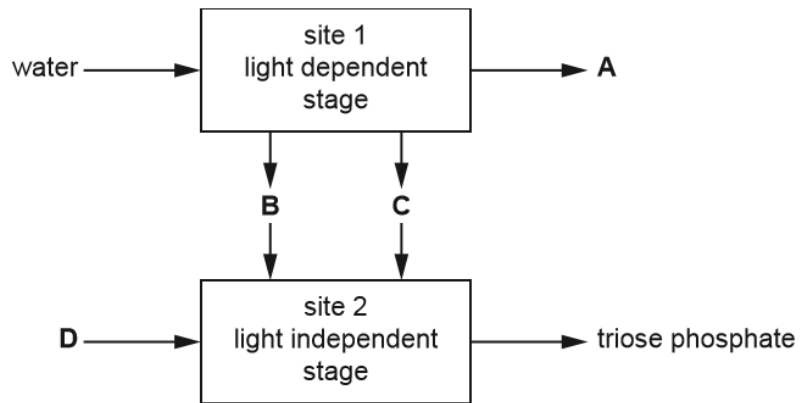


Figure 3,1

- (i) Name the parts of a chloroplast labelled **site 1** and **site 2** in Figure 3.1. (2 marks)
- (ii) Name the substances labelled **A**, **B**, **C** and **D** (4 marks)
- (iii) State one example of organic compound in plant cell that triose phosphate is used to synthesis. (1 mark)

(b) Figure 3.2 shows changes in DNA content in a cell during a cell cycle.

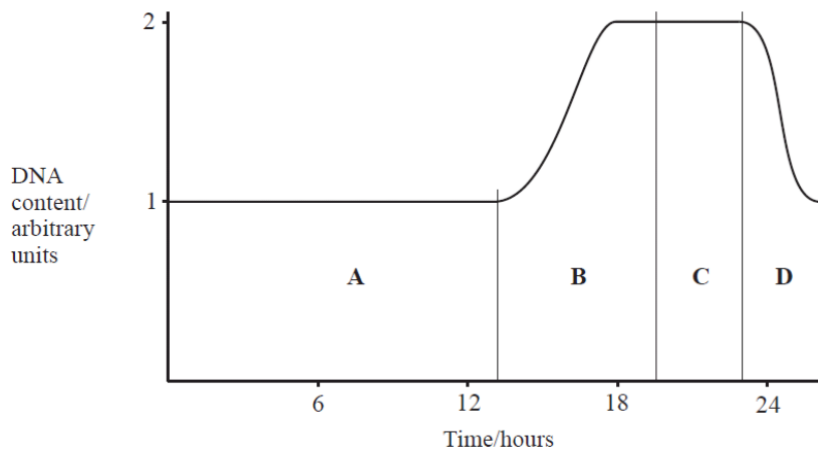


Figure 3.2

Use the letters from the Figure 3.2 to indicate the period(s) when:

- (i) chromosomes are being duplicated. (1 mark)
- (ii) cell division is taking place. (1 mark)
- (iii) Explain the change in DNA content in **D**. (2 marks)

- (c) List **THREE (3)** processes which take place during interphase. (3 marks)
- (d) Colour blindness is a condition characterized by the inability of the brain to perceive certain colours accurately.
- The most common form is termed red-green colour blindness (RGC).
  - RGC results from a recessive allele.
  - 0.6% of females worldwide have RGC.
  - 8.0% of males worldwide have RGC.
- (i) Explain the meaning of *X-linked inheritance*. (1 mark)
- (ii) Explain why males are more likely than females to have RGC. (2 marks)

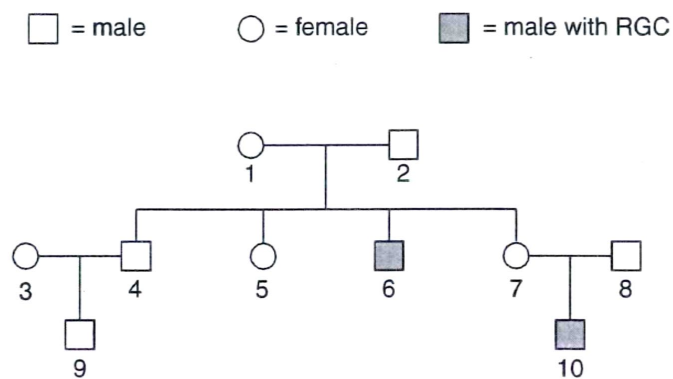


Figure 3.3

- (iii) With reference to Figure 3.3 above, using the symbols **R** for the dominant allele and **r** for the recessive allele, state the genotypes of the individuals **1**, **5**, **8** and **10**. (2 marks)
- (e) A man with blood type A marries a woman with blood type B, and their four children have blood types A, B, AB and O. State the genotypes of the parents. (2 marks)

Figure 3.4 shows the structure of small sections of DNA.

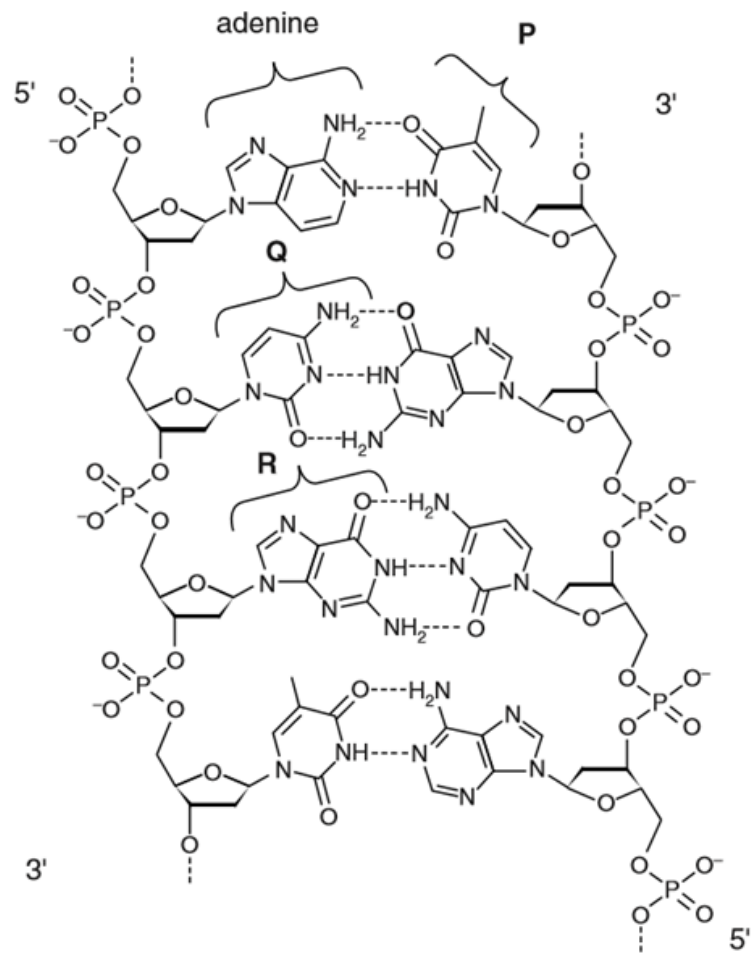


Figure 3.4

- (f) Name the bases **Q** and **R** in Figure 3.4 (2 mark)
- (g) A DNA strand has the sequence 5'CGAATGC 3'
- (i) Write the complementary sequence for the above DNA strand. (1 mark)
- (ii) State the numbers of hydrogen bonds formed between the two DNA strands. (1 mark)

**Question 4**

(a) Figure 4.1 below shows protein synthesis in an eukaryotic cell.

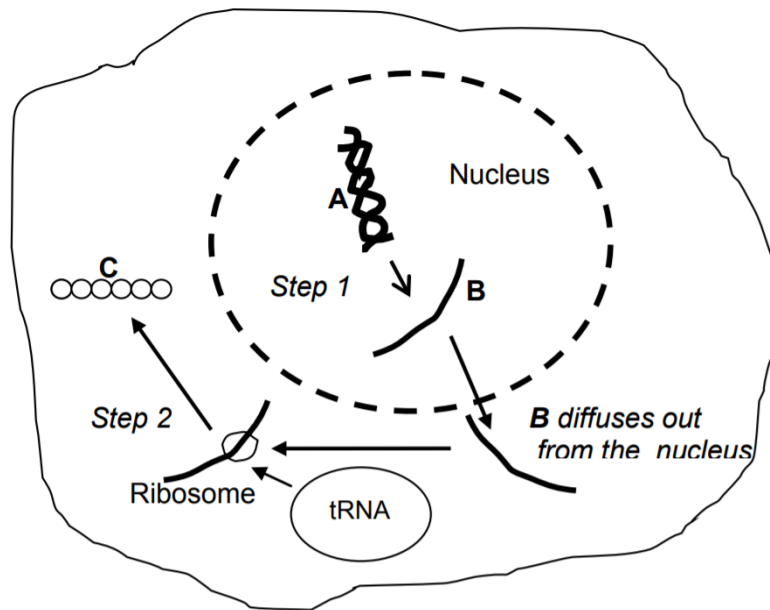


Figure 4.1

- (i) Name **step 1** and **step 2**. (2 marks)
- (ii) Name the structures labeled **A**, **B** and **C**. (3 marks)
- (iii) Explain what happened in **step 2**. (4 marks)

(b) Fig. 4.2 shows the gene regulation and the expression of a *lac* operon when lactose is present.

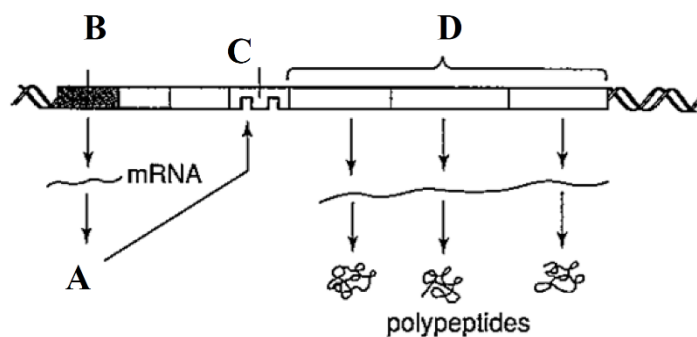


Figure 4.2

- (i) Identify the components labeled **A**, **B**, **C** and **D**. (4 marks)
- (ii) Explain how *lac* operon works when lactose is absent. (4 marks)

- (c) A female chimpanzee recently gave birth to an infant while in captivity. Because the paternity of the infant is unclear, scientists tested the DNA from two male chimpanzees, along with the female and infant to conduct a DNA profiling. The result of the electrophoresis gel is shown below in Figure 4.3.

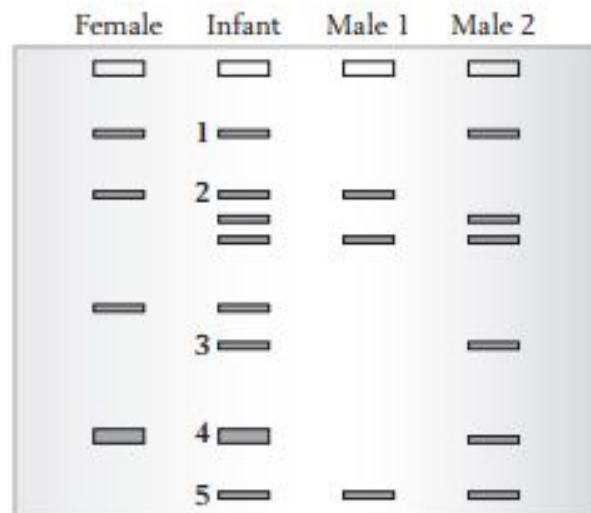


Figure 4.3

- (i) Based on the gel electrophoresis result, which male chimpanzee could be the biological father of the infant. (1 mark)
- (ii) Explain your choice given in section (i) based on the gel electrophoresis result. (4 marks)
- (iii) Explain how electrophoresis works. (3 marks)

~ The End ~

*BIO1203(f)/august 2021/formatted*