FINAL
Alternative Assessment

(COVER PAGE)

Session	:	**April 2022**
Programme	:	Foundation in Science (CFSI)
Course	:	**BIO1203: Biology 1**
Date of Examination	:	5 August 2022 (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** questions.

All questions carry equal marks.

Materials permitted :

Non-programmable calculator

Materials provided :

Nil

Examiner(s)	:	**Dr. Khor Soo Ping**
Chief Moderator	:	Dr. Ramani Poospooragi

*This paper consists of **11** printed pages, including the cover page.*

FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL ALTERNATIVE ASSESSMENT: APRIL 2022 SESSION

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

Question 1

(a) A population of giraffes lives in a forest with trees of varying heights. Following a flood in the area, all shorter plants were destroyed and only tall trees remain. After many generations, it is noted that giraffes living in this forest have longer necks on average, than giraffes living in the same forest prior to the flood. Explain the principles of natural selection presented by Charles Darwin produce the evolution of giraffes with longer necks.

(4 marks)

(b) Water plays very important role within the cytoplasm of cells. State **TWO (2)** properties of water that make it an important part of the cytoplasm of cells.

(2 marks)

(c) Most substances are denser as solids than in their liquid states. Use your knowledge of the structure of water to explain why water does not obey this rule. Explain the advantages to aquatic life that this provides.

(4 marks)

(d) The Figure Q1(d) below shows a part of a polypeptide chain. This structure is found in proteins.

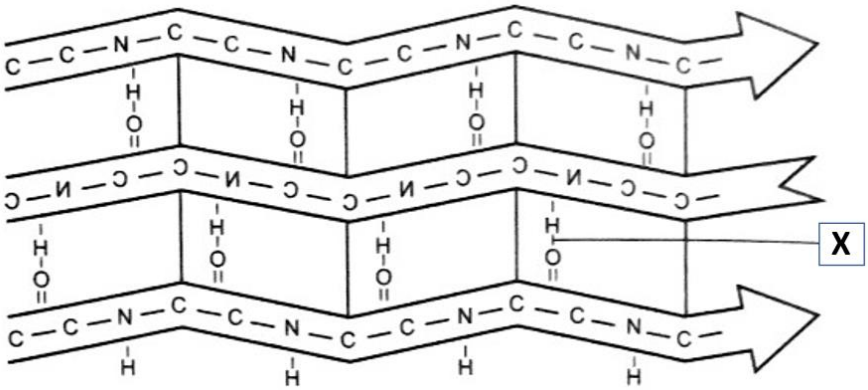

Figure Q1(d)

(i) State the protein level represented by the diagram.

(1 mark)

(ii) State the basic unit of a polypeptide.

(1 mark)

(iii) State and explain the chemical reaction of how the basic units stated in Question 1d(ii) formed a polypeptide chain.

(3 marks)

(iv) Identify the type of bond in the structure labelled **X**.

(1 mark)

(e) Figure Q1(e) represents a molecule of triglycerides.

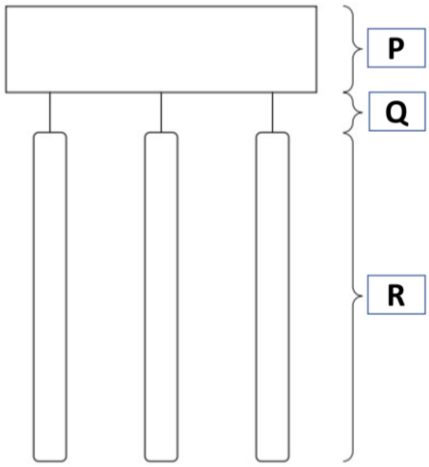

Figure Q1(e)

(i) Name the components **P** and **R** and name the bond **Q**.

(3 marks)

(ii) Describe how the structure of **R** determine if a compound is solid or liquid at room temperature.

(2 marks)

(f) Ecology involves the study of organisms in their environment. Define the meaning of following ecological terms:

(i) Community

(1 mark)

(ii) Population

(1 mark)

(g) During all ecological processes, energy and matter are conserved. In this context, describe the role of decomposer in ecological system.

(2 marks)

Question 2

(a) Figure Q2(a) shows part of a mitochondria in a cell.

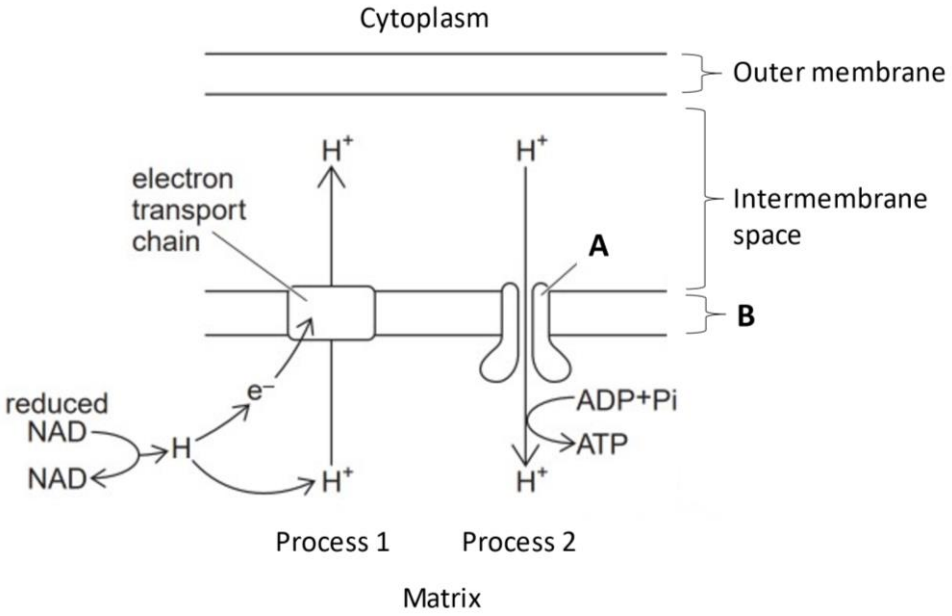

Figure Q2(a)

(i) Name structure **A** and **B**.

(2 marks)

(ii) Based on the diagram, state which **process** where chemiosmosis occurs? Describe how this process generate ATP.

(2 marks)

(iii) Describe how H^+ ion enters into intermembrane space in **process 1** from matrix.

(2 marks)

(iv) Respiration produces more ATP per molecule of glucose in the presence of oxygen than it does when oxygen is absent. Explain why.

(4 marks)

(b) Figure Q2(b) is a diagram of a eukaryotic cell showing the organelles involved in the production and secretion of an extracellular protein. The rough endoplasmic reticulum (RER) is shown enlarged at the side of the diagram.

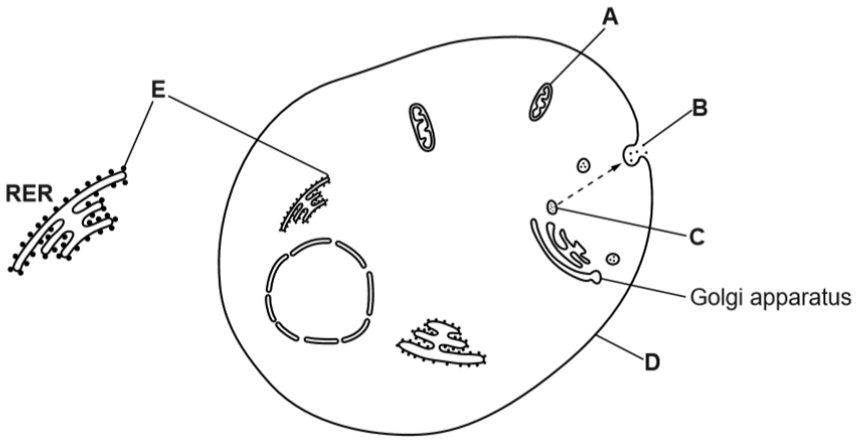

Figure Q2(b)

(i) Eukaryotic cells produce and release proteins.
Describe the role of organelles in endomembrane system for the production, transport and release of proteins from eukaryotic cells. Do not include details of transcription and translation in your answer.

(3 marks)

(ii) Identify **TWO (2)** features, visible in Figure Q2(b), which would not be present in a prokaryotic cell.

(2 marks)

(iii) Name one feature that would be present in the cytoplasm of a prokaryotic cell that is not found in a eukaryotic cell.

(1 mark)

(iv) A student suggested that the details of component **A** could be seen clearly with a very good light microscope.
Identify component **A**. Explain why the student is **NOT** correct.

(2 marks)

(v) Structure **D** allows different substances to enter and leave the cell. List **THREE (3)** components that can be observed in structure **D**.

(3 marks)

(vi) Many substances are said to be actively transported across membranes. Explain what is meant by active transport.

(2 marks)

(vii) What happen to the cell in Figure Q2(b) if it was placed in a hypertonic solution? Give reason to your answer.

(2 marks)

Question 3

(a) Cleft iris (CI) is a condition where there is a change in the shape of the iris in the eye. It is caused by a rare, sex-linked and recessive allele.

(i) Explain what is meant by the term sex-linked.

(1 mark)

(ii) Complete the genetic diagram below to show the genotypes and phenotypes of a man with cleft iris and a normal woman who is a carrier for this trait. Draw a Punnet square to predict all their possible children.

Key to symbol
Recessive allele: **a** Dominant allele: **A**

Parental phenotypes	Male with cleft iris	Normal female
Parental genotypes	_____	_____
Possible Gametes	_____	_____

(5 marks)

(b) Figure Q3(b) shows an incident during cell division.

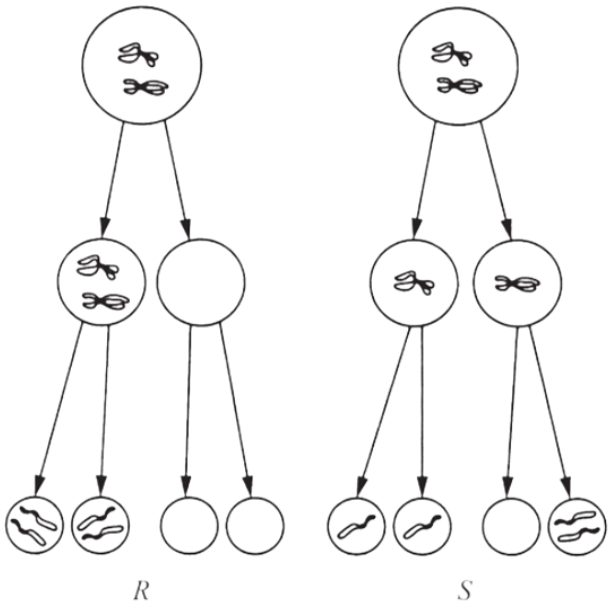

Figure Q3(b)

(i) State the type of mutation in **R**.

(1 mark)

(ii) What is the phenomenon that causes the type of mutation in **S**?

(1 mark)

(c) (i) Name the syndrome which resulted the fertilization between a female gamete which has an extra X chromosome and a normal male gamete.

(1 mark)

(ii) Describe **ONE (1)** physical characteristics of an individual who has the syndrome mentioned in Question 3c(i).

(1 mark)

(d) The Figure Q3(d) show an image of onion root tip observed by a student under microscope. The student concluded that cell A was in the anaphase stage of mitosis.
Was she correct? Give **ONE (1)** reason for your answer.

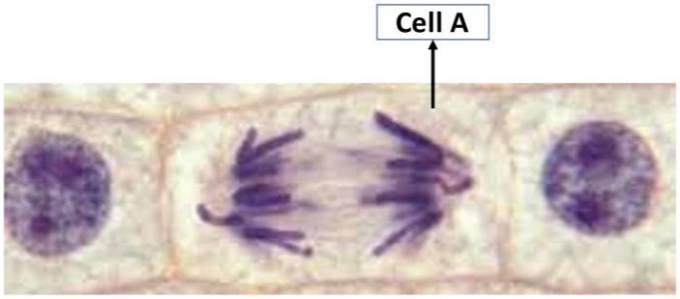

Figure Q3(d)

(2 marks)

(e) In chickens, the inheritance of feather colour is controlled by codominant alleles. The allele for black feathers is **B**, and the allele for white feather is **b**. Figure Q3(e) shows a parent with all black feathers and a parent with all white feathers. It also shows one of their offspring with a mixture of black and white feathers.

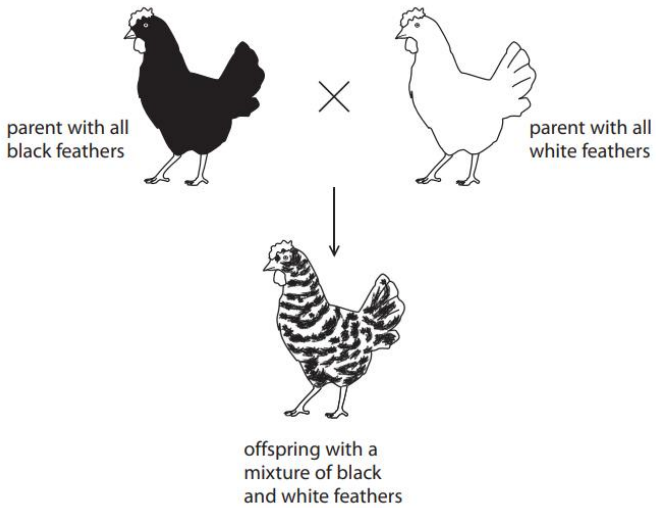

Figure Q3(e)

(i) Define the term codominant.

(1 mark)

(ii) Write the genotype of chicken with a mixture of black and white feathers.

(1 mark)

(iii) The number of chromosomes in chicken eggs and in sperm is less than the number of chromosomes in the body cells of chickens. Explain how the number of chromosomes in animals is maintained in their offspring.

(3 marks)

(f) Figure Q3(f) shows the double-membrane envelope of a chloroplast.

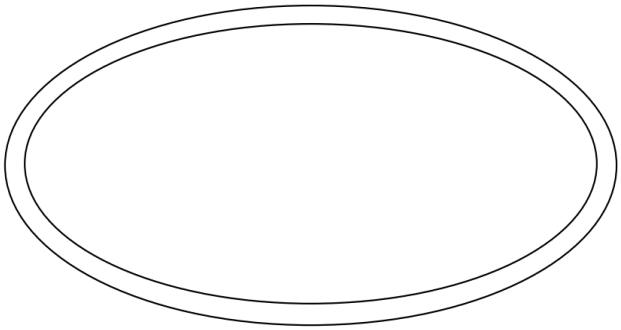

Figure Q3(f)

(i) In your answer sheet, duplicate Figure Q3(f) and complete the diagram to show structures involved in the light-dependent reaction of photosynthesis. Label these structures.

(2 marks)

(ii) The structures involved in light-dependent reaction of photosynthesis contains various photosynthetic pigments. Suggest why chloroplast contain more than one type of pigments.

(1 mark)

(iii) ATP and NADPH are the two products of light-dependent reaction. State their function in light-independent reaction.

(2 marks)

(iv) Briefly describe the role of Rubisco in Calvin cycle.

(2 marks)

(v) Give an advantage of CAM plant.

(1 mark)

Question 4

(a) Tissue plasminogen activators (TPAs) are human proteins that are used as drugs to break down blood clots. TPAs can be produced by genetically-engineered bacteria.
Figure Q4(a) shows some of the stages involved in genetically engineering a bacterium to make a TPA.

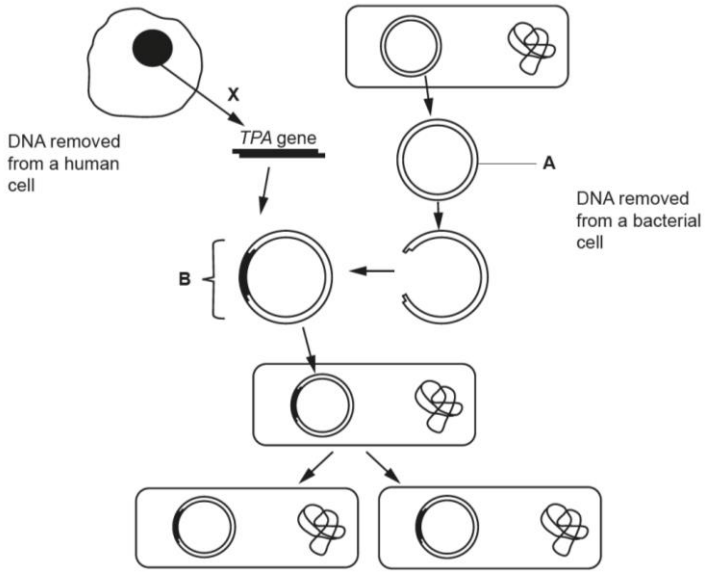

Figure Q4(a)

(i) State the name of structure **A** in Figure Q4(a).

(1 mark)

(ii) In the flow chart, **X** represents the action of an enzyme on a molecule of DNA. State the name of this enzyme.

(1 mark)

(iii) The TPA gene is inserted into structure **A**. Explain how the gene is inserted into structure **A** to form structure **B** as shown in Figure Q4(a).

(3 marks)

(iv) Describe why human cDNA is used to form structure B before inserted into the bacteria instead of the original DNA in the genetic engineering process.

(2 marks)

(v) Before TPA was made by genetically-engineered bacteria, it was only available from blood donated by people. Suggest **ONE (1)** advantage of producing TPA by genetically-engineered bacteria.

(1 mark)

(b) Figure Q4(b) show a process located in a cell.

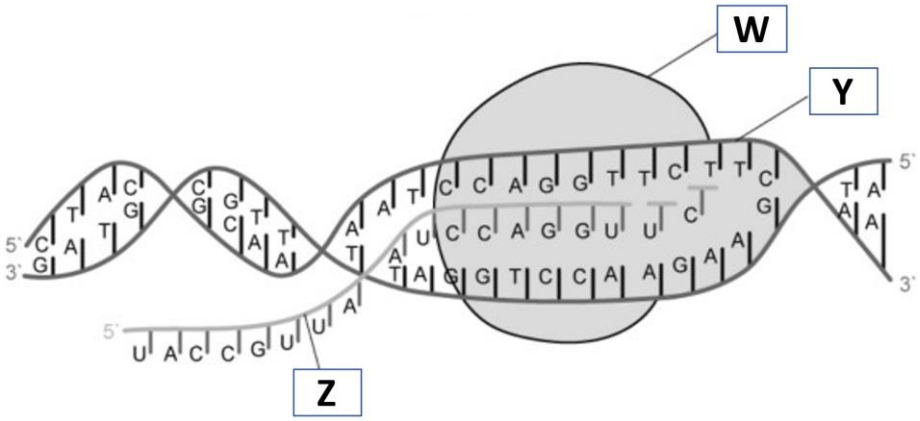

Figure Q4(b)

(i) Name the structure labelled **W**, **Y** and **Z** in Figure Q4(b).

(3 marks)

(ii) What does this process illustrates in Figure Q4(b)? Describe the **THREE (3)** stages of this process.

(4 marks)

(c) Explain why a mutation involving the deletion of a base might have a greater effect than a mutation involving the substitution of one base for another.

(2 marks)

(d) The Figure Q4(d) shows the *lac* operon in *E. coli*.

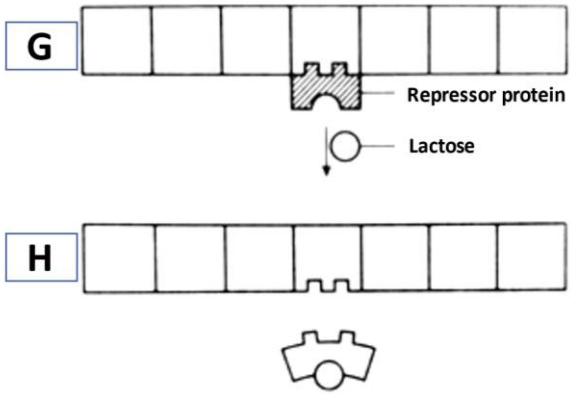

Figure Q4(d)

(i) State **ONE (1)** function of lactose in *lac* operon?

(1 mark)

(ii) Explain what happen after repressor protein detached from *lac* operon **H**.

(2 marks)

(iii) Why is the *lac* operon classified as an inducible system?

(1 mark)

(e) Figure Q4(e) shows different level of eukaryotic DNA packing.

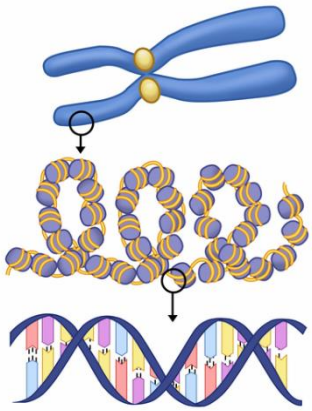

Figure Q4(e)

(i) Based on Figure Q4(e), describe how enourmous length of DNA strands form a chromosome structure.

(2 marks)

(ii) How does DNA packing regulates gene expression?

(1 mark)

(iii) Give **ONE (1)** mechanism of how gene expression can be regulated at post-transcriptional level.

(1 mark)

~ The End ~

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