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FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2017**
Programme	:	Foundation in Science (CFSI)
Course	:	**BIO1203: Biology 1**
Date of Examination	:	14 December 2017 (Thursday)
Time	:	11:00am – 1:00pm Reading Time : Nil
Duration	:	2 Hours

Special Instructions :

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

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Nil

Examiner(s)	:	**Tan Bee Hooi**
Moderator	:	Assoc. Prof. Dr. Sreeramanan A/L Subramaniam

*This paper consists of **14** printed pages, including the cover page*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL EXAMINATION: AUGUST 2017 SESSION

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

Question 1

(a) Figure 1.1 shows the reaction to form a dipeptide.

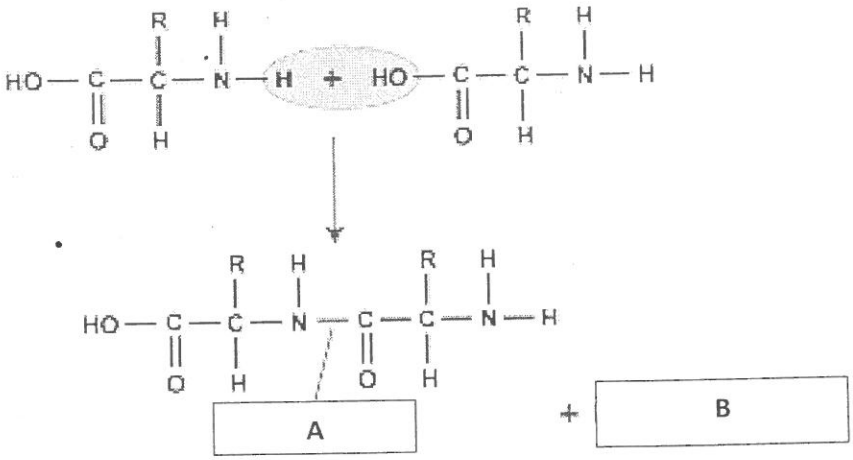


Figure 1.1

(i) Name the molecules labelled A and B. (2 marks)

(ii) State the name of the reaction showed. (1 mark)

(b) Copy the diagrams below.

Figure 1.2

(i) Identify with labels which one represents a lipid and which a phospholipid.
(1 mark)

(ii) Which of the two molecules is water-soluble? Explain.
(2 marks)

(c) The cell membrane has a fluid mosaic structure. Figure 1.3 shows a portion of a plasma membrane.

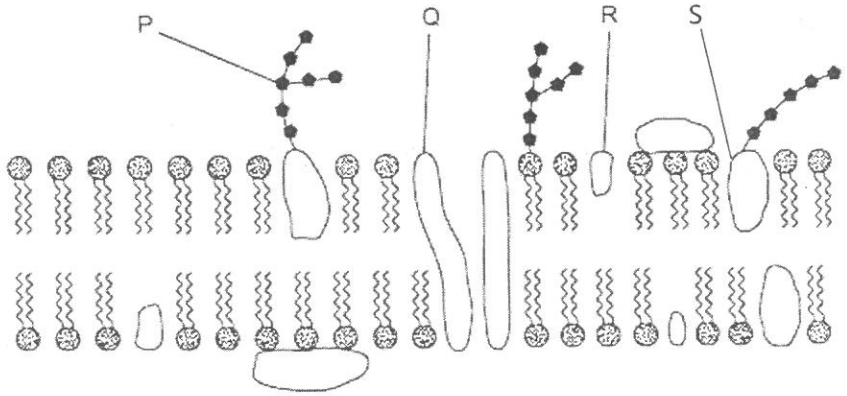


Figure 1.3

(i) Describe what is meant by the term fluid mosaic.
(2 marks)

(ii) Identify structures P, Q and R.
(3 marks)

(iii) Structure S is a protein composed of 398 amino acids.
Calculate the minimum number of nucleotide base pairs required in the gene coding for this protein. Show your working.
(2 marks)

(iv) One way in which substances can cross cell membranes is by active transport.
Describe the mechanism of active transport.
(2 marks)

(d) Figure 1.4 shows electron micrographs of some eukaryotic cell organelles.

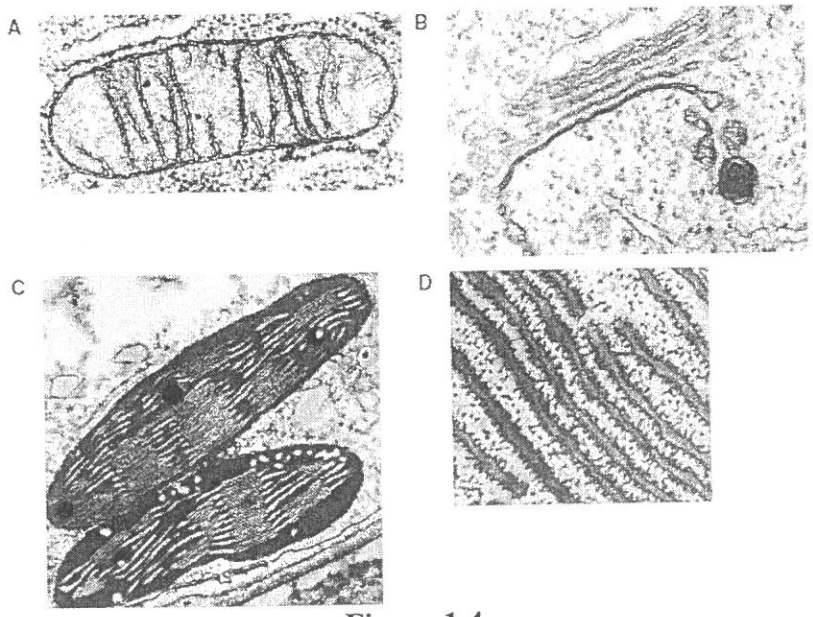


Figure 1.4

(i) For each of the organelles A, B, C and D shown in Figure 1.4, state the name and its function.

(8 marks)

(ii) Explain why an electron micrograph is able to provide more detail than a light micrograph.

(2 marks)

Question 2

(a) Figure 2.1 shows an inhibition of an enzyme.

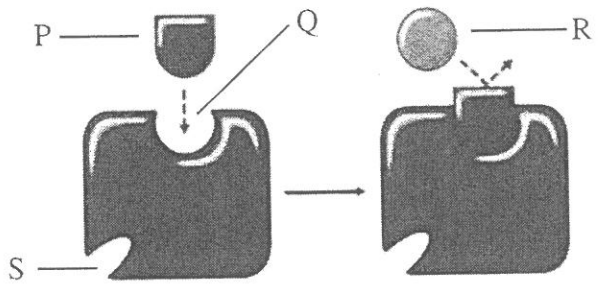


Figure 2.1

(i) Identify structures labelled P, Q, R and S.

[4 marks]

(ii) Which type of inhibition is shown in the diagram above. Briefly explain the inhibition.

[4 marks]

(b) Figure 2.2 shows different biological molecules.

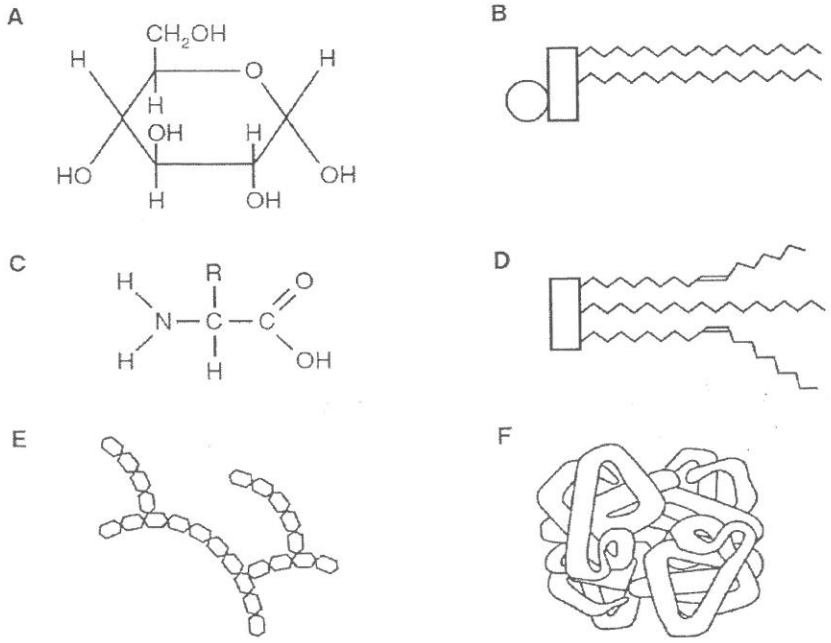


Figure 2.2

(i) State the letter of the molecule shown in Figure 2.2 that contains:
phosphate:
glycosidic bonds:
peptide bonds:
ester bonds:

(4 marks)

(c) Figure 2.3 shows the reduction of NAD^+ that occurs during respiration.

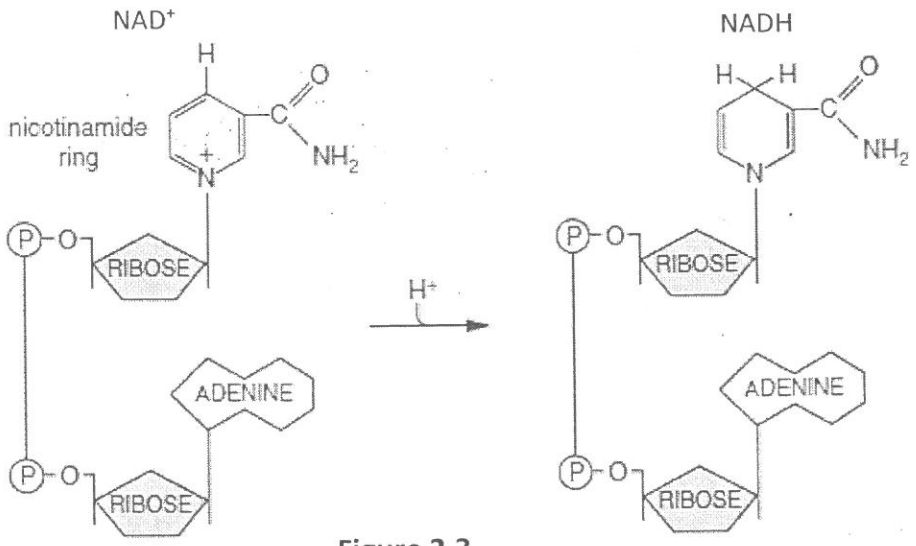


Figure 2.3

(i) State two specific places in the eukaryotic cell where NAD^+ is reduced. (2 marks)

(ii) Describe the role of NAD^+ in aerobic respiration. (3 marks)

(d) Figure 2.4 shows the light dependent reaction of photosynthesis.

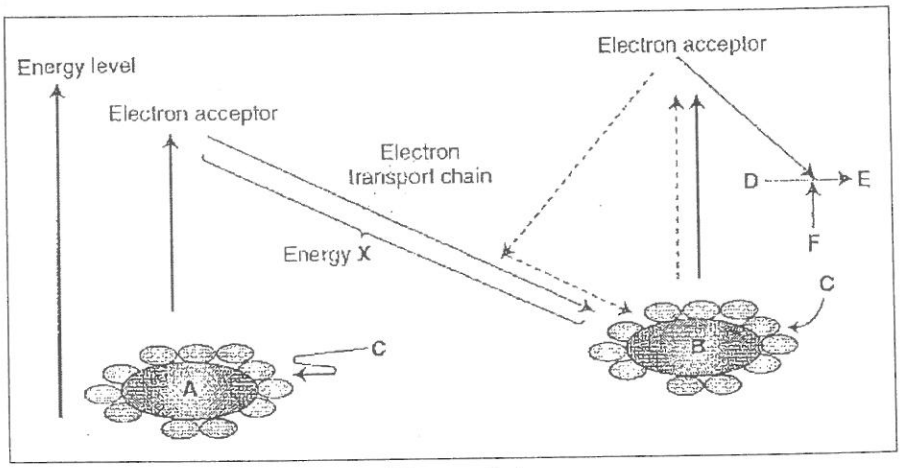


Figure 2.4

(i) Identify A, B, C, D, E and F in the diagram above. (3 marks)

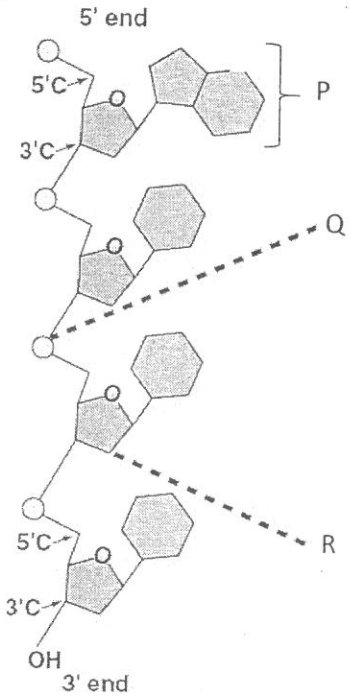
(ii) In chloroplast, where can you find structures A and B. (1 mark)

(iii) Name **TWO (2)** examples of photosynthetic pigments. (2 marks)

(iv) List **TWO (2)** roles of thylakoid membrane in photosynthesis. (2 marks)

Question 3

(a) Examine the DNA strand below.



(i) Name the structures P, Q and R.

(3 marks)

(ii) Name the bond that helped makes this polymer.

(1 mark)

(b) Figure 3.1 shows the bases sequence within the gene for angiotensinogen that codes for this short polypeptide, the RNA codons and the primary structure of angiotensin.

DNA base sequence	CTA	GCA	CAA	ATG	TAG	GTG	GGG	W .....
RNA codons	X	CGU	Y	UAC	AUC	Z	CCC	UUC
polypeptide primary structure	Asp	Arg	Val	Tyr	Ile	His	Pro	Phe

Figure 3.1

(i) Complete W, X, Y and Z.

(2 marks)

(ii) State the full name of the type of RNA shown in Fig. 3.1.

(1 mark)

(iii) State the full name of the type of RNA complementary to the RNA stated in b (ii).

(1 mark)

(c) Phosphatase enzymes remove phosphate groups from a wide range of organic compounds that contain phosphate. This makes available a supply of phosphates ions within cells. The reaction catalyzed by phosphatase enzymes is as follows:

$$XPO_4 \xrightarrow{\text{Phosphatase enzyme}} X + PO_4^{3-}$$

[X = an organic compound]

The activity of phosphatase was measured at different values of pH by using nine different buffer solutions. The temperature was kept constant at 30°C. The results are shown in the figure below.

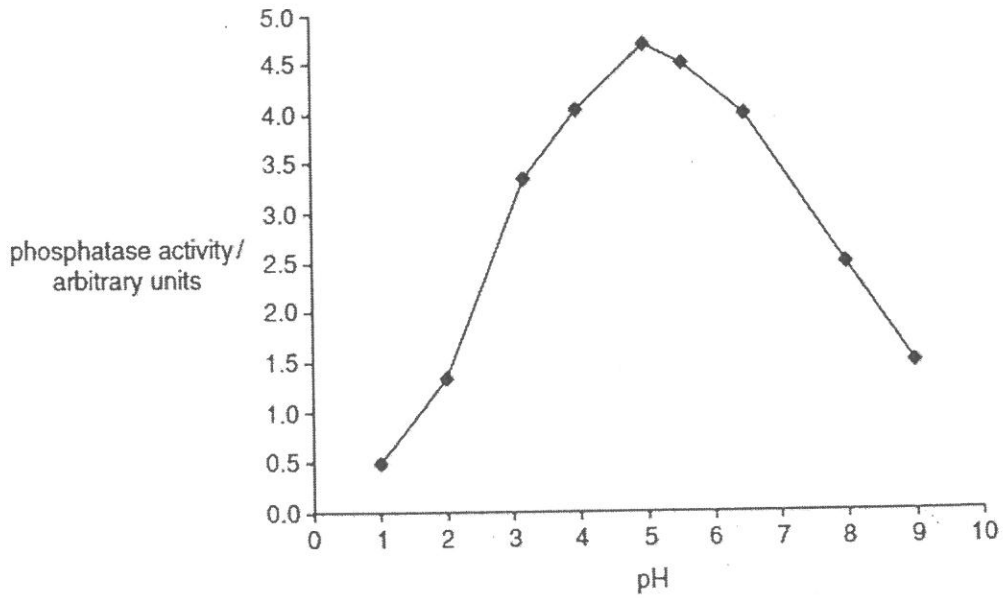


Figure 3.2

(i) Using the date in the figure above, describe the effect of pH on the activity of phosphatase.

(3 marks)

(ii) Explain why the activity of phosphatase is very low at pH 1.

(4 marks)

(iii) Copy the graph in Figure 3.2. Draw a curve on the figure to show the results you would expect if the experiment was repeated in exactly the same way but at a 20°C.

(2 marks)

(d) Muntjac deer are small deer found throughout Asia. Cells at the base of the epidermis of the skin continually divide by mitosis. Figure 3.3 shows the chromosomes from a skin cell of a female Indian muntjac deer at metaphase of mitosis.

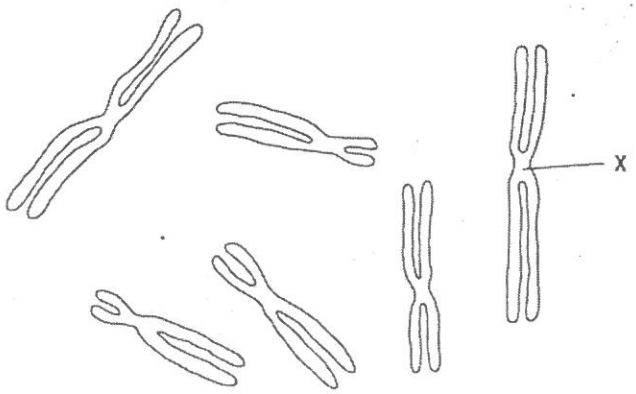


Figure 3.3

(i) State the diploid chromosome number of the female Indian muntjac deer.

(1 mark)

(ii) Name X and state its role in mitosis.

(2 marks)

(iii) Draw **ONE (1)** of the chromosomes shown in the figure as it would appear during anaphase of mitosis.

(2 marks)

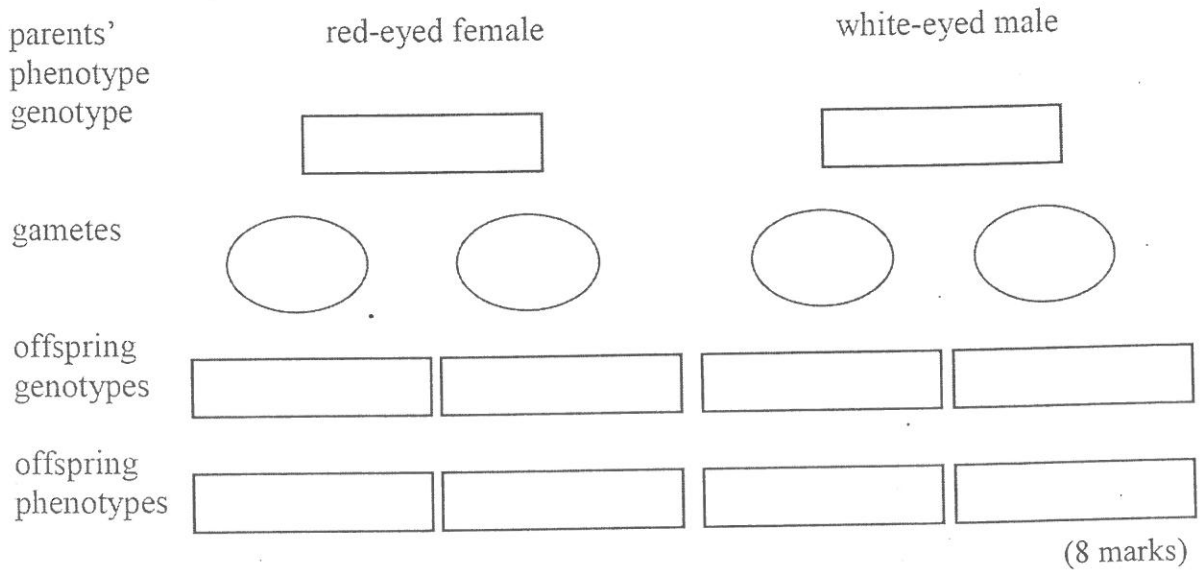
(iv) Outline what happens to a chromosome between the end of anaphase and the start of the next mitosis.

(3 marks)

Question 4

(a) The fruit fly, *Drosophila melanogaster*, has many phenotypic variations and has been used in experiments to demonstrate the principles of inheritance.
The majority of fruit flies have red eyes but there is a variant with white eyes.
Red-eyed are dominant to white-eyed variants of the fruit flies.

The gene for eye colour is located on the X chromosome.
Using suitable symbols, draw a genetic diagram to show the possible offspring of a cross between heterozygous red-eyed female fruit fly with a white-eyed male fruit fly.
keys to symbols: ..... ; .....



(8 marks)

(b) Figure 4.1 below shows the life cycle of a tiger.

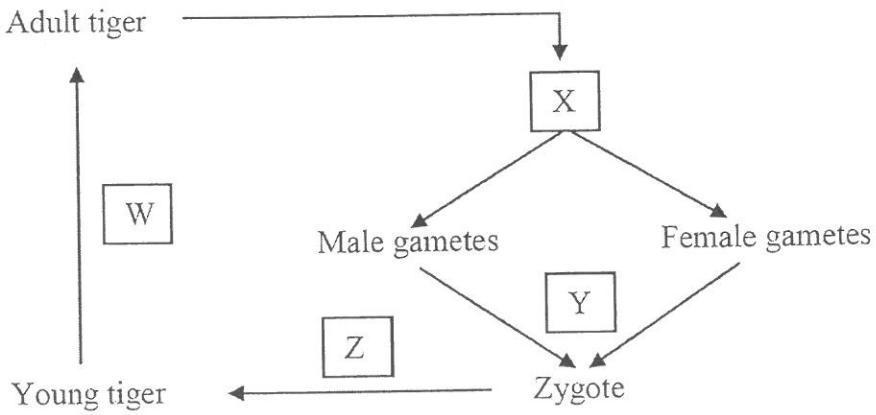


Figure 4.1

(i) Identify the stage(s) where meiosis occurs.

(1 mark)

(ii) Identify the stage(s) where mitosis occurs.

(1 mark)

(iii) During formation of eggs in the ovary of the female tiger, the chromosome number changes. State what happens to the chromosome number and explain why this change is necessary.

(2 marks)

(iv) State **TWO (2)** importance of mitosis in life cycle of this tiger.

(2 marks)

(v) Cells that are produced as a result of mitosis are genetically identical. Explain why are the cells identical.

(2 marks)

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

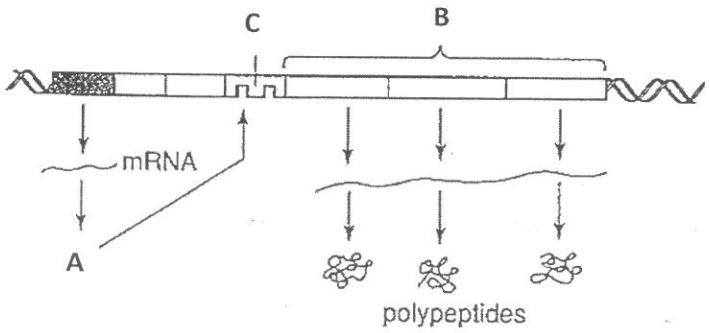


Figure 4.2

(i) Identify the substances labeled A, B and C.

(3 marks)

(ii) Explain how *lac* operon works when lactose is absent.

(3 marks)

(d) What is polymerase chain reaction (PCR)? Explain its process.

(3 marks)

Question 5

(a) The metabolic pathway in which a hexose sugar, such as glucose, is broken down in respiration by cells starts with glycolysis. Figure 5.1 outlines the key stages of glycolysis.

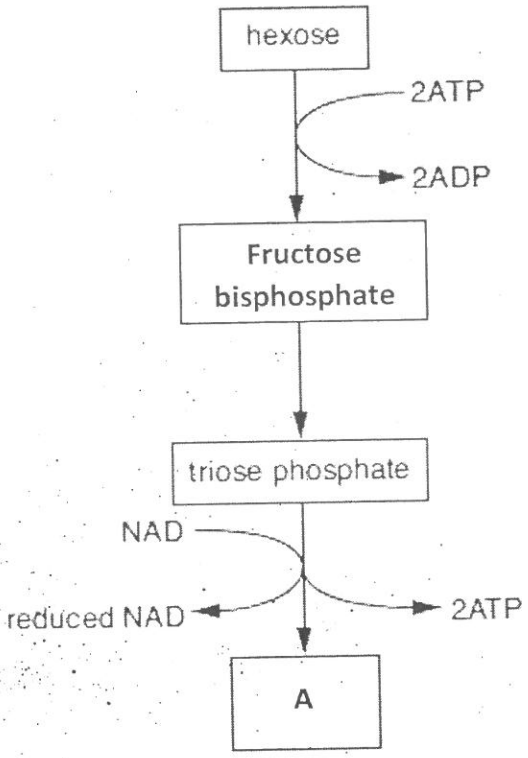


Figure 5.1

(i) State where in the cell glycolysis takes place. (1 mark)

(ii) Name substances A. (1 mark)

(iii) Briefly describe what happens to pyruvate if yeast is deprived of oxygen. (4 marks)

(b) Figure 5.2 shows an electron micrograph showing the main structural features of a mitochondrion in section.

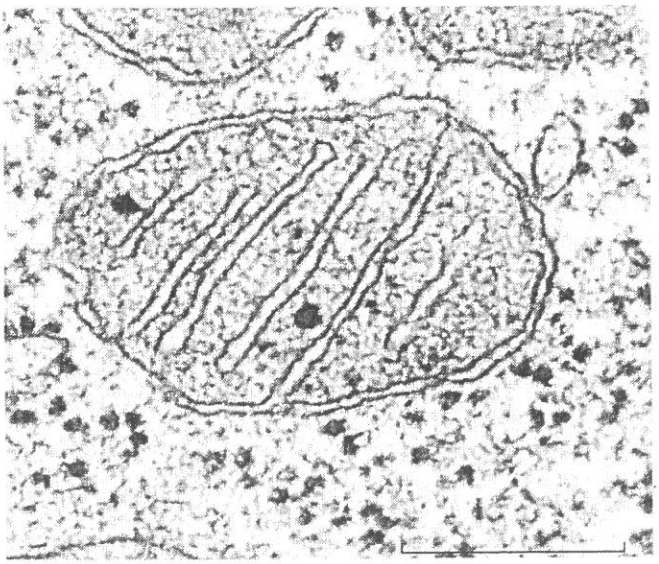


Figure 5.2

(i) State where oxidative phosphorylation and Krebs cycle occurs.

(2 marks)

(iI) Describe **TWO (2)** ways in which the structure of the mitochondrion is adapted for oxidative phosphorylation.

(4 marks)

(iii) State how ATP is synthesized in the mitochondria.

(4 marks)

(c) Fig. 5.3 shows some of the steps involved in the production of bacteria capable of synthesizing human insulin.

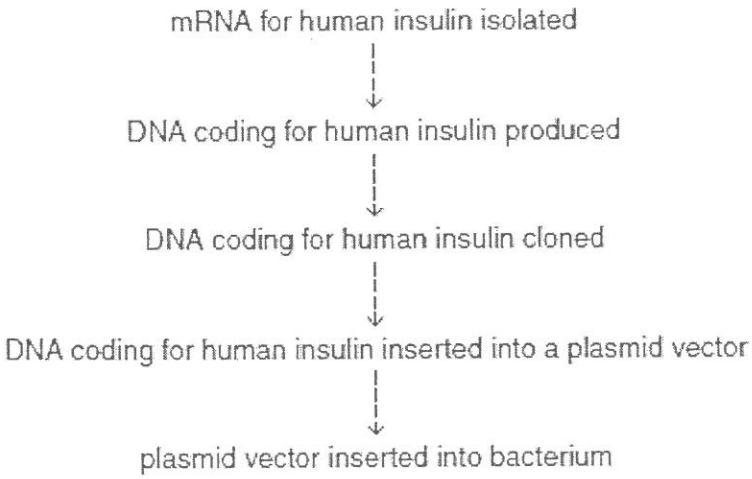


Figure 5.3

State the role of each of the following enzymes in the production of bacteria capable of synthesizing human insulin;

- reverse transcriptase
- restriction enzymes
- DNA ligase

(3 marks)

(d) There is much controversy throughout the world regarding the use of genetically modified (GM) crops.

(i) Suggest **TWO (2)** disadvantage of growing GM plants.

(2 marks)

(ii) Suggest **TWO (2)** advantage of growing GM plants.

(2 marks)

(e) DNA technology has changed the pharmaceutical and medical industry. State **TWO (2)** examples of products of DNA technology.

(2 marks)

~The End~

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