

# INTI

## International College Penang

FINAL  
Examination Paper  
(COVER PAGE)

Session : AUGUST 2018

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Programme : Foundation In Science (CFSI)

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Course : **BIO 1203 : BIOLOGY 1**

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Date of Examination : 13 December 2018 (Thursday)

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Time : 11:00AM – 1:00PM      Reading Time : -

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Duration : 2 Hours

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**Special Instructions** :

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

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Materials permitted :

Non-Programmable Scientific Calculator

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Materials provided :

Nil

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Examiner(s) :

**Jason Chin**

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Moderator :

Assoc. Prof Dr. Sreeramanan Subramaniam

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

INTI INTERNATIONAL COLLEGE PENANG  
FOUNDATION IN SCIENCE (CFSI)  
**BIO1203: BIOLOGY 1**  
FINAL EXAMINATION: AUGUST 2018 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 (25 marks)**

- a) Name the stage of meiosis at which each the following occurs (i.e. Prophase I, Metaphase II...). Remember to state whether the stage you name is during meiosis I or meiosis II.
- (i) Homologous chromosomes pair with its partner. (1 mark)
  - (ii) Crossing over between chromatids of homologous chromosomes takes place. (1 mark)
  - (iii) Homologous chromosomes separate. (1 mark)
  - (iv) Centromeres split and chromatids separate. (1 mark)
  - (v) Haploid nuclei are first formed. (1 mark)
- b) List **FOUR (4)** major organic molecules in human body cells. (2 marks)
- c) What are the four types of protein structures? (2 marks)
- d) Enzyme is categorized under which group of organic compound? (1 mark)
- e) What is the function of enzyme? (1 mark)
- f) List **TWO (2)** environmental conditions that influence enzyme activity and discuss how they do so. (4 marks)
- g) What is the difference between exergonic reactions and endergonic reactions? (2 marks)
- h) Based on Figure 1.1, which shows the energy changes during a chemical reaction that has not been catalysed by an enzyme and the energy changes for the same chemical reaction that has been catalysed by an enzyme.

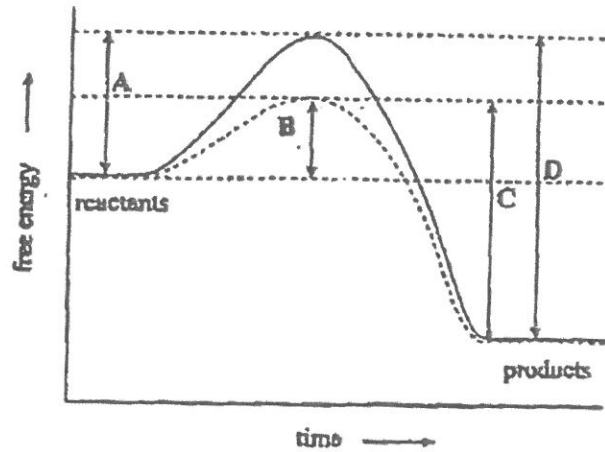
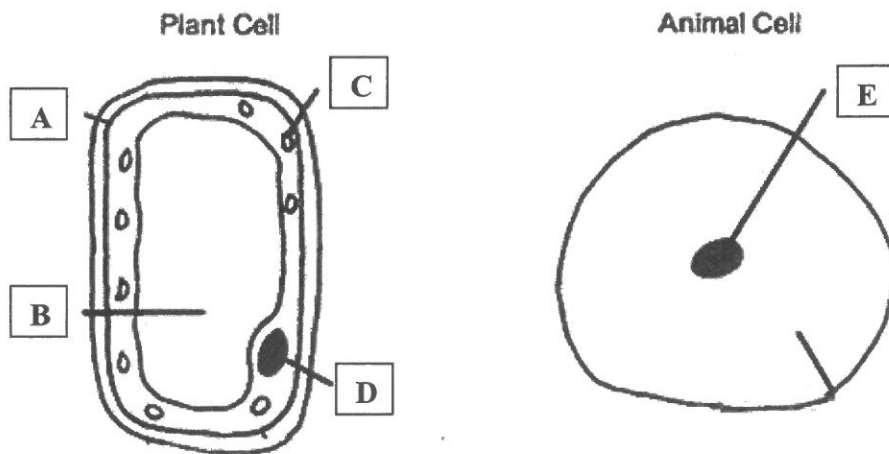


Figure 1.1

- (i) Which letter on Figure 1.1 indicates the activation energy for the chemical reaction that has not been catalysed by an enzyme? (1 mark)
- i) **One (1)** method of classification is based on whether the organism is prokaryotic or eukaryotic in its cellular structure.
- (i) Define prokaryotes and give an example. (2 marks)
- (ii) Define eukaryotes and give an example. (2 marks)
- j) Briefly characterize the structure and function of the cell nucleus, nuclear envelope and nucleolus. (3 marks)

**Question 2 (25 marks)**

a) Figure 2.1 shows part of an animal cell and is based on a series of electron micrographs.



**Figure 2.1**

- (i) (1.1) Name the structures labeled **A**, **B**, **C**, **D** and **E**. (5 marks)
- (1.2) What is the function of **A**. (1 mark)
- (1.3) What is the part played by **C**? (1 mark)
- (1.4) Write **ONE (1)** function **D** may have in the cell. (1 mark)
- (ii) State **TWO (2)** differences between plant and animal cells (2 marks)
- b) (i) Define Osmosis. (2 marks)
- (ii) In a supermarket, vegetable products are often sprayed with water. Explain why this makes vegetables look fresh. (2 marks)

c)

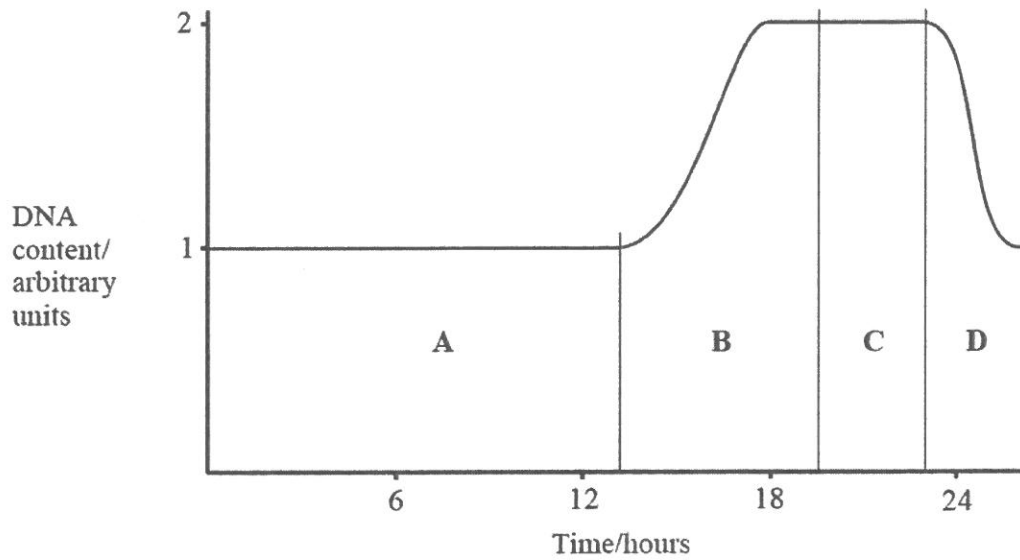


Figure 2.2

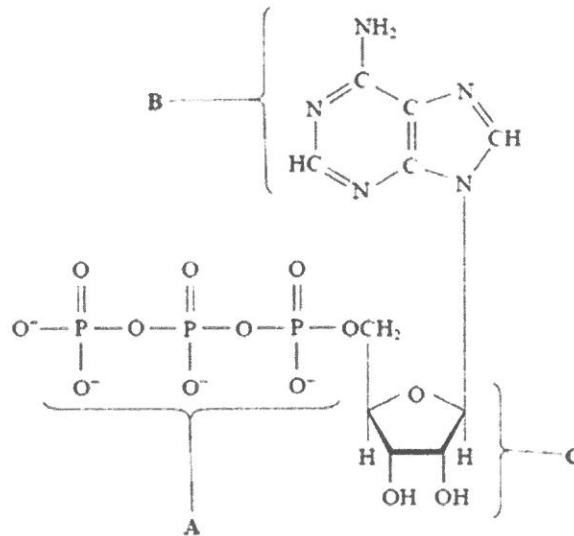
- (i) Use the letters from the Figure 2.2 to indicate the period(s) when:
- (2.1) chromosomes are being duplicated. (1 mark)
  - (2.2) cell division is taking place. (1 mark)
- (ii) Explain the change in DNA content in **D** for Figure 2.2. (1 mark)
- (iii) Give **TWO (2)** ways in which the chromosomes at the end of meiosis I would differ from those at the end of mitosis. (2 marks)
- d) Explain how mature proteins are made from mRNA. (6 marks)

**Question 3 (25 marks)**

a) Photosynthesis converts light energy to the chemical energy of food.

- (i) Explain why photorespiration lowers photosynthetic output for plants? (2 marks)
- (ii) Which type of plants are adapted to dry conditions and limit photorespiration by fixing the carbon twice? (1 mark)
- (iii) In the light reaction, what is the initial electron donor? Where do the electrons end up? (2 marks)

b) Figure 3.1 shows a molecule of ATP.



**Figure 3.1**

- (i) Name **A**, **B** and **C** in Figure 3.1. (3 marks)
- (ii) Which group of molecules does ATP belong to? (1 mark)
- (iii) Explain why ATP is important to cells. (2 marks)
- (iv) State **TWO (2)** sites of ATP synthesis in living organisms. (2 marks)

c) Plant genetic engineering starts with vectors that can carry genes into them. *Agrobacterium tumefaciens* is a species of bacteria that can infect many plants. Describe how the *Agrobacterium tumefaciens* with Ti plasmid transfer its gene into a plant.

(5 marks)

d) Figure 3.2 shows some of the processes that occur within a mitochondrion and some of the substances that enter and leave the organelle.

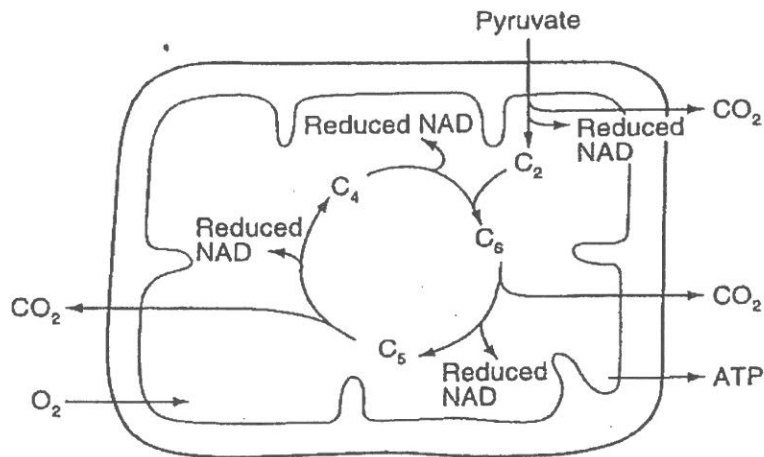


Figure 3.2

Name the process that:

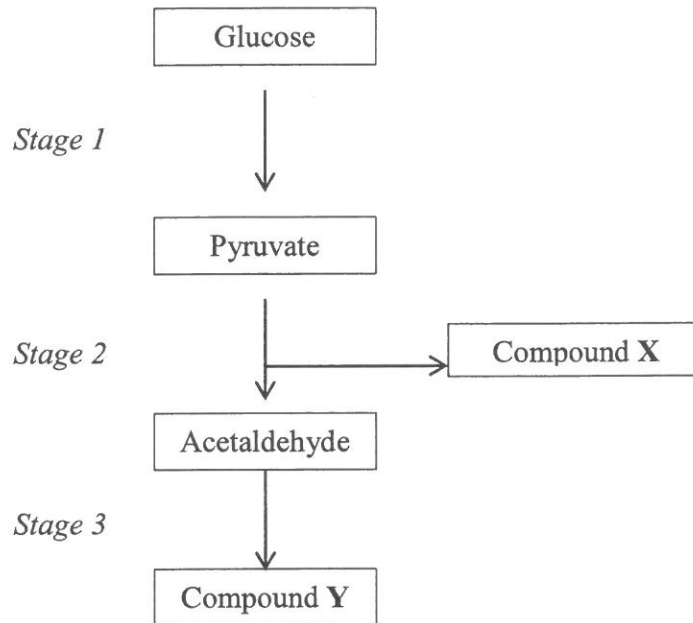
(i) Produces reduced NAD and Carbon dioxide in the matrix of the mitochondrion.

(1 mark)

(ii) Produces pyruvate in the cytoplasm.

(1 mark)

e) The diagram below shows some of the stages of anaerobic respiration in a yeast cell.



- (i) Identify compound Y, produced in *Stage 3*. (1 mark)
- (ii) Identify compound X, produced in *Stage 2*. (1 mark)
- f) State the equation for photosynthesis (1 mark)
- g) What is the name given to the first stable product produced in the Calvin-Benson cycle (Light Independent stage of photosynthesis)? (1 mark)
- h) What is the name given to the substance which combines with CO<sub>2</sub> in the Calvin-Benson cycle? (1 mark)

**Question 4 (25 marks)**

- a) The colour and shape of radish is controlled by two pairs of allele that do not show dominance. Radish can be red (RR), purple (Rr), or yellow (rr). Radish shape can be long (LL), oval (Ll) and round (ll).
- (i) Draw a genetic diagram for the cross between the red and long radish with the yellow and round radish and indicates F<sub>1</sub> genotype and F<sub>1</sub> phenotype. (2 marks)
- (ii) Draw a Punnett square if the F<sub>1</sub> generation obtained from (a) is crossed among itself. (3 marks)
- b) A dog has 39 pairs of chromosomes in its somatic cells.
- (i) How many chromosomes did the dog inherit from each parent? (1 mark)
- (ii) How many chromosomes are in each dog's gamete? (1 mark)
- (iii) How many chromatids in an eukaryotic chromosome during its duplicated stage? (1 mark)
- (iv) What are the haploid and diploid numbers for dogs? (2 marks)
- c) In a leguminous plant, tall (D) is dominant towards short (d) and yellow (G) is dominant to green (g).
- (i) A tall homozygous leguminous plant was cross-fertilized with a short homozygous plant. What is/are the phenotypic and genotypic ratio of F<sub>1</sub> and F<sub>2</sub>? Show all working. (2 marks)
- (ii) If a homozygous plant which is tall and has yellow cotyledon is cross-fertilized with a short plant with green cotyledon, what is/are the resulting phenotypic and genotypic ratio of F<sub>1</sub> as well as phenotypic ratio of F<sub>2</sub>? Show all working. (3 marks)
- d) (i) A man has type B blood and a female has type A blood. What are the possible blood types can their child has. (3 marks)
- (ii) What is the relation of the gene for the different enzymes that determine the blood type of a human? (1 mark)
- (iii) What is the outcome if the blood of two people from different group mixes during transfusion? (1 mark)
- e) Describe the light dependent reactions and light independent reactions in photosynthesis. (4 marks)
- f) What happens when light excites chlorophyll? (1 mark)

**Question 5 (25 marks)**

- a) Please explain the purpose of Polymerase Chain Reaction (PCR). Please list the **THREE (3)** major steps involve in PCR and explain. (4 marks)
- b) Give **ONE (1)** difference between DNA and RNA. (1 mark)
- c) Define DNA transcription and translation. (2 marks)
- d) Briefly describe the definition and steps of Plasmid DNA cloning (5 marks)
- e) The letters below represent the base sequence in a section of a strand of DNA.

3'- A T T G C T-5'

- (i) Write down this strand and its complementary strand, clearly indicating the 5' and 3' end of the complementary strand. (2 marks)
- (ii) State the names of **TWO (2)** of the bases present. (2 marks)
- (iii) Draw a diagram to show the arrangement of sugars, phosphates and bases for the single strand of DNA given above. (2 marks)
- (iv) The DNA molecule usually consists of two strands arranged in a three dimensional structure. State the name of this structure and draw a sketch of it. (2 marks)
- f) There are **TWO (2)** important enzymes found in DNA replication. Which enzyme
- (i) Links nucleotides into growing DNA chain during replication? (1 mark)
- (ii) Join different DNA fragments / Okazaki fragments? (1 mark)
- g) Why are the plasmid and foreign gene cut by using the same restriction enzyme? (1 mark)
- h) Would a mutation in a protein-coding region of DNA be more detrimental than a mutation in a non-coding region? Explain your answer. (2 marks)

**[25 marks]**