INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2019**
Programme	:	Foundation in Science (CFSI)
Course	:	**BIO1203 : BIOLOGY 1**
Date of Examination	:	13 December 2019 (Friday)
Time	:	11:00AM – 1:00PM Reading Time : Nil
Duration	:	2 hours
Special Instructions	:	

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

Materials permitted :

Non-Programmable Calculator

Materials provided :

Answer Booklet

Examiner(s)	:	**Dr. Khor Soo Ping**
Moderator	:	**Prof. Dr. Sreeramanan Subramaniam**

*This paper consists of **13** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG
FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL EXAMINATION: AUGUST 2019 SESSION

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

Question 1

(a) List the **THREE (3)** domains of life.

(3 marks)

(b) Figure Q1(b) shows the structure of *Amoeba*.

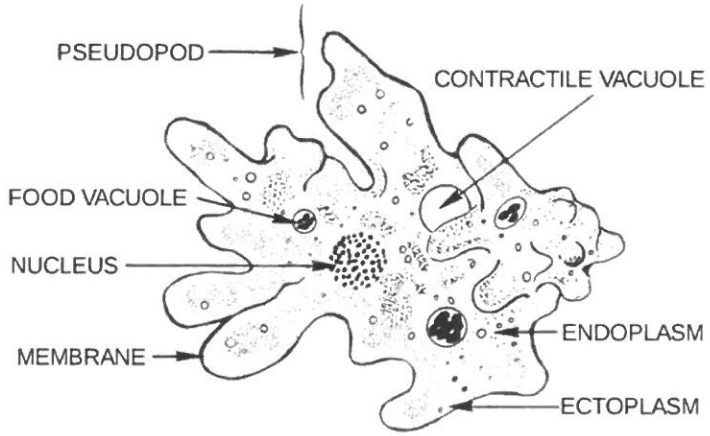


Figure Q1(b)

(i) Is the cell of *Amoeba* prokaryotic or eukaryotic?

(1 mark)

(ii) Give a reason for your answer to b(i).

(1 mark)

(c) Briefly discuss how does natural selection adapt a population of organisms to its environment?

(3 marks)

(d) Lauren wants to know which location in her apartment is best for growing African violets. She has three African violets. She puts one on the balcony, one by the kitchen window, and one on the mantel in the living room. Each plant has the same size pot and the same soil, and Lauren gives each plant the same amount of water. In this investigation, identify the **control, independent and dependent variable**.

(3 marks)

(e) State and describe **THREE (3)** properties of water that is important to support life.

(3 marks)

(f) The Figure Q1(f) below shows the structure of a lipid molecule.

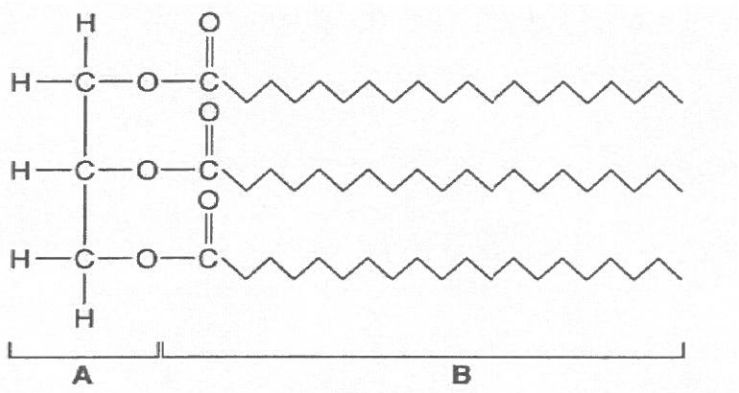


Figure Q1(f)

(i) Name the parts labeled **A** and **B.**

(2 marks)

(ii) Name the chemical reaction used to form the bonds between **A** and **B**. Explain this chemical reaction.

(3 marks)

(g) Figure Q1(g) shows the structure of monomer that make up of nucleic acid DNA and RNA.

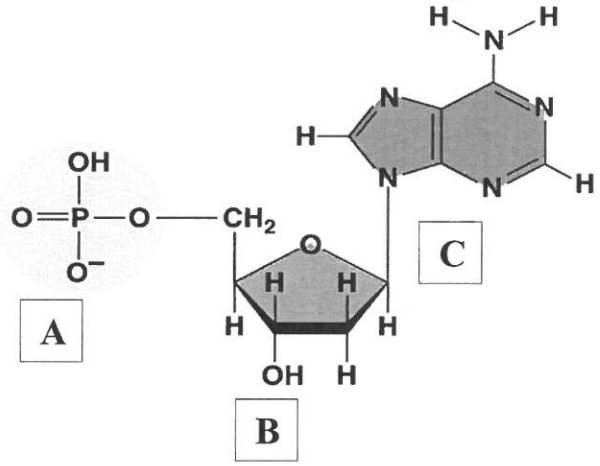


Figure Q1(g)

(i) Name the components labeled A, B and C in Figure Q1(g).

(3 marks)

(ii) Which components form the backbone of a DNA strand?

(1 mark)

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

(2 marks)

Question 2

(a) The Figure Q2(a) shows the relationship between certain organelles in a phagocytic cell.

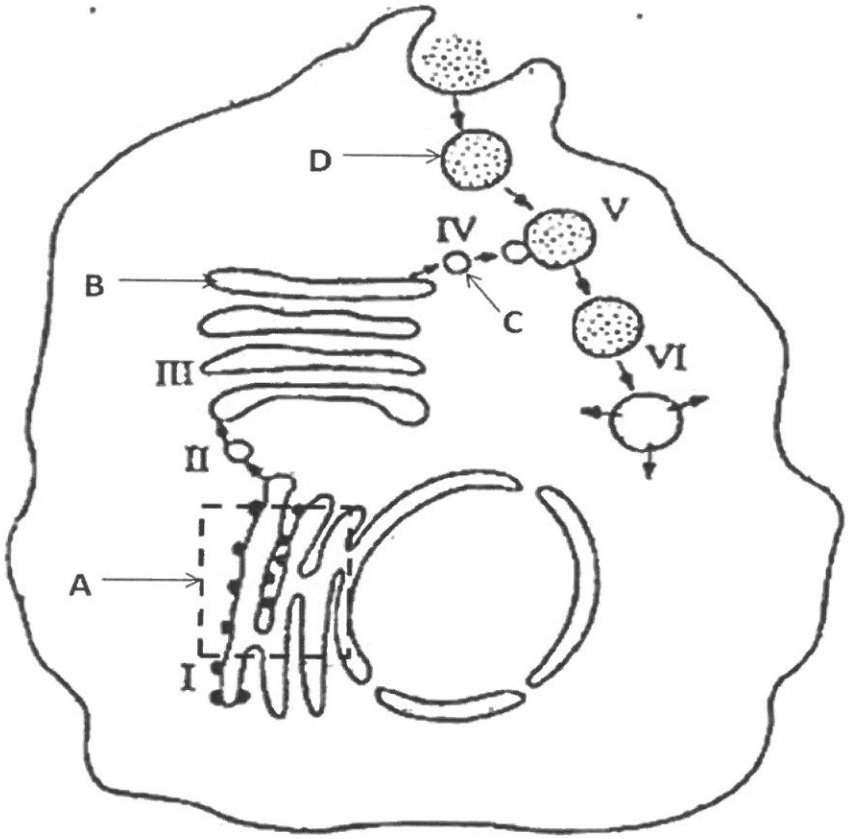


Figure Q2(a)

(i) Name the structure labelled **A, B C** and **D**.

(4 marks)

(ii) Explain what happens in stages **I, II, III, IV, V** and **VI** in the above diagram.

(6 marks)

(b) What are the differences between exergonic reactions and endergonic reactions?

(2 marks)

(c) Figure Q2(c) below represents the section of a cell plasma membrane.

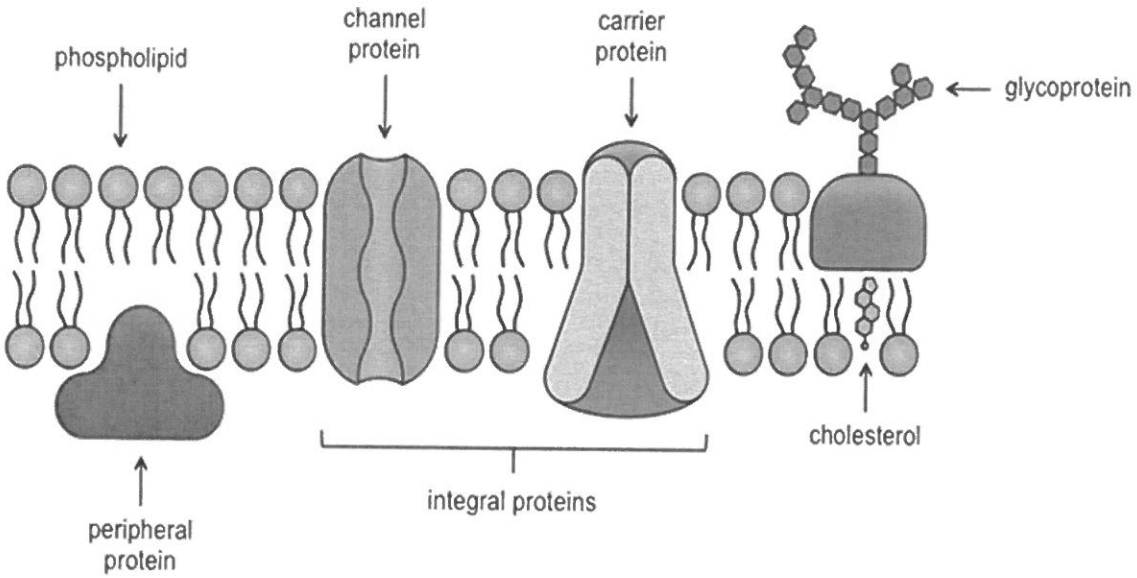


Figure Q2(c)

(i) State and explain the model that is used to describe cell membrane's structure

(3 marks)

(ii) With reference to Figure Q2(c), list any **TWO (2)** functions of membrane protein.

(2 marks)

(iii) What is the role of cholesterol in cell membrane?

(1 mark)

(d) Figure Q2(d) shows a normal enzyme reaction. With reference to the diagram below, **DRAW a labeled diagram** and describe how competitive and non-competitive enzyme inhibitor regulates enzyme activities.

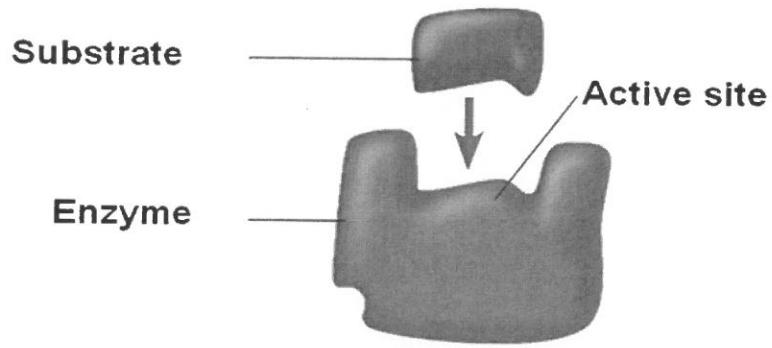


Figure Q2(d)

(4 marks)

(e) The following list shows methods by which substances may pass across a cell membrane:
Facilitated diffusion
Active transport
Simple diffusion
Exocytosis
Phagocytosis

With reference to the methods above, identify how likely the following materials would enter or leave a cell.

(i) an amoeba, which is unicellular protest, ingesting a smaller animal

(1 mark)

(ii) the kidney of a fish removing excess salt from the blood

(1 mark)

(iii) a cell in your pancreas secreting small vesicles of insulin

(1 mark)

Question 3

(a) Figure Q3(a) below represents the stages in cellular respiration under aerobic condition.

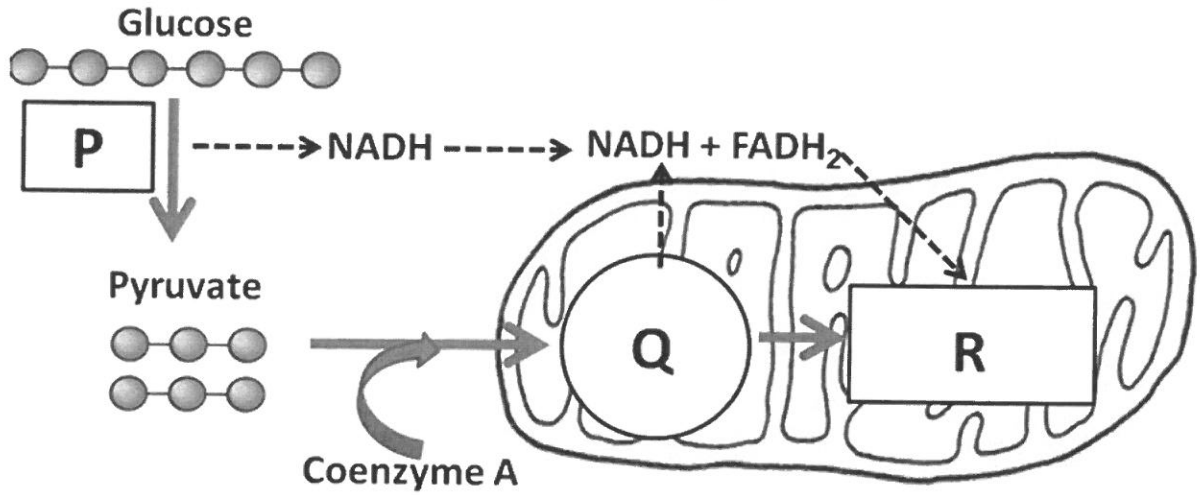


Figure Q3(a)

(i) Identify stages P, Q and R of cellular respiration. Which of these stages will operate in the absence of oxygen?

(4 marks)

(ii) State the place where stage P happen in a cell.

(1 mark)

(iii) What is the function of NADH and $FADH_2$?

(1 mark)

(iv) Which stages of cellular respiration has the majority of ATP produced?

(1 mark)

(v) Describe the reaction that links pyruvate to stage Q. Include the role of coenzyme A as part of your discussion.

(3 marks)

(b) Photosynthesis converts light energy to the chemical energy of food. Figure Q3(b) illustrates the overview of photosynthesis in a chloroplast.

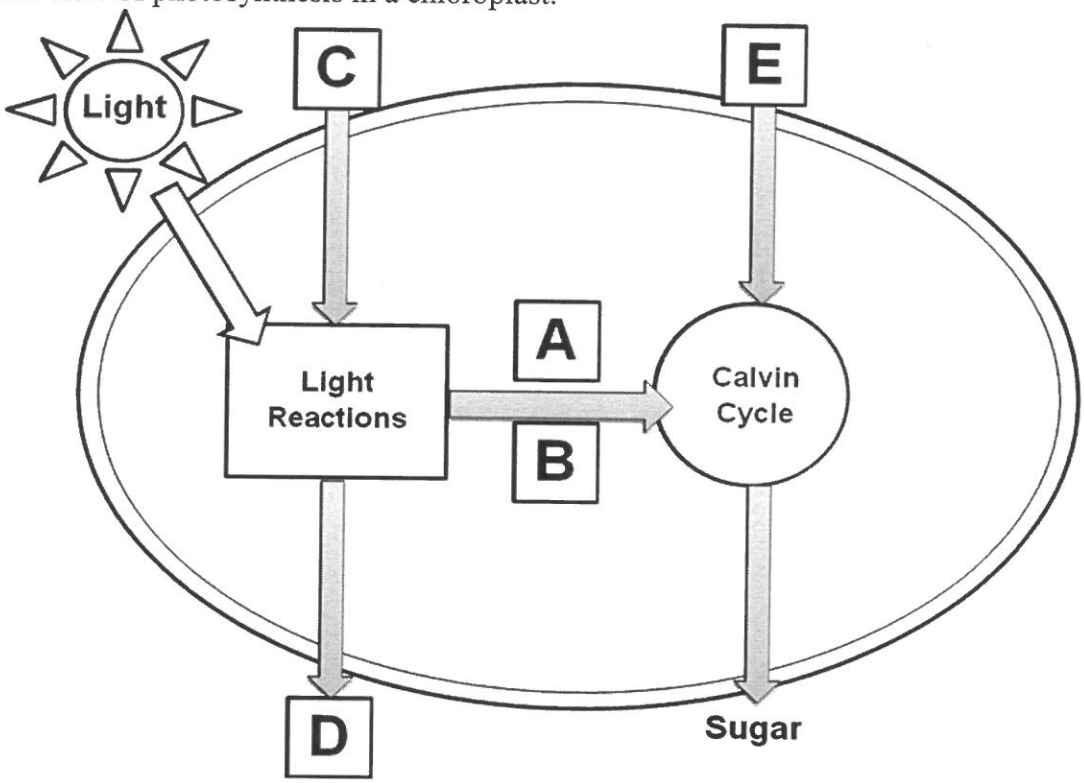


Figure Q3(b)

(i) Substance A and B are important outputs of light-dependent reaction that is required for Calvin cycle. Identify substance A and B and state their role in Calvin cycle.

(4 marks)

(ii) Name the molecule C, D and E.

(3 marks)

(iii) What is the initial electron donor and final electron acceptor in light reaction?

(2 marks)

(iv) Briefly explain why photosynthesis is considered as an endergonic reaction?

(1 mark)

(c) The fixation of carbon dioxide in photosynthesis is represented in Figure Q3(c)

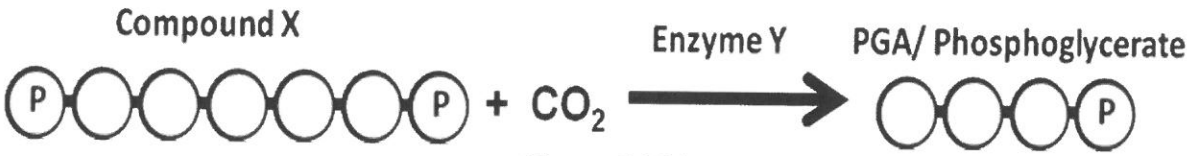


Figure Q3(c)

(i) Determine compound **X** and enzyme **Y**.

(2 marks)

(ii) How C4 and CAM plants overcome photorespiration under hot and dry climates?

(3 marks)

Question 4

(a) Figure Q4(a) is a diagram of a cell in late prophase of mitosis.

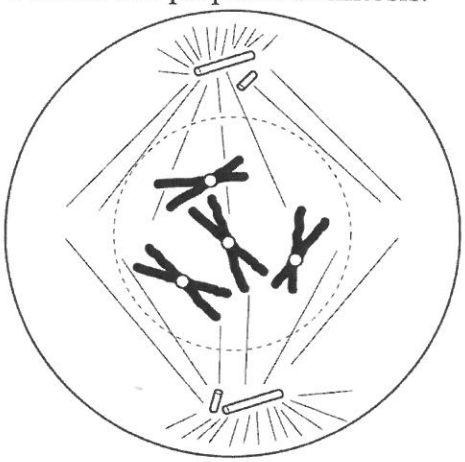
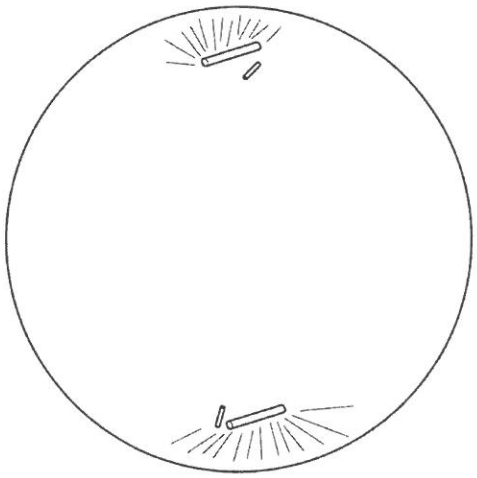


Figure Q4(a)

(i) Complete the drawing below to show a cell in metaphase of mitosis. *(Recreate this drawing in your answer booklet.)*



(2 marks)

(ii) Describe what is happening during metaphase stage.

(2 marks)

(iii) List **TWO (2)** importance of mitosis in multicellular organisms.

(2 marks)

(iv) List **TWO (2)** ways in which meiosis can lead to variation.

(2 marks)

(v) Outline **ONE (1)** difference of prophase in mitosis compared to prophase I of meiosis.

(1 mark)

(vi) What is the advantage of using light microscopy in studying cell division compared to electron microscopy.

(1 mark)

(b) The colour and shape of radish is controlled by two pairs of allele that do not show dominance; each genotypes producing different phenotypes. 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. Show the genotype and phenotype of the F1 generation.

(4 marks)

(ii) Draw a Punnett square if the F1 generation obtained from b(i) is crossed among itself.

(3 marks)

(iii) By using the data obtained in b(ii), complete the table below. *(recreate this table in your answer booklet)*

Phenotype	Genotype	Genotype ratio	Phenotype ratio
Red, long			
Red, oval			
Red, round			
Purple, long			
Purple, oval			
Purple, round			
Yellow, long			
Yellow, oval			
Yellow, round			

(3 marks)

(c) 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 is results from a recessive allele. It has been reported that 0.6% of females worldwide have RGC which 8% of males worldwide have RGC.

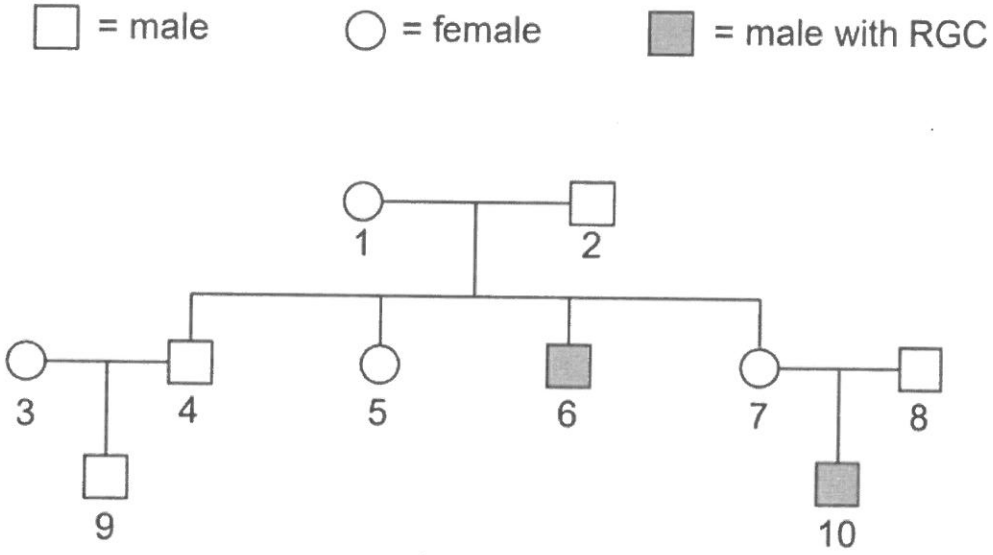


Figure Q4(c)

(i) Define the term recessive.

(1 mark)

(ii) Explain why females are less likely than males to have RGC.

(1 mark)

(iii) With reference to Figure Q4(c) and using the symbols R for the dominant allele and r for the recessive allele, state the genotypes of the individuals 4,6 and 7.

(3 marks)

Question 5

(a) Figure Q5(a) below shows protein synthesis in an eukaryotic cell.

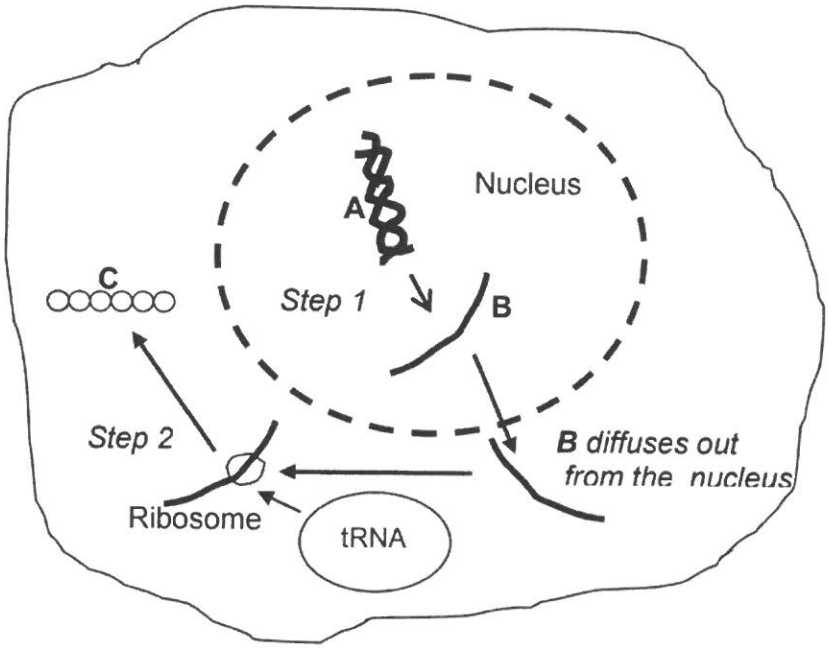


Figure Q5(a)

(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) Figure Q5(b) shows the *lac* operon when lactose is absent

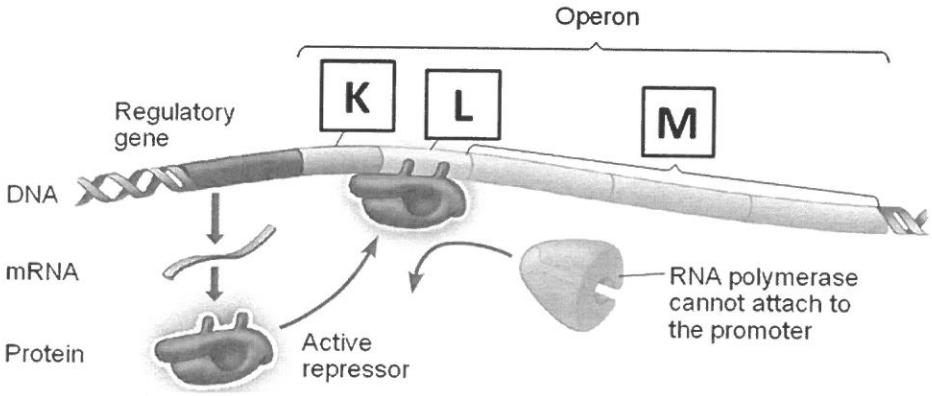


Figure Q5(b)

(i) List the **three (3)** components of an operon, structure **K**, **L** and **M**.

(3 marks)

(ii) With reference to Figure Q5(b), explain what happen when lactose is present in the environment.

(3 marks)

(c) Figure Q5(c) shows a part of gene cloning process.

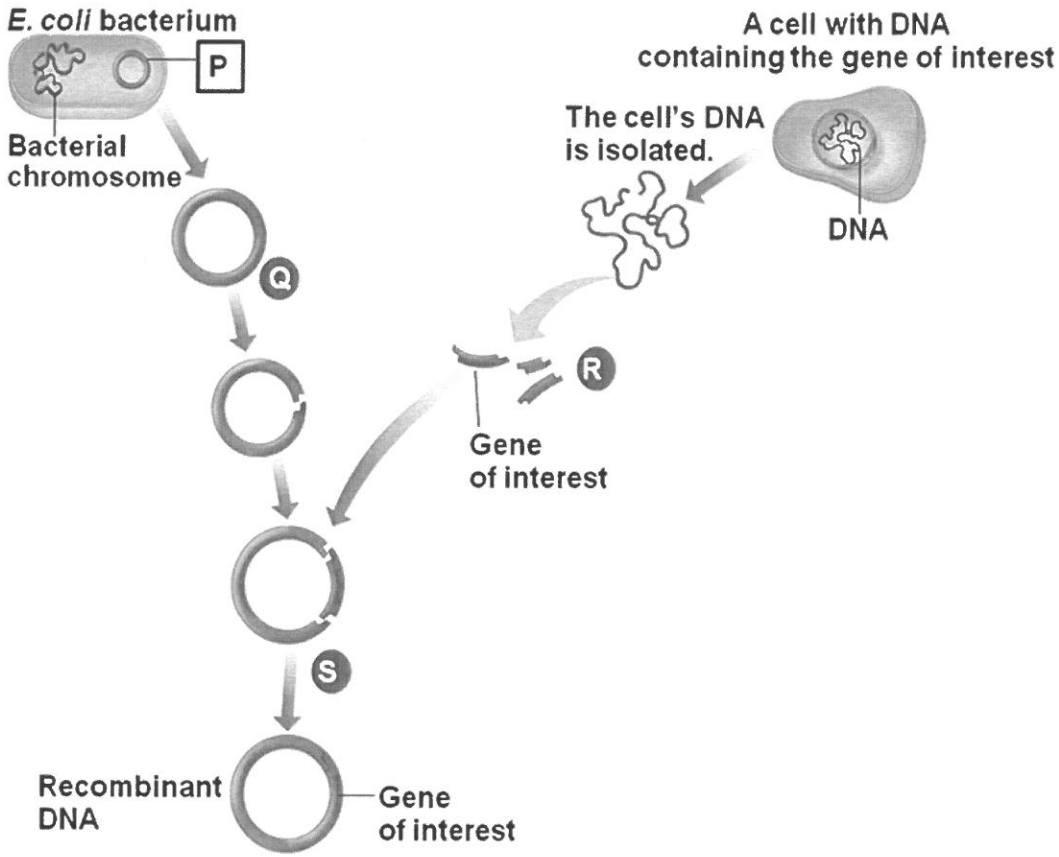


Figure Q5(c)

(i) Name structure P.

(1 mark)

(ii) With reference to Figure Q5(c), explain the event in steps Q, R and S.

(3 marks)

(d) List **TWO (2)** advantages of producing genetically modified (GM) crops.

(2 marks)

(e) Figure Q5(e) shows the analysis of sample DNA taken from crime scene and possible suspects.

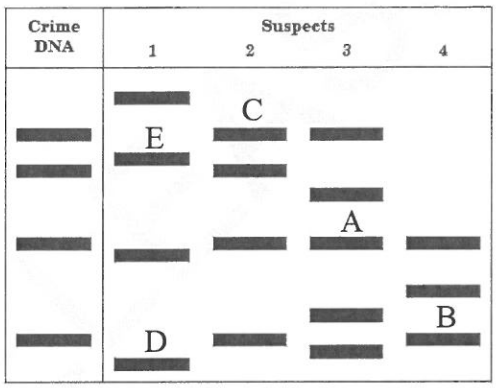


Figure Q5(e)

(i) Name the laboratory technique demonstrated in Figure Q5(e)

(1 mark)

(ii) Which suspect is the most likely to have committed the crime? Explain why.

(2 marks)

(iii) Based on the banding pattern shown in Figure Q5(e), arrange the size of DNA fragment from the smallest to largest.

(1 mark)

~ The End ~

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