INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session : **April 2017**

Programme : Foundation In Science (CFSI)

Course : **BIO1203: Biology 1**

Date of Examination : 3 August 2017 (Thursday)

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 Scientific Calculator

Materials provided :

Nil

Examiner(s) : **Ooi Saik Huey**

Moderator : Assoc. Prof. Dr. Sreeramanan A/L Subramaniam

*This paper consists of **15** printed pages, including the cover page*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL EXAMINATION: APRIL 2017 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) How does natural selection adapt a population of organisms to its environment?

(2 marks)

(b) What is the difference between discovery science and hypothesis science?

(2 marks)

(c) (i) What enables neighboring water molecules to hydrogen-bond to one another?

(2 marks)

(ii) Describe **TWO (2)** ways in which the water in your body helps stabilise your body temperature?

(2 marks)

(d) List **THREE (3)** different types of lipids and describe their functions.

(6 marks)

(e) Figure Q1(e) shows four types of linkage, **A** to **D**, which occur in biological molecules.

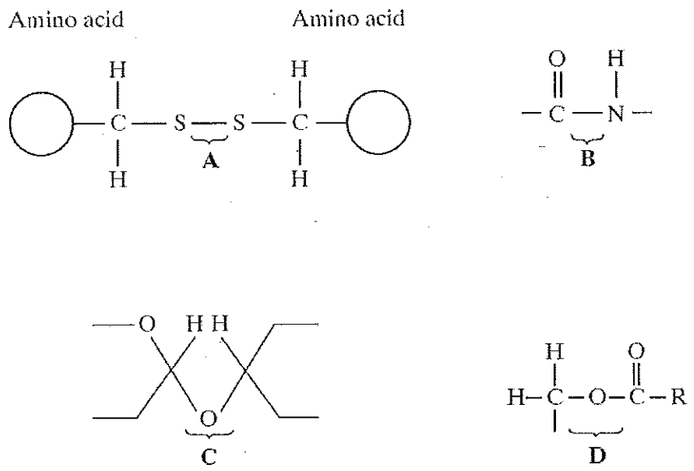


Figure Q1(e)

(i) Name the chemical process involved in the formation of linkage **B**.

(1 mark)

INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**April 2017**
Programme	:	Foundation In Science (CFSI)
Course	:	**BIO1203: Biology 1**
Date of Examination	:	3 August 2017 (Thursday)
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 Scientific Calculator

Materials provided :

Nil

Examiner(s)	:	**Ooi Saik Huey**
Moderator	:	Assoc. Prof. Dr. Sreeramanan A/L Subramaniam

*This paper consists of **15** printed pages, including the cover page*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
BIO1203: BIOLOGY 1
FINAL EXAMINATION: APRIL 2017 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) How does natural selection adapt a population of organisms to its environment?

(2 marks)

(b) What is the difference between discovery science and hypothesis science?

(2 marks)

(c) (i) What enables neighboring water molecules to hydrogen-bond to one another?

(2 marks)

(ii) Describe **TWO (2)** ways in which the water in your body helps stabilise your body temperature?

(2 marks)

(d) List **THREE (3)** different types of lipids and describe their functions.

(6 marks)

(e) Figure Q1(e) shows four types of linkage, **A** to **D**, which occur in biological molecules.

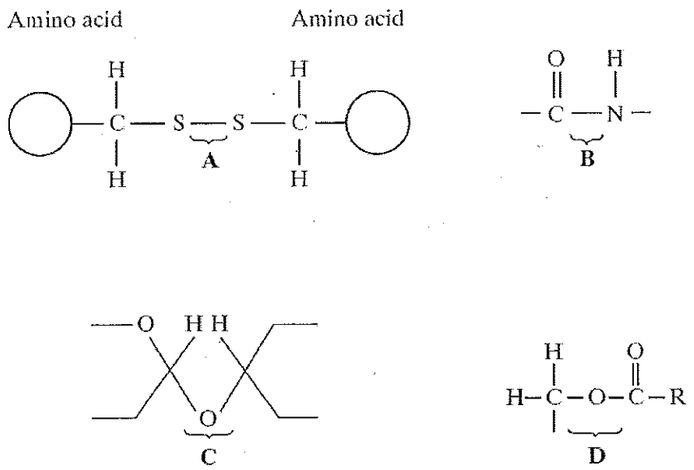


Figure Q1(e)

(i) Name the chemical process involved in the formation of linkage **B**.

(1 mark)

(ii) Give the letter of the linkage which occurs in a disaccharides molecule.

(1 mark)

(iii) Give the letter of the linkage which occurs in a triglyceride molecule.

(1 mark)

(iv) Give the letter of the linkage that may occur in the tertiary, but not the primary structure of protein.

(1 mark)

(f) Figure Q1(f) shows how some organelles may be distinguished from each other.

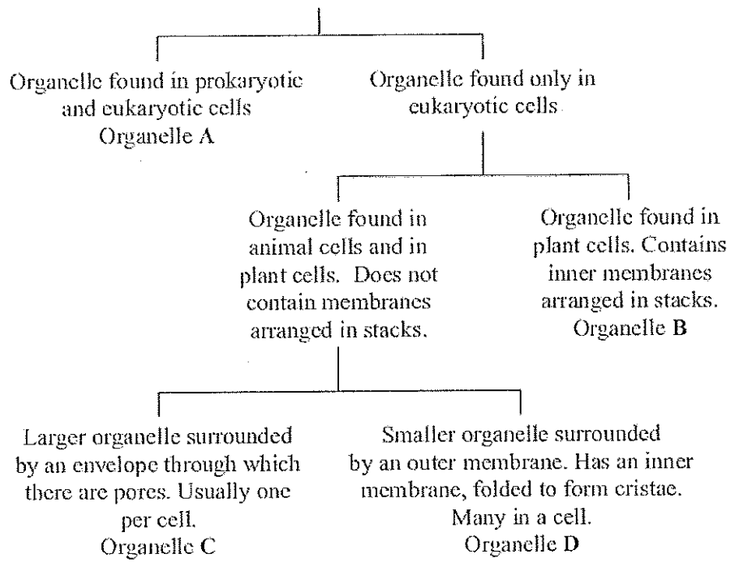


Figure Q1(f)

(i) Name organelle **B**.

(1 mark)

(ii) Describe the function of organelle **B**.

(2 marks)

(iii) Which of organelles **A**, **B**, **C** or **D** is a ribosome?

(1 mark)

(iv) Which of organelles **A**, **B**, **C** or **D** contains most of the DNA found in a plant cell?

(1 mark)

(g) Differentiate between exocytosis and endocytosis.

(2 marks)

Question 2

(a) Living organisms are classified into five kingdoms. Use the following key to identify each of the kingdoms **A**, **B**, **C**, **D** and **E**.
Key:

1 Cells have several linear DNA molecules which are separated from the cytoplasm by a nuclear envelope	go to 2
Cells have circular DNA molecules and no nuclear envelope separating them from the cytoplasm	Kingdom **A**
2 Body is usually composed of branching thread-like hyphae	Kingdom **B**
Body is not composed of hyphae	go to 3
3 Contains both single-celled organisms and multicellular organisms	Kingdom **C**
Contains only multicellular organisms	go to 4
4 Autotrophic, non-motile organisms whose cells possess a wall containing cellulose	Kingdom **D**
Heterotrophic, usually motile organisms whose cells do not possess a wall	Kingdom **E**

(i) Kingdom **A**

(1 mark)

(ii) Kingdom **B**

(1 mark)

(iii) Kingdom **C**

(1 mark)

(iv) Kingdom **D**

(1 mark)

(v) Kingdom **E**

(1 mark)

(b) Figure Q2(b) shows a bacterial cell.

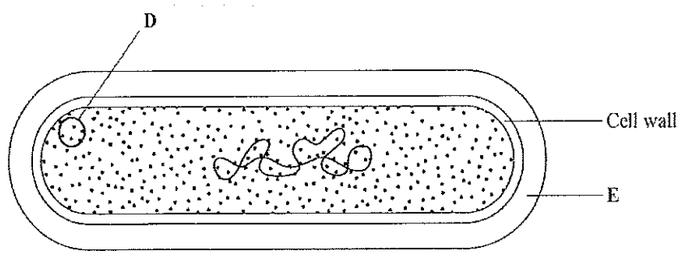


Figure Q2(b)

(i) Name the parts labelled **D** and **E**.

(2 marks)

(ii) Give **ONE (1)** function of the cell wall.

(1 mark)

(iii) Name **TWO (2)** structures present in eukaryotic cells that are not present in the cells of prokaryotes.

(2 marks)

(c) When soft-centred chocolates are made, the enzyme invertase is used to convert sucrose into the smaller molecules glucose and fructose. This causes the centres of the chocolates to become softer and sweeter.

(i) State why the invertase must not be heated to temperatures above 45°C.

(1 mark)

(ii) State how invertase increases the rate of conversion of sucrose into glucose and fructose.

(1 mark)

(iii) Explain why the effect of an inhibitor on an enzyme may be reduced by increasing the concentration of the substrate.

(2 marks)

(d) Explain the roles of phospholipids in the structure and functioning of cell membranes.

(4 marks)

(e) The list shows methods by which substances may enter or leave cells.

A simple diffusion
B facilitated diffusion
C osmosis
D active transport
E exocytosis

Choose the correct method, **A** to **E**, to give the most likely reason for

(i) the secretion of large droplets of fat from milk-producing cells in a mammary gland

(1 mark)

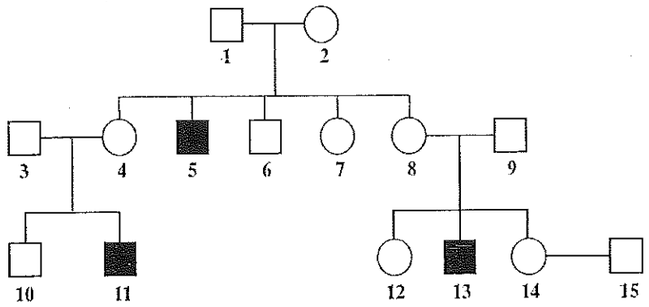
(ii) the swelling and bursting of red blood cells in a very dilute salt solution

(1 mark)

(iii) the increase in the rate of loss of sodium ions from a cell that occurred when the energy source, ATP, was injected into the cell

(1 mark)

(f) Duchenne muscular dystrophy is a sex-linked inherited condition which causes degeneration of muscle tissue. It is caused by a recessive allele. Figure Q2(f) shows the inheritance of muscular dystrophy in one family.



Key:

= male with muscular dystrophy

= unaffected male

= female with muscular dystrophy

= unaffected female

Figure Q2(f)

(i) Give evidence from figure Q2(f) which suggests that muscular dystrophy is sex-linked and caused by a recessive allele.

(2 marks)

(ii) Using the following symbols,

$\mathbf{X^D}$ = an X chromosome carrying the normal allele
$\mathbf{X^d}$ = an X chromosome carrying the allele for muscular dystrophy
Y = a Y chromosome

provide **ALL** the possible genotypes of each of the following persons for **5**, **6**, **7** and **8**.

(2 marks)

Question 3

(a) Figure Q3(a) gives an outline of the process of aerobic respiration

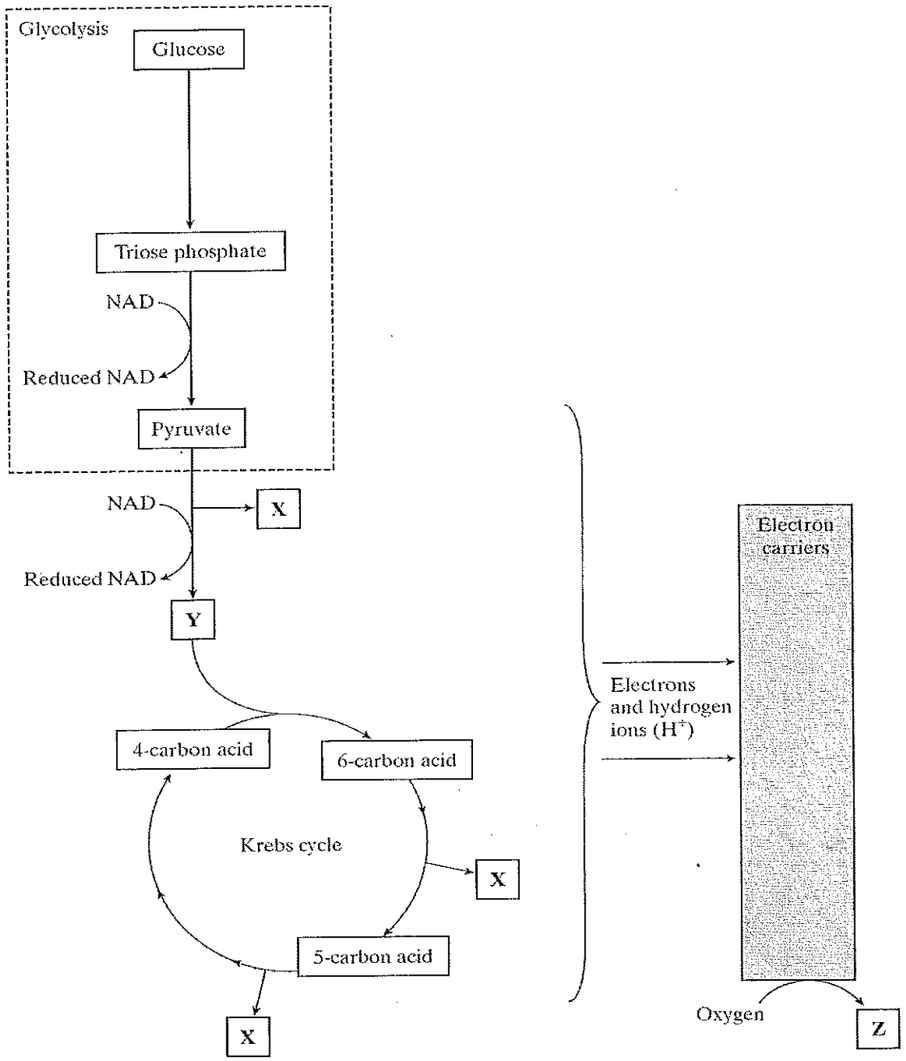


Figure Q3(a)

(i) Name substances **X**, **Y** and **Z**.

(3 marks)

(ii) Give the location of glycolysis and the Krebs cycle in a liver cell.

(2 marks)

(iii) Based on figure Q3(a), state **ONE (1)** step where ATP is used.

(1 mark)

(iv) Base on figure Q3(a), state **TWO (2)** steps where ATP is produced.

(2 marks)

(v) Apart from respiration, give **THREE (3)** roles of ATP in a liver cell.

(3 marks)

(vi) Human skeletal muscle can respire both aerobically and anaerobically. Describe what happens to pyruvate in anaerobic conditions.

(3 marks)

(b) State **TWO (2)** structural differences, other than size, between a chloroplast and a mitochondrion.

(2 marks)

(c) Figure Q3(c) summarises some of the light-dependent reactions of photosynthesis.

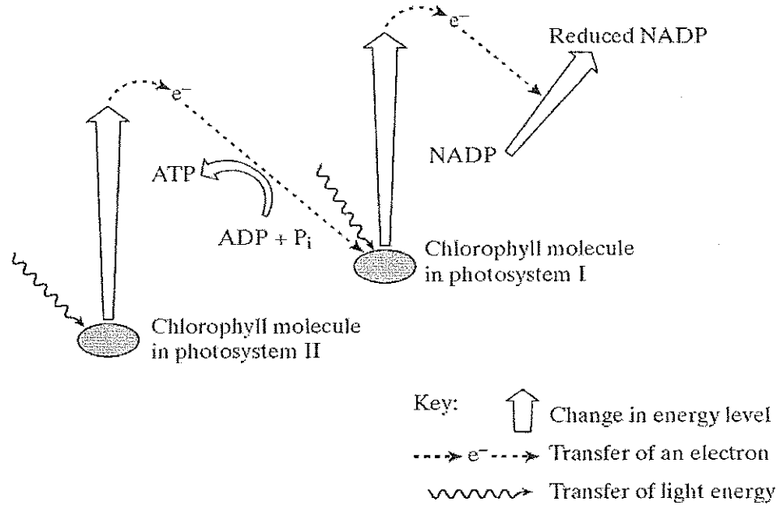


Figure Q3(c)

(i) Use figure Q3(c) to describe what happens to a molecule of chlorophyll in photosystem II when it absorbs a photon of light.

(2 marks)

(ii) Molecules of ATP are formed as electrons are transferred from photosystem II to photosystem I. Explain how this is possible.

(1 mark)

(iii) Reduced NADP produced during the light-dependent reactions of photosynthesis is used in the light-independent reactions. Explain how.

(2 marks)

(d) State **TWO (2)** differences between C_3 and C_4 plants.

(2 marks)

(e) What do plants do with the sugar they produce in photosynthesis?

(2 marks)

Question 4

(a)

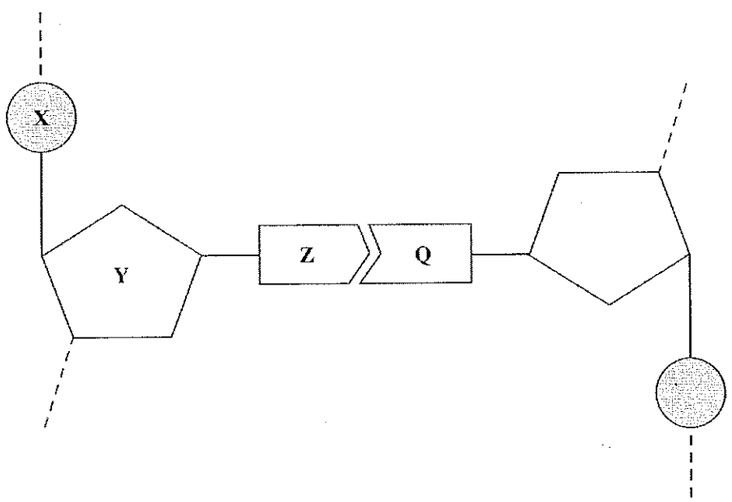


Figure Q4(a)

(i) Name the parts of the nucleotide labelled **X, Y** and **Z.**

(3 marks)

(ii) What type of bond holds **Z** and **Q** together?

(1 mark)

(iii) A sample of DNA was analysed. Total 28% of the nucleotides contained thymine. Calculate the percentage of nucleotides which contained cytosine. Show your working.

(2 marks)

(b) The figure Q4(b) shows cells from an onion root tip. The root tip has been squashed and stained to show the stages of mitosis.

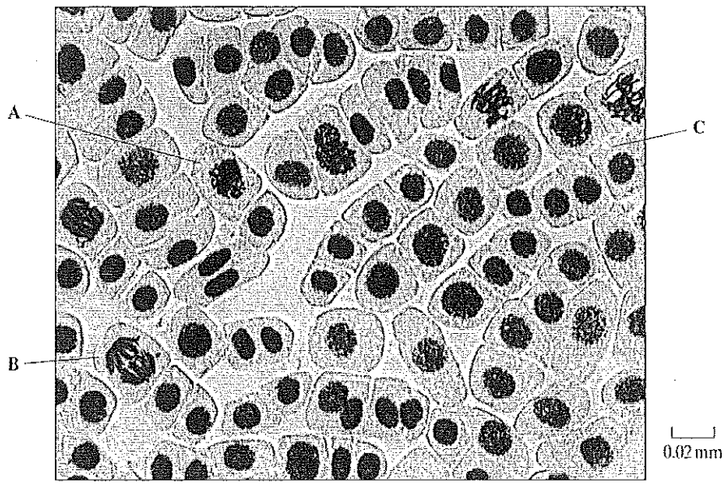


Figure Q4(b)

(i) At what stage of mitosis is cell **A**?

(1 mark)

(ii) What is the evidence that cell **B** is in anaphase?

(1 mark)

(iii) Cell **C** is in interphase. Give **TWO (2)** processes which occur during interphase that enable cell division to occur.

(2 marks)

(c) Compare cytokinesis in plant and animal cells.

(2 marks)

(d) Briefly describe how **THREE (3)** different processes that occur during a sexual life cycle increase the genetic diversity of offspring.

(3 marks)

(e) Division of the nucleus by meiosis produces haploid cells from a diploid cell. Nuclei produced by mitosis have the same number of chromosomes as the parent nucleus.

(i) What is the biological importance of reducing the chromosome number when the cell divides by meiosis?

(2 marks)

(ii) State **TWO (2)** differences between mitosis and meiosis.

(2 marks)

(f) In the ABO blood-grouping system, a single gene with three alleles controls the production of the antigens that determine a person's blood group. Figure Q4(f)1 shows the alleles and the antigens whose production they control. Figure Q4(f)2 shows the different genotypes and their corresponding blood groups.

Allele	Antigen produced
I^A	Antigen A
I^B	Antigen B
I^O	Neither antigen

Figure 4(f)1

Genotype	Blood group
$I^A I^A$ or $I^A I^O$	A
$I^B I^B$ or $I^B I^O$	B
$I^A I^B$	AB
$I^O I^O$	O

Figure 4(f)2

(i) Explain why people with the genotype $\mathbf{I^A I^B}$ have the blood group AB.

(2 marks)

(ii) In one family, the four children each have a different blood group. Their mother is group A and their father is group B. Complete the genetic diagram to show how this is possible.

Parental phenotypes	Blood group A	Blood group B
Parental genotypes	_____	_____
Gametes	_____	_____
Offspring genotypes	_____	
Offspring phenotypes	_____	

(4 marks)

Question 5

(a) Figure Q5(a) shows the process of DNA replication. The horizontal lines represent the positions of bases.

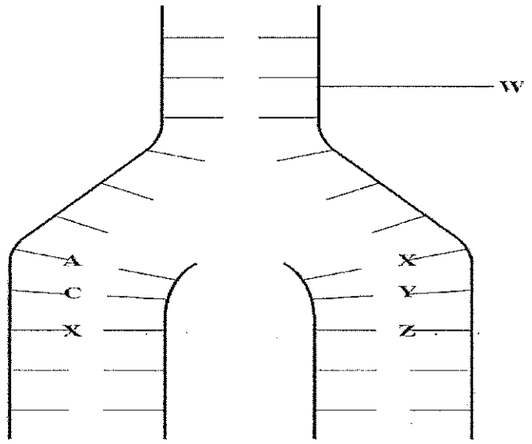


Figure Q5(a)

(i) What is represented by the part of the DNA molecule labelled **W**?

(1 mark)

(ii) In figure Q5(a), **A** represents adenine and **C** represents cytosine.
Name the base found at position **X, Y and X.**

(3 marks)

(iii) Describe **TWO (2)** ways in which the process shown in figure Q5(a) differs from transcription.

(2 marks)

(b) Figure Q5(b) shows the mRNA codons for some amino acids.

Codon	Amino acid
CUA	Leucine
GUC	Valine
ACG	Threonine
UGC	Cysteine
GCU	Alanine
AGU	Serine

Figure Q5(b)

(i) Give the DNA sequence coding for cysteine.

(1 mark)

(ii) Name the amino acid coded by the tRNA anticodon UCA.

(1 mark)

(iii) A particular gene is 562 base-pairs long. However, the resulting mRNA is only 441 nucleotides long. Explain this difference.

(1 mark)

(c) State and explain **THREE (3)** ways of bacteria genetic transfer.

(3 marks)

(d) A clone of frogs was produced by nuclear transfer. This procedure is summarised in the figure Q5(d).

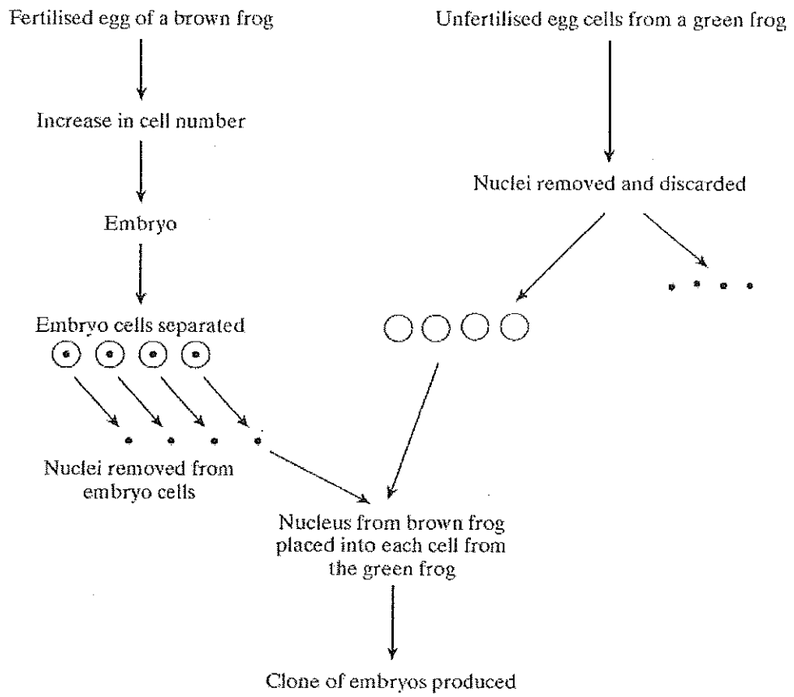


Figure Q5(d)

(i) What is a clone?

(1 mark)

(ii) Name the type of cell division occurring in a developing embryo.

(1 mark)

(iii) The embryo cells used are from an early stage of development. Explain why.

(1 mark)

(iv) Give **ONE (1)** differences between the nuclei removed from the embryo cells and the nuclei discarded from the unfertilised egg cells.

(1 mark)

(e) The polymerase chain reaction is a process which can be carried out in a laboratory to replicate DNA. Figure Q5(e) shows the main stages involved in the polymerase chain reaction.

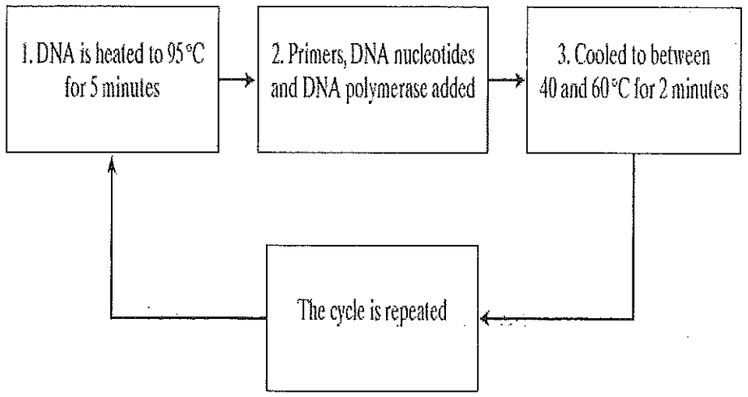


Figure Q5(e)

(i) Explain why DNA is heated to 95 °C.

(1 mark)

(ii) What is the role of DNA polymerase and a primer in this process?

(2 marks)

(iii) How many DNA molecules will have been produced from one molecule of DNA after 6 complete cycles?

(1 mark)

(iv) Suggest **ONE (1)** use of the polymerase chain reaction.

(1 mark)

(f) Figure Q5(f) shows
(i) a plasmid that contains two genes for resistance to antibiotic before modification
(ii) the same plasmid after it has been modified by inserting a gene from another organism

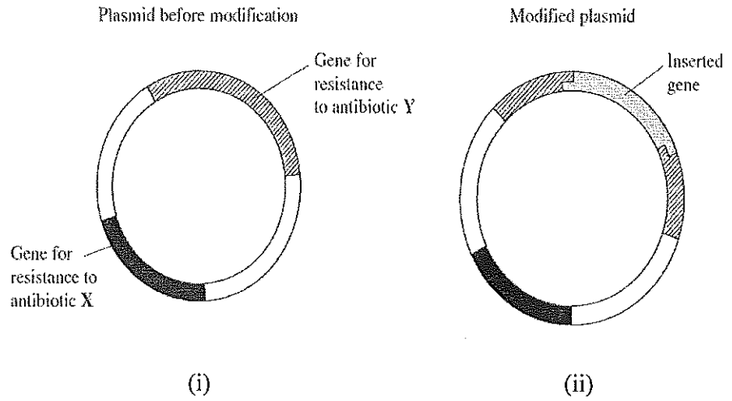


Figure Q5(f)

Two different enzymes are required to produce the modified plasmid. Name these **TWO (2)** enzymes. Describe the function of each in producing the modified plasmid.

(4 marks)

~ The End ~