DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

BIOLOGY

Tuesday
16 October 2012

Time allowed:

2 hours and 30 minutes

(8:00 am – 10:30 am)

NO EXTRA TIME
(NO OTHER TIME)

Candidates are advised to fully utilise the allocated time

INSTRUCTIONS TO CANDIDATES

To be read by the external invigilator to all candidates

1. The subject code for **Biology** is **5**
2. There are **13** printed pages in the question booklet.
3. An Electronic Answer Sheet and a **7 printed** pages of answer booklet are inserted in the centre of the question booklet.
4. There are two sections in this paper.

   Section A : Multiple Choice (Question 1 – 30) 30 marks
   This section will be electronically marked.
   All answers to the Multiple Choice Section MUST be answered on this Answer Sheet.
   Carefully following the instructions, fill in your Candidate Information and Subject Information.

   Section B: Short Answers (Question 31 – 40) 70 marks
   Write your name, your school name and complete your 10 digit candidate number on the Section B Answer Booklet provided.
5. You are required to only write the correct answer in the space provided.
6. Calculators may be used.
7. Write answers neatly in spaces allocated on the Answer Sheet. Enough spaces have been allocated for answers to every question.
8. Questions must be answered in spaces as allocated. Answers all over the Answer Booklet nor any other paper including rough work paper and the question paper will NOT be marked.
9. Answers to questions that involve calculations must have the workings shown step by step to get full marks. Students may lose marks for writing down final answers only.
10. Correction fluid is NOT allowed on the answer sheet. Where you have made an error, cross out all the working and start on a new line.
11. Graphical Calculators are NOT permitted.

PENALTY FOR CHEATING OR ASSISTING TO CHEAT IN NATIONAL EXAMINATIONS IS NON-CERTIFICATION.

B

DO NOT TURN OVER THE PAGE AND DO NOT WRITE UNTIL YOU ARE TOLD TO START.

SECTION A: MULTIPLE CHOICE (QUESTIONS 1 TO 30) 1 MARK EACH

Answer each question by shading in with HB pencil the circle directly under the correct alternative A, B, C or D.

If you make a mistake, rub it out completely using an eraser and shade the correct answer on the ELECTRONIC ANSWER SHEET.

QUESTION 1

During urine formation in animals, materials from the blood are firstly non-selectively taken into the kidneys so that

A. useful substances can be reabsorbed.

B. filtration would be fast and efficient.

C. the excess salts such as Na^+ can be secreted into urine.

D. most water can be excreted.

QUESTION 2

In photosynthesis, oxygen is produced in the _____ reactions while sugar is a by-product of the _____ reactions.

Which of the options below would correctly fill in the blanks?

A. dark / light

B. light / dark

C. catabolic / anabolic

D. anabolic / catabolic

QUESTION 3

How would you classify an animal with well-defined molars and very long small and large intestines?

A. Omnivore B. Carnivore C. Herbivore D. Human

QUESTION 4

Bile salts function in

A. breaking down starch.

B. protein digestion.

C. producing other digestive enzymes.

D. fat emulsification.

QUESTION 5

Which of the following regarding animal circulatory system is NOT true of arteries and veins?

A. Arteries have thick structure and are always under high pressure

B. Exchange of materials occur in the veins and not arteries

C. Veins are much thinner than arteries in structure

D. Veins posses valves, which are absent in arteries

QUESTION 6

A tagged red blood cell was released into the right ventricle of human heart. From there, it travelled to the left lung and was detected in the left atrium.

Which of the following is true regarding the statement?

A. Systematic circulation
B. Pulmonary circulation
C. Transport of deoxygenated blood
D. Transport of oxygenated blood

QUESTION 7

Sucrose made in plant stems are transported to all parts of the plant including the leaves by

A. sieve tubes. B. xylem vessel. C. osmosis. D. diffusion.

QUESTION 8

Of the following, which is directly involved in maximizing absorption of gases?

A. Trachea
B. Folding of the fish gills
C. Chest cavity
D. Nose

QUESTION 9

Small organisms like grasshoppers and frogs allow for gaseous exchange to occur

A. through their lungs.
B. over their body surfaces.
C. when submerged in water.
D. just like humans.

QUESTION 10

Which of the following is NOT true of ribonucleic acid (RNA)?

A. Guanine (G) pairs with Cytosine (C)
B. Uracil (U) pairs with Thymine (T)
C. Adenine (A) pairs with Uracil (U)
D. It has ribose sugar

QUESTION 11

A swamp habitat has two species of cane toads that are completely reproductively isolated. This was purely due to genetic drift that occurred in a single cane toad population that initially occupied the habitat.

How would you define genetic drift?

A. Movement of the same species into or out of the swamp habitat.
B. Mating of individuals irrespective of fitness or phenotype.
C. Survival of the fittest.
D. A random fluctuation in the genetic make-up of some individuals of the original population.

QUESTION 12

A couple, both heterozygous for a recessive trait (hair colour) produced a child with black hair which is a dominant phenotype to light hair.

What chances do the couples have of producing a child with white hair?

A. 25% B. 50% C. 75% D. 100%

QUESTION 13

The exchange and combination of different genes and chromosome segments during meiosis are the causes for

A. development of a diploid organism.
B. point mutation.
C. genetic variation.
D. sexual reproduction.

QUESTION 14

Select the functional description that does NOT define the endocrine glands.

A. Ductless glands
B. Synthesize, store and secrete hormones
C. Pancreas is an endocrine gland
D. Hormonal secretions from endocrine glands are distributed by extracellular fluids

QUESTION 15

The structure of a fertilized egg through to early foetal development in chicken, pig, monkey and man are similar across each stage.

Which category of evidence for evolution does the statement above describe?

A. Comparative anatomy
B. Homologous structures
C. Embryology
D. Natural Selection

QUESTION 16

During DNA transcription, which of the following occurs?

A. DNA makes a copy of itself
B. Proteins are synthesized
C. The cell carrying the DNA divides into two
D. An mRNA molecule is formed

QUESTION 17

In biotechnology, polymerase chain reaction (PCR) is used to

A. make many copies of DNA.
B. introduce a gene into an organism.
C. cut DNA into small fragments.
D. separate DNA helical structure into two single strands.

QUESTION 18

Which of these structures would you NOT find in the epithelial cells of a cassowary?

A. Mitochondria
B. Golgi bodies
C. Ribosomes
D. Cell wall

QUESTION 19

The organism, *Mycobacterium tuberculosis* is the causative agent of tuberculosis.

To which of these kingdoms does it belong?

A. Fungi
B. Animal
C. Monera
D. Plant

QUESTION 20

Which of these is the correct order of direction of nerve impulses in a sensory neuron?

A. dendrites, cell body, axon, motor endplates
B. sensory receptors, axon, cell body, dendron, synaptic knobs
C. dendrites, axon, cell body, axon, synaptic knobs
D. sensory receptor, dendron, cell body, axon, synaptic knobs

QUESTION 21

Conservation biologists are concerned about global warming because

A. rate of change in climate is projected to be faster than the rate at which many species can shift their ranges.
B. it's already too hot in the tropics.
C. climate has been stable for thousand of years that all species will not be able to tolerate variable temperature.
D. climate change will be especially harmful to extinct species.

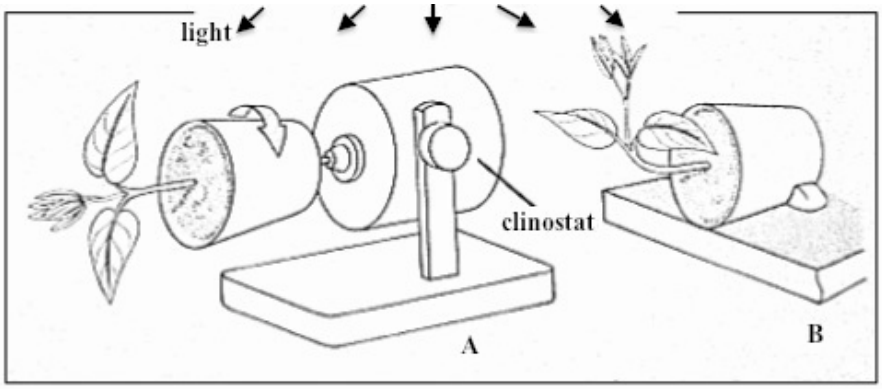
QUESTION 22

Which of this category of contraceptive methods best describes the intrauterine device (IUD)?

A. Barrier method
B. Preventing ovulation
C Preventing implantation
D. Sterilization

QUESTION 23

In this experimental setup below a pot plant is grown on a rotating clinostat (A) while the other pot is laid on its side on a flat board (B). The setup is covered by a large card box with an opening at the top and observed.



Select the statement that best describes the results of the shoots in this experiment.

A. Pot A is negatively geotropic
B. Pot B is positively geotropic
C. Pot A is positively phototropic
D. Pot B is negatively phototropic

QUESTION 24

Select the characteristic that is NOT true of organisms that undergo asexual reproduction.

A. Individual arising as an outgrowth of an older one
B. Pieces of an organism giving rise to new individuals
C. Development of offspring from unfertilized eggs
D. Joining haploid gametes to form a new diploid zygote

QUESTION 25

During teenage female puberty, what hormone is released by the hypothalamus that stimulates the secretion of hormones by the anterior pituitary gland?

A. Follicle-stimulating hormone (FSH)
B. Gonadotropin-releasing hormone (GnRH)
C. Luteinizing hormone (LH)
D. Human chorionic gonadotropin (hCG)

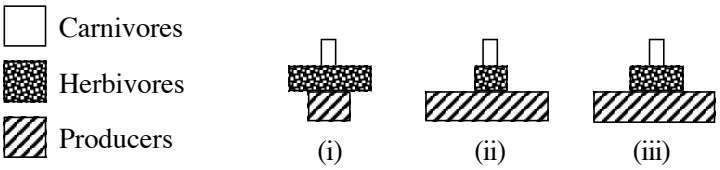
QUESTION 26

Which word and its definition in the table below DO NOT match?

	WORD	DEFINITION
A	Population	all members are of the same species
B	Biotic factors	air, water, soil
C	Ecosystem	all living organisms and the non-living factors in a particular part of the environment
D	Community	all populations of living things in one area

QUESTION 27

Which of these pyramids of biomass is representative of the open ocean?



A. (i) only B. (ii) only C. (iii) only D. (i) and (iii) only

QUESTION 28

Select the statement that is NOT true of the element nitrogen in our ecosystem.

A. It is the most abundant atmospheric gas.

B. All organisms acquire it directly from the atmosphere.

C. It is biologically converted by species of bacteria.

D. It is an essential element of nucleic acids and proteins found in organisms.

QUESTION 29

6000 crocodiles were counted in the Upper Sepik River (A=20,000km^2) and 9000 crocodiles were counted in the Lower Sepik (A=60000km^2).

Which of the following statements is correct about the population density of crocodiles in the Sepik River?

A. Population density is high in the Lower Sepik. B. Population density is the same in both areas.

C. Population density is low in the Upper Sepik. D. Population density is high in the Upper Sepik.

QUESTION 30

Biotic factors affecting the population of green turtles in PNG seas were investigated.

Which of these biotic factors is a least significant factor affecting green turtle populations in PNG?

A. Sea grass populations and species B. Human hunting activity

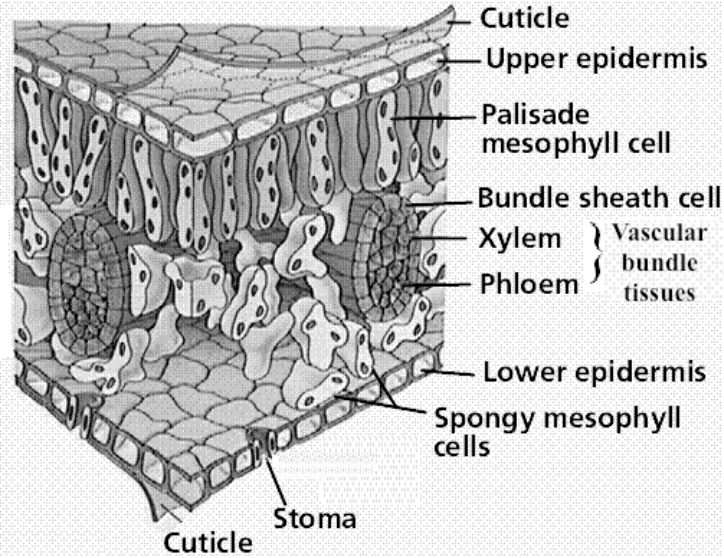
C. Temperature of sea waters D. Parasitic disease of turtles

SECTION B: SHORT ANSWERS (QUESTIONS 31 to 40)

Write your answer to the questions in the spaces provided in your Section B - Answer Booklet.

QUESTION 31

The figure below shows a cross section of a leaf.



i) Explain why most stomata are located on the lower side of the leaf? (2 marks)

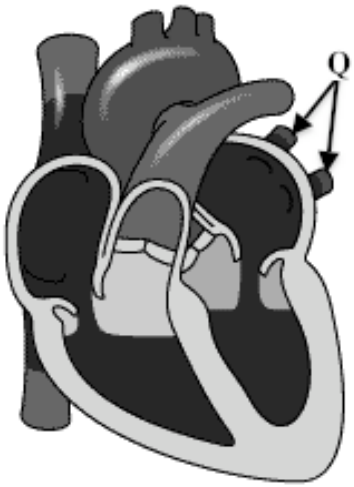
ii) Where in the leaf do you think most photosynthesis occur? Explain. (2 marks)

iii) Explain how important the presence of vascular bundle tissues are? (2 marks)

iv) Name the cell organelle that is involved in photosynthesis. (1 mark)

QUESTION 32

The figure below shows the dog heart.



A. i) Name the structure labelled 'Q' and state its function. (2 marks)

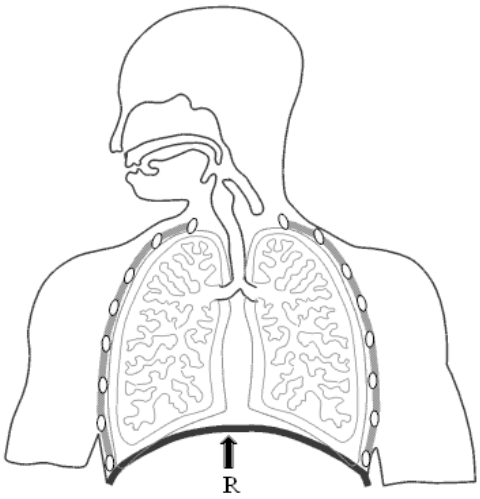
ii) Name a common heart disease and explain the likely cause of it. (2 marks)

B. i) State the general function of white blood cells. (1 mark)

ii) Explain why someone with blood group A cannot receive blood from someone with blood B or AB? (2 marks)

QUESTION 33

The figure below shows the respiratory structure of human.



A. i) Name the structure labelled 'R' and state its function. (2 marks)

ii) Explain fully the process of inhalation.

(2 marks)

B. Under anaerobic conditions, explain what happens to glucose in:

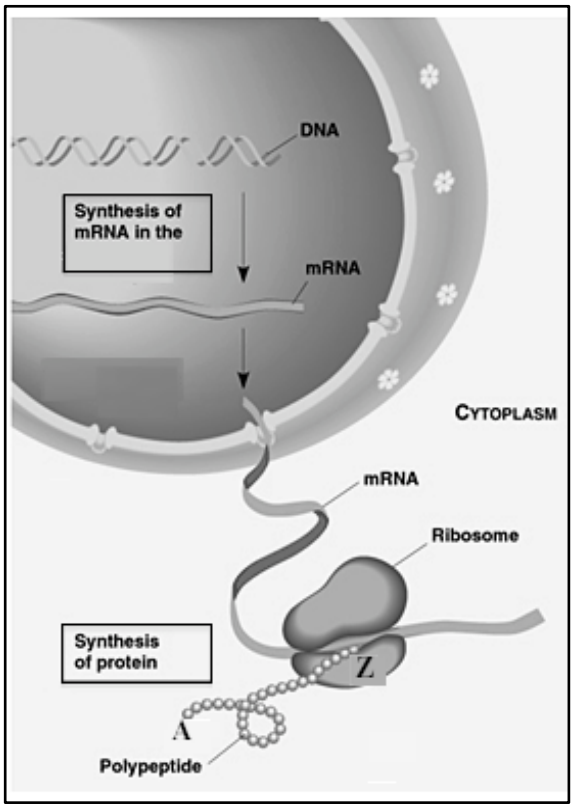
i) Yeast (1 mark)

ii) Humans (1 mark)

C. i) Write out the balanced chemical equation for respiration in plants. (1 mark)

QUESTION 34

The chart below illustrates the flow of genetic information through to protein synthesis.



i) Where in the cell is mRNA formed?

(1 mark)

ii) If the mRNA produced had the sequence ACGCGU, what would be the tRNA anticodon sequence?

(2 marks)

iii) Name and explain the process by which mRNA is formed.

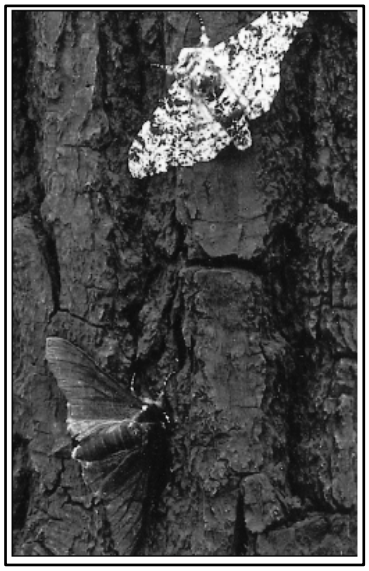
(2 marks)

iv) Name the blocks labeled A-Z and explain their role in protein synthesis.

(2 marks)

QUESTION 35

The peppered moths (*Biston betularia*) are of two types: the white *typica* and black *carbonaria* forms.



i) There are four (4) basic principles of natural selection by which evolution works. Outline and explain the one that is demonstrated in the picture. (2 marks)

ii) Name the evolutionary force that was initially involved in causing different colours in Peppered Moths. (1 mark)

iii) Explain what would happen to the moth population if birds were able to see and feed more on the *typica* form. (2 marks)

iv) Define natural selection if the *carbonaria* form were favoured by the environment. (2 marks)

QUESTION 36

A. What is the defining feature of oviparous animals? (2 marks)

B. In which of the respective male and female sex organs do the following take place: (3 marks)

i) Production of sperm?

ii) Maturation of sperm?

iii) Site of fertilization of sperm and ovum?

C. What is the scientific term given to describe all the male parts (stamen, filament, anther, pollen) of a flower? (1 mark)

D. In what type of cells does the process of meiosis typically occur? (1 mark)

QUESTION 37

A. Study the dichotomous key below and answer the questions that follow.

1.	Body flattened; not more than about 2 cm long; gliding movement …..	FLATWORM
	Body not flattened ……..	(2)
2.	Body with a shell ……	MOLLUSC
	Body with no shell ……..	(3)
3.	Body narrow cylindrical and segmented ……	(4)
	Body not narrow and cylindrical ……	(5)
4.	Obvious head; appendages or mouth parts on front segments ……	Insect larva
	No obvious head; no appendages or mouth parts ……	ANNELID
5.	Head appendages used for locomotion ……	Water fleas or Cyclops
	Other appendages used for locomotion ……..	(6)
6.	Three pairs of legs ……	INSECT
	More than three pairs of legs ……	CRUSTACEAN

i) Identify the following two organisms using the key provided. (2 marks)

X. 

Y. 

ii) What is the lowest taxonomic rank in the Linnaean Classification System? (1 mark)

B. Write True (T) or False (F) against the following statements. (4 marks)

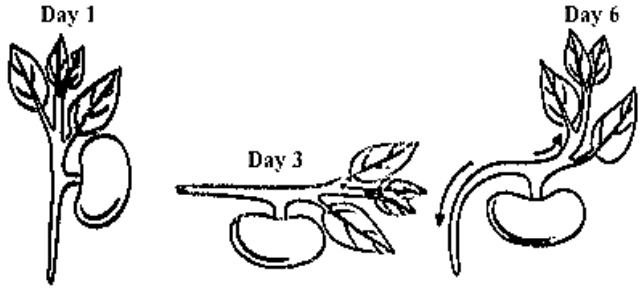
Statement
i) Endoplasmic reticulum has the responsibility of transporting substances within a cell
ii) Golgi bodies produce proteins and package them into secretory vesicles
iii) ATP production usually takes place in the mitochondrion
iv) Communication between adjacent cells in all organisms takes place at junctions called plasmodesmata

QUESTION 38

A. Name the primary function of the hormone thyroxin, which is released from the thyroid gland of humans.

(1 mark)

B. Study the diagram below and answer the two questions that follow.



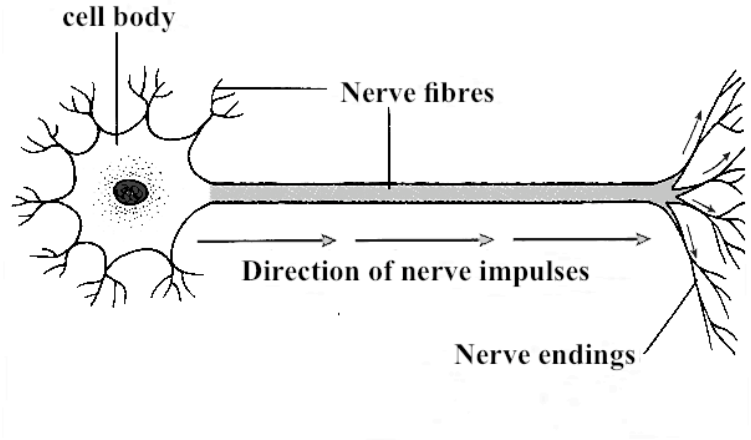
i) Name the plant hormone that is responsible for this type of tropism.

(1 mark)

ii) How does the plant hormone affect growth of root cells to cause it to curve downwards on Day 6?

(2 marks)

C. Below is a generalized diagram of a nerve cell.



i) Name one type of cell which the axon terminals can form very close associations without touching.

(1 mark)

ii) What two components of the peripheral nervous system are responsible for the rapid removal action of the hand that touches a hot pot?

(2 marks)

QUESTION 39

A. Name the type of ecological interaction that exists between the following: (3 marks)

i) Two different species of Paramecium in a fish tank

ii) HIV infecting a woman

iii) Microbes in the rumen of a cow

B. Name two abiotic factors that may affect a typical desert biome. (2 marks)

C. A study was carried out on the Angabanga river system to determine the extent of water pollution caused by the Tolukuma mine.

i) Name the most probable cause of eutrophication that would occur in the river system. (1 mark)

ii) Which trophic level of this aquatic system would be the worst affected? (1 mark)

QUESTION 40

A. The capture/mark – recapture method was used to give an accurate estimate of the rhinoceros beetle population in the Western province. Traps were set up and captured beetles were painted light brown as oppose to red and yellow. All captured-recaptured were counted and recorded.

Total count in Sample 1	Total marked in Sample 1	Total counts in Sample 2	Total marked in Sample 2
40	40	15	35

i) Use the Lincoln Index to calculate the total beetle population. (2 marks)

ii) Why was light brown paint used instead of red or yellow? (1 mark)

B. Kerema town had a human population of 20,000 in 2001. There were 800 births and 400 deaths. In that year, 300 people left the town and 180 people moved in to work in various businesses in town.

i) Calculate the birth rate. (2 marks)

ii) What is the net migration? (1 mark)

iii) At a growth rate of 0.61%, the total human population in this town will rise steeply, giving rise to problems. Name one probable consequence of a high population growth. (1 mark)

END OF EXAMINATION

BIOLOGY — 2012

SECTION B - ANSWER BOOKLET

Write your name, your province and school codes, and your candidate number correctly and clearly in the space provided below.

Year		Province		School			Candidate No		
1	*2*								

Candidate Name: _____

School Name: _____

Answers written on the QUESTION paper or any other paper will NOT be marked. Write answers in the spaces as provided on this answer booklet.

FOR MARKERS USE ONLY

	Score	Markers Initials	
		M1	**M2**
Section B:			
Question 31			
Question 32			
Question 33			
Question 34			
Question 35			
Question 36			
Question 37			
Question 38			
Question 39			
Question 40			
FINAL TOTAL			

SECTION B - ANSWERS

Write your answers in the spaces provided below. Your answers must be clear and precise.

QUESTION 31

i) _____ 2

_____

_____

ii) _____ 2

_____

_____

iii) _____ 2

_____

_____

iv) _____ 1

For Markers Use only **Q31 Total**

QUESTION 32

A. i) Q: _____ 1

Function: _____ 1

_____

_____

ii) Heart Disease: _____ 1

Cause: _____ 1

_____

B. i) _____ 1

_____

ii) _____ 2

_____

_____

For Markers Use only **Q32 Total**

QUESTION 33

A. i) R: _____ 1

Function: _____ 1

_____

_____

ii) _____ 2

_____

_____

_____

_____

B. i) _____ 1

_____

ii) _____ 1

_____

C. i) _____ 1

For Markers Use only **Q33 Total**

QUESTION 34

A. i) _____ 1

ii) _____ 2

iii) Name of Process: _____ 1

Explanation: _____ 1

_____

_____

_____

iv) Name of A-Z: _____ 1

Explanation: _____ 1

_____

_____

_____

For Markers Use only **Q34 Total**

QUESTION 35

i) Principle: _____ 1

Explanation: _____ 1

_____

_____

ii) _____ 1

iii) _____ 2

_____

_____

iv) _____ 2

_____

_____

For Markers Use only **Q35 Total**

QUESTION 36

A.		_____	2
B.	i)	_____	1
	ii)	_____	1
	iii)	_____	1
C.		_____	1
D.		_____	1
		For Markers Use only **Q36 Total**	

QUESTION 37

A.	i)	X: _____	1
		Y: _____	1
	ii)	_____	1
B.	i)	_____	1
	ii)	_____	1
	iii)	_____	1
	iv)	_____	1
		For Markers Use only **Q37 Total**	

QUESTION 38

A.		_____	1
		_____	
B.	i)	_____	1
	ii)	_____	2
		_____	
C.	i)	_____	1
	ii)	Component 1: _____	1
		Component 2: _____	1
		For Markers Use only **Q38 Total**	

QUESTION 39

A.	i)	_____	1
	ii)	_____	1
	iii)	_____	1
B.		Factor 1: _____	1
		Factor 2: _____	1
C.	i)	_____	1
	ii)	_____	1
		For Markers Use only **Q39 Total**	

QUESTION 40

A. i)

Answer: _____ 2

ii) _____ 1

_____

B. i)

Answer: _____ 2

ii)

Answer: _____ 1

iii) _____ 1

For Markers Use only	**Q40 Total**	