



DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

BIOLOGY

**Tuesday
20th October 2015**

Time allowed:
2 hours and 30 minutes
(8:00am – 10:30 am)

**NO EXTRA TIME
(NO OTHER TIME)**

Candidates are advised to fully
utilise the allocated time

B

INSTRUCTIONS TO CANDIDATES

To be read by the external invigilator to all candidates

1. The subject code for **Biology** is **5**.
2. There are **12** printed pages in the question booklet and **6** printed pages in the answer booklet.
3. There are two parts in this paper. Answer all questions.

Part A: Multiple Choice Questions - 30 marks

This section will be electronically marked.

Electronic Answer Sheets will be distributed by your external invigilator. All answers to the Multiple Choice Part **MUST** be answered on this Answer Sheet.

Carefully following the instructions, fill in your Candidate Information and Subject Information.

Part B: Short Answer Questions - 70 marks

Write down your name, your school name and your 10 digit candidate number on the Section B Answer Sheet Provided.

4. You are required to only write the correct answer in the spaces provided.
5. Calculators may be used.
6. Answers written on the question paper will not be marked. Write answers neatly in spaces as allocated on the answer sheet. Answer **ALL** questions.
7. Answer all questions on the answer sheet. Answers on any other paper including rough work paper and the question paper **will not be marked**.
8. **ALL** working must be shown step by step to get full marks. Students may lose marks for writing down final answers only.
9. Enough spaces have been allocated for answers to every question. Questions must be answered in spaces as allocated. Answers all over the answer booklet may not be marked.
10. Correctional 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.

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

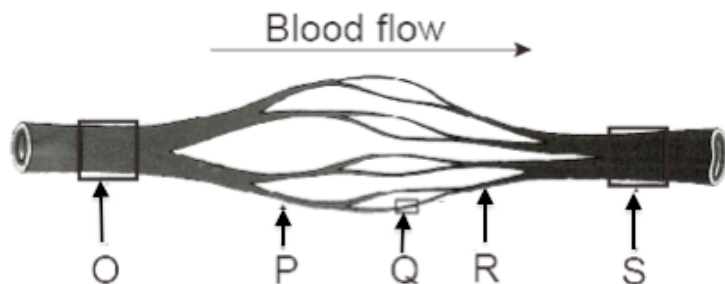
QUESTION 7

A person with AB blood type can only donate his or her blood to people with _____ blood type.

- A. O B. A C. B D. AB

QUESTION 8

The diagram below shows the flow of blood around the body.

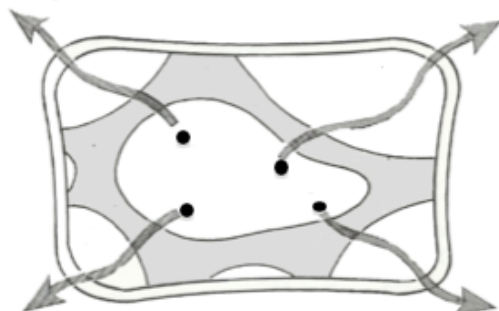


If O represents the artery, then R must be the

- A. vein. B. venule. C. arteriole. D. capillary.

QUESTION 9

Study the diagram of plasmolysis below.



The vacuole's content passes out because

- A. the solution outside of the vacuole is highly diluted.
 B. dissolved salts and sugars in the vacuole give it a low water potential.
 C. the solution outside the cell is more concentrated than the inside of the vacuole.
 D. the concentration of salts, ions and water on the outside of the cell is unbalanced.

QUESTION 10

One of the requirements of a gas exchange surface is to

- A. be close to the transport system. B. be exposed and not protected.
 C. be dry so that it can be moistened by air. D. have a small surface area to volume ratio.

QUESTION 11

Anaerobic respiration in yeast results in the production of _____.

- A. ATP B. sugar C. alcohol D. lactate

QUESTION 12

Which of these is initially responsible for directional growth of plant shoots?

- A. Light B. Gravity C. Abscisic acid D. Cytokinins

QUESTION 13

Which statement is true of hydrotropism?

- A. Hydrotropism is not controlled by hormones.
B. Plant roots growing down by the pull of gravity.
C. A response by plant shoots towards water source.
D. Auxin causes roots to grow towards the water source.

QUESTION 14

If the ovaries are damaged, which hormone is likely to be affected?

- A. Insulin B. Oestrogen C. Testosterone D. Thyroxine

QUESTION 15

Which of the following methods of birth control does not use any form of gel latex or drug?

- A. Diaphragm B. Cervical cap C. Coitus interruptus D. Oral contraceptives

QUESTION 16

Which of the following statements is NOT true of the reproductive structure, epididymis?

- A. Site of testosterone production. B. Only found in males.
C. Produces sperm and sex hormones. D. Tightly coiled tubular structure.

QUESTION 17

A boy in his late teens had a medical complaint regarding unusually strong body odour and a bad case of acne (pimples). Which of these hormones is likely to be responsible for his discomfort?

- A. Testosterone B. Luteinizing hormone
C. Follicle stimulating hormone D. Interstitial cell-stimulating hormone

QUESTION 18

Most fishes have swim bladders that help them remain suspended in water. By adjusting the amount of gas in its swim bladder, a fish can control the depth in the water column at which it is stable.

Swim bladders are therefore adaptations for

- A. buoyancy. B. locomotion. C. streamlining. D. osmoregulation.

QUESTION 25

Which of the following is FALSE of genes and chromosomes?

- A. Chromosome number is halved in gametes.
- B. Genes are small segments of chromosomes.
- C. Genes contain instructions for protein synthesis.
- D. DNA replication results in chromosome number being halved.

QUESTION 26

Asexual reproduction results in all of the following except

- A. offspring look the same as each other.
- B. offspring look different from parents.
- C. genetic variation in the offspring is low.
- D. no exchange of genetic material between the parents.

QUESTION 27

Recombinant DNA is DNA that

- A. contains virus.
- B. combines with protein.
- C. recoils to form a double structure.
- D. contains DNA piece from another source.

QUESTION 28

Which of the following contains all homologous structures that a biology student can use to support his claim for evolution?

- A. Tails of monkeys, dogs and lions
- B. Pig skull, fish fin, human pelvis
- C. Feathers of peacocks, parrots and chickens
- D. Forearm bones of humans, birds, porpoises and elephants

QUESTION 29

All of the following are mechanisms of evolution except

- A. mutation.
- B. genetic drift.
- C. random mating.
- D. migration into or out of a population.

QUESTION 30

Charles Darwin's book titled 'Origin of Species' published in 1859, emphasised that _____ contributed largely to the process of evolution.

- A. gene flow
- B. genetic drift
- C. crossing-over
- D. natural selection

PART B: SHORT ANSWERS

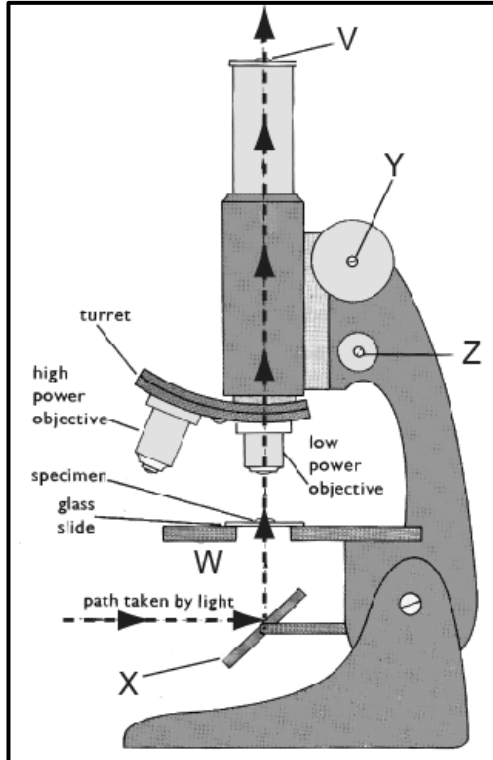
(QUESTIONS 31 TO 40)

70 MARKS

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

QUESTION 31

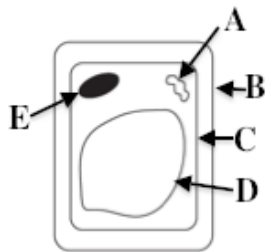
a) The diagram below shows the picture of a compound microscope.



- i) Name the part labelled X. (1)
- ii) Glass slides containing specimens are usually placed on W for viewing.
What is W called? (1)
- b) i) Rewrite this species name, *ROSA GALLICA*, using the standard binomial nomenclature system. (2)
- ii) What kingdom do mosquitoes belong to? (1)
- c) Samples were collected by forensic scientists at a scene. Death was by unexplained means. Analysis of these cell samples showed that the potential cause was not of animal origin, eukaryotic in nature, and had traces of cellulose.
Name two features that would suggest that the samples did not come from an animal source. (2)

QUESTION 32

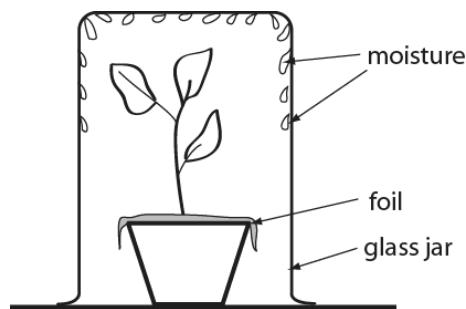
The picture below depicts a plant cell.



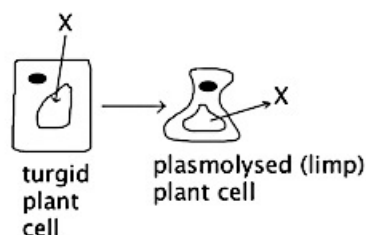
- a) Which structure shown in the cell above makes it hard for herbivores to digest? (1)
- b) i) Name two (2) of the three (3) important raw materials needed by plants for photosynthesis. (2)
- ii) Ions and minerals enter plants via root hairs and roots. Explain how these ions and minerals are then absorbed by the rest of the plant. (2)
- c) Explain how oxygen is produced as a by-product of photosynthesis. (2)

QUESTION 33

- a) i) In the human circulatory system, which vessel carries deoxygenated blood to the lungs? (1)
- ii) The human body often produces excess fluids within tissues. Which system is responsible for returning excess fluids to the circulatory system? (1)
- iii) List the three processes in urine formation from the first to the last in the correct order. (1)
- b) i) The diagram below shows a pot plant sealed under a glass bell jar outdoors with its soil covered with foil. Moisture has accumulated on the inner part of the glass. (1)



- ii) The most widely accepted theory which explains the rise of water in plants is known as _____ theory. (1)
- iii) What process has resulted in the plant cell shown below becoming turgid? (1)



- iv) Entry and exit of molecule(s) X are responsible for causing the turgidity and plasmolysis in plant cells. What is molecule X? (1)

QUESTION 34

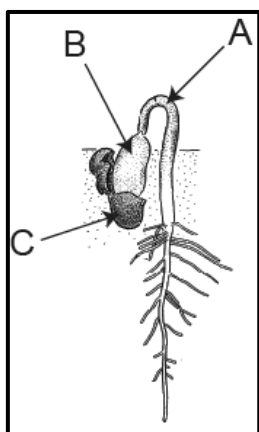
- a) i) Name the structure(s) in the lungs responsible for efficient gaseous exchange. (1)
 ii) By referring to your answer in i) above, explain how the structure suits the function. (2)
- b) Amphibians use internal nares to breathe on the land. How do they breathe when in damp places, for example, in a pond? Explain. (2)
- c) The isomers of galactose and glucose are both monosaccharaides. In cellular respiration, the human body only recognises glucose and not galactose.
 How will cellular respiration proceed if only galactose is present? (1)
- d) Name the process by which sugars are burned in cells to generate overall energy. (1)

QUESTION 35

- a) In humans, sometimes the sugar level drops below the normal levels and something has to be done to bring the sugar level back to normal levels.
 Name the hormone that does that and explain how it does so. (2)
- b) i) If the Schwann cells wrapped around a motor axon are damaged, what would be the likely result? (2)
 ii) The brain receives information from which part of the peripheral nervous system? (1)
- c) A farmer is desperate to sell his freshly harvested raw bananas at a local food and vegetable market. He is faced with the problem that the bananas are not ready.
 Name the plant hormone that would solve his problem. (1)
- d) The bananas were harvested from plants growing in complete shade.
 What type of tropism are they reflecting? (1)

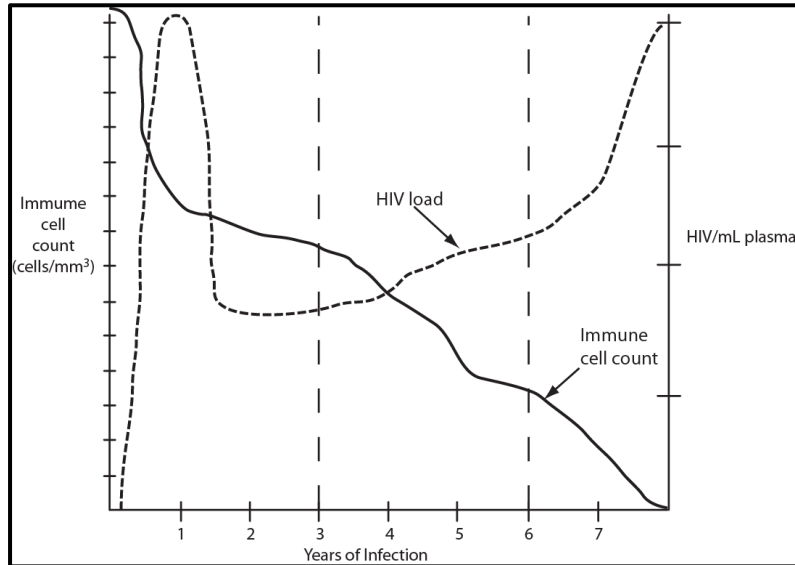
QUESTION 36

- a) Refer to the diagram below.



- i) What is structure B called? (1)
 ii) In plants, what structure encases the female megasporangia? (1)
- b) i) A woman chose to use the birth control method that when administered prevents the pituitary gland from releasing Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) resulting in less likelihood of pregnancy occurring.
 What type of birth control method did she use? (1)
- ii) Name one form of natural family planning method. (1)

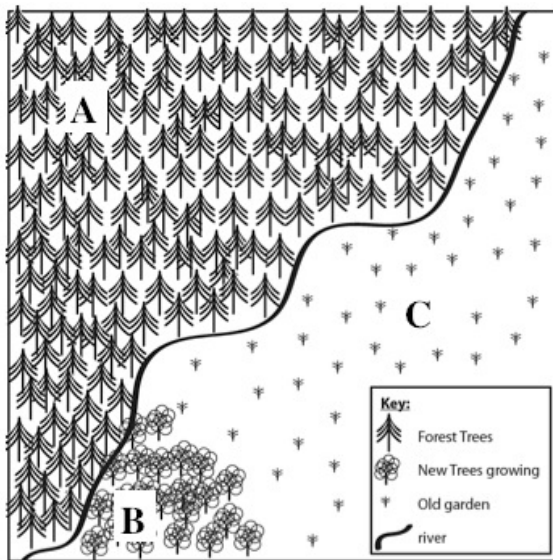
c) Refer to the graph below and answer the questions that follow.



- i) Name a type of immune cell of the human body that can be targeted by HIV. (1)
- ii) Explain what is happening to the immune cells in the first three (3) years of infection. (1)
- iii) What has caused the immune cell counts to become dangerously low after five (5) years of infection? (1)

QUESTION 37

Refer to the sketch of a successive forest community below and answer the questions that follow.



- a) i) Area A has a high diversity of plants and animals living within and below the canopy in specific functional units. (1)
What are these units called? (1)
- ii) Epiphytes grow on branches of trees in Area A and compete for light in the canopy by climbing up those large trees while using them for support at the same time. (1)
What type of ecological interaction is seen here? (1)

- b) Areas **B** and **C** were once a climax community like Area **A**. However, due to gardening these two areas were changed into an/a _____ community.

What is the missing word? (1)

- c) i) Trees then begin to grow in place of the old garden in Area **B**. This is known as _____ succession. (1)

ii) What is happening to the biomass in Area **B** now? (1)

- d) i) Forests are known as carbon sinks. If more forest trees in Area **A** are cut down, what would happen to the levels of carbon dioxide in the atmosphere? (1)

ii) By allowing Area **A** to remain undisturbed it can be used in the _____ for money when traded for emissions in industries from developed countries.

What is the missing word? (1)

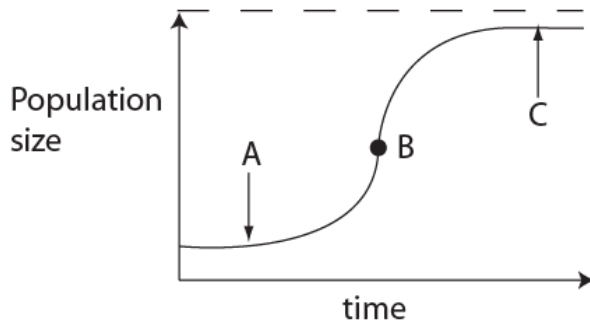
QUESTION 38

- a) What do life tables represent? (2)

- b) Ecologists when wanting to know the types of organisms in a particular habitat use various shapes and sizes of quadrats to sample a representative area.

What two (2) major requirements of quadrat sampling must be considered to acquire satisfactory results? (2)

- c) Study the graph below and answer the questions that follow.



- i) From this S-shaped growth pattern, what can be said of the growth rate at point B? (1)

ii) An environment can support no more than a certain number of individuals of any particular species; this is known as and reflected on the graph above as _____ (1)

iii) Why can't any population keep growing exponentially? (1)

QUESTION 39

- a) Fill in the blanks with the most correct word.

A gene that codes for a characteristic is made up of two different copies called _____. One copy is dominant to the other and controls a character that is expressed. Expressed characters are called _____.

(2)

- b) A nucleotide is made up of a base, a phosphate and a _____. The bases are of four (4) types, in DNA uracil is replaced by _____.
- (2)
- c) In sexually reproducing organisms, crossing over is a process that results in the varieties of differences observed. Explain the term crossing-over.
- (2)
- d) Restriction enzymes are used to cut DNA into smaller fragments.
- What are enzymes?
- (1)

QUESTION 40

- a) Refer to the diagram below and answer the following questions.



- i) In the chromosome diagram above, what type of mutation is shown here?
- (1)
- ii) Define mutation.
- (1)
- b) One of the main theories of evolution states that after the Earth cooled down, it allowed for chemical reactions to produce among other small compounds, amino acids.
- Explain the importance of amino acids with respect to evolution of life.
- (2)
- c) Name the mechanism of evolution that is due to random fluctuations or chance events in the gene pool.
- (1)
- d) If certain organisms descend from a common ancestor, what stages of embryonic development can be used as evidence to support the common descent?
- (2)

END OF EXAMINATION

BIOLOGY — 2015

PART 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	5								

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
Part B:			
Question 31			
Question 32			
Question 33			
Question 34			
Question 35			
Question 36			
Question 37			
Question 38			
Question 39			
Question 40			
FINAL TOTAL			

PART B - ANSWERS

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

QUESTION 31

a) i) _____	1
ii) _____	1
b) i) _____	2
ii) _____	1
c) i) _____	1
ii) _____	1
For Markers Use Only	Q31 Total

QUESTION 32

a) _____	1
b) i) 1. _____	1
2. _____	1
ii) _____	2

c) _____	2

For Markers Use Only	Q32 Total

QUESTION 33

a) i) _____	1
ii) _____	1
iii) _____ _____ _____	1
b) i) _____	1
ii) _____	1
iii) _____	1
iv) _____	1
For Markers Use Only	Q33 Total

QUESTION 34

a) i) _____	1
ii) _____ _____	2
b) _____ _____	2
c) _____ _____	1
d) _____	1
For Markers Use Only	Q34 Total

QUESTION 35

a)	_____	2

b) i)	_____	2

	ii) _____	1
c)	_____	1
d)	_____	1
For Markers Use Only		Q35 Total

QUESTION 36

a) i)	_____	1
	ii) _____	1
b) i)	_____	1
	ii) _____	1
c) i)	_____	1
	ii) _____	1

	iii) _____	1

For Markers Use Only		Q36 Total

QUESTION 37

a) i) _____	1
ii) _____	1
b) _____	1
c) i) _____	1
ii) _____	1
d) i) _____	1
ii) _____	1
For Markers Use Only	Q37 Total

QUESTION 38

a) _____ _____	2
b) 1. _____	1
2. _____	1
c) i) _____	1
ii) _____	1
iii) _____	1
For Markers Use Only	Q38 Total

QUESTION 39

a) i) _____	1
ii) _____	1
b) i) _____	1
ii) _____	1
c) _____ _____	2
d) _____ _____	1
For Markers Use Only	Q39 Total

QUESTION 40

a) i) _____	1
ii) _____	1
b) _____ _____	2
c) _____	1
d) _____ _____	2
For Markers Use Only	Q40 Total