DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

BIOLOGY

Tuesday

14 October 2014

Time allowed:

2 hours and 30 minutes

(11:00am – 1:30 pm)

NO EXTRA TIME

(NO OTHER TIME)

Candidates are advised to fully utilize 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 part will be electronically marked.

All answers to the Multiple Choice Part MUST be answered on the ELECTRONIC ANSWER SHEET provided.

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 8-digit candidate number on the Part B Answer Sheet provided.

4. You are required to only write the correct answer in the space provided.
5. Answers written on the question paper will not be marked. Write answers neatly in spaces as allocated on the answer sheet.
6. ALL working must be shown step by step to get full marks. Students may lose marks for writing down final answers only.
7. 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.
8. 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.
9. Graphical Calculators are not permitted.

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

DO NOT TURN OVER THE PAGE

AND DO NOT WRITE

UNTIL YOU ARE TOLD TO START.

PART A: MULTIPLE CHOICE (QUESTIONS 1 to 30) 30 MARKS

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

Which is the correct order of categories of the Linnanean Classification System?

[C=class, F=family, G=genus, K=kingdom, O=order, P=phylum, S=species]

A. K,C,P,F,O,G,S B. K,F,P,C,O,G,S C. K,P,C,O,F,G,S D. K,P,O,F,C,G,S

QUESTION 2

Animal responses to any stimuli are mediated by

A. CNS only.
B. CNS and PNS only.
C. CNS and Endocrine System.
D. CNS, PNS and Endocrine System.

QUESTION 3

One of these statements does **NOT** describe characteristics of typical Grassland Biomes.

Which one is it?

A. Has scattered shrubs and trees.
B. Soils are typically very poor.
C. Very little rainfall in some areas.
D. Warm year-round weather in some parts.

QUESTION 4

Which one of these examples is **NOT** a human-induced threat to species extinction?

A. Global warming
B. Habitat destruction
C. Direct exploitation
D. Natural plant and animal disease

QUESTION 5

The maximum number of individuals a specific area can sustain is known as the

A. resource limit.
B. logistic equation.
C. carrying capacity.
D. intrinsic rate of growth.

QUESTION 6

Which one of the following is the correct sequence of uptake of water and minerals by root hairs in plants through plasmodesmata?

A. epidermis → endodermis → pericycle → xylem → cortex
B. epidermis → cortex → endodermis → pericycle → xylem
C. epidermis → pericycle → cortex → endodermis → xylem
D. endodermis → pericycle → cortex → epidermis → xylem

QUESTION 7

Which one of these below is **NOT** part of the vascular tissue in plants?

A. Tracheids B. Sclereids C. Vessel elements D. Sieve tube members

QUESTION 8

Which one of the following correctly matches with its function in the spermatogenesis process in males?

A. Vas deferens – maturation of sperms
B. Sertoli cells – produce follicles of ovaries
C. Spermatogonia cells – produce male gametes sperms
D. Epididymis – responsible for nutritional and mechanical support

QUESTION 9

Which one of these birth control methods gives 100% effectiveness?

A. IUD B. Rhythm methods C. Using condoms D. Sterilization

QUESTION 10

Effects of pregnancy on the mother's body includes all except

A. onset of menstruation.
B. enlargement of the uterus.
C. increased lumbar curvature.
D. increased blood pressure and heart rate (pulse).

QUESTION 11

The correct order of movement of (secondary oocyte) egg during fertilisation is

A. ovaries → uterine tube → uterus.
B. uterine tube → ovaries → uterus.
C. uterus → ovaries → uterine tube.
D. ovaries → uterus → uterine tube.

QUESTION 12

The small molecules (or monomers) that are put together to make DNA are called

A. nuclei. B. nucleotides. C. nucleic acids. D. amino acids.

QUESTION 13

Which of the following statements regarding genetic variation is <u>incorrect</u>?

A. The ABO blood group system is an example of continuous variation.
B. Genetic variation in offspring can be controlled by one or more genes.
C. Continuous variation has intermediate values while discontinuous variation is discrete.
D. Offspring of sexually reproducing organisms show more variation unlike asexual organisms.

QUESTION 14

The lengthy structure of DNA can be cut into shorter fragments by

A. PCR.
B. DNA ligase.
C. Restriction enzymes.
D. Gel electrophoresis.

QUESTION 15

One of the theories of evolution of life on earth called the "chemical soup" was the result of some gases present at the time, starting to react with each other and resulting in bigger or complex molecules that eventually gave rise to primitive life form(s).

Which of these is **NOT** one of the complex molecules?

A. Enzymes B. Methane C. Nucleotides D. Amino acids

QUESTION 16

Which part of a compound light microscope is used to give a sharp focus on the image obtained from the specimen on the slide when viewed using x100 objective lens?

A. Eyepiece lens
B. Condenser lens
C. Fine focus knob
D. Coarse focus knob

QUESTION 17

The following statements are true of the endocrine system, with the exception of:

A. produces chemical messengers.
B. consist of endocrine and exocrine glands.
C. chemical messengers made of amino acids and steroids.
D. most chemical messengers are distributed via blood stream.

QUESTION 18

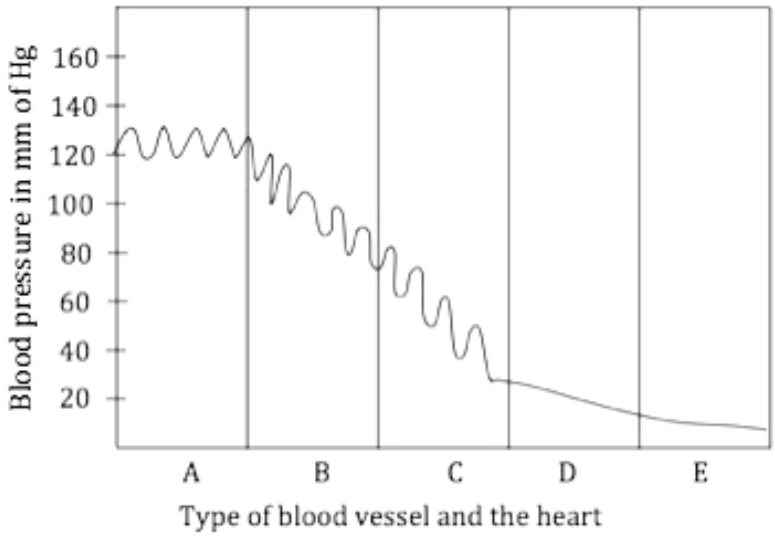
Plants typically produce five (5) classic hormones. Only two are absolutely essential for plant development.

Which two combinations represent these two essential plant hormones?

A. ethylene and auxin
B. cytokinin and auxin
C. auxin and gibberellin
D. cytokinin and abscisic acid

QUESTION 19

The graph in figure below shows how blood pressure varies in the heart and blood vessels. Sections A, B, C, D and E refer to the arteries, veins, capillaries and heart but not necessarily in that order.



The sections labelled **A** and **E** are most likely to respectively represent conditions in the

A. heart and veins.
B. heart and arteries.
C. arteries and veins.
D. veins and capillaries.

QUESTION 20

Which one of these types of ecological interaction best describes moss growing on tree barks?

A. Competition B. Mutualism C. Parasitism D. Commensalism

QUESTION 21

A mark-recapture experiment to estimate the population size of tilapia fish in a small lake was conducted. The first catch of 90 fish was marked and returned to the lake. Two weeks later, 120 fish were caught of which 15 were found to be marked.

What is the estimated size of the tilapia population based on this data?

A. 14 B. 210 C. 720 D. 1890

QUESTION 22

Which of the following happens before puberty?

A. Testosterone plays no role in the development of the male sex organs.
B. The hypothalamus does not secrete much Gonadotropin Releasing Hormone (GnRH).
C. Males can stimulate massive muscle development through a vigorous training program.
D. The pituitary gland secretes Lutenising hormone (LH) and Follicle Stimulating Hormone (FSH) but the gonads are unresponsive.

QUESTION 23

A gene labelled 'C' controls pea colour and another gene labelled 'D' controls the shape of the pea beans in pea plants. Yellow colour is dominant to green and round shape is dominant to wrinkle. If you do a dihybrid cross between CcDd x CcDd, what is the likely ratio based on the first offspring genotypic ratio of 9:3:3:1 that the pea offspring would have yellow beans but wrinkle in shape?

A. 1 B. 3 C. 9 D. 16

QUESTION 24

A genetically modified organism is one that has a

A. virus in it.
B. bacterium in it.
C. gene from another organism in it.
D. vaccine in it for protecting children against diseases.

QUESTION 25

If you were to confirm that the DNA of man and chimps are 98% identical, which evidence of evolution would you rely on?

A. Fossil record B. Embryology C. Biochemistry D. Physiology

QUESTION 26

Geographic hotspots are those areas of the world that are rich in _____.

A. species B. habitats C. rare species D. endemic species

QUESTION 27

Qualitative test for carbohydrate using Benedict's test indicates that carbohydrates contain

A. amino acids which gives colour change from blue to purple.
B. monosaccharides which gives colour change from blue to rusty red.
C. monosaccharides which gives colour change from greenish blue to black.
D. amino acids which gives colour change from light yellow to deep yellow.

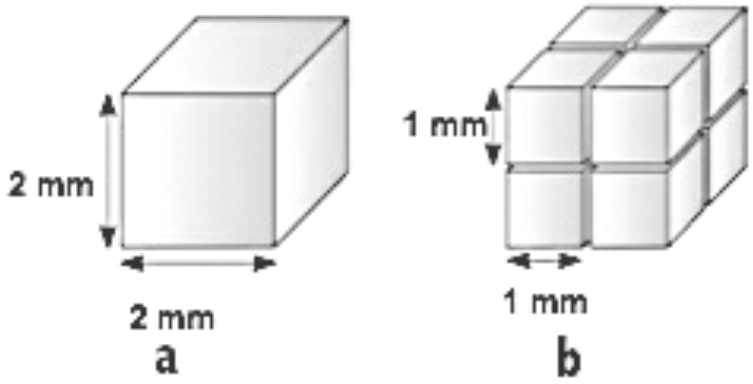
QUESTION 28

Which of the stages or phases below would you find the levels of estrogen and progesterone hormones to be both high during ovarian and uterine cycles respectively?

A. Ovulation and Luteal phase
B. Follicular phase and ovulation
C. Ovulation and Follicular phase
D. Ovulation and menstrual (flow) phase

QUESTION 29

An experiment was performed on potato cubes to determine the surface area to volume (SA:Vol) ratio for exchange surfaces. Set-up 'b' is actually set-up 'a' cut in three (3) places.



Which is true of set-ups 'a' and 'b'?

A. Set-up 'a' has a large SA:Vol ratio.
B. Set-up 'b' has the smallest SA:Vol ratio.
C. Almost all gaseous exchange surfaces have a typical set-up as in 'a'.
D. Almost all gaseous exchange surfaces have a typical set-up as in 'b'.

QUESTION 30

One of Darwin's most fascinating discoveries was the 14 species of Galapagos finches.

Darwin was interested in the birds

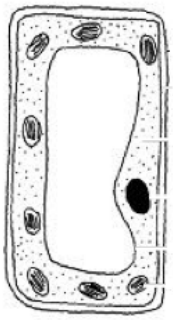
A. due to the isolation of the Galapagos islands from the mainland.
B. because of the evolution of different bill shape and sizes for feeding.
C. because the finches are quite colourful which suggests the evolution of colour trait.
D. which had something to do with random reproduction among members of the different finches.

PART B: SHORT ANSWERS (QUESTIONS 31 to 40) 70 MARKS

For each question, work out the answer and write the answer in the space provided on the ANSWER BOOKLET.

QUESTION 31

I. Examine the diagram of the cell below and answer questions a and b.



a. Which kingdom typically has all members with a cell type like that shown? (1 mark)

b. State two reasons for your answer above. (2 marks)

II. Not all organisms have a nucleus.

What organisms do not possess a nucleus? (1 mark)

III. In an experiment, yeast cells were observed using a x10 eyepiece lens and x40 objective lens.

Calculate the total magnification of the cells. (2 marks)

IV. Feeding, growing, respiring, reproducing, sensitivity and excretion are six (6) of the seven (7) characteristics of living things.

What is the seventh characteristic? (1 mark)

QUESTION 32

I. a. Important stimuli for plants include: light, day length, temperature, gravity and _____. (1 mark)

b. In the fruit-farming industry, plant hormones play a role in fruit development.

Name the hormone most likely to be used in this industry to stimulate ripening of fruits. (1 mark)

II. a. The Endocrine System acts much slower than the Nervous System in response to stimuli in vertebrates.

What is responsible for making the effects of the Nervous System almost instantaneous? (2 marks)

b. Name the main structures of a nerve cell that are responsible for rapid movement of impulses along the nerve cell. (2 marks)

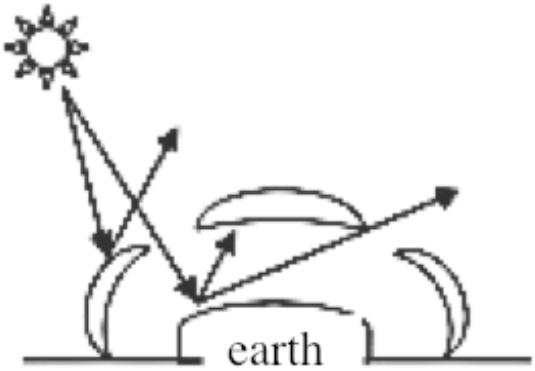
c. Which component of the Nervous System is responsible for involuntary and voluntary effector systems? (1 mark)

QUESTION 33

I. Answer T (True) or F (False) to the following statements. (4 marks)

a.	Human activity near freshwater biomes can lead to eutrophication of the water.
b.	TB disease in humans is an example of predation interaction.
c.	In the water cycle, animals return water to the environment by respiration only.
d.	Food webs are a series of organisms that successfully eat each other.

II. Study the diagram below and answer questions a and b.



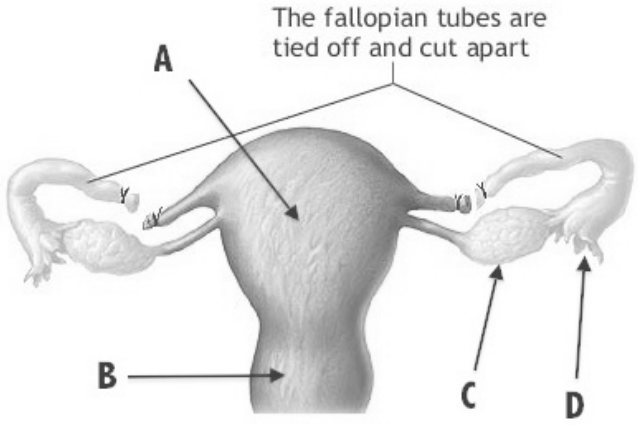
a. What phenomenon does this diagram illustrate? (1 mark)

b. What immediate effect does this phenomenon have on earth? (1 mark)

III. The increase in the concentration of a substance in living organisms from lower to higher trophic levels in the food web is known as _____. (1 mark)

QUESTION 34

The diagram below shows the reproductive organs of the human female after tubal ligation.



I. Name the parts labelled **A** and **B** on the diagram.

A: _____ (1 mark)
B: _____ (1 mark)

II. Which letter on the diagram represents the site of egg production? (1 mark)

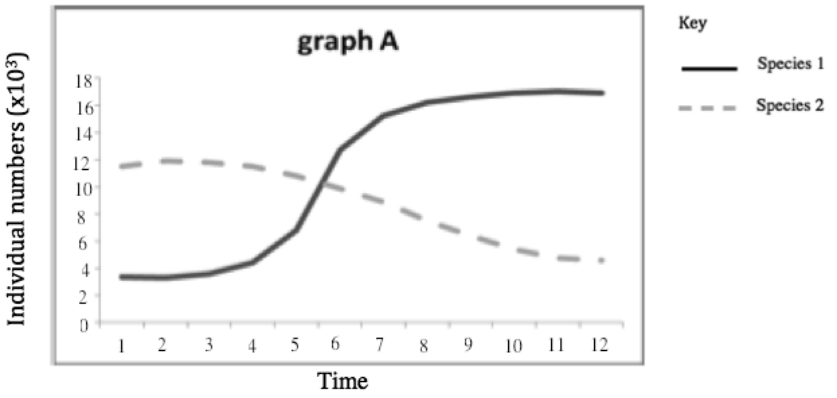
III. How does tubal ligation act as a method of contraception to prevent unwanted future pregnancies? (1 mark)

IV. Why is it so important that all the donated bloods be screened before any transfusion? (1 mark)

V. State any two ways that one can get infected with HIV. (2 marks)

QUESTION 35

I. Graphs A and B illustrate population fluctuations between two (2) different species in two separate conditions.

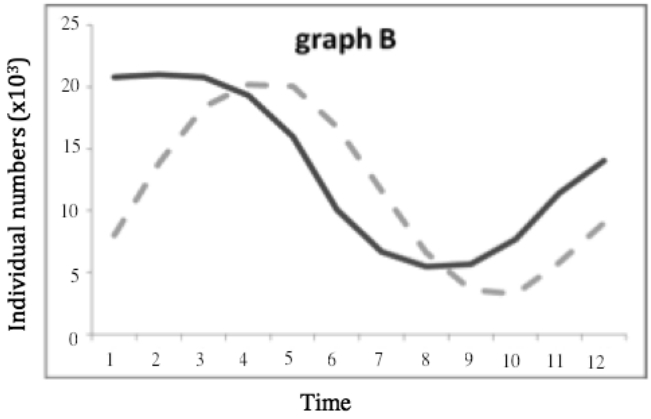


a. What type of species interaction is being reflected by

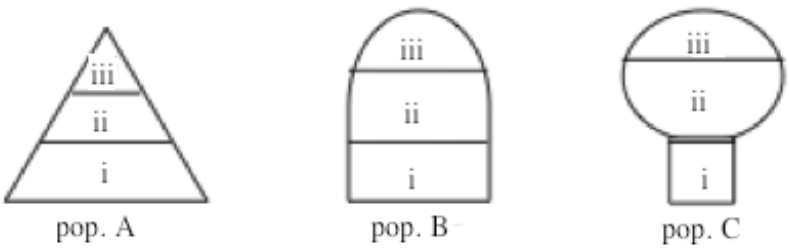
(i) Graph A? (1 mark)

(ii) Graph B? (1 mark)

b. If the set up for graph A had a total volume of 1500 cm^3 and a population of 10,000 individuals of species 1, calculate the population density at that time. (2 marks)



II. Use the three figures depicting population pyramids below to answer the questions that follow.



Survival rates among the young vary between different types of populations.

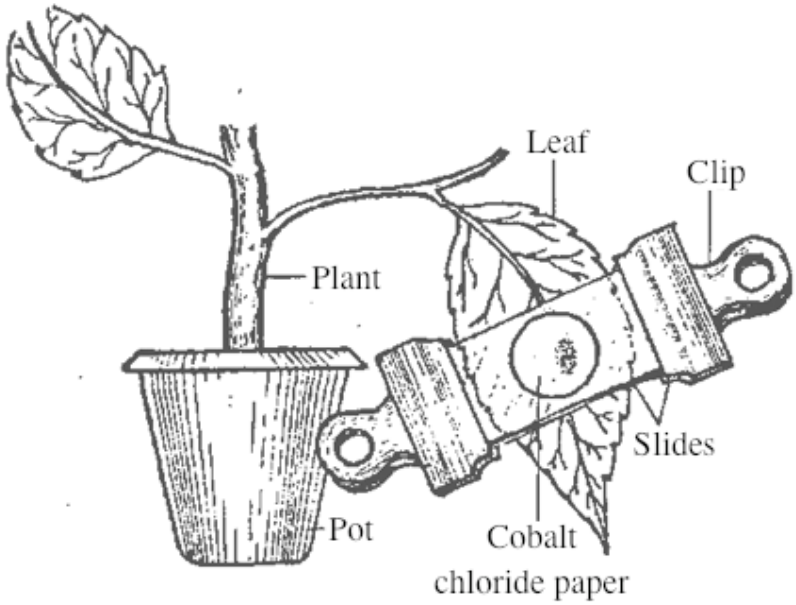
a. Which one of the above pyramids represents a population with high death rate amongst the young? (1 mark)

b. PNG has an expanding population. Which figure represents this type of population fluctuation? (1 mark)

c. What age distribution represents (ii) on all three figures? (1 mark)

QUESTION 36

When a strip of filter paper is soaked in cobalt chloride solution, it turns pink when damp with water and is blue when dry. The figure below shows strips of dry cobalt chloride paper on the upper and lower surfaces of a leaf pressed between two (2) dry glass slides by the clips.



Using pot plants of the same species, a student used this method to investigate the time taken for strips of cobalt chloride paper to turn from blue to pink which would imply activities in the leaves. The experiment was performed five times and the following results were obtained.

Expt. No.	**Time (in mins) taken for paper to change from blue to pink**	
	Upper Surface	**Lower Surface**
1	40	3
2	46	4
3	32	3
4	42	4
5	44	3

I. What is this experiment investigating? (1 mark)

II. What conclusions could be drawn from the results obtained in the above experiment? (2 marks)

III. Explain why the paper strips on the upper surface of the leaf took longer time to change from blue to pink than the lower surface of the leaf. (2 mark)

IV. Suggest two possible ways that students could improve the reliability of the experiment conducted. (2 marks)

QUESTION 37

I. The table below shows the cell type and counts of three (3) individuals samples of blood.

Cell type	Cell Counts (no/mm^3) of Blood Sample from		
	Jill	**Jenny**	**Jackie**
Red blood cells	7,500,000	5,000,000	2,000,000
White blood cells	500	6,000	5,000
Blood platelets	250,000	50	255,000

a. Which person is most likely to have lived at high altitudes recently? (1 mark)

b. Which person's blood is least likely to clot efficiently? (1 mark)

c. Jill would be the most likely person to become ill if exposed to virus. Why? (1 mark)

d. Which person is most likely to have an iron deficiency in her diet? (1 mark)

II. Xylem transports water and materials from the region of higher concentration to the region of lower concentration in plants so as the phloem to transport food.

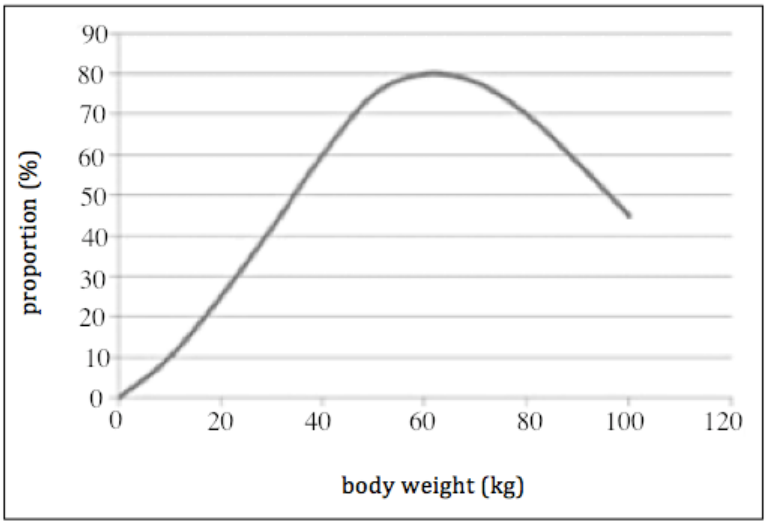
a. Name the process that defines what is happening in the above statement. (1 mark)

b. When would you expect translocation of food to proceed most rapidly in a 24-hour day? (1 mark)

c. Suggest a method which influences the efficient translocation of water and minerals in a water logged soil. (1 mark)

QUESTION 38

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



I. Is the graph showing continuous or discontinuous variation? (1 mark)

II. The bell-shaped curve follows a pattern called the _____.(1 mark)

III. Body weight is a trait or characteristic that is polygenic. Explain polygenic. (2 marks)

IV. Name a trait in humans that does not give a bell-shaped curve as shown here. (1 mark)

V. Polygenic traits are not only controlled by genes but also by the environment. Do you agree with this statement? Explain your answer. (2 marks)

QUESTION 39

A potted plant was exposed to different levels of sunlight to determine the rates of respiration and photosynthesis. The varying degrees of light are: dim light, darkness and bright light.

I. Explain the rates of respiration and photosynthesis in
   a. dim light. (1 mark)
   b. darkness. (1 mark)
   c. bright light. (1 mark)

II. Name the main non-gaseous by-product of respiration and give its function. (2 marks)

III. Define cellular respiration. (2 marks)

QUESTION 40

The questions below refer to the mechanisms of evolution.

I. A lawyer would most preferably marry a lawyer or someone of the same education level.

Which mechanism of evolution is implicated here, and briefly explain your answer. (2 marks)

II. Gene flow refers to the transfer of alleles (or genes) from one location to another when individuals of the same species move about. If the frequency of the black eye colour allele in cane toads in location 'A' is 0.4 and the same allele's frequency in location 'B' is 0.6, what happens overtime to the allele frequency when some cane toads move from 'A' to 'B'? (2 marks)

III. Some individuals are usually separated from the original population stock by natural disasters or these individuals could actually move out to a different location.

Explain in terms of genetic drift what happens overtime if the separation time is much longer. (2 marks)

IV. A change in the biochemical composition of a gene is called _____. (1 mark)

END OF EXAMINATION

BIOLOGY — 2014

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	4								

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

I. a) _____	1
b) i). _____	1
ii). _____	1
II. _____	1
III.	
Answer: _____	2
IV. _____	1
For Markers Use Only **Q31 Total**	

QUESTION 32

I. a) _____	1
b) _____	1
II. a) _____	
_____	2
b) _____	
_____	2
c) _____	1
For Markers Use Only **Q32 Total**	

QUESTION 33

I. a) ____	1
b) ____	1
c) ____	1
d) ____	1
II. a) _____	1
b) _____	1
III. _____	1
For Markers Use Only **Q33 Total**	

QUESTION 34

I. **A**. _____	1
B. _____	1
II. _____	1
III. _____	1
IV. _____	1
V. i) _____	1
ii) _____	1
For Markers Use Only **Q34 Total**	

QUESTION 35

I. a) i). _____	1
ii). _____	1
b)	
Answer:_____	2
II. a) _____	1
b) _____	1
c) _____	1
For Markers Use Only **Q35 Total**	

QUESTION 36

I. _____	1
II. _____	2
III. _____	
_____	2
IV. i) _____	1
ii) _____	1
For Markers Use Only **Q36 Total**	

QUESTION 37

I. a) _____	1
b) _____	1
c) _____	1
d) _____	1
II. a) _____	1
b) _____	1
c) _____	1
For Markers Use Only **Q37 Total**	

QUESTION 38

I. _____	1
II. _____	1
III. _____	
_____	2
IV. _____	1
V. _____	
_____	2
For Markers Use Only **Q38 Total**	

QUESTION 39

I. a) _____	1
b) _____	1
c) _____	1
II. Name: _____	1
Function: _____	1
III. _____	
_____	2
For Markers Use Only **Q39 Total**	

QUESTION 40

I. Mechanism: _____	1
Explanation: _____	
_____	1
II. _____	
_____	2
III. _____	
_____	2
IV. _____	1
For Markers Use Only **Q40 Total**	