DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

BIOLOGY

Tuesday
15 October 2013

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

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 **7** printed pages in the Part B 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 10-digit candidate number on the Part B Answer Booklet provided.
4. You are required to only write the correct answer in the space 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.
7. 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.
8. 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

Below is a list of plants and animals.

i. Hibiscus
ii. Yeast
iii. Blue – Green algae
iv. Spider

Which of the following lists organisms that make their own food?

A. i, ii & iv
B. ii, iii & iv
C. i & iii only
D. i, ii & ii

QUESTION 2

Which is true of photosynthetic plants?

A. Desert plants absorb and store CO_2 during the night.
B. Oxygen is a by-product of the Calvin Cycle of photosynthesis.
C. The amount of sugar produced is inversely related to absorbed light.
D. The by-products of respiration do not serve as raw materials for photosynthesis.

QUESTION 3

The mechanical digestion of food is facilitated by all of the others except

A. tongue.
B. dentition.
C. digestive enzymes.
D. digestive tract muscles.

QUESTION 4

Which is the correct sequence of uptake of minerals in plants?

A. Diffusion – phloem vessel – leaves - stem
B. Osmosis – leaves – phloem – storage sites (eg. Roots)
C. Osmosis – root hairs – phloem vessels – rest of the plant
D. Diffusion – root hairs – xylem vessels – rest of the plant

QUESTION 5

What is the function of the large intestine?

A. Elimination of solid wastes from the body.
B. Storage site for wastes before being evacuated.
C. Reabsorption of water back into the body.
D. Absorption of digested nutrients into the body.

QUESTION 6

Of all the following, which is NOT a function performed by the blood?

A. Filtration process in the glomerulus.
B. Absorption and transmission of heat.
C. Distribution of antibodies for fighting off infection.
D. Elimination of nitrogenous wastes into the kidneys.

QUESTION 7

A stroke experienced by some adults is a result of

A. presence of excessive CO_2 in the brain.
B. presence of excessive blood in the brain.
C. failure in sufficient transport of CO_2 to the lungs..
D. failure in sufficient transport of blood to the brain.

QUESTION 8

All gaseous exchange surfaces must fulfill these requirements except

A. being moist.
B. being protected.
C. close to a transport system.
D. all respiratory organs are evaginated.

QUESTION 9

What is the cell organelle that is responsible for respiration?

A. Lung.
B. Nucleus.
C. Chloroplast.
D. Mitochondrion.

QUESTION 10

Comparative anatomy _____ related organisms.

A. compares embryos of
B. studies fossil remains to group together
C. uses similarities in structures and forms to group
D. explains similarities in enzyme / protein structures of

QUESTION 11

Which of the following statements about RNA is true? RNA

A. has thymine (T).
B. is single-stranded.
C. is not a nucleic acid.
D. is made of phosphates and pentose sugars only.

QUESTION 12

Translation is a process that

A. produces mRNA.
B. makes copies of DNA.
C. uses mRNA and tRNA to make proteins.
D. assembles the ribosomal subunits together.

QUESTION 13

A chemical is made up of a nitrogenous base, deoxyribose sugar and phosphoric acid.

What could that chemical be?

A. DNA.
B. Urea.
C. Protein.
D. Carbohydrates.

QUESTION 14

If someone crossed the genotypes: **Aa x Aa**, what chances are there of getting the same genotype in the offspring?

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

QUESTION 15

Which of these statements is NOT true of sexual reproduction in animals?

A. Produces genetic diversity.
B. Involves diploid sex cells.
C. Produces a new diploid individual.
D. Associated with mating behaviours.

QUESTION 16

An alteration in the genetic composition has the ability to give rise to a different phenotype.

This statement refers to

A. mutation.
B. transcription.
C. reproduction.
D. sexual recombination.

QUESTION 17

Binomial Naming Systems in the classification of organisms uses

A. one name.
B. two names.
C. three names.
D. four names.

QUESTION 18

If two closely related organisms mate successfully to produce an offspring that is infertile or sterile, how would you classify the parent organisms? They are

A. different species.
B. practicing recombination.
C. members of the same species.
D. undergoing genetic drift and natural selection.

QUESTION 19

In a slide preparation of onion tissues stained with iodine and viewed using a compound light microscope, what structure of the cell are you most likely to see?

A. Cell wall.
B. Chloroplasts.
C. Golgi bodies.
D. Chromosomal structures.

QUESTION 20

What naturally cycled element is so abundant atmospherically and vital for nucleic acid and protein synthesis, yet not directly available for use by animals and plants?

A. Carbon.
B. Oxygen.
C. Nitrogen.
D. Phosphorus.

QUESTION 21

Which of these factors is NOT a determining cause of species endangerment or extinction of species?

A. Over exploitation.
B. Captive propagation.
C. Habitat destruction.
D. Introduced pests or predators.

QUESTION 22

Biomes are said to be identified by their distinctive dominant vegetation and _____.

A. climate
B. temperature
C. precipitation
D. geographical location

QUESTION 23

Small oxidation ponds at the Waigani Sewage Treatment Facility in Port Moresby usually become eutrophic for periods of time a year.

Which statement below is NOT true of events occurring within these eutrophic ponds?

A. Oxygen levels become depleted quickly.

B. Decomposition processes virtually absent.

C. Aerobic algal and bacteria blooms in upper layer.

D. Anaerobic microbes dominate at the bottom of pool.

QUESTION 24

Exponential population growth by living things is influenced by the environmental carrying capacity. Carrying capacities are determined by all of the following except

A. disease.

B. mating partners.

C. availability of nest sites.

D. availability of food sources.

QUESTION 25

What plant hormone is responsible for promoting aging and fruit ripening?

A. Auxins.

B. Cytokinins.

C. Ethylene.

D. Abscisic acid.

QUESTION 26

In a crop field of two species of peanuts one species grew faster from monopolizing food sources, forcing the second species of peanuts to die out. Ecologically, this type of an outcome is best referred to as

A. extinction.

B. population limitation.

C. competitive exclusion.

D. intraspecific competition.

QUESTION 27

Which gland does not match with its adjacent hormone produced in the table below?

	GLAND	**HORMONE**
A	Hypothalamus	Vasopressin
B	Thyroid	Glucagon
C	Pineal	Melatonin
D	Ovaries	Estrogen

QUESTION 28

A corn farmer discovered upon harvest that 60% of his field of corn were dwarfed but with normal roots, leaves and fruit.

Which of the following statements is the correct scientific explanation for the growth results of his yield? Cells of

A. dwarf corns have less gibberellin than normal corns.

B. dwarf corns have more gibberellin than normal corns.

C. both dwarf and normal corns have no levels of gibberellin.

D. both dwarf and normal corns have same amounts of gibberellin.

QUESTION 29

Spermatogenesis and maintenance of male secondary sexual traits depend on _____ produced by _____.

A. testosterone, epididymis

B. oestrogen, sertoli cells

C. testosterone, leydig cells

D. oestrogen, prostate gland

QUESTION 30

Which one of these is NOT a mode of asexual reproduction occurring in the animal kingdom?

A. Budding.

B. Binary fission.

C. Regeneration.

D. Parthenogenesis.

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

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

QUESTION 31

Use the information provided below to answer the questions that follow:

"A student had buttered bread and chicken for lunch"

A. Name the enzyme that would initially act on

i. the bread. (1 mark)

ii. protein from chicken. (1 mark)

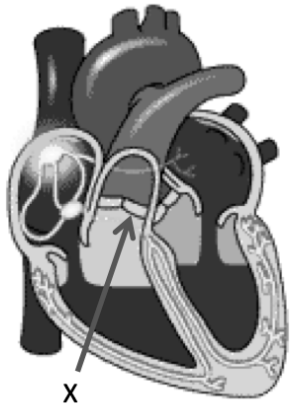
B. Where in the digestive system are proteins enzymatically broken down? (1 mark)

C. Explain the digestion of fats in the student's diet. (2 marks)

D. Name the teeth in the front of the human oral cavity and state the function(s). (2 marks)

QUESTION 32

Refer to the diagram of the human circulatory system below and answer the questions that follow.



A. Name the structure labeled **X** and state its function. (2 marks)

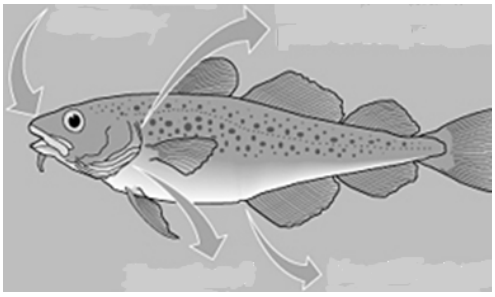
B. Explain what happens to the blood in the left ventricle. (2 marks)

C. Heartbeat is initiated by specialized cells that are located in the right atrium.
Name these cells and explain the process of heartbeat. (2 marks)

D. Where does the blood flow to from structure **X**? (1 mark)

QUESTION 33

Refer to the diagram below of a seawater fish and answer the questions that follow. The arrows indicate the movement of salt and water.



A. In terms of maintaining homeostasis, what is the biggest problem faced by seawater fishes? (2 mark)

B. Explain how seawater fishes breath. (2 marks)

C. Where do seawater fishes get their supply of oxygen? (1 mark)

D. Sea mammals like whales and reptiles like turtle surface out of water to breath. Why? (2 marks)

QUESTION 34

A. Complete the following table by using a ☑ to indicate presence or ☒ to indicate absence of the organelle in the respective kingdoms. (4 marks)

Organelle	Fungi	Plant	Animal	Bacteria
cell wall	(i)	✓	(ii)	✓
nucleus	✓	(iii)	✓	(iv)

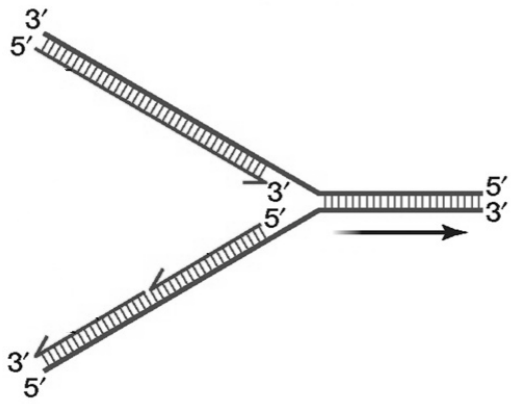
B. What would the total magnification be if you were viewing a prepared slide of a plant specimen using a **x10** objective lens and viewing with an eyepiece lens of a **x5** magnification? (1 mark)

C. What organisms posses a prokaryotic cell type? (1 mark)

D. How does a prokaryotic cell differ from a eukaryotic cell in terms of its nuclear membrane? (1 mark)

QUESTION 35

Refer to the diagram of the DNA structure below and answer the questions that follow.



A. Name the process shown by the diagram. (2 marks)

B. What names are given to the structures that keep the strands together? (2 marks)

C. After the first round of its activity, how many DNA molecules will be formed from this parent DNA?(1 mark)

D. Suppose that a strand on the parental DNA shown has the sequence ATATAGCGC and it goes on to produce a functional mRNA.

What would be the tRNA anti-codons that matched the mRNA? (1 mark)

E. If the sequence on parent DNA given in 'D' above produces a protein, what name should be given to such a sequence? (1 mark)

QUESTION 36

A. Name two parts of a plant that can be means by which plants may reproduce asexually or vegetatively in soil. (2 marks)

B. There are two types of abortions of pregnancy. Spontaneous (miscarriages) or Therapeutic (physical intervention) abortions.

i. Give one possible reason as to why spontaneous abortions occur? (1 mark)

ii. Briefly state why therapeutic abortion can be much riskier than spontaneous abortions. (1 mark)

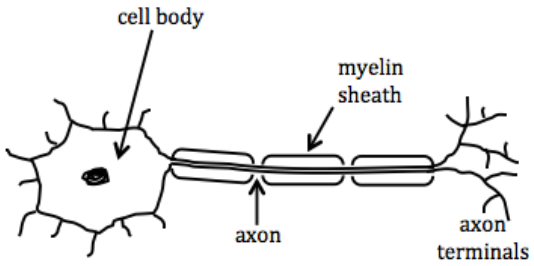
C. Name a common sexually transmitted disease caused by a bacterium. (1 mark)

D. Fill in the missing blanks with appropriate terms. (2 marks)

In relation to plants, female gametophytes called _____(i)_____ develop in megasporangia. And male gametophytes called _____(ii)_____ develop in microsporangia.

QUESTION 37

A. Refer to the diagram of a nerve cell below and answer the questions that follow.



i. In the human body, in which direction does the electrical impulse normally travel along the nerve cell? (1 mark)

ii. What is the purpose of having the myelin sheath covering the axon? (2 marks)

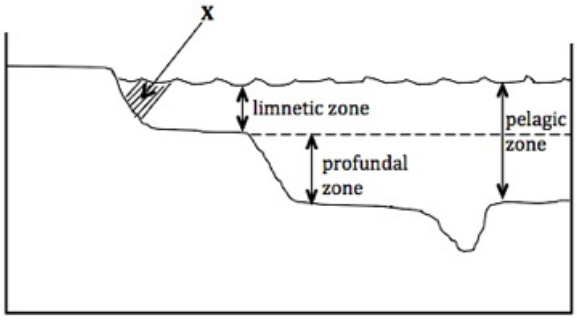
iii. Name one chemical substance found in the synapse which is largely responsible for controlling the transmission of nerve impulses between nerve cells across the synapse? (1 mark)

iv. On which part of the nerve cell would you find dendrites? (1 mark)

B. How does the endocrine system differ from the nervous system in bringing about adaptive responses to stimuli in the animal? (2 marks)

QUESTION 38

Study the diagram below and answer the questions that follow.



A. i. Label the oceanic zone labeled **X**. (1 mark)

ii. Describe the productivity of this zone **X**. (1 mark)

iii. Name one abiotic factor that can be limiting to growth of the primary producers in the profundal zone. (1 mark)

iv. The relationship of some marine fish with marine invertebrates is such that the fish benefits from the relationship with no harmful or beneficial effects on the invertebrate.

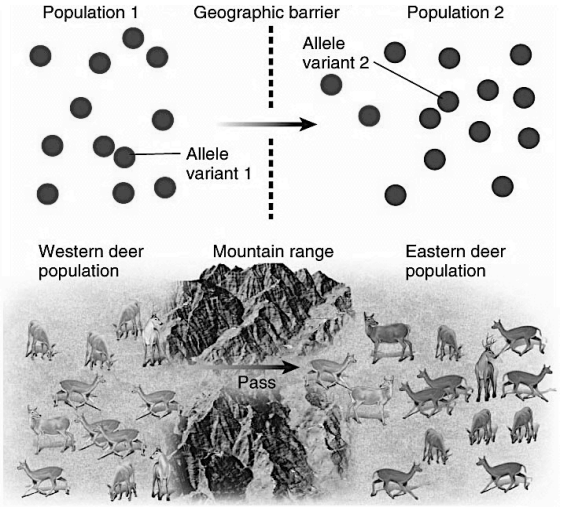
What type of a relationship is this? (1 mark)

B. i. Name a common organism one would find at the lowest trophic level of lakes. (1 mark)

ii. Does all the energy captured at the lowest trophic level become fully available to organisms of the next level? Briefly explain. (2 marks)

QUESTION 39

A. Refer to the diagram of mountain deers of the same species below and your understanding of evolution answer the questions that follow.



pact on the _____.

i. Name and explain the mechanism of evolution that would occur if individual members of deer move from one side of the range to the other. (2 marks)

ii. When male and female deers choose mates based on certain characters, what name is given to such mechanism of evolution? (1 mark)

iii. A genetic change in the DNA of deers on one side of the range gave rise to individuals with powerful vision for sighting preys and predators.

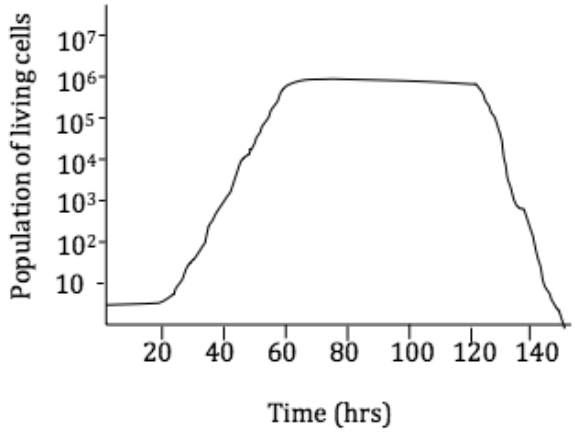
By natural selection, explain what is expected to be seen overtime. (2 marks)

B. Fill in the blanks using the words provided here: RNA, phenotype, natural selection, genotype. (2 mark

A change in the _____(i)___ will have an im-

QUESTION 40

A. The growth curve below is that of a bacterium growing in a petri dish.



Name two possible reasons why the number of live bacteria cells have reached the stationary growth by 60hrs and start to die off after 120hrs. (2 marks)

B. Refer to the life table below and answer the questions that follow.

Age Interval (months)	No. alive at beginning of age interval	No. dying during age interval	Number of seeds produced during age interval
0 – 3	950	130	0
3 – 6	820	180	140
6 – 9	640	330	170
9 – 12	310	205	220
12 – 15	105	60	155
15 – 18	45	38	70
18 – 21	7	5	35
21 – 24	2	2	5
24	0	0	0

i. At what age did this grass species start to produce seeds? (1 mark)

ii. State what pattern can be seen with regards to the population of live species in the age intervals 6 – 9 and 9 – 12 months. (2 marks)

iii. What age interval had the highest death rate? (Show working out). (2 marks)

END OF EXAMINATION

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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	3								

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) _____	1
c) _____	
_____	
_____	
_____	2
d) Name: _____	1
Function: _____	
_____	1
For Markers Use Only **Q31 Total**	

QUESTION 32

a) **X**= _____	1
Function _____	
_____	1
b) _____	
_____	2
c) Name: _____	1
Explanation: _____	
_____	1
d) _____	1
For Markers Use Only **Q32 Total**	

QUESTION 33

a) _____ _____ _____	2
b) _____ _____ _____	2
c) _____	1
d) _____ _____ _____	2
For Markers Use Only **Q33 Total**	

QUESTION 34

a) (i) _____	1
(ii) _____	1
(iii) _____	1
(iv) _____	1
b) _____	1
c) _____	1
d) _____ _____	1
For Markers Use Only **Q34 Total**	

QUESTION 35

a) _____	2
b) _____	2
c) _____	1
d) _____	1
e) _____	1
For Markers Use Only **Q35 Total**	

QUESTION 36

a) (i) _____	1
(ii) _____	1
b) (i) _____	
_____	1
(ii) _____	
_____	1
c) _____	1
d) (i) _____	1
(ii) _____	1
For Markers Use Only **Q36 Total**	

QUESTION 37

a) (i) _____	1
(ii) _____ _____	2
(iii) _____	1
(iv) _____	1
b) ____ _____ _____ _____ _____	2
For Markers Use Only **Q37 Total**	

QUESTION 38

a) (i) _____	1
(ii) _____	1
(iii) _____	1
(iv) _____	1
b) (i) _____	1
(ii) _____ _____ _____	2
For Markers Use Only **Q38 Total**	

QUESTION 39

a) (i) Name: _____	1
Explanation: _____ _____ _____	1
(ii) _____	1
(iii) _____ _____ _____ _____	2
b) (i) _____	1
(ii) _____	1
For Markers Use Only **Q39 Total**	

QUESTION 40

a) (i) _____ _____ _____	1
(ii) _____ _____ _____	1
b) (i) _____	1
(ii) _____ _____ _____	2
(iii) Answer: _____	2
For Markers Use Only **Q40 Total**	