PHOENIX NORTH LIFE SCIENCES CLUSTER

FINAL EXAMINATION – NOVEMBER 2017

GRADE 11 - PAPER ONE

EXAMINER: T.B. GOVENDER (HAVENPARK SECONDARY)

MODERATOR: L.I. BAGIRATHI (FORESTHAVEN SECONDARY)

MARKS: 150 DATE 7/11/2017

TIME: 2,5 HOURS SESSION 2

This question paper consists of 14 pages

INSTRUCTIONS AND INFORMATION

Read the following information carefully before answering the questions

1. Answer ALL the questions
2. Write ALL the answers in the answer book.
3. Number the answers according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. All drawings should be done in pencil and labelled in blue or black ink.
6. The diagrams in this question paper are not necessarily drawn to scale.
7. Do NOT use graph paper.
8. You must use a non-programmable calculator, protractor and a compass where necessary.
9. Write neatly and legibly.

## SECTION A

## QUESTION 1

1.1. Various options are provided as possible answers to the following questions. Choose the correct answer and write only the LETTER (A to D) next to the question number (1.1.1 to 1.1.10) in your answer book for example 1.1.11 D.

1.1.1. Cellular respiration in a green leaf takes place ...

A continuously
B during the day only
C in tissues without chlorophyll only
D during the night only

1.1.2. Air breathed out is different from air breathed in because it ...

A is cooler
B is drier
C contains less carbon dioxide
D contains less oxygen

1.1.3. Which ONE of the following can be absorbed without further digestion?

A proteins
B lipids
C glucose
D starch

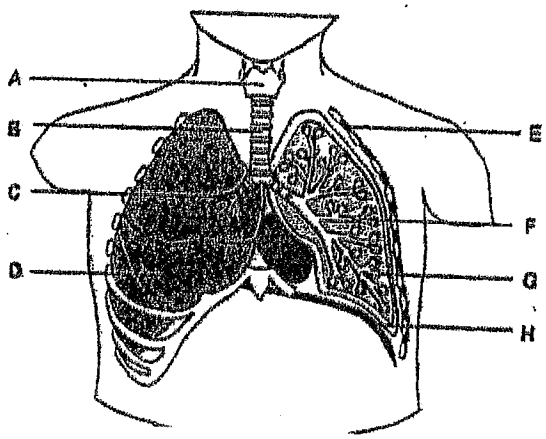
1.1.4. Photolysis occurs during ....

A dark phase
B light phase
C kreb's cycle
D oxidative phosphorylation

1.1.5. Which ONE of the following characteristic of a developing country is false?

A high birth rate
B high infant mortality rate
C high standard of living
D high population growth

Questions 1.1.6. and 1.1.7. are based on the diagram showing the human thorax




1.1.6 Which of the following are represented by A, B, D and E?

A trachea, lung, intercostal muscle, larynx
B larynx, trachea, lung, intercostal muscle
C larynx, intercostal muscle, trachea, lung
D bronchiole, lung, alveolus, trachea

1.1.7 Study the features listed below

1. Lined with hair to remove dust
2. Has cartilage that are C- shaped to allow the oesophagus to stretch during swallowing
3. Lined with ciliated columnar epithelial tissue with goblet cells to secrete mucus to trap dust and germs.

Which combination of features are adaptation of part B?

A 1, 2 ,3
B 1 and 3
C 2 and 3 only
D 1 and 2 only

1.1.8 Which one of the following is the correct sequence of activities that occur during nutrition?

A egestion, digestion, absorption, ingestion
B ingestion, digestion, absorption, egestion
C digestion, absorption, ingestion, egestion
D absorption, ingestion, digestion, egestion

1.1.9 Each of the following increase the rate of photosynthesis except an Increase in .....

A carbon dioxide
B light intensity
C oxygen
D temperature

1.1.10 Which ONE of the following represent the correct function of the renal artery and the renal vein?

| | Renal artery | Renal Vein |
|---|---|---|
| A | Carries deoxygenated with waste products to the kidney | Carries oxygenated blood with waste products to the kidney |
| B | Carries oxygenated blood with no waste products to the kidney | Carries deoxygenated blood with waste products away from the kidney |
| C | Carries oxygenated blood with waste products to the kidney | Carries deoxygenated blood with no waste products away from the kidney |
| D | Carries oxygenated blood with waste products away from the kidney | Carries deoxygenated blood with waste products to the kidney |

**(10 X 2 ) (20)**

1.2. Give the correct **biological term** for each of the following descriptions . Write only the term next to the question number (1.2.1. to 1.2.8.) in the ANSWER BOOK.

1.2.1. Storage form of glucose in plants
1.2.2. Lymph vessel which transport absorbed fats
1.2.3. Wave like muscular contractions which moves food along the alimentary canal
1.2.4. A nutritional disease which occur in children who are fed on a high carbohydrate and a low protein diet
1.2.5. A protective membrane surrounding the lung
1.2.6. Structural and functional unit of the kidney
1.2.7. Energy carrier in a cell
1.2.8. The acid which accumulates in the muscles of humans during continuous strenuous physical activity

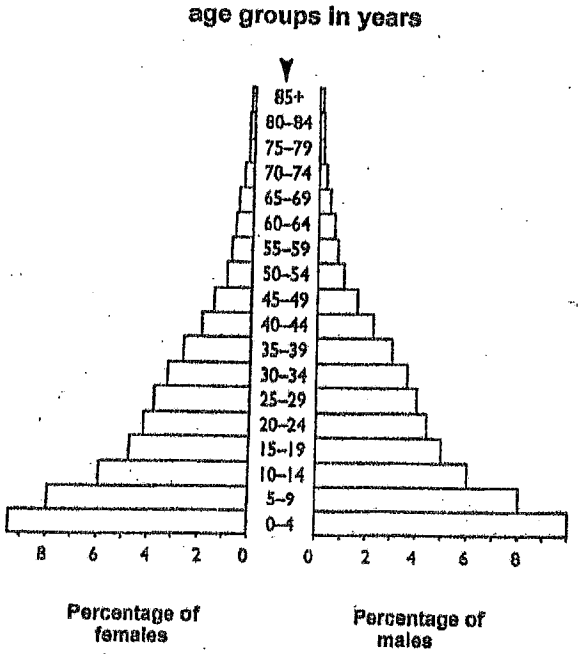
**(8)**

1.3. Indicate whether each of the statement in COLUMN I applies to **A ONLY, B ONLY , BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only, B only, both A and B,** or **none** next to the question number (1.3.1. to 1.3.5.) in the ANSWER BOOK for example 1.3.6. B only.

| COLUMN I | COLUMN II |
|---|---|
| 1.3.1. Micro -organism which cause tuberculosis | A: Bacteria<br>B: Fungi |
| 1.3.2. Occur in the mitochondria | A: Kreb's cycle<br>B: Oxidative Phosphorylation |
| 1.3.3. Organ which secretes gastric juice | A: Liver<br>B: Pancreas |
| 1.3.4. Density independent factor | A: Drought<br>B: Flood |
| 1.3.5. Individuals of the same species competing for a resource | A: Interspecific competition<br>B: Intraspecific competition |

(5 X 2) **(10)**

1.4. The diagram below represent age distribution pyramid for the human population of a developing country in one year at a certain time.




**Age Pyramid A**

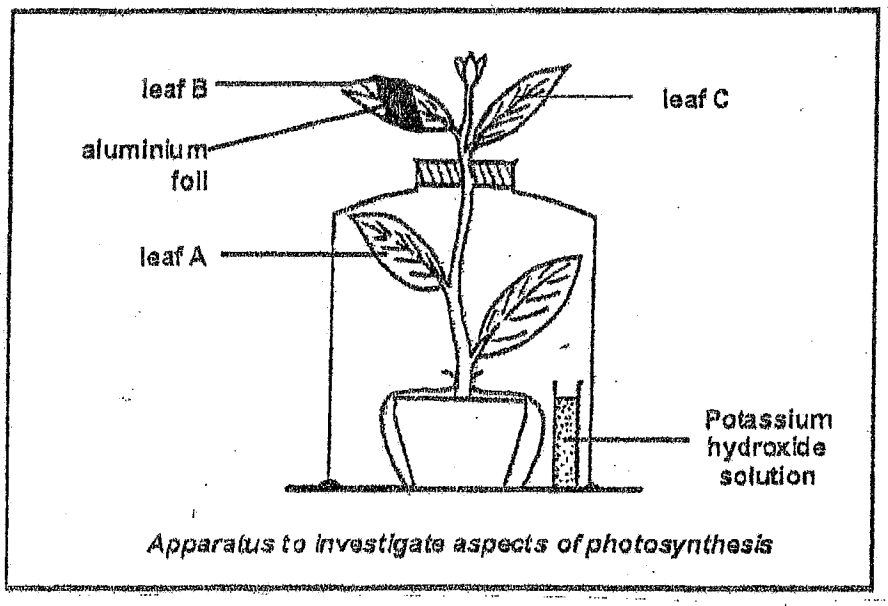
1.4.1. Comment on why the above diagram represent an age pyramid of a developing country. (2)

1.4.2. Name the method used to determine the population size of a country (1)

1.4.3. Why is the life expectancy lower in a developing country than in a developed country? (2)

**(5)**

1.5. The following diagram illustrates some investigations carried out on photosynthesis. The plant was kept in the dark for 48 hours before being placed in sunlight.




*Apparatus to investigate aspects of photosynthesis*

1.5.1. What is the aim of the investigation on:

(i) leaf A (1)

(ii) leaf B (1)

1.5.2. Why was the plant kept in the dark for 48 hours before being placed in sunlight ? (1)

1.5.3. What is the purpose of the potassium hydroxide solution? (1)

1.5.4. The following question refers to the method used to test the leaf (A, B and C) for starch.

1.5.4.1. Why was the leaf boiled in a beaker of water? (1)

1.5.4.2. Why was the leaf boiled in a test tube containing alcohol? (1)

1.5.4.3. Name the chemical used to test for starch. (1)

**(7)**

**TOTAL SECTION A: 50**

## SECTION B

## QUESTION 2

2.1. The results below show the effect of light intensity on the rate of photosynthesis in a plant when placed, in turn, in two concentrations of carbon dioxide.

| Light Intensity | Rate of photosynthesis in 0,03% $CO_2$ | Rate of photosynthesis in 0,13% $CO_2$ |
|---|---|---|
| 1 | 0.9 | 1.5 |
| 2 | 1.5 | 2.3 |
| 3 | 2.0 | 3.1 |
| 4 | 2.3 | 3.9 |
| 5 | 2.4 | 4.3 |
| 6 | 2.4 | 4.3 |
| 7 | 2.4 | 4.3 |

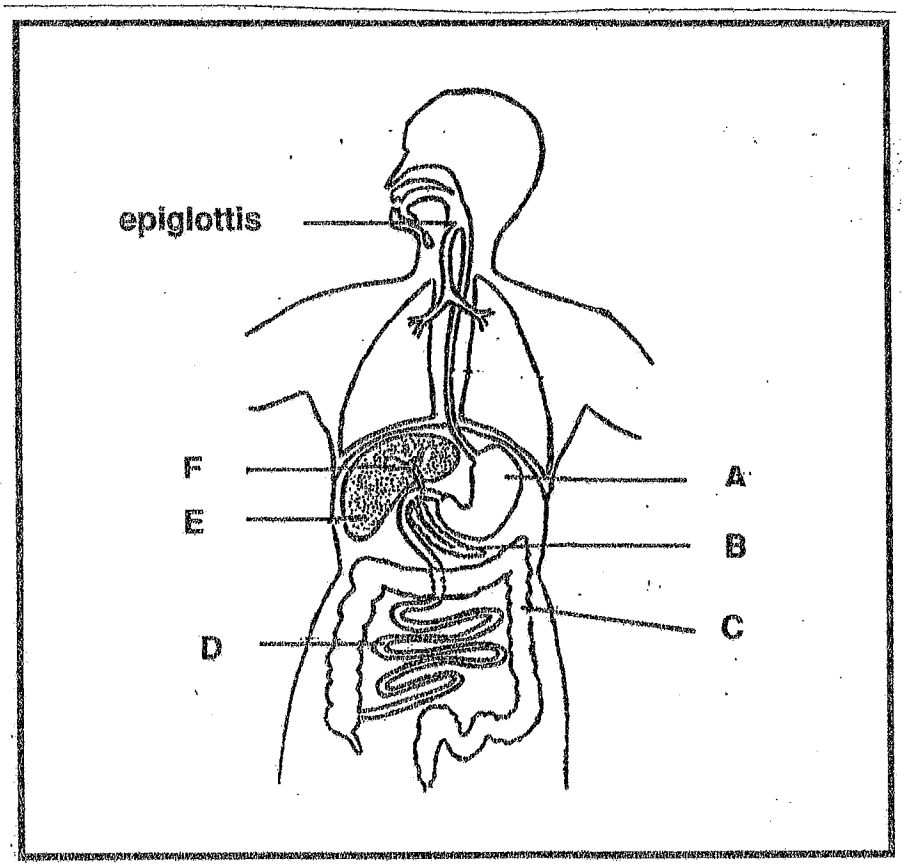
2.1.1. Using the results reflected in the table above draw, on the same system of axes, line graphs showing the rate of photosynthesis in the two consecutive concentrations of $CO_2$ when exposed to different light intensities. (8)

2.1.2. Describe two conclusions that can be made from the graphs. (4)

2.1.3. Suggest a reason as to why the rate of photosynthesis would drop if the $CO_2$ level is raised to 4%. (3)

**(15)**

2.2. Study the diagram below showing the human digestive system.




2.2.1. Give the LETTER and the NAME of the part that:

2.2.1.1. produces bile (2)

2.2.1.2. contains millions of tiny finger like projections called villi. (2)

2.2.1.3. a bag like organ which store food temporarily (2)

2.2.2. State the end products of:

2.2.2.1 lipid digestion (2)

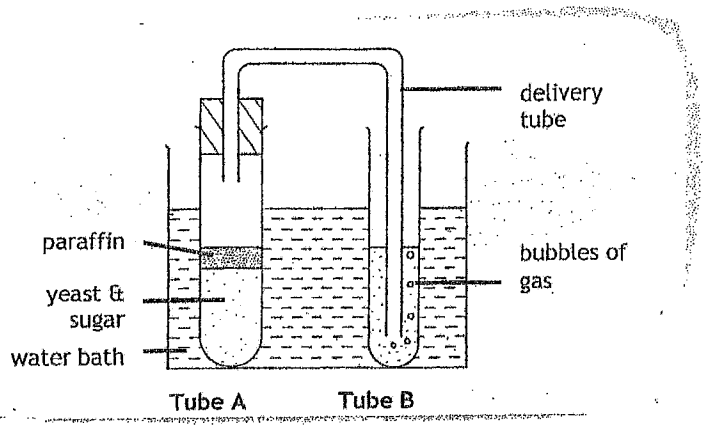
2.2.2.2. protein digestion (1)

2.2.3.1. Identify organ B. (1)

2.2.3.2. Explain the role played by organ B when the blood glucose level is raised above the normal limit. (4)

**(14)**

2.3. A test tube containing some yeast and sugar was placed in a water bath as shown in the diagram below. After 10 minutes the rate of bubbling was measured. The experiment was then repeated with the temperature of the water bath at each temperature shown in the table below. Test tube A has a layer of paraffin to prevent $O_2$ from reaching the yeast and sugar solution.




| Temperature (°C) | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|
| Number of gas bubbles per minute | 5 | 12 | 20 | 26 | 28 | 14 |

2.3.1. Name the type of anaerobic respiration taking place in yeast cells which produces the gas. (2)

2.3.2. Identify the :

2.3.2.1. dependent variable (1)

2.3.2.2. independent variable (1)

2.3.3. Name the gas being produced. (1)

2.3.4. Describe the test used to identify the gas present in test tube B. (3)

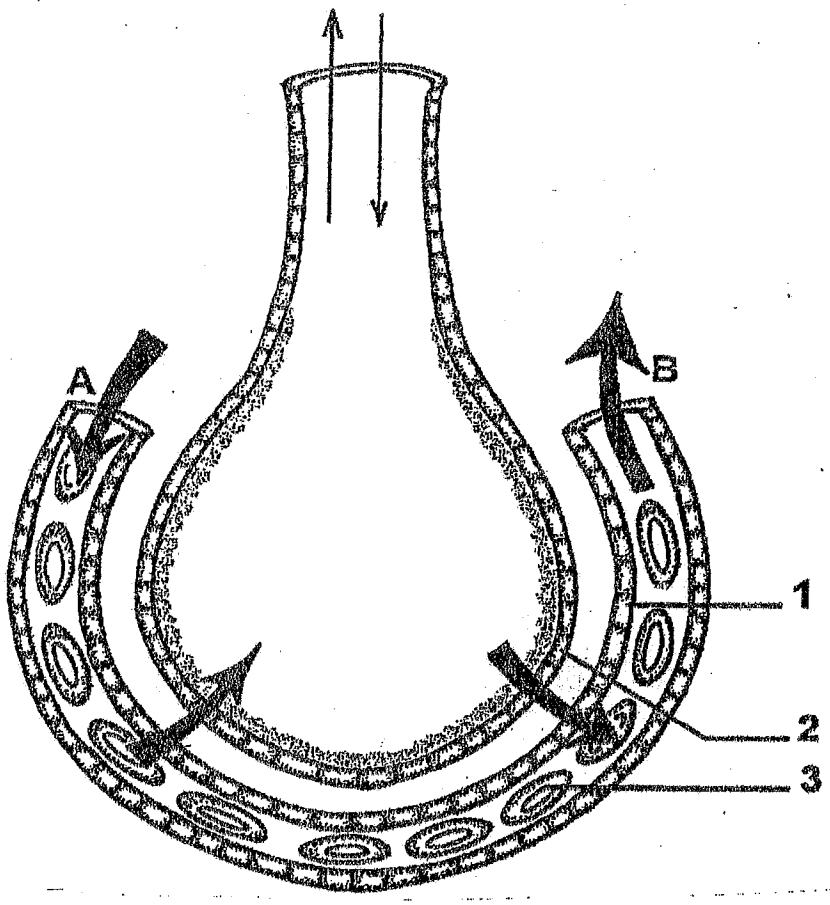
2.3.5. Explain why the number of gas bubbles released per minute decreases when the temperature is 60°C. (3)

**(11)**

**TOTAL FOR QUESTION 2: 40**

## QUESTION 3

3.1. The diagram below represent a section through an alveolus and surrounding blood capillary in the human body.




3.1.1. Name the type of epithelial tissue numbered 1 and 2. (2)

3.1.2. Identify the blood cell numbered 3. (2)

3.1.3. Discuss ONE structural adaptation displayed by the blood cell identified in 3.1.2.above which enables it to carry out its function efficiently. (2)

3.1.4. Discuss the difference in composition of blood entering at A and leaving at B. (2)

3.1.5. List any two structural adaptations of the alveolus which makes it well suited for gas exchange. (2)

"Inhalation is the process by which air rich in oxygen is drawn into the lungs as a result of the action of the breathing muscles."

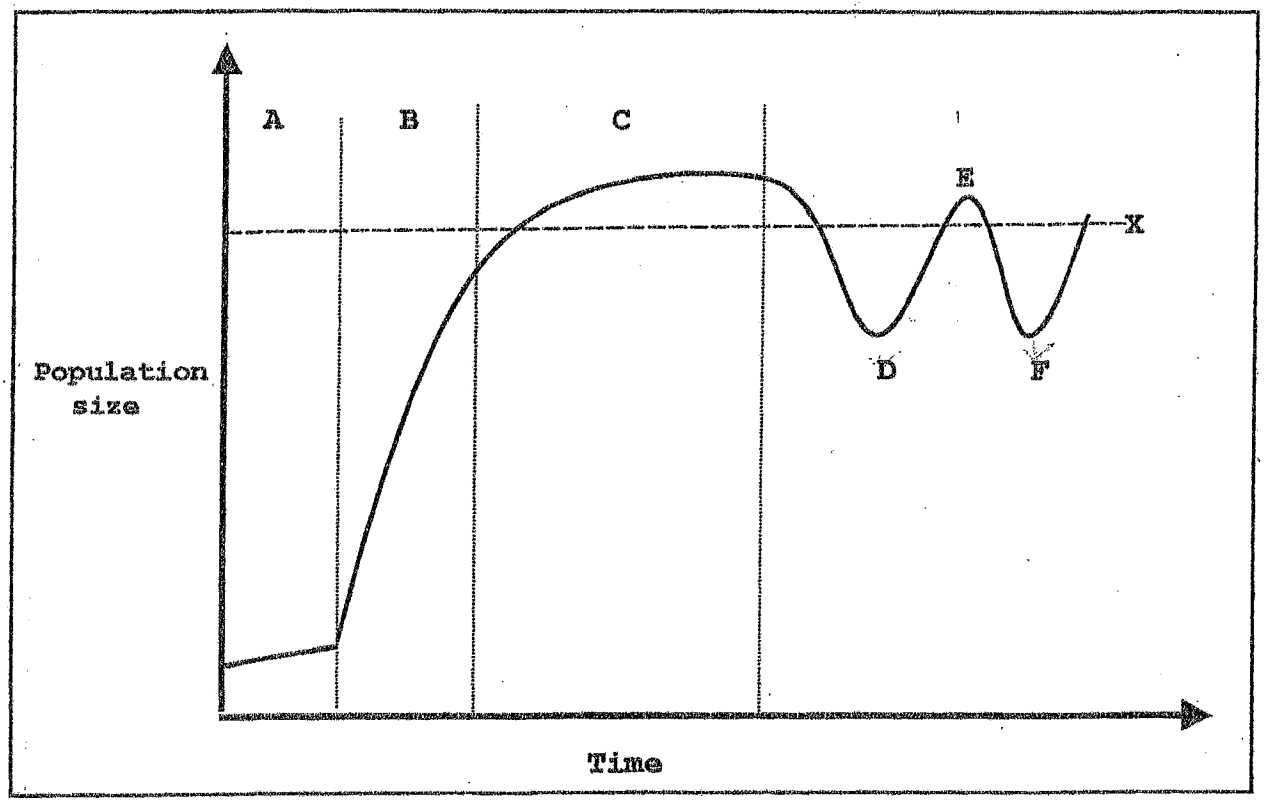
3.2. Discuss how the process of inhalation occurs. (6)

**(16)**

3.3.1. Differentiate between the terms:

3.3.1.1. Immigration and emigration (2)
3.3.1.2. Natality and mortality (2)

3.3.2. The graph below represent a population of zebras in a specific habitat.

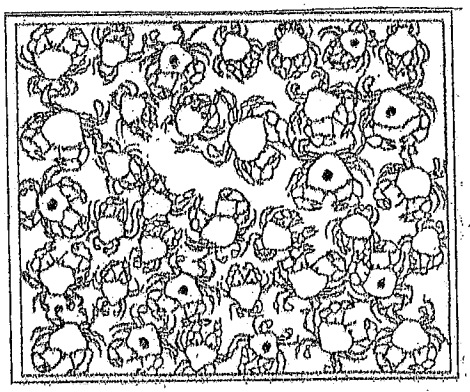



3.3.2.1. Name the growth form shown in the graph. (1)
3.3.2.2. Identify phases A, B and C. (3)
3.3.2.3. Explain the initial phase A start slowly. (2)
3.3.2.4. What does the dotted line X represent. (1)
3.3.2.5. List 3 density dependent factors which could limit the size of the zebra population. (3)

**(10)**

3.4. In an investigation to determine the size of the crab population in a dam, 45 crabs were caught. The shell of each crab was marked with a spot of black paint. The crabs were then released back into the dam.

Two weeks later, a sample of 36 crabs was taken from the same dam. The following diagram show the crabs that were caught.



3.4.1. Using the Petersen Index, estimate the total number of crabs in the dam. Show all working. (5)

3.4.2. Suggest TWO reasons why the estimated size of the population may differ from the real population size. (2)

3.4.3. List 3 precautions to be taken to ensure that the mark-recapture method is reliable. (3)

**(10)**

**TOTAL FOR QUESTION 3: 40**

## SECTION C

## QUESTION 4

The kidneys function as excretory as well as osmoregulatory organs. A group of scientists investigated the relationship between the colour of urine and the loss of water from the body. It was observed that on a hot day the urine generally tends to be dark yellow and concentrated. Discuss the role played by the kidneys, hypothalamus and pituitary gland on a hot day which results in concentrated urine being produced which is dark yellow and also discuss 4 ways in which the kidneys are structurally suited to carry out their function as excretory organs.

| | |
|---|---|
| Content | (17) |
| Synthesis | (3) |
| | **(20)** |
| **Grand Total:** | **150** |

PHOENIX NORTH LIFE SCIENCES CLUSTER

FINAL EXAMINATION – NOVEMBER 2017

GRADE 11 – PAPER 1

SUGGESTED ANSWERS AND MARKING GUIDELINES

SECTION A

QUESTION ONE

1.1.1. A
1.1.2. D
1.1.3. C
1.1.4. B
1.1.5. C
1.1.6. B
1.1.7. C
1.1.8. B
1.1.9. C
1.1.10. C

1.2.1. Starch
1.2.2. Lacteal
1.2.3. Peristalsis
1.2.4. Kwashiokor
1.2.5. Pleura
1.2.6. Nephron
1.2.7. ATP
1.2.8. Lactic acid

1.3.1. A only
1.3.2. Both A and B
1.3.3. None
1.3.4. Both A and B
1.3.5. B only

1.4.1. The pyramid has a very broad base due to high birth rates.
In the older age group fewer individuals survive

1.4.2. Census

1.4.3. Lack of medical care/ Low standard of living./ Lack of nutritious food

1.5.1. (i) To investigate whether light is required for photosynthesis.
(ii) To investigate whether carbon dioxide is required for photosynthesis.

1.5.2. To destarch the plant

1.5.3. To absorb carbon dioxide from within the belljar .

1.5.4.1. To soften the tissues/ To break down the cell walls. ANY 1

1.5.4.2. To extract the chlorophyll

1.5.4.3. Iodine

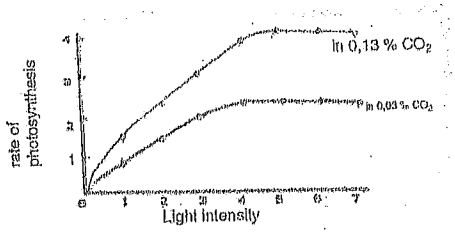
[7]

**SECTION B**

TOTAL SECTION A : 50

**QUESTION 2**

2.1.1.
Line graphs showing the rate of photosynthesis in 0,03% $CO_2$ and 0,13% $CO_2$ at different light intensities




Rubric for marking of graph

| Aspect | Mark |
|---|---|
| Type of graph: Line graph with both the graphs drawn on the same system of axes | 1 |
| Title for the graph | 1 |
| Correct scale for X axis and Y axis | 1 |
| Correct label for x axis and Y axis | 1 |
| Graph showing photosynthesis in 0.13% $CO_2$ | All 7 points plotted and joined : 2<br>1-6 points plotted and joined: 1 |
| Graph showing photosynthesis in 0.03% $CO_2$ | All 7 points plotted and joined : 2<br>1-6 points plotted and joined: 1 |

2.1.2. The rate of photosynthesis is higher at $CO_2$ concentration of 0.13% than at 0,03%.
For both $CO_2$ concentrations , the rate of photosynthesis increases up to light intensity of 5 and thereafter levels off.

2.1.3. High concentration of $CO_2$ in cells increases the acidity and lowers the pH causing the enzymes controlling the dark phase to become denatured .
The reaction rate decreases and the rate of photosynthesis will drop.

[15]

2.2.1.1. E Liver
2.2.1.2. D Small Intestine
2.2.1.3. A Stomach

2.2.2.1. Fatty acids and glycerol
2.2.2.2. Amino acids

2.2.3.1. Pancreas

2.2.3.2. When the blood glucose level is raised , organ B/pancreas secretes insulin into the blood. Insulin decreases the blood glucose levels by converting excess glucose into glycogen which is then stored in the liver and muscles. It also promotes the absorption of glucose into the body cells.

[14]

2.3.1. Alcoholic fermentation

2.3.2.1. Amount of Carbon dioxide / $CO_2$ produced

2.3.2.2. Temperature

2.3.3. Carbon dioxide / $CO_2$ ANY 1

2.3.4. Introduce the gas into a test tube containing clear lime water. If the clear lime water turns milky/becomes cloudy , then the gas tested for is carbon dioxide / $CO_2$

2.3.5. High temperature causes the enzymes controlling the process of anaerobic respiration to become denatured.The reaction rate decreases resulting in a decrease in the number of bubbles released.

**QUESTION 3**

3.1.1. Squamous epithelium

3.1.2. Red blood cell/ red blood corpuscle/ Erythrocyte.

3.1.3. It is anucleated/doesn't have a nucleus making more space available to accommodate more haemoglobin to take up more oxygen.
It is bi-concave to increase the surface area so that more oxygen can enter/diffuse into the red blood cell.
It is very flexible and can twist and bend itself out of shape to fit into blood capillaries with a narrower diameter, slowing down its movement allowing for more time to take up more oxygen.

3.1.4. The blood at A is deoxygenated/ has a concentration of carbon dioxide while the blood at B is oxygenated/ has a high concentration of oxygen.

3.1.5. The wall of the alveolus is made up of a single layer of squamous epithelial cells, making it very thin to promote the rapid diffusion of gases.
The alveolus is lined with a thin film of moisture allowing for oxygen to dissolve before diffusing
The alveolus is pouched/ cup shaped/lobed, increasing the surface area for gas exchange. ANY 2 [10]

3.2. The diaphragm contracts and flattens, increasing the volume of the thorax from top to bottom.
The external intercostal muscles contracts, causing the ribs/ribcage to be lifted upwards and outwards.
The volume of the thoracic cavity increases sideways/from side to side and from back to front*

Total volume of the thoracic cavity increases and pressure on the lungs (interpleural pressure) decreases.
Since atmospheric pressure is now higher than pressure within the lungs, air rushes into the lungs via the nostrils/air is drawn in through the air passages into the lungs. ANY 6

3.3.1.1. Immigration refers to movement of organisms into an area while emigration refers to movement of organisms out of an area.

3.3.1.2. Natality refers to the inherent ability of a population to increase/ increase in the population owing to new offspring being added while mortality refers to death of individuals in a population [4]

3.3.2.1. Logistic growth form

3.3.2.2. A – lag or establishment phase
B- Geometric or logarithmic phase
C – Stationary or equilibrium phase

3.3.2.3. Population is adapting to the new environment
There are few sexually mature individuals

3.3.2.4. Carrying capacity

3.3.2.5. Competition ( for food, for space, for mating partners)
Disease
Predation [10]

3.4.1. $N = \frac{C \times M}{R}$

$= \frac{36 \times 45}{9}$

$= 180$

OR

Estimated population size of crabs = $\frac{\text{total number of crabs in 2nd capture x number of crabs marked in 1st capture}}{\text{number of marked crabs recaptured in 2nd capture}}$

= $\frac{36 \times 45}{9}$

= 180 ANY METHOD (5)

3.4.2. Some of the crabs may have left the area
Some of the crabs may have died
Estimate is unreliable because only 1 sample taken ANY 2

3.4.3. The mark must not harm nor affect the animal's behavior, movement or acceptance within the population.

The mark must last for the entire period of investigation.

The population must be a closed population i.e. no immigration or emigration must take place during the sampling and the count must not take place during the breeding season

Sufficient time must be allowed for the marked animals to mix with the population before the 2nd capture is made.

The chances of the animal being caught must not be affected by the method of capture i.e. they must not become trap shy or trap addicted.

A number of samples should be taken and an average result calculated to reliably estimate the total population size.

ANY 3

[10]

SECTION C

QUESTION 4

**Role of the kidney, hypothalamus and pituitary gland on a hot day**

- On a hot day when the water content of the blood is low, osmoreceptors in the hypothalamus are stimulated.
- A message is sent to the pituitary gland which now releases ADH into the blood stream.
- ADH increases the permeability of the cells in the wall of the distal convoluting tubule and the collecting tubule.
- More water now leaves the tubule by osmosis and enters the blood in capillaries in the medulla.
- The water content of the blood increases and the urine becomes more concentrated.

**Max 9**

**The structural suitability of the kidneys in carrying out its function**

- The afferent vessel is wider than the efferent vessel, causing pressure to be built up in the glomerulus which facilitates the filtration process.
- Podocytes of the Bowman's capsule and endothelial cells of the capillaries form an effective filtration membrane allowing only small substances to pass through.
- The cup-shape of the Bowman's capsule allows for a close fitting of the glomerulus and a greater area for filtration.
- Cells of the tubules have brush border / microvilli which provides a large surface area for selective reabsorption.
- The renal tubule is long and convoluted, allowing sufficient time for tubular reabsorption and excretion.
- A large number of mitochondria are present in the cells of the proximal convoluted tubule which provide energy for active reabsorption to occur.

**Max 8**

**Synthesis: 3**

**Content: 17**

**(20)**

ASSESSING THE PRESENTATION OF THE ESSAY

| Criterion | Relevance (R) | Logical Sequence (L) | Comprehensive (C) |
|---|---|---|---|
| **Generally** | All information provided is relevant to the question | Ideas are arranged in a logical sequence | All aspects of the essay have been sufficiently addressed |
| **In this essay in Q4** | Provided information relevant only to<br>- Role of the kidneys, hypothalamus and pituitary gland in restoring water balance in the blood when the water content of the blood decreases.<br>- Structural suitability of the kidneys to carry out its function<br>No relevant information | The description of<br>- The role of the kidneys, hypothalamus and pituitary gland in restoring water balance when the water content of the blood decreases.<br>- Structural suitability of the kidneys for it function<br>Are presented in a logical and sequential manner | At least the following marks should be obtained:<br>- Role of kidneys, hypothalamus and pituitary gland in restoring water balance when the water content of the blood decreases 7/9<br>- Structural suitability of the kidneys for its function 6/8 |
| **Mark** | 1 | 1 | 1 |

Moderated
11/10/17.