

# Education

KwaZulu-Natal Department of Education  
REPUBLIC OF SOUTH AFRICA

**LIFE SCIENCES**

**FINAL EXAMINATION**

**2 NOVEMBER 2018**

**GREENBURY  
SECONDARY  
SCHOOL**

**GRADE 11  
PAPER ONE**

**MARKS: 150**

**TIME: 2½ hour**

**N.B. This question paper consists of 13 pages excluding this page.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

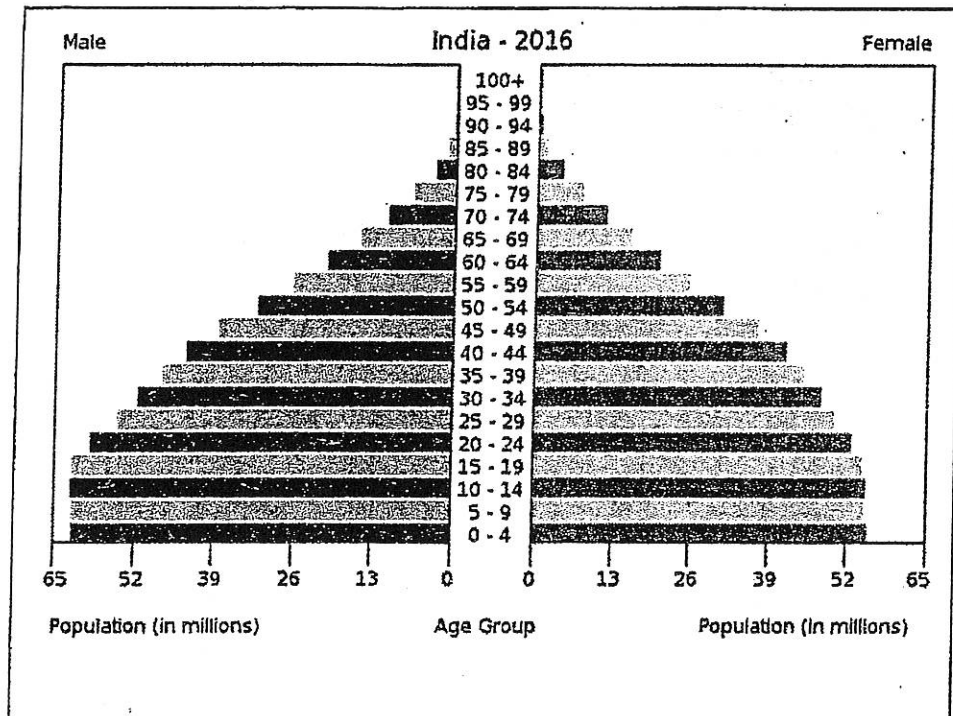
1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

## SECTION A

### Question 1

1.1 Various options are provided as possible answers to the following questions. Choose the most appropriate answer and write **only the letter** (A to D) next to the question number on your answer sheet.

1.1.1 Study the age-gender pyramid shown below.



The following are statements relating to population pyramids.

- i) There's a high birth rate
- ii) There's a low birth rate
- iii) There's low life expectancy
- iv) The birth and death rate are about the same

Which of the following combinations correctly represent information that can be deduced from the above age-gender pyramid?

- A) i, iii and iv
- B) ii and iii
- C) i and iv
- D) i and iii

1.1.2 Which of the following is not a density-independent factor?

- A) Competition
- B) Drought
- C) Fire
- D) Flood

1.1.3 Which is not a requirement for an efficient gaseous exchange system?

- A) A thin gaseous exchange surface
- B) An efficient transport network
- C) An effective ventilating mechanism
- D) A small surface area

1.1.4 What is the likely pH of urine produced when there is an excess of hydrogen ions in the blood?

- A) 5
- B) 7
- C) 8
- D) 9

1.1.5 Which one of the following is a requirement in the light independent phase of photosynthesis?

- A) Radiant energy
- B) Oxygen
- C) Carbon dioxide
- D) Water

1.1.6 These are some of the substances found in the human body.

- i) Water
- ii) Urea
- iii) saliva
- iv) carbon dioxide

Which of the following combinations best refer to human excretory products?

- A) iv only
- B) i, ii and iii
- C) i, ii and iv
- D) ii and iv only

1.1.7 Disease caused by the bronchioles becoming constricted.

- A) Emphysema
- B) Hay fever
- C) Asthma
- D) Bronchitis

1.1.8 May be used by predators as a successful hunting strategy.

- A) caste system
- B) herds
- C) packs
- D) dominant breeding pairs

1.1.9 Which of the following combination of conditions must be satisfied for the mark-recapture technique to be valid?

- i) The mark must last for the duration of the investigation.
- ii) The population must not be a closed population.
- iii) The mark must not affect the behaviour of the organism.
- iv) The marked organisms must be given time to mix freely with the other organisms in the population.

- A) (i) ;( ii) and (iii) only
- B) (i) ;( ii) and (iii) only
- C) (i) ;( iii) and (iv) only
- D) (i) ;( ii) ;( iii) and (iv) only

(9x2) (18)

1.2 Give the correct biological term for each of the following descriptions.  
Write down only the term next to your question number

1.2.1 Main form in which carbon dioxide is transported in blood.

1.2.2 Structure on leaves allowing for gaseous exchange in plants.

1.2.3 Different species living in the same habitat, but using resources differently.

1.2.4 Group of enzymes that help to break down lipids.

1.2.5 Hormone that controls salt content in the human body.

1.2.6 Type of ecological succession that takes place after an established community was destroyed after a fire.

1.2.7 Openings found on insect bodies that allow for air to be taken in.

1.2.8 Part of the brain that controls the rate of breathing.

1.2.9 Cartilaginous structure that prevents food from entering the trachea.

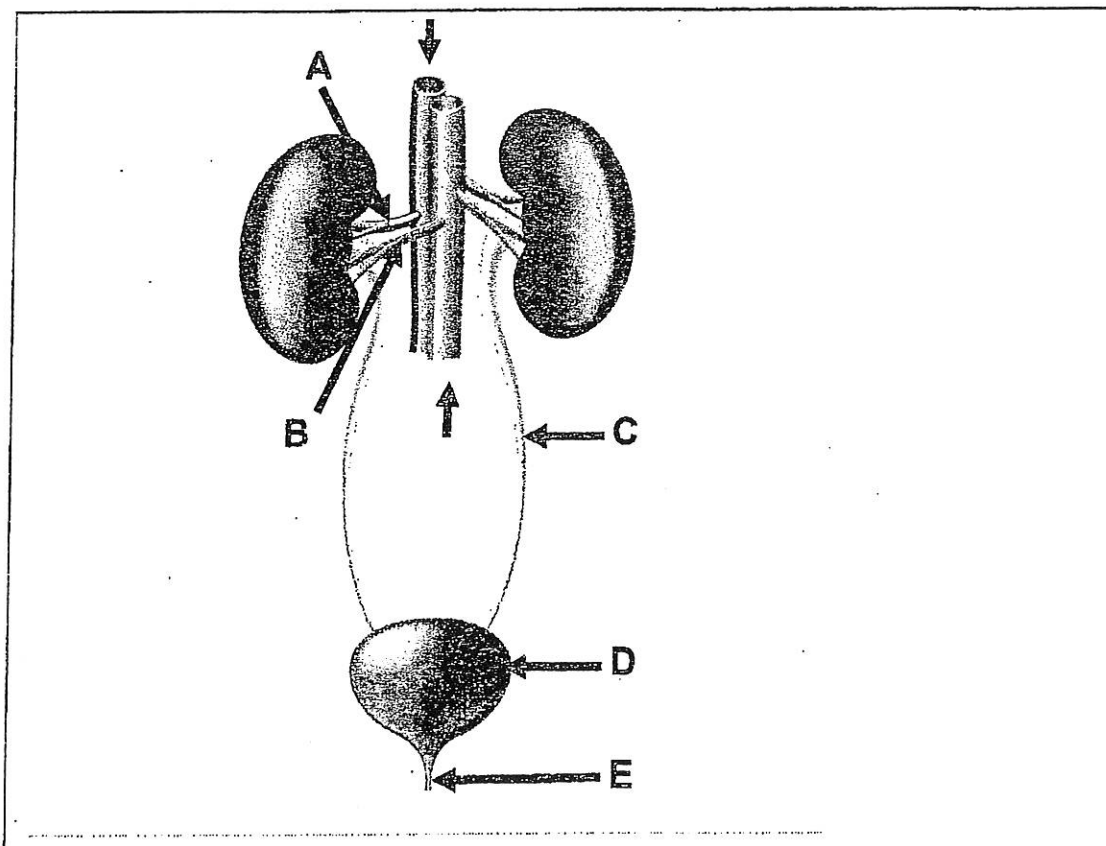
(9x1)(9)

1.3 Indicate whether each of the statements in COLUMN 1 applies to A only, B only, Both A & B or None of the items in COLUMN 11. Write A only, B only, Both A & B or None next to the question number on your answer sheet

COLUMN 1	COLUMN 11
1.3.1 Results in an increase in population size	A Natality B Mortality
1.3.2 Competition that exists between two different species	A Inter-specific B Intra-specific
1.3.3 Symbiotic relationship in which one organism benefits and the other one is harmed.	A Mutualism B Commensalism
1.3.4 Characteristic population growth pattern of a developed nation	A High life expectancy B Low birth rate
1.3.5 Population growth form represented by a characteristic S curve	A Logistic B Geometric

(5x2)(10)

1.4 Study the diagram below and answer the questions that follow.



1.4.1 Label parts B and E.

(2)

1.4.2 List THREE substances present in part A which is normally absent in part C (3)

1.4.3 State the function of :

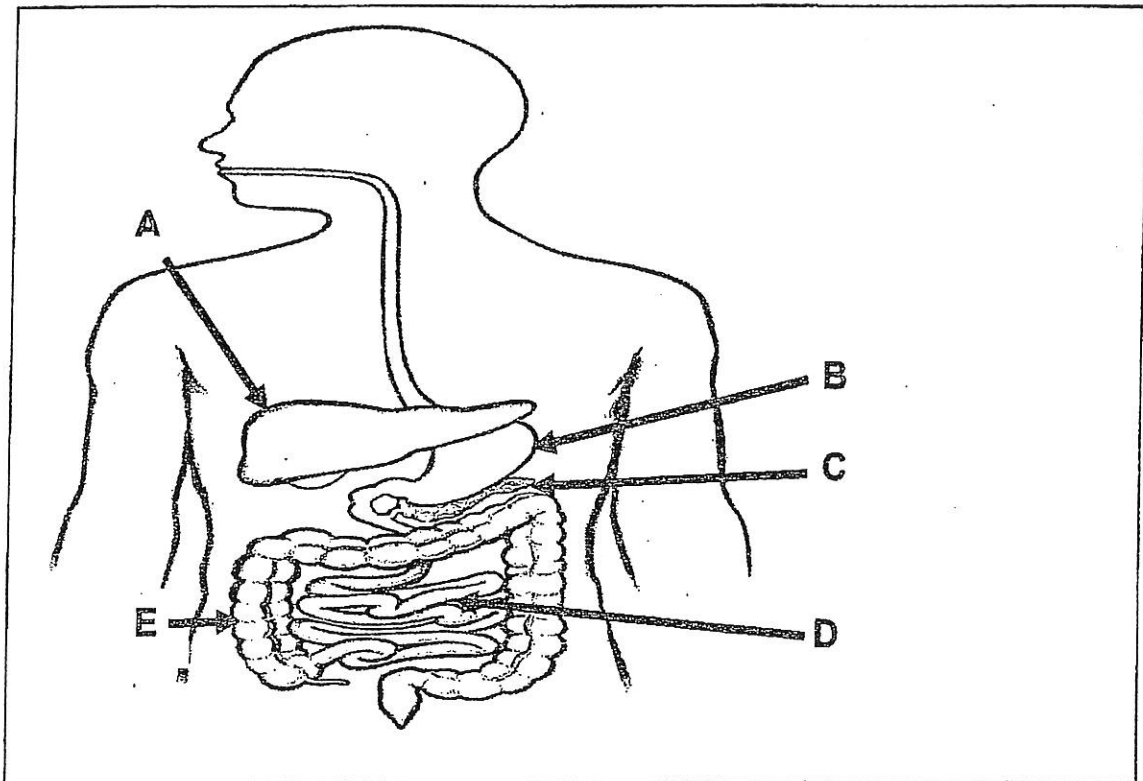
i) C

ii) D

(2)

(7)

1.5 Study the diagram below and answer the questions that follow.



1.5.1 Provide labels for parts:

i) C

(1)

ii) D

(1)

iii) E

(1)

1.5.2 Write only the LETTER of the part:

i) that represents both an endocrine and exocrine gland.

(1)

ii) where protein digestion begins.

(1)

iii) that stores glycogen

(1)

(6)

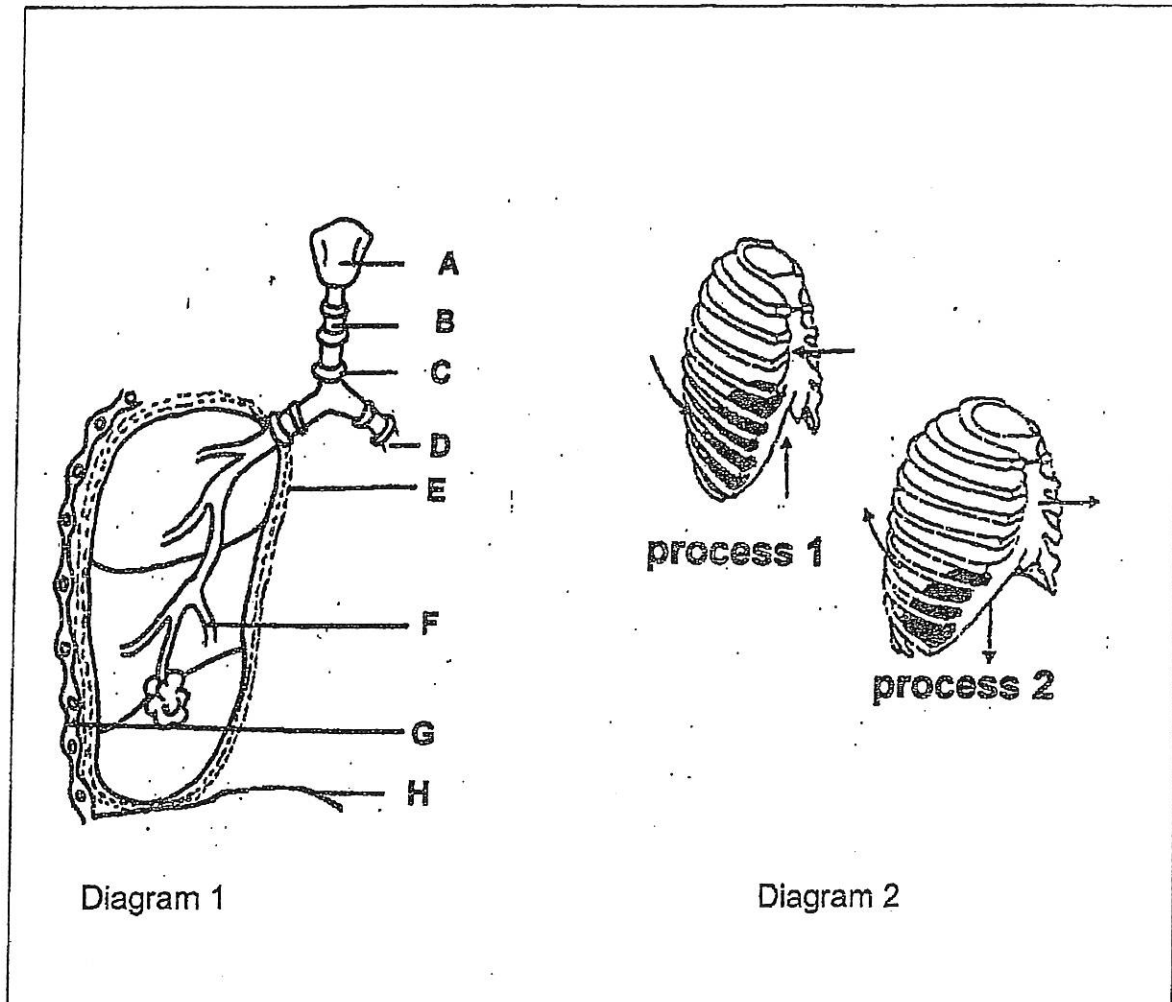
**Total Question 1: 50**

**Total Section A: 50**

## SECTION B

### Question 2

2.1 The diagrams below illustrate some parts of the human respiratory system and changes in the size of the thoracic cavity



2.1.1 Identify the following parts:

- i) A
- ii) B
- iii) C
- iv) D

(4)

2.1.2 List two visible reasons why diagram 1 provides for efficient gaseous exchange.

(2)

2.1.3 Tabulate TWO differences between the two processes occurring in Diagram 2

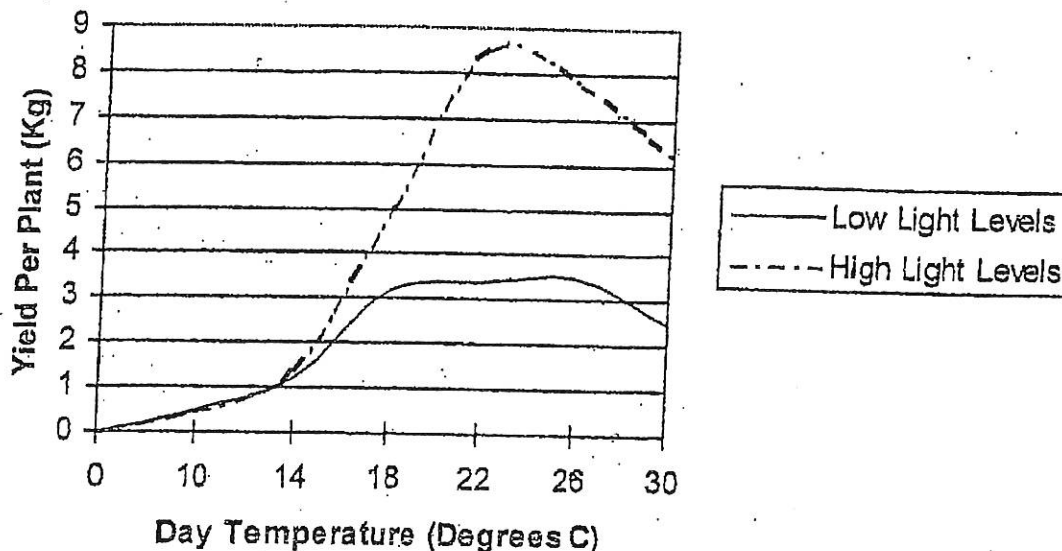
(5)

(11)



2.2 The graph below shows some results of a study which investigated the effect of different temperatures and levels of light on the growth of tomatoes. The amount of tomatoes produced by each plant is called a yield. The yield of each plant was measured at different temperatures and light levels.

**Line graph showing the effect of temperature and light intensity on the growth of tomatoes**



2.2.1 From the graph, determine what the best conditions would be for growing tomatoes. (3)

2.2.2 Identify the following in this investigation:

i) the independent variables (2)

ii) the dependent variable (1)

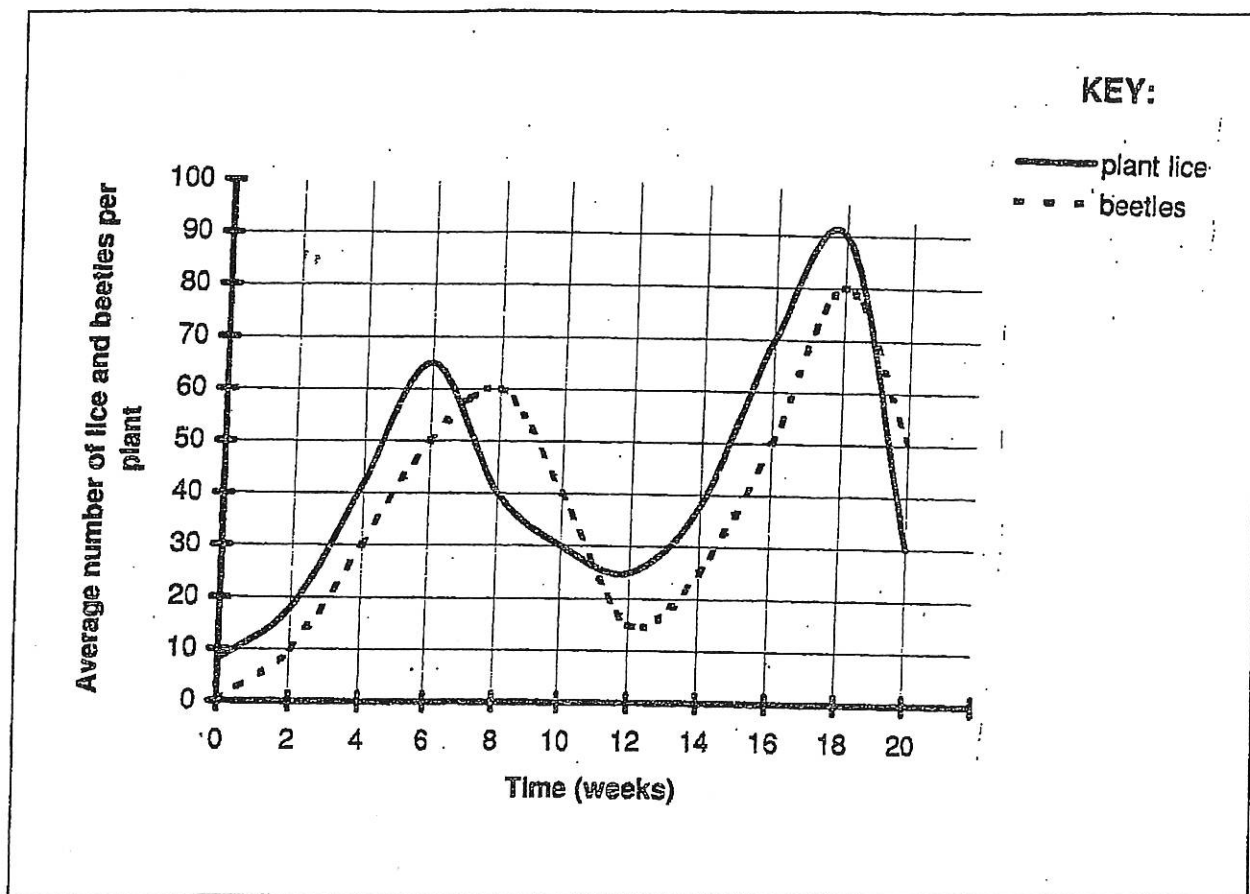
2.2.3 List TWO things that the investigator could have done to ensure the validity of this investigation. (2)

2.2.4 Write a suitable conclusion for this investigation (2)

2.2.5 Explain how it will benefit the farmer if he grew his tomatoes in a greenhouse (3)

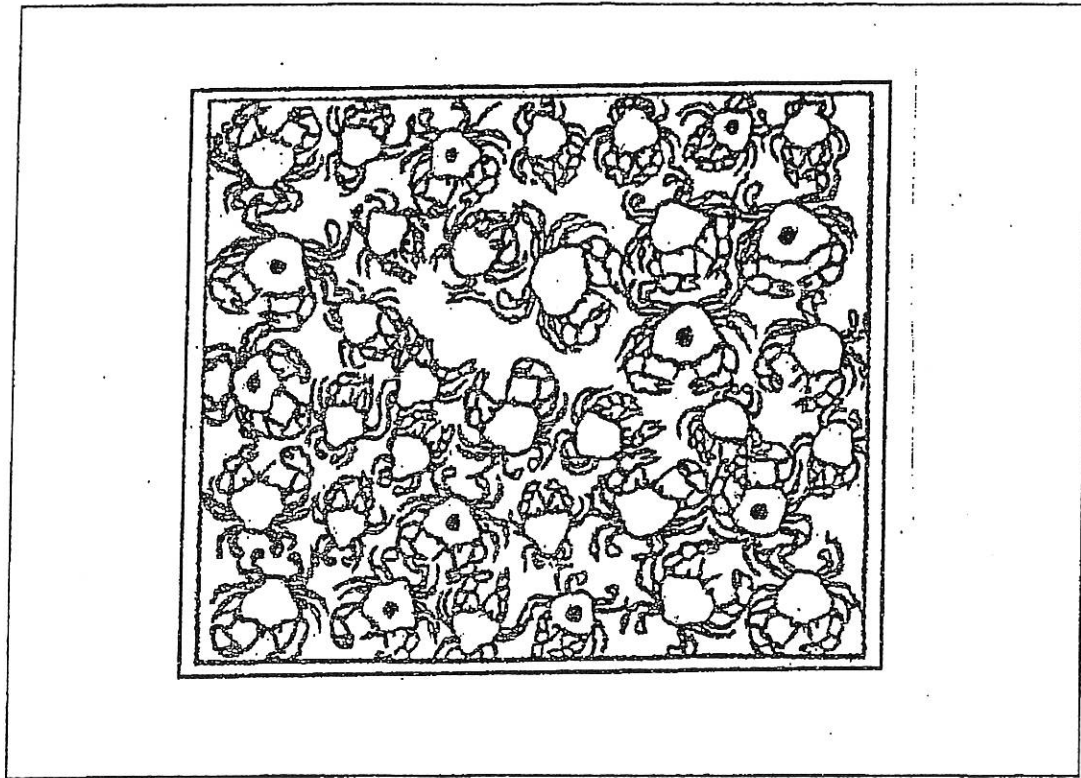
(13)

2.3 The owner of a nursery (place where plants are sold) experienced trouble when parasitic plant lice started to infect his plants. He decided to use ladybird beetles to help get rid of the plant lice. The graph below shows the results of his efforts.



- 2.3.1 Use the graph to determine which animal is the predator (1)
- 2.3.2 Give a reason for your choice in 2.3.1. (2)
- 2.3.3 Is predation an example of a density dependent or density independent factor? (1)
- 2.3.4 After approximately six weeks the number of plant lice started to decrease. Give two possible reasons for this. (2)
- 2.3.5 Name the method used by the farmer to control the pest population (1)
- (7)

- 2.4 In an investigation to determine the size of the crab population that were living on the rocky shore near Treasure Beach, 50 crabs were caught and all their shells were marked with a spot of paint. The crabs were then released and three weeks later a second sample of 36 crabs were captured. The diagram below shows the crabs that were caught in the second sample.



- 2.4.1 Using the formula,  $N = \frac{C \times M}{R}$

estimate the size of the crab population on the rocky shore of Treasure Beach. Show all your working. (4)

- 2.4.2 State the ways in which this method used to estimate the crab population can be made more reliable. (3)

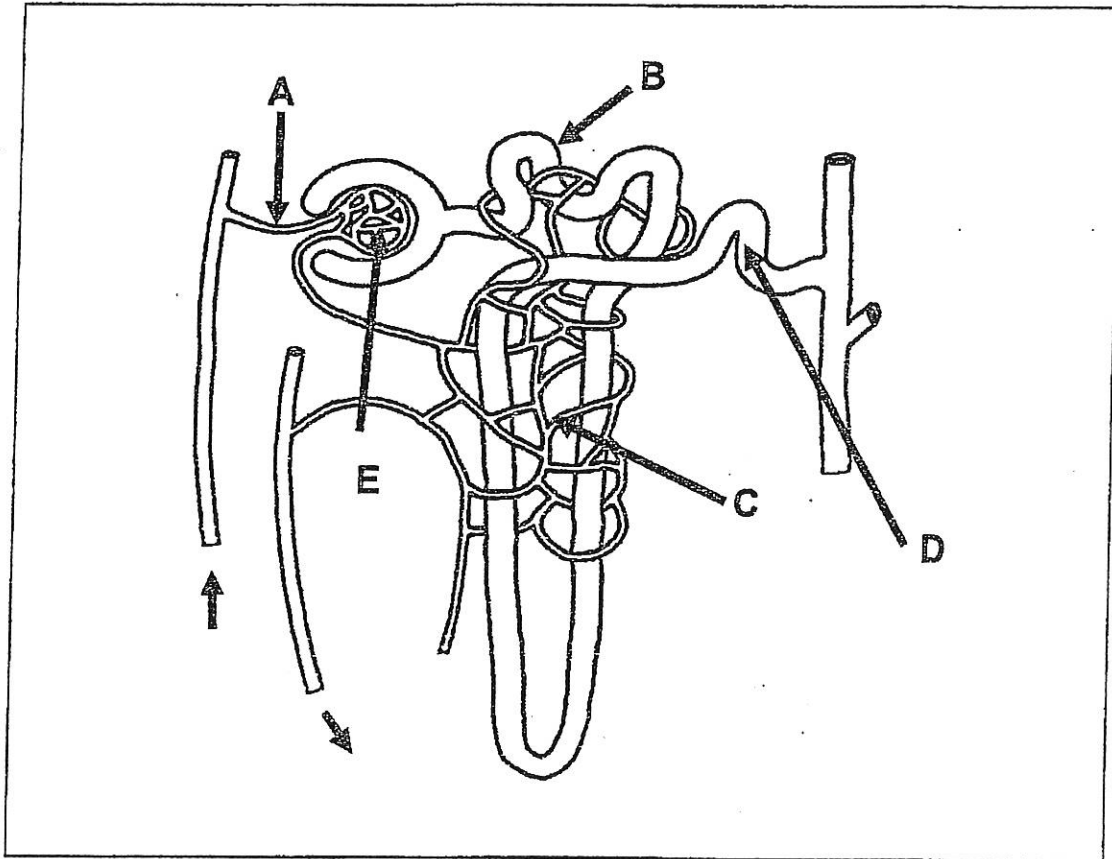
- 2.4.3 Name one other indirect method (besides this one) and one direct method that can be used to estimate population size. (2)

(9)

**Total Question 2: 40**

Question 3

3.1 Study the diagram of a structure found in the human kidney and answer the questions that follow



3.1.1 Identify the following labelled parts:

- i) A
- ii) C
- iii) D
- iv) E

(4)

3.1.2 Explain two ways in which the part labelled B is well suited to carry out its function.

(4)

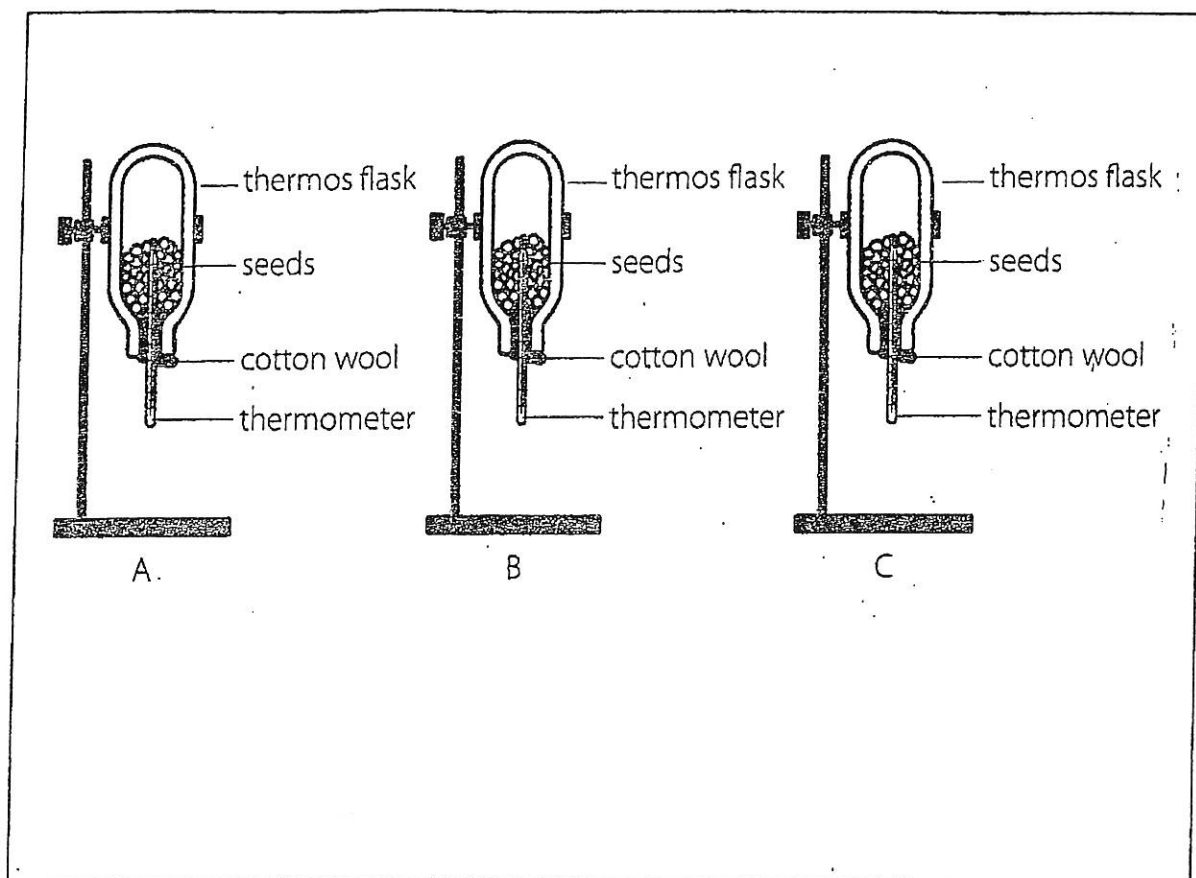
3.1.3 Explain why you are unlikely to find plasma proteins in the filtrate found in the Bowman's capsule.

(2)

(10)

3.2 In the experimental set up found below three thermos flasks were used.

Flask A contained moist germinating bean seeds that were sterilised.  
Flask B contained the same type of bean seeds that had been boiled.  
Flask C contained boiled seeds that were sterilised.



The table below show the results obtained, indicating changes in temperature, in °C, in the different thermos flasks.

Intervals between readings in hours	12	24	36	48	60
Flask A	20	20,5	22	23,5	24
Flask B	20	20	25	22	23
Flask C	20	20	20	20	20

- 3.2.1 Which of the above flasks A, B or C is the experiment? (1)  
3.2.2 Explain why thermos flasks were used in the investigation (2)  
3.2.3 State one reason why the flasks were turned upside down? (1)  
3.2.4 What caused the difference in temperatures that were recorded in the reading between 36 hours and 60 hours in each of the different flasks (2)

3.2.5 Describe the metabolic process that took place in the mitochondria of the seeds in flask A, that resulted in the release of heat energy (6)

3.2.6 Draw a bar graph representing the changes in temperature in flask A over the duration of the investigation (6)  
(18)

3.3 Two identical plants were placed in a dark cupboard for two days and then treated as follows:

Plant A	Plant B
Half of each leaf was covered with aluminium foil.	The upper and lower leaf surfaces were covered with Vaseline

Both plants were then exposed to sunlight for 48 hours and a few leaves were tested for starch. The following results were obtained:

Plant A	Plant B
The uncovered half of the leaves tested positive for starch	All the leaves tested negatively for starch

3.3.1 Explain why starch was absent in all the leaves of plant B. (2)

3.3.2 Give a possible aim for this investigation involving plant A (2)

3.3.3 Which part of the leaf in plant A serves as control ? (1)

3.3.4 Explain the importance of having a control in any scientific investigation (2)

3.3.5 Describe the light independent phase that took place in plant A that resulted in the formation of starch. (5)

(12)

**Total Question 3: 40**

## **SECTION C**

### **Question 4**

Describe the chemical digestion of proteins in the human body and what happens to excess amino acids. Also discuss how the liver and pancreas work together to bring about homeostasis when blood glucose levels are high and the consequences if the pancreas is unable to control high blood glucose levels.

Content: 17

Synthesis: 03

**Total Question 4: 20**

**Grand Total: 150**

## Life Sciences Grade 11 Paper 1 Memorandum 2018

### Question 1

#### 1.1

- 1.1.1 D✓✓
- 1.1.2 A✓✓
- 1.1.3 D✓✓
- 1.1.4 A✓✓
- 1.1.5 C✓✓
- 1.1.6 C✓✓
- 1.1.7 C✓✓
- 1.1.8 C✓✓
- 1.1.9 C✓✓

(9x2=18)

#### 1.2

- 1.2.1 Bicarbonate ions✓
- 1.2.2 Stoma✓
- 1.2.3 Resource partitioning✓
- 1.2.4 Lipases✓
- 1.2.5 Aldosterone✓
- 1.2.6 Secondary✓
- 1.2.7 Spiracles✓
- 1.2.8 Medulla oblongata ✓
- 1.2.9 Epiglottis✓

(9x1=9)

#### 1.3

- 1.3.1 A only✓✓
- 1.3.2 B only✓✓
- 1.3.3 None✓✓
- 1.3.4 Both A and B✓✓
- 1.3.5 A only ✓✓

(5x2=10)

1.4

1.4.1 B – renal vein✓ (1)

F - urethra✓ (1)

1.4.2 Glucose✓, amino acids✓, plasma proteins✓, blood cells✓  
(mark first 3 only) (3)

1.4.3 i) Carries urine from the kidneys to the bladder✓ (1)

ii) Stores urine✓ (1)

(7)

1.5

1.5.1 i) Pancreas✓ (1)

ii) Small intestine/ jejunum✓ (1)

iii) Colon/large intestine/ascending colon✓ (1)

1.5.2 i) C✓ (1)

ii) B✓ (1)

iii) A✓ (1)

(6)

**Question 1 total (50)**

**Question 2**

2.1

2.1.1 i) larynx/voice box✓ (1)

ii) trachea✓ (1)

iii) C shaped cartilage✓ (1)

iv) bronchus✓ (1)

2.1.2 – Alveoli provide a large surface area for gaseous exchange✓

- Ribs help to protect the gaseous exchange surface✓

- Intercostal muscles and diaphragm serve as a ventilating mechanism✓  
(mark first 2 only) (2)



2.1.3 Table (T) ✓

Process 1/Exhalation	Process 2/Inhalation
Diaphragm relaxes and curves✓	Diaphragm contracts and flattens✓
External intercostal muscles relax✓	External intercostal muscles contract✓
Volume of thoracic cavity decreases✓	Volume of thoracic cavity increases✓
More pressure is exerted on the lungs✓	Less pressure is exerted on the lungs✓
Air is forced out of the lungs✓	Air is sucked into the lungs✓

**Mark first two only**

(5)

(11)

2.2

2.2.1 – high light levels✓

(1)

- temperature of 22✓°C ✓/ 23✓°C✓

(2)

2.2.2 i) Temperature✓

Light✓

(2)

ii) Growth of tomatoes✓/ Yield per plant✓

(1)

2.2.3 - Use the same species of tomato plants✓

- Yield must be measured for the same amount of time at each setting✓

- Use the same measuring instrument✓

- Same person must take the measurements✓

-All environmental factors(excluding temperature and light) must be the same✓

**(Mark the first 2 only)**

(2)

2.2.4 An increase in temperature and light level up to optimum✓

will increase the yield of tomatoes✓

(2)

2.2.5 Less money will be spent on pesticides✓

Crop yield won't be destroyed by pests/weather✓

Therefore his profit will be greater ✓

(3)

(13)

## 2.3

2.3.1 beetles✓ (1)

2.3.2 – There's usually more prey than predators✓

- as predators are dependent on their prey for their survival✓ (2)

2.3.3 density dependent✓ (1)

2.3.4 - Increased competition between the plant lice resulted in some dying✓

- The beetles preyed on the lice✓ (2)

2.3.5 Biological control✓ (1)  
(7)

## 2.4

2.4.1  $N = \frac{C \times M}{R}$

$$\begin{aligned} &= \frac{50 \times 36}{10} \\ &= 180 \end{aligned} \quad (4)$$

2.4.2 Repeat the investigation to see if you get the same results✓

Take more samples✓  
and get an average✓ (3)

2.4.3 Quadrat method✓/ simple sampling✓ (indirect)

Census✓ (2)  
(9)

**Total Question 2: 40**

### Question 3

#### 3.1

3.1.1 i) Afferent arteriole✓

ii) Second capillary network✓

iii) Distal tubule✓/distal convoluted tubule✓

iv) Glomerulus✓/first capillary network ✓ (4)

3.1.2 –The cells have micro-villi✓

-which provide a large surface area✓ for selective reabsorption

- The cells have many mitochondria✓

- that help to provide energy✓for active reabsorption

- The tubule is long/convoluted✓

- allowing sufficient time for reabsorption✓

**(mark first 2 only)** (2x2=4)

3.1.3 –Plasma proteins are large particles✓

- therefore they cannot pass through the slits of the podocytes✓ (2)  
**(10)**

#### 3.2.

3.2.1 Flask A✓ (1)

3.2.2 -It ensures that heat from the outside can't influence the results in any way✓

- thereby increasing validity ✓ (2)

3.2.3 – It allows for CO<sub>2</sub> to escape✓

- It will limit heat loss through the cotton wool✓

**(Any 1)** (1)

3.2.4 - In flask A Heat is given off by germinating seeds✓

- In flask B micro-organisms present may have given off heat✓ (2)

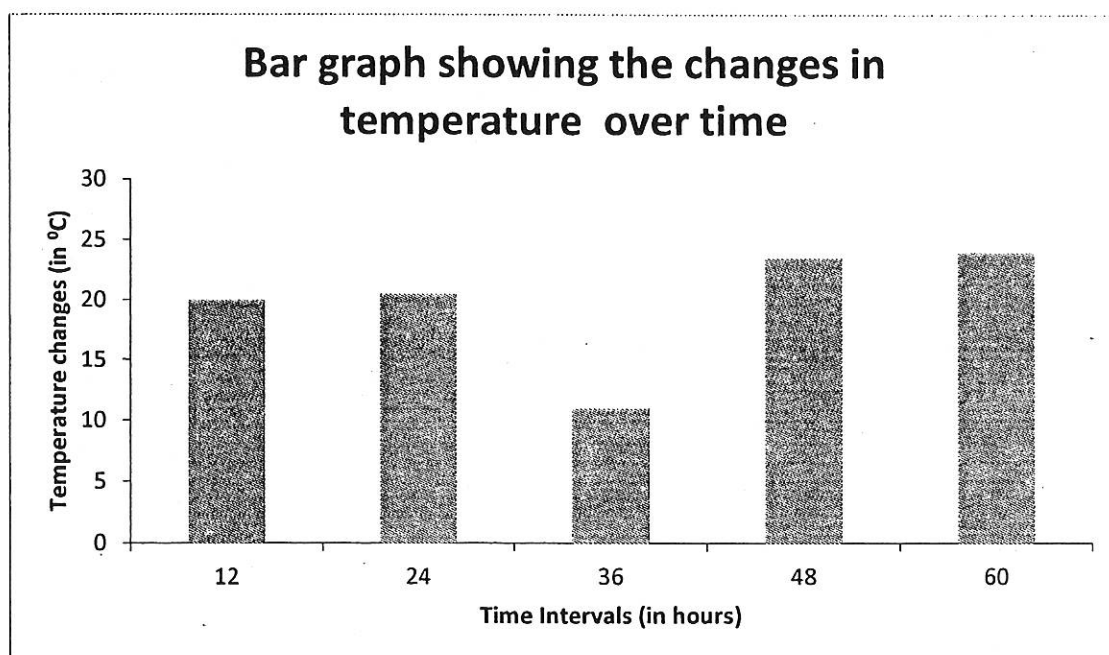
### 3.2.5 - During the Krebs cycle✓

- pyruvic acid goes through a cyclic✓ series of reactions
- releasing CO<sub>2</sub>✓
- and energised hydrogen atoms✓
- In oxidative phosphorylation✓
- the energised hydrogen atoms are used to make ATP molecules✓
- The de-energised hydrogen atoms join with oxygen to form water✓

(any 6)

(6)

### 3.2.6



### Rubric for marking the graph

(Max 6 marks)

- |   |        |
|---|--------|
| 1. Type of graph(T)   | 1      |
| 2. Suitable labels with units of measurement for both axes (L)  | 1      |
| 3. Suitable scale for both axes (S) X axis should be assessed on just the spacing(equal) of bars and the width(equal) of the bars | 1      |
| 4. Plotting all bars correctly  | 2      |
| 1-4 bars correctly plotted  | 1      |
| 5. Suitable caption (C) that includes both variables  | 1 (18) |

### 3.3

3.3.1 Photosynthesis could not take place✓

since CO<sub>2</sub> could not enter✓ (2)

3.3.2 To determine if light✓ is a requirement for photosynthesis✓ (2)

3.3.3 Part covered with foil✓ (1)

3.3.4 It makes the investigation valid✓ since the results will be due to the investigative factor and nothing else✓ (2)

3.3.5 –Takes place in the stroma✓

- of the chloroplast. ✓
  - CO<sub>2</sub> from the atmosphere✓
  - combines in the energised hydrogen atoms✓ from the light phase
  - to form glucose. ✓ (5)
- (12)

**Total Question 3: 40**

## Section C

### Question 4

#### Protein digestion

- Chemical digestion begins in the stomach✓
- Protease is added to break down food✓
- in acidic conditions✓
- Protein digestion is completed in the small intestine✓
- Proteases found in pancreatic and intestinal juices✓
- break the proteins into amino acids ✓ (max 5)

#### Fate of excess amino acids

- Liver✓
- deaminates/breaks down excess amino acids✓
- into urea✓ (max 2)

### Control of high glucose levels

- Islets of Langerhans✓ in the pancreas
- secretes insulin✓
- to lower glucose levels✓
- by promoting the absorption of glucose into cells✓
- and by stimulating the liver✓
- to convert glucose✓
- into glycogen✓
- which is then stored in the liver✓
- Thereby helping to bring glucose levels back to normal✓ (max 7)

### Consequence of the pancreas not being able to control high blood glucose levels

- The pancreas does not secrete enough insulin✓
- Therefore blood glucose level stays high✓
- This results in the person suffering from diabetes✓
- Diabetes can be controlled by taking insulin injections✓ (max 3)

Content 17  
Synthesis 3

[20]

Relevancy	Logical Sequence	Comprehensive
All information provided is relevant to the topic	Ideas are arranged in a logical sequence regarding chemical digestion and control of glucose levels	At least 3/5 for protein(P); 1/2 for role of liver in deamination(A); at least 4/7 for control of glucose(G) levels; 2/3 for diabetes(D)
1	1	1