TOTAL: 150 **TIME: 2½ HOURS**

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 given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 Plants absorb oxygen…

A. Continuously.

B. During the day only.

C. During the night only.

D. During photosynthesis only.

1.1.2 A person who has his gall bladder removed may be expected to have some difficulty in …

A Digestion of fat

B Excretion of urea

C Storage of glycogen

D Absorption of minerals

1.1.3 The gaseous exchange organs of an amoeba, a fish and an earthworm respectively are …

A Lungs, gills and stomata.

B Skin, cell membrane and lungs.

C Spiracles, stomata and skin.

D Cell membrane, gills and skin.

QUESTIONS 1.1.4 to 1.1.6 are based on the cartoon.

1.1.4 Which ONE of the following basic requirements for human survival is produced by the innovate design, as illustrated in the cartoon?

A. Water
B. Antibodies
C. Oxygen
D. Optimum body temperature

1.1.5 The bio-chemical reaction that yields the by-product mentioned in QUESTION 1.1.4 is …

A. Cellular respiration
B. Protein synthesis
C. Transpiration
D. Photosynthesis

1.1.6 Study the following statements:

(i) A light source is provided day and night.

(ii) A steady supply of water is provided.

(iii) The light source is switched off at night.

(iv) A steady supply of carbon dioxide is guaranteed.

Which ONE of the following combinations is designed to make sure that there is a continuous supply of the by-product mentioned in QUESTION 1.1.4, for human survival.

A (i), (ii) (iii) and (iv)

B (i), (ii) and (iv) only

C (i), (ii) and (iii) only

D (i), (iii) and (iv) only

1.1.7 Which of the following processes needs energy from respiration?

A Movement of sugar in the phloem.

B Uptake of carbon dioxide by leaves.

C Absorption of ions by plant roots.

D Absorption of water of plant roots.

1.1.8 $C_6H_{12}O_6 + 6O_2 + ADP + P \rightarrow 6CO_2 + 6H_2O +$ MOLECULE A

The process shown in the equation above begins in the cytoplasm of a cell and ends in the…

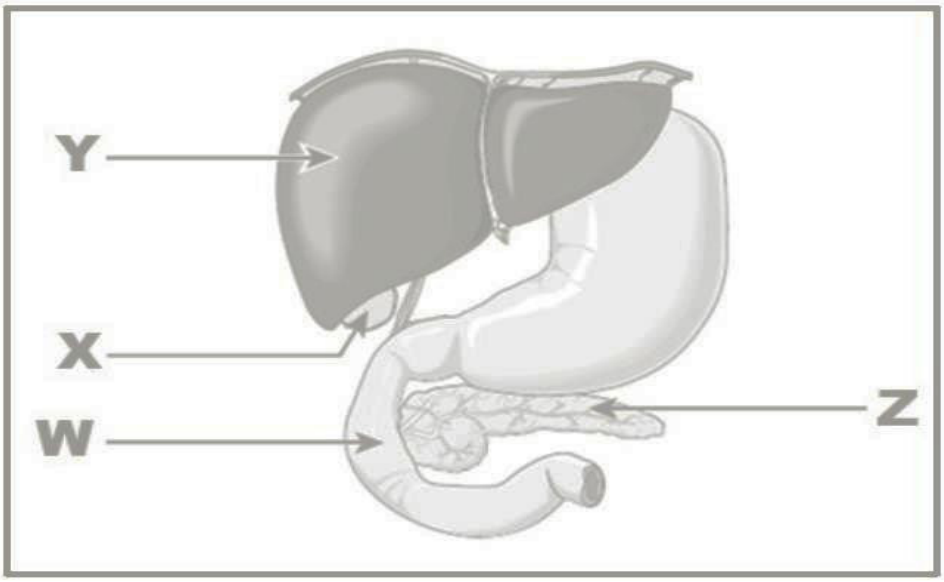
A Cytoplasm.

B Mitochondria.

C Endoplasmic reticulum.

D Lysosome.

1.1.9 Which labelled structure secretes a hormone which causes an increased production of glycogen?



A. W

B. X

C. Y

D. Z

1.1.10 Which of the following combination of symptoms may occur if the body cells receive little glucose?

(i) Wounds that heal slowly.

(ii) Blurred vision

(iii) Blood in urine

(iv) Fatigue and dizziness

A B C DAll of the above (i), (ii) and (iv)

(i), (iii) and (iv)

(i), (ii) and (iii)

(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 1.2.7) in the ANSWER BOOK.

1.2.1 Process used in the production in the production of beer, wine and cheese.

1.2.2 Site of reactions of the dark phase in the chloroplast.

1.2.3 The maintenance of a constant environment in the body.

1.2.4 The death of all members of a particular species.

1.2.5 An important energy carrier in the cell.

1.2.6 The maximum number of individuals that can be accommodated by the resources of a particular habitat.

1.2.7 A chemical substance used to test for the presence of starch in a leaf.

1.2.8 The kind of competition when individuals of the same species living in the same habitat compete for the same food resources.

1.2.9 The double membrane that covers the outer surface of the lungs.

1.2.10 The ejection of solid wastes from the body.

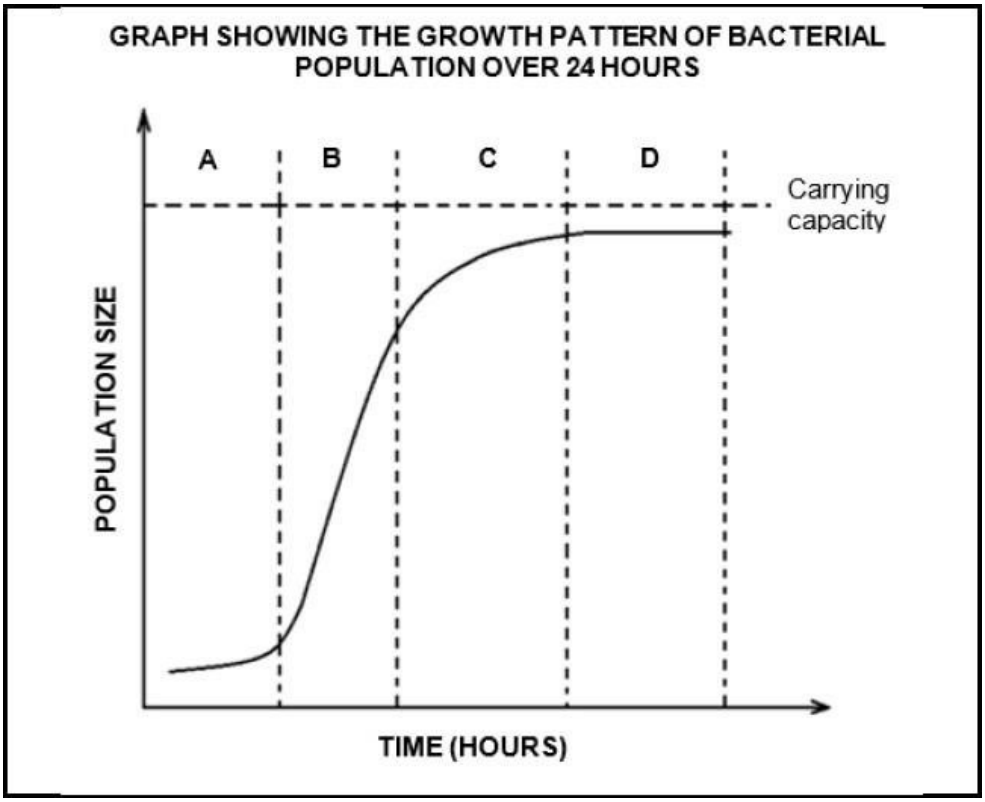
(10x1)(10)

1.3 Indicate whether each of the descriptions 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.

COLUMN I	COLUMN II
1.3.1 Resource partitioning	A. Reduce overlapping of ecological niches B. Increase in biodiversity
1.3.2 Osmoregulation	A. ADH B. TSH
1.3.3 Simple sampling	A. Indirect technique B. Direct technique
1.3.4 Conversion of excess glucose to glycogen	A. Insulin B. Glucagon
1.3.5 The average number of children born in one generation per female of child bearing age.	A. Fertility B. Fecundity

(5 x 2) (10)

1.4 The graph below shows the growth pattern of a bacterial population in a petri dish over 24 hours.



1.4.1 Identify the growth pattern illustrated in the above graph.

1.4.2 Name the phases A-D

1.4.3 During which phase:

(a) Does natality equal mortality? (1)

(b) Is population growth the fastest? (1)

(c) Does natality exceed mortality to the greatest extent? (1)

(d) Does environmental resistance come into effect? (1)

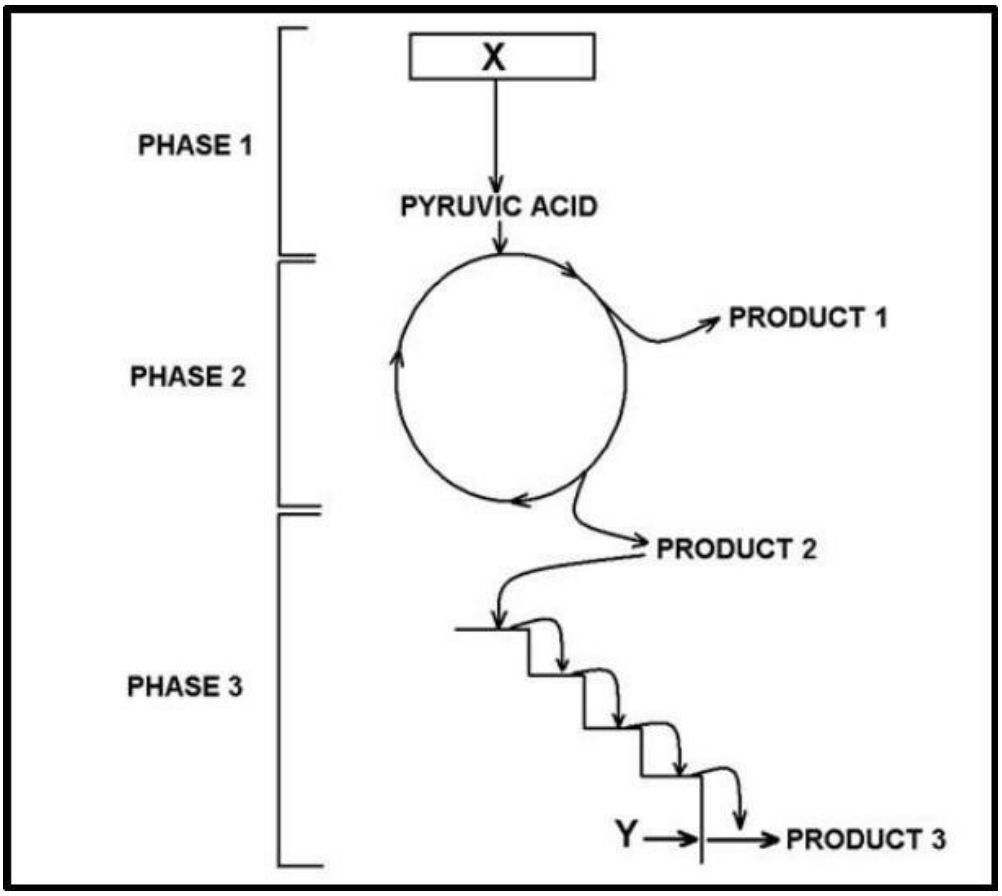
1.4.4 Which phase is not shown in this diagram? (1)

[10]

TOTAL SECTION A:50

SECTION B
QUESTION 2

2.1 The diagram below represents aerobic respiration in humans. Study the diagram and answer the questions.



2.1.1 Identify phases **1**, **2** and **3**. (3)

2.1.2 Name **X** and **Y**. (2)

2.1.3 State the origin of **X** and **Y**. (2)

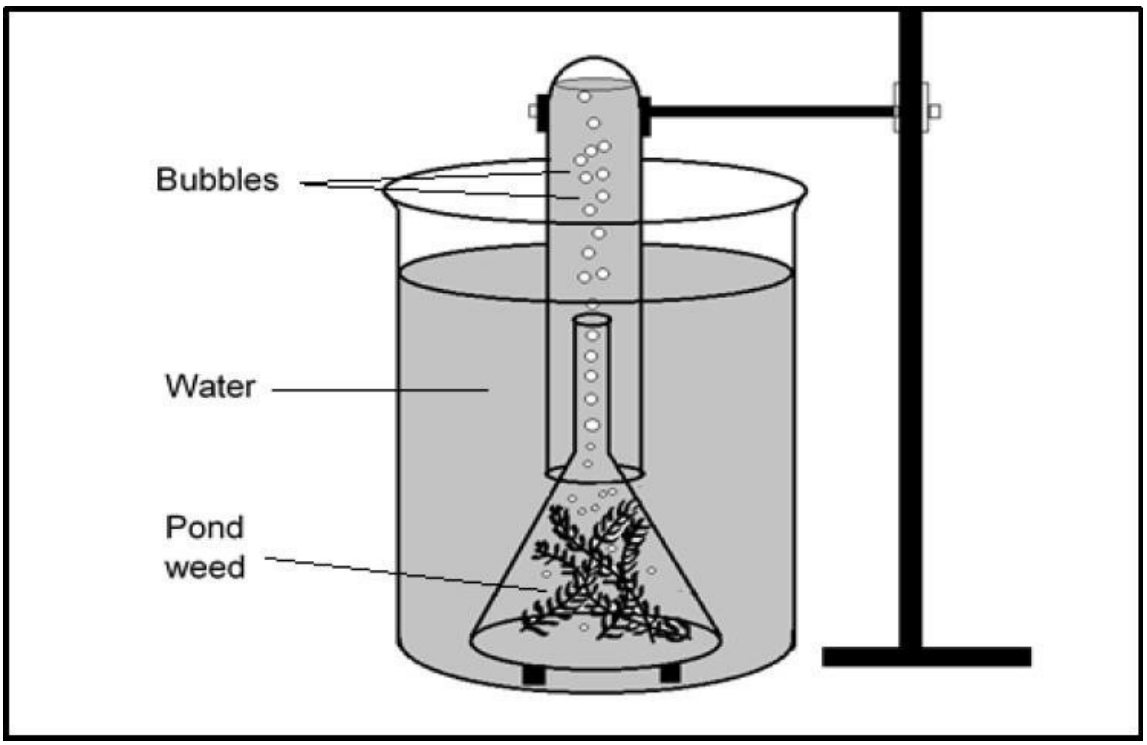
2.1.4 Identify products **1**, **2** and **3**. (3)

[10]

2.2 When light shines on pondweed, Elodea sp, bubbles of gas are released. The rate at which bubbles of gas are produced can be used to measure the rate of photosynthesis. An investigation was carried out to study the effect of different colours of light on the rate of photosynthesis in the pondweed.

The apparatus was set up as shown in the diagram below.

- The pondweed was exposed to one colour of light and left for 5 minutes before measurements were taken.
- The time taken for the release of 20 bubbles was recorded.
- The procedure was repeated using light of different colours but of same intensity.
- The measurements are given in the table below.



Colour of light	Time (in seconds) for bubbles to form
Violet	80
Green	40
Blue	160
Red	140
Yellow	70

2.2.1 Which colour of light is the best for photosynthesis? (1)

2.2.2 Name the:

(a) Independent variable (1)

(b) Dependent variable (1)

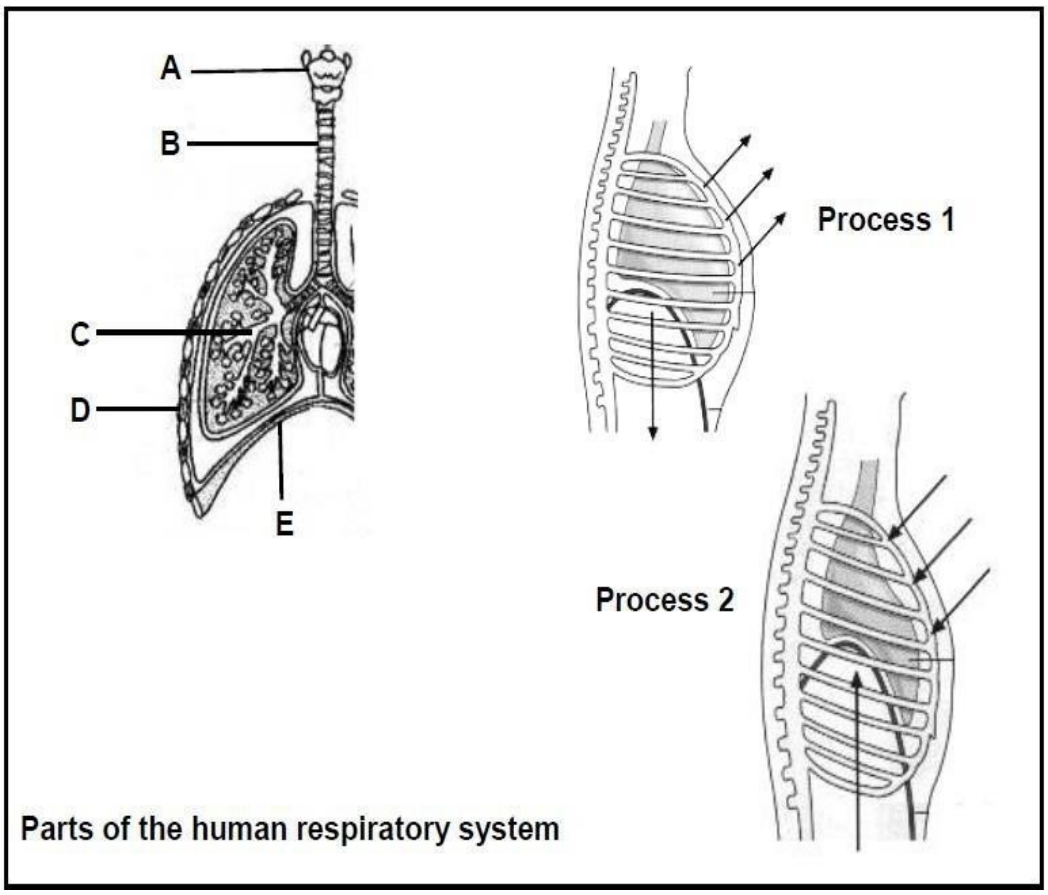
(c) Two constant variables (2)

2.2.4 What can be done to increase the levels of carbon dioxide in the investigation? (1)

2.2.3 Draw a bar graph of the results shown in the table. (6)

[12]

2.3 Study the diagrams below showing some parts of the human respiratory system. Answer the questions that follow.



2.3.1 Identify parts A, B, C and E. (4)

2.3.2 Which process in the above diagrams illustrates inhalation (Process 1 or Process 2)? (1)

2.3.3 Give TWO reasons from the diagrams to support your answer to QUESTION 2.3.2. (2)

2.3.4 Use the LETTERS and the NAMES of the muscles shown in the diagram that are involved during inhalation. (4)

2.3.5 Draw and label a diagram showing gaseous exchange across an alveolus. Use arrows to show the direction of gas movement (5)

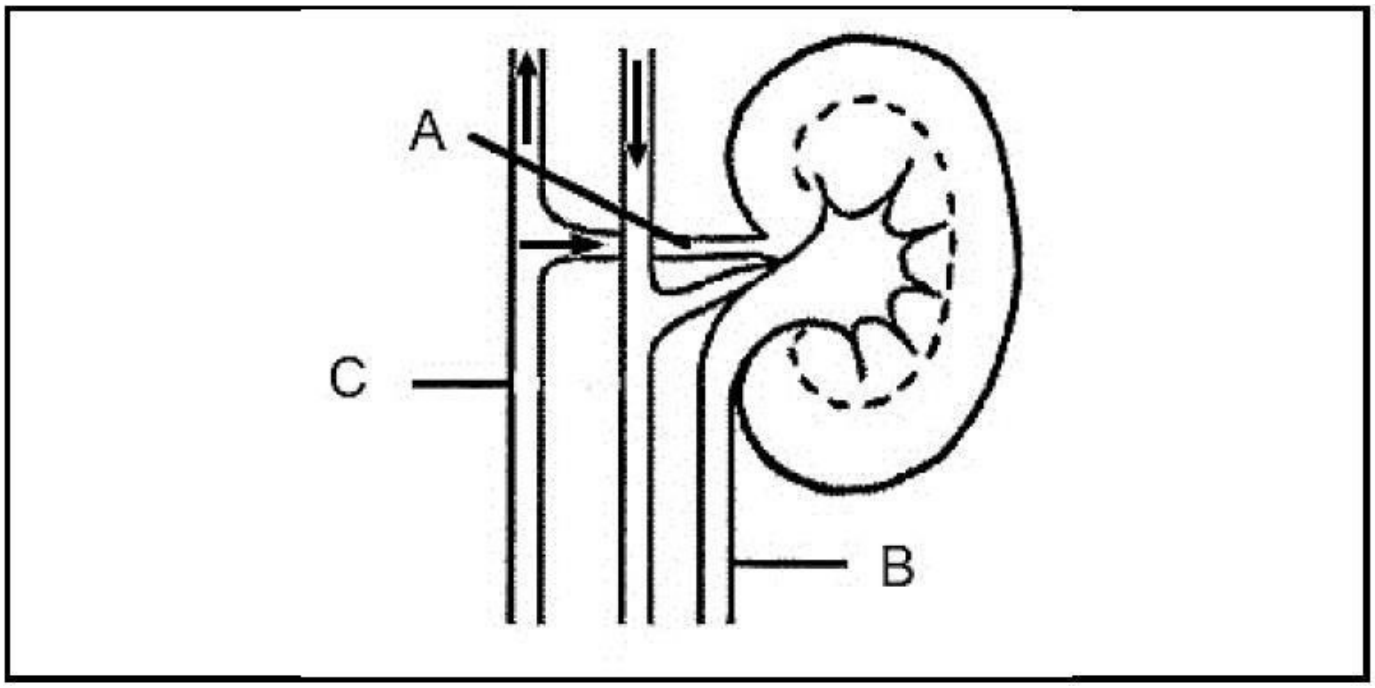
2.3.6 A person's thoracic wall is punctured during a motor vehicle accident. Explain how this injury will affect the breathing process. (2)

[18]

TOTAL QUESTION 2: [40]

QUESTION 3

3.1 The accompanying diagram shows part of the excretory system of the human body. Study the diagram and the table below before answering the questions that follow.



The table below is showing the composition of fluid in Structure A and Structure B of the diagram.

	Structure A	**Structure B**
Component	Concentration (%)	Concentration (%)
Urea	3	200
Glucose	10	0
Amino acids	5	0
Salts	72	150
Proteins	800	0

3.1.1 Identify the labels marked A, B and C. (3)

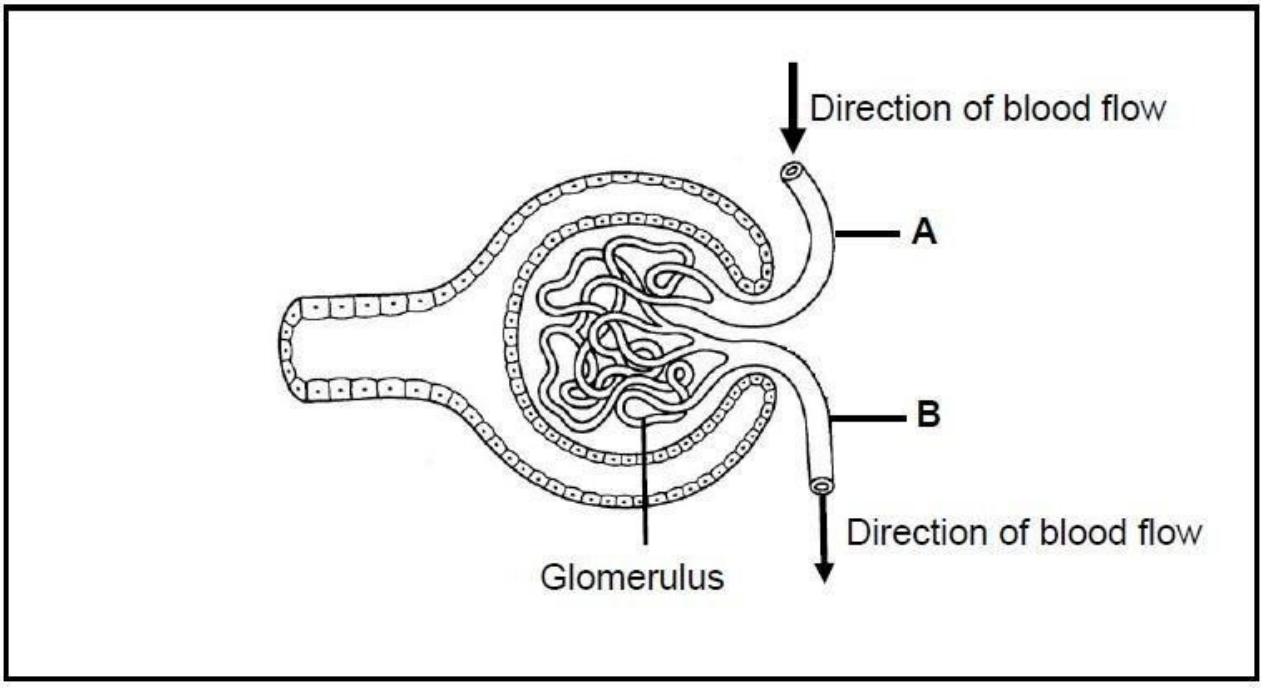
3.1.2 By Comparing the contents of structures A and B, what conclusion can be drawn regarding the functions of the kidney? (1)

3.1.3 Would you consider that the person with the medical report shown above suffers from diabetes mellitus? Explain your answer. (4)

3.1.4 Which organic substances in the table are considered to be useful? Give a reason for your answer. (4)

[12]

3.2 Study the representation of a part of a nephron.



3.2.1 Identify the represented part of the nephron shown. (1)

3.2.2 Name the parts labelled A and B. (2)

3.2.3 Explain why the above diagram does not accurately represent one of the structural adaptations for the process taking place in it. (3)

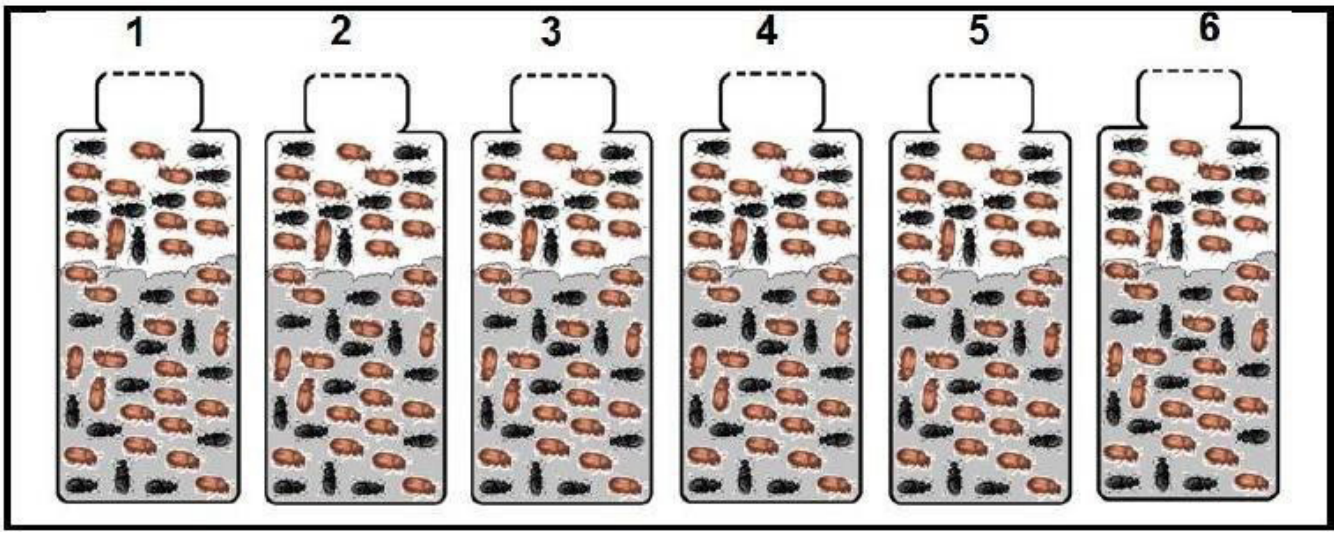
[6]

3.3 Learners at a certain school conducted an investigation to study the communal interaction between two different species in a particular ecological niche.

The investigation was set up as follows:

- Populations of two different species of Tribolium (a flour beetle) were kept in six different bottles of flour numbered 1-6 as shown in the diagram below. (The bottles of flour served as food and habitat).
- Each bottle contained approximately 100 beetles of each species.
- Each bottle was kept under different temperatures and humidity conditions.
- After a period of time, the number of each species surviving in each of the bottles was determined and the results were recorded.

The table below shows the results of the investigation.



Bottle	Temperature (°C)	Relative humidity (in %)	No. of T. castaneum surviving	No. of T. confusum surviving
1	34	70	100	0
2	34	30	10	90
3	29	70	86	14
4	29	30	13	87
5	24	70	29	70
6	24	30	0	100

3.3.1 Define the following terms:

(a) Community (2)

(b) Ecological niche (2)

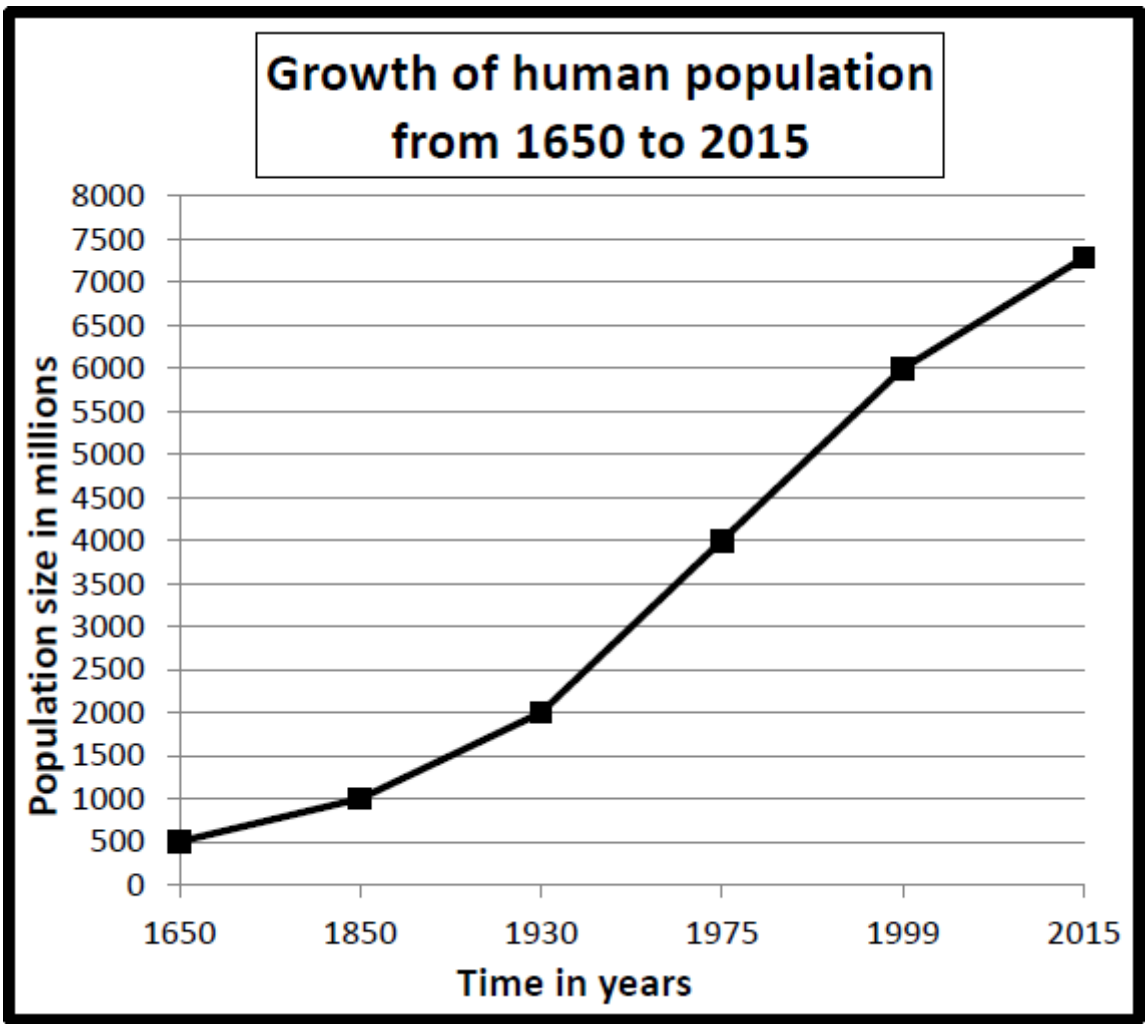
3.3.2 Which one of the species is more tolerant to low temperature and low humidity? State a reason for your answer. (2)

3.3.3 Are the factors being investigated density-dependent and density-independent? (2)

3.3.4 From the above results, what deduction can be made with regards to the type of competition which has occurred? (1)

[9]

3.4Study the graph showing the growth of human population and answer questions:



3.4.1 What kind of growth form is followed by the humans?

3.4.2 Which phase of growth form mentioned in the above question i represented from 1930 to 1999?

3.4.3 Explain why the stage of population growth depicted from 1930 to 1999 ha occurred.

3.4.4 Give any TWO reasons for the slow population growth from 1999 to 2015.

3.4.5 Read the extract below and answer questions.

Current global population of over 7 billion is already two to three times higher than the sustainable level. Several recent studies show that Earth's resources are enough to sustain only about 2 billion people at a European standard of living.

(a) Predict the fate of humans if the current trend of population growth is sustained without check.

(b) Suggest a practical solution to reduce the accelerated growth of human population.

3.5 Mention one way in which chloroplast is structurally adapted to perform it function. (2)

TOTAL QUESTION 3:[40]

TOTAL SECTION B:80

SECTION C
QUESTION 4

Write a short essay to explain the homeostatic control of glucose in the human body. Briefly discuss the symptoms and management of the resultant chronic conditions that develop due to a dysfunctional system.

Content: (17)

Synthesis: (3)

(20)

NOTE:NO marks will be awarded for answers in the form of tables, flow charts or diagrams.

TOTAL SECTION C: 20

GRAND TOTAL: 150