P530/2
BIOLOGY
(Theory)
PAPER 2
July/August 2018
$2^1/_2$ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

BIOLOGY

(Theory)

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *This paper consists of sections,* **A** *and* **B.**
- *Answer question* **one** *in section* **A** *plus* **three** *other questions from section* **B.**
- *Any additional question(s) answered will* **not** *be marked.*
- *Candidates are advised to read the questions carefully, organize their answers and present them precisely and logically.*
- *Illustrate with well labelled diagrams, wherever necessary.*

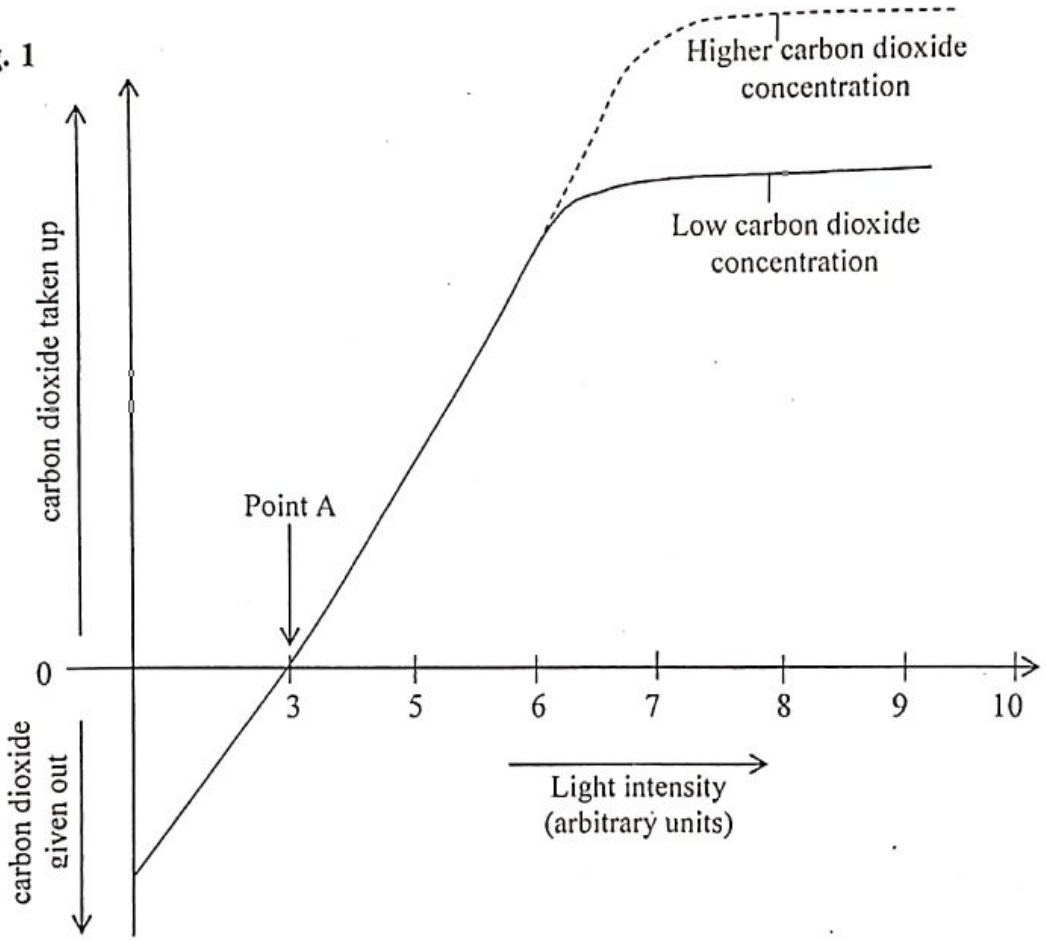
Turn Over

SECTION A (40 MARKS)

COMPULSORY QUESTION

1. The graph in figure 1 below represents the rate of photosynthesis as measured by amount of carbon dioxide exchanged at low carbondixide concentration and at higher carbon dioxide concentration with varying light intensity. Study it and use it to answer the question that follows.

Fig. 1



(a) (i) Describe the rate of photosynthesis at low carbondixide concentration (08mark)

(ii) Explain your description above. (12marks)

(b) Give any one difference between higher carbondioxide concentration and low carbondixide concentration. (01 mark)

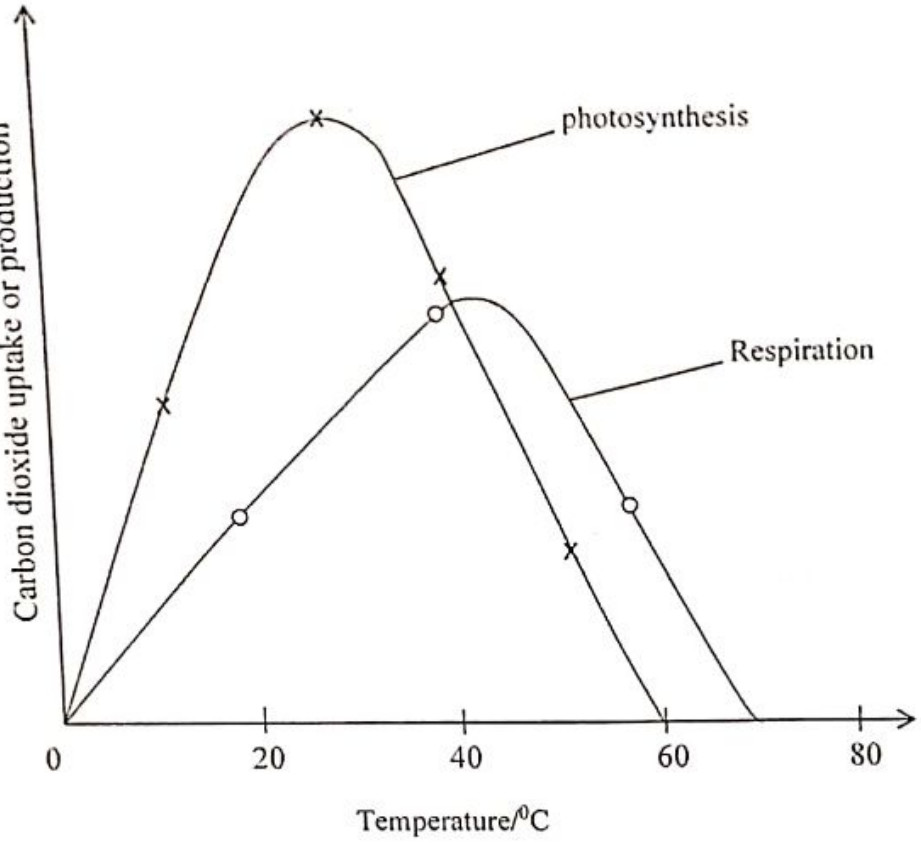
(c) Use the graph above to explain why envoronmentalists recommend afforestation to reduce global warming. (04marks)

(d) (i) Name point marked A on the graph and explain what occurs at this point. (02mark)

(ii) Suggest and explain what would happen to a point A if instead a shade plant was used. (03marks)

(c) Figure 2 below is a graph showing the effect of temperature on the rate of photosynthesis and respiration in well illuminated leaves. (light and other variables kept constant)

Fig. 2



(i) Compare the effect of temperature on the rate of photosynthesis and respiration. (05marks)

(ii) Suggest a possible reason why the rate of respiration is less affected by temperatures above 40^0C than the rate of photosynthesis. (03marks)

(iii) What would be the effect of rise in temperatures on the rate of photosynthesis if the intensity of light falling on the leaf was very low. (03marks)

SECTION B (60 MARKS)

Answer three questions from this section.

2. a) How are the following tissues adapted to their functions. (08marks)

(i) Phloem tissue.

(ii) Xylem tissue.

b) (i) Define blood pressure. (02marks)

(ii) Describe the cause of pressure in blood vessels and how it changes in different parts during circulation. (10marks)

3. (a) Describe behavior of chromosomes during the cell cycle involving mitotic cell division. (09marks)

(b) Explain how the following contribute to variation among organism: (11marks)
(i) independent assortment.
(ii) crossing over.

4. (a) Describe with aid of diagrams how each of the following types of movement occurs;
(i) Ciliary movement. (08marks)
(ii) Amoeboid movement. (08marks)

(b) What is the importance of ciliary and amoeboid movements in humans? (04marks)

5. (a) Suggest the various ways in which synaptic transmission improves efficiency of the nervous system. (08marks)

(b) Explain the factors that control the rate of impulse transmission along the axon of a sensory neurone. (12marks)

6. (a) Describe the mutalistic relationships that exist among marine organisms and state how each organism benefits. (13marks)

(b) Outline plants are adapted to overcome water stress. (07marks)

END

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- *Answer question* **one** *in section* **A** *plus* **three** *other questions from section* **B.**
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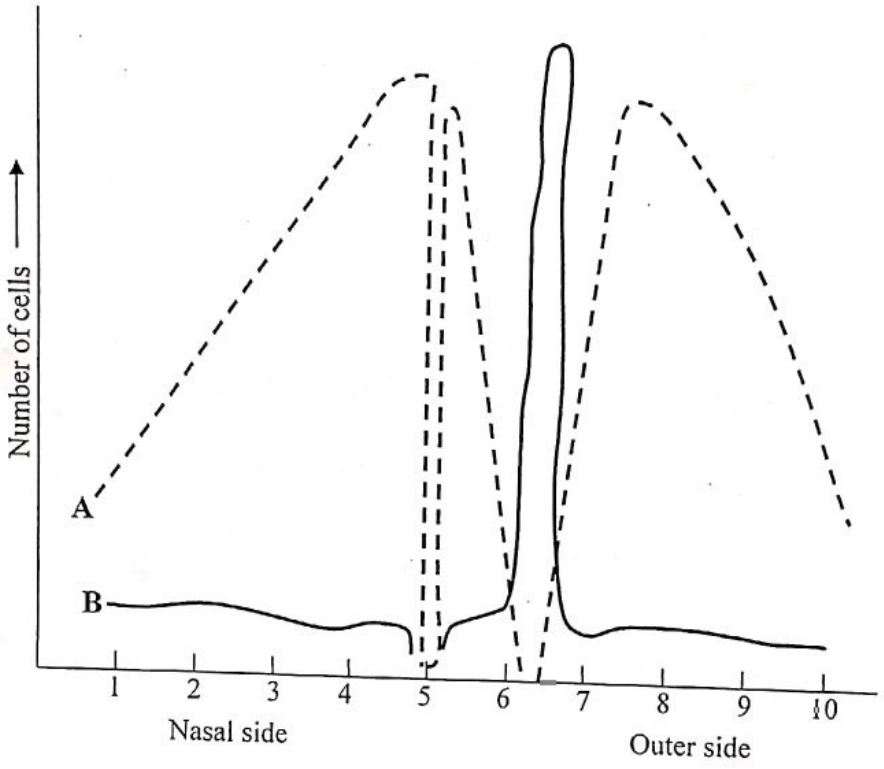
Turn Over

SECTION A: (40 MARKS)

1A

The graph below shows the number of receptor cells (type A and B) in arbitrary units in the human retina along a horizontal line from the nasal side of the eye to the outer side.



(a) (i) Giving reasons, identify the types of receptor cells represented by A and B. (02marks)

(ii) Explain why there are no receptor cells at position 5. (04 marks)

(iii) What is the name of the region of the retina at position 6.3. Give a reason for your answer. (01 mark)

(b) Explain why;

(i) the greatest concentration of receptor cells of type B occurs at position 6.3. (03 marks)

(ii) on entering a dimly-lit room, objects in the room at first are invisible but gradually become visible. (09 marks)

(iii) in a dimly-lit room, objects are only visible in black and white colour? (02 marks)

(c) (i) From the graph, identify and describe the features of the receptor cells which allow colour vision. (04 marks)

(ii) The flowers of three species of a plant are similar in form and appear to have yellow colours of petals. When photographed in ultraviolet light, each species shows a different pattern on its petals. Using this information, explain how bees are able to distinguish between the flowers of the three species, but not humans. (05 marks)

1B.

A theory of colour vision suggests that a photoreceptor has pigment that exists in three forms namely – red, blue and green according to the colour of wave length absorbed by each. The absorption of different waves lengths by the three forms of photoreceptor pigments is given in the table below. Study the information given and answer the questions that follow:

Wave lengths (nm)	**Amount of light absorbed as a percentage of maximum**		
	Red cones	Green cones	Blue cones
660	5	0	0
600	75	15	0
570	100	45	0
550	85	85	0
530	60	100	10
500	35	75	30
460	0	20	75
430	0	0	100
400	0	0	30

(a) From the data, explain why light of wave length:-

(i) 430nm appears blue. (02 marks)

(ii) 550nm appears yellow. (02 marks)

(iii) 570nm appears Orange. (02 marks)

(b) Explain why two closely placed small objects can be easily distinguished by cones than rods. (04 marks)

Turn Over

SECTION B (60 MARKS)

2. (a) Respectively, describe the formation and synthesis of:
   (i) Polynucleotide (5 marks)
   (ii) Polypeptide. (10 marks)

   (b) Suggest evidence that DNA is hereditary material. (5 marks)

3. Describe the;
   (a) role of the pancreas in the digestion of food and metabolism of the absorbed products. (09 marks)
   (b) control of digestive juice secretion along the alimentary canal in humans. (11 marks)

4. (a) Explain the different ways by which a flowering plant obtain nutrients and water from the soil. (10 marks)

   (b) Describe the pathway and mechanisms by which water from the roots of a plant reach the atmosphere. (10 marks)

5. (a) Give an account of how the different human activities have resulted into poor quality of air and water. (10 marks)
   (b) Describe the ecological impact of organic pollution on fresh water bodies. (10 marks)

6. (a) Distinguish between the following responses:-
   (i) Tropic and reflex. (5 marks)
   (ii) Instinctive and learned. (6 marks)

   (b) Describe the sequence of events involved in stimulation and contraction of a skeletal muscle. (9 marks)

END

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Turn Over

SECTION A: COMPULSORY QUESTION (40 MARKS)

1. The data below was obtained from experiments using plant materials treated as shown below:

Fig I. shows rate of uptake of potassium ions in carrot discs which were transferred from pure water to potassium chloride solution. Potassium cyanide was then added to the solution after 90minutes duration of the experiment.

Figure I:

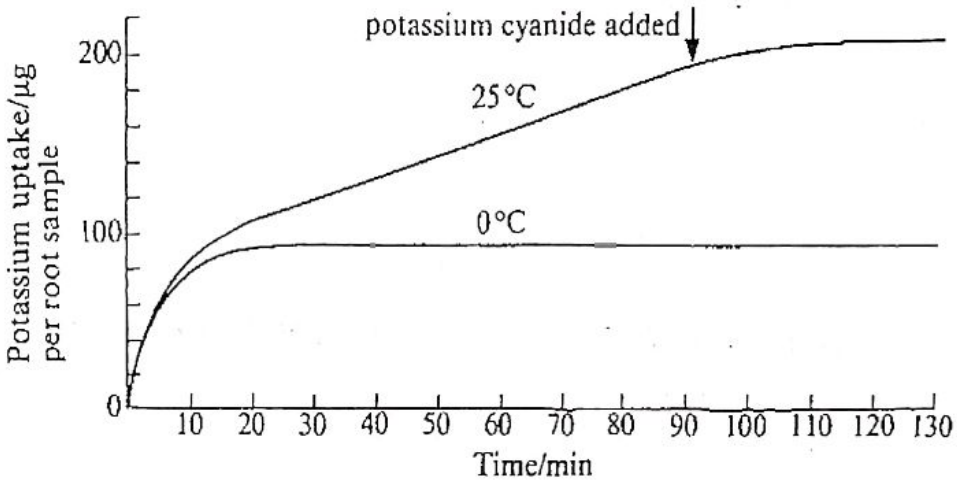
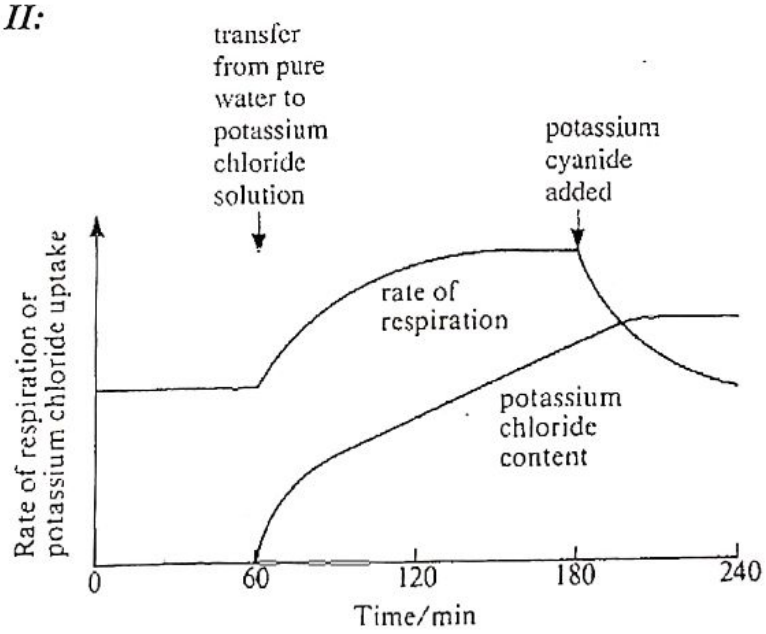


Figure II: shows the rate of respiration and uptake of Potassium ions by young cereal roots. The roots had previously been thoroughly washed in pure water and transferred to potassium chloride solution after 60minutes. Potassium cyanide was added to the solution after 180minutes.

Figure II:



Study the two figures and answer the questions that follow:

a) i) Compare the uptake of potassium ions at O°C and 25°C in figure. I *(06marks)*

ii) Account for the observed difference in active uptake of potassium ions at the given temperatures. *(06marks)*

iii) Suggest a reason why the cereal roots were washed before placing them in a solution containing potassium ions. *(01mark)*

b) With reference to Figure II above,

i) Describe and explain the observed trend in rate of respiration before addition of potassium cyanide. *(10marks)*

ii) Account for the rate of respiration. *(07marks)*

c) State the **two** main mechanisms of uptake of mineral salts by plants and give three differences between them. *(04marks)*

d) Apart from the factors shown in Figures I and II, state and explain **three** other factors that affect the rate of mineral uptake by plants. *(06marks)*

SECTION B:

Answer **three** questions (60marks)

2. a) Describe the influence of light on plant processes. *(08marks)*

b) Outline the events that contribute to the formation of reproductive cells in dichotyledonous plants. *(12marks)*

3. a) What are the peculiar features of a species? *(05marks)*

b) Explain how humans have benefited from their role in species formation. *(04marks)*

c) Discuss the advantages and disadvantages of small and big size in animals. *(11marks)*

4. a) Describe the structure and function of the locomotory structure in Paramecium. *(08marks)*

b) State the advantages of the use of electron microscope over the light microscope. *(04marks)*

c) With reference to the fluid Mosaic model of membranes, account for the different mechanisms for transport of substances across membranes. *(08marks)*

5. a) Explain why enzymes are essential in biotic systems? *(04marks)*

b) Giving examples, describe how control of enzyme activity in cells is achieved. *(16marks)*

6. a) Relate the structure of a leaf to its functions. *(08marks)*

b) i) Describe the series of events which occur in C_4 plants in absence of light. *(08marks)*

ii) Outline four advantages of C_4 over C_3 photosynthesis. *(04marks)*

END

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Paper 2

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INSTRUCTIONS TO CANDIDATES:

- *Answer question* **one** *in section* **A** *plus* **three** *other questions from section* **B.**
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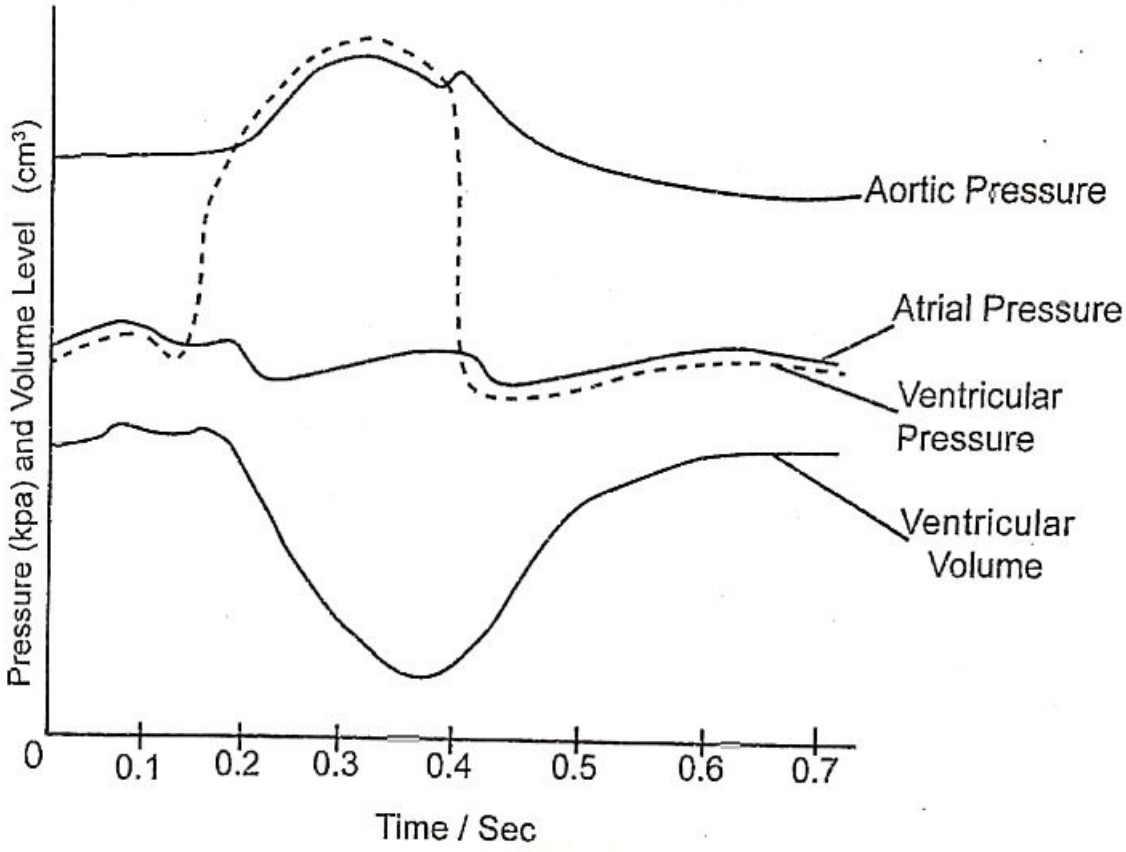
- *Illustrate with diagrams, whenever necessary.*

SECTION A (40 MARKS)

1. The figure below shows the pressure and volume changes that occur during the mammalian cardiac cycle (of dog). The pressure changes were measured in the left atrium and ventricle, and the aorta. Volume changes were measured for both ventricles.
Study the information and use it to answer the questions that follow.



a) Describe the changes in;

i) Atrial pressure *(08 marks)*

ii) Ventricular pressure *(08 marks)*

b) Compare the changes in ventricular pressure and ventricular volume between 0.1sec and 0.5sec. *(05 marks)*

c) Explain the effect of the changes in atrial, aortic and ventricular pressures to blood flow during the cardiac cycle. *(10 marks)*

d) State the significance of the relationship between Aortic and ventricular pressures. *(07marks)*

e) State **two** factors that ensure efficient flow of blood within the mammalian heart. *(02marks)*

SECTION B (60 MARKS)

2. a) i) Describe the path of a carbon atom into a photosynthetic cell in a leaf of a C_3 plant. *(04marks)*

ii) Outline the events that are involved in incorporating the above carbon atom into a named polysaccharide. *(06marks)*

b) Explain the effect of altitude on the distribution of C_3 and C_4 plants in a given habitat. *(10marks)*

3. a) Explain how the following buffer systems operate to bring about an acid-base balance in the body.

i) Phosphate buffer system *(06marks)*

ii) Protein buffer system *(06marks)*

b) i) State three important ways by which the body defends against pathogens. *(03marks)*

ii) Explain the process of inflammation at a wounded region, taking into account its cardinal signs. *(05marks)*

4. a) Describe the structure of a skeletal muscle. *(04marks)*

b) Explain the following processes that occur in skeletal muscles to cause movement;

i) Excitation *(07marks)*

ii) Contraction *(09marks)*

5. a) What is photoperiodism? *(02marks)*

b) Explain the effects of light and dark conditions on the process of flowering in;

i) Short day plants *(08marks)*

ii) Long day plants *(08marks)*

c) Explain the effect of interrupting a short day plant with a flash of red light at night during flowering. *(02marks)*

6. a) Explain the significance of the following in evolutionary study.

i) Comparative anatomy *(07marks)*

ii) Comparative serology *(03marks)*

b) How does the concept of development and distribution of Darwin's finches at Galapagos Island explain evolution? *(10marks)*

END

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Paper 2

2 hours 30 minutes

NSTRUCTIONS TO CANDIDATES:

Answer question **ONE** in section **A** plus **THREE** questions in section **B**

Turn Over

SECTION A (40 MARKS)

1. In an experiment, two species of protozoan A and B were exposed to dilutions of sea water for one hour and the number of vacuolar contractions counted.
The following results were obtained.

Concentration of sea water (%)	Number of Vacuolar contractions per hour	
	Species A	Species B
100	0	0
80	0	0
65	0	0
50	6	0
35	20	25
25	42	45
20	56	58
15	64	65
10	63	74
5	20	82
0	22	90

a) Represent the information above on the same graph. (15mks)

b) Account for the effect of concentration of sea water on the vacuolar contractions per hour in species:
i) A (14mks)
ii) B (04mks)

c) State **one** advantage species A has over species B. (02mks)

d) Suggest an explanation for what would happen in another experiment where small quantities of mercury were added to the 15% sea water concentration containing the specimens. (05mks)

SECTION B (60 MARKS)

2. a) Describe the mechanism of heart excitation and contraction. (07 mks)

   b) How does retinal – convergence increase sensitivity? (05 mks)

   c) Outline the effects of gibberellins to plants. (08 mks)

3. a) Describe the mechanisms in flowers which favour,
   i) Inbreeding (03 mks)
   ii) Out breeding (03 mks)

   b) State the genetical consequencies of inbreeding and out breeding in flowering plants. (08 mks)

   c) Discuss the importance of hereditary and environmental factors in growth and development of organisms. (06 mks)

4. a) Explain the lack of vascular system in specific organisms. ($10^1/_2$ mks)

   b) How is blood flow maintained in mammals? (07 mks)

   c) State the advantage of a double circulatory system over a single circulatory system. ($12^1/_2$ mks)

5. a) Give an account of the changes that occur in the nucleus of an animal cell during meiosis I. ($12^1/_2$ mks)
   b) State the significance of interphase stage to a dividing cell. ($07^1/_2$ mks)

6. a) State the advantages of complete metamorphosis over incomplete metamorphosis. (03 mks)

   b) Account for the physiological changes that occur during pregnancy up to lactation. (17 mks)

END

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BIOLOGY
Paper 2
2 hours 30 minutes

INSTRUCTIONS

- *Answer question **ONE** and any other **THREE** from section **B**.*
- *Marks shall **NOT** be awarded for non-scientific and illogical answers.*
- *Start every question on a fresh page.*

SECTION A

1. a) Five small discs, cut from spinach leaves, were floated on a small volume of buffered bicarbonate solution in 5 separate flasks. Each flask was attached to a respirometer to measure the changes in the air as a result of oxygen release or uptake. The discs in the setups were first exposed to bright light, then dim light and finally left in the dark. The release of oxygen was recorded as positive values and uptake of oxygen as negative values. The average volumes were then recorded. The results obtained for intervals of time in minutes were recorded in the table below:-

Light intensity	**Time interval/ minutes**	**O2 uptake or release per 3minutes interval**
BRIGHT LIGHT	0 – 3	+57
	3 – 6	+64
	6 – 9	+58
	9 – 12	+60
DIM LIGHT	12 – 15	+16
	15 – 18	+03
DARKNESS	18 – 21	-16
	21 – 24	-12
	24 – 27	-15
	27 – 30	-14

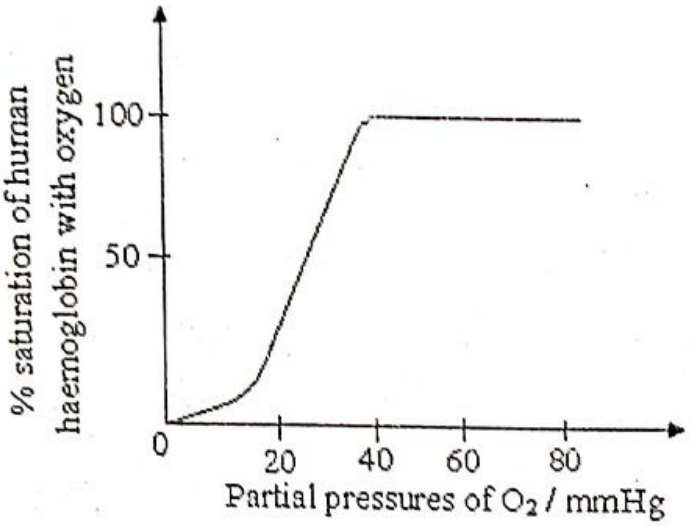
i) Present the data in a suitable graph form. (5 ½ marks)

ii) Calculate the mean rate of oxygen release in bright light. (2 ½ marks)

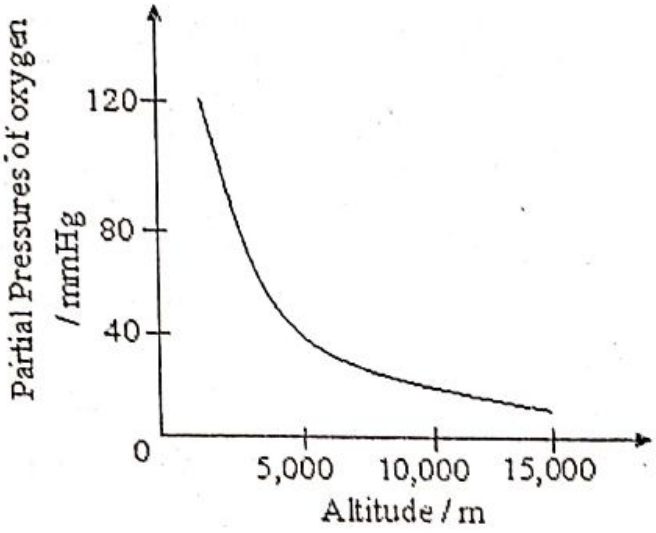
iii) Explain the significance of the results obtained from the experiment/ investigation (10marks)

b) Graph 1 below shows the percentage of haemoglobin in blood associated with oxygen to form oxyhaemoglobin over a range of partial pressures of oxygen. Graph 2 below, shows the relationship between altitude and partial pressures of oxygen.

Graph 1



Graph 2



i) Using the information given on both graphs, explain why most people who are not acclamatised to living at high attitude will lose consciousness at altitudes between 6,000 and 8,000metres. (11marks)

ii) Permanent human habitations occur up to approximately 7,000metres and people who are acclimatized to high altitudes can survive for a few hours when breathing

air at about 9,000metres. Suggest three adjustments which probably occur in the physiology for such acclimatized people. (04 marks)

iii) Explain the physiological adjustments you have suggested above. (04 marks)

iv) By referring only to general principles, explain the role of oxygen in energy release. (03 marks)

SECTION B

2. a) What is the importance of control of osmotic potential in animals? (02 marks)

   b) Describe the methods by which sodium ions and water content of the body is regulated in;

   i) Mammals (12 marks)

   ii) Fresh water fish (6 marks)

3. By means of labeled annotated diagrams, show the differences between the following pairs of cells and tissues.

   a) Sclerenchyma and Collenchyma (8marks)

   b) Phloem and Xylem (12marks)

4. a) Give an account of the chemical nature and variety of carbohydrates. (10marks)

   b) Outline the role of carbohydrates in the life of a plant. (10 marks)

5. a) i) What is meant by the term ecosystem? (02 marks)

   ii) Give an outline of the biotic components of an ecosystem. (6marks)

   b) Outline how the variety of the biotic component can be conserved in a terrestrial environment. (12 marks)

6. Discuss the mechanisms by which a new species may arise and a species become extinct. (20marks)

END