O-LEVEL BIOLOGY Qn. 31 SAMPLE QUESTIONS:

1. The table below shows the effect of temperature on the activity of amylase on starch. Six test tubes, each containing a mixture of starch and amylase were placed in water baths maintained at 0^oC, 10^oC, 20^oC, 30^oC, 40^oC and 50^oC, and allowed to stand. Study the table and answer the questions that follow.

Test tube	**Temperature (^oC)**	**Time taken for starch to be hydrolyzed (minutes)**
1	0	Starch still present after 60 minutes
2	10	22
3	20	11
4	30	5
5	40	3.5
6	50	Starch still present after 60 minutes

a) How does temperature affect the action of amylase? (***2mks***)

b) Give one reason in each case for the results obtained in the test tubes kept at
   (i) O^oC (***1mk***)
   (ii) 30^oC (***1mk***)
   (iii)50^oC (***1mk***)

c) Suggest the time it would take amylase to hydrolyse starch if the temperature was kept at O^oC. (***2mks***)

d) Suggest with a reason what would happen to starch when the test tube at O^oC and 50^oC were transferred to a water bath at 30^oC.
   (i) Test tube from O^oC. (***2mks***)
   (ii) Test tube from 50^oC. (***2mks***)

e) Describe the test you would carry out to determine the substance into which starch has been hydrolysed and write the possible observation.
   (i) Description of the test (***2mks***)
   (ii) Possible observation (***2mks***)

2. Students of S.3 carried out an experiment to investigate the effect of temperature on the rate of an enzyme catalyzed reaction. The results which were obtained are as given in the table below.

Temperature (^oC)	Rate of reaction (mg of products per minute)
0	0
5	0.3
10	0.4
15	0.6
20	0.8
25	1.0
30	1.2
35	1.6
40	1.6
45	1.2
50	0.6
55	0.3
60	0

a) Draw a graph to represent the above given data. ***(10mks)***

b) What was the rate of reaction when the temperature was 18^oC ***(2mks)***

c) From the graph, explain the effect of temperature on the enzyme activity.(***3mks)***

d) What is the optimum range of temperature needed by the enzyme? ***(1mk)***

e) Mention any other four factors which affect enzyme activity. ***(4mks)***

3. The table below shows the changes in dry mass of germinating seeds.

Time (days)	0	2	4	6	8	10	11
Dry mass (g)	9.4	9.0	8.4	7.6	7.9	11.0	14.5

a) Represent this data in a graph form on the graph paper. ***(8mks)***

b) i) What is the dry mass of the germinating seeds on the 3^{rd} day? ***(1mk)***

ii) On which day is the dry mass of the germinating seedlings the same as that of the seeds? ***(1mk)***

c) Explain the:

i) Decrease in dry mass of the germinating seeds. ***(3mks)***

ii) Final increase in their dry mass. ***(4mks)***

d) Explain what would happen to the dry mass of the seedlings if they were kept in the dark. ***(3mks)***

4. An experiment was performed to find out how fast a plant photosynthesized as the concentration of carbon dioxide in the air around it was varied. The results were as follows given in the table below.

CO_2 concentration by volume (%)	Rate of photosynthesis (in arbitrary units)	
	Low light intensity	High light intensity
0	0	0
0.02	20	33
0.04	29	53
0.06	35	68
0.08	39	79
0.10	42	86
0.12	45	89
0.14	46	90
0.16	6	90
0.18	46	90
0.20	46	90

a) Plot the results on the same set of axes on a graph paper. ***(8mks)***

b) What is the CO_2 concentration in normal air? ***(2mks)***

c) What is the rate of photosynthesis at this CO_2 concentration in high light intensity? (***2mks***)

d) Describe the shape of the curve for the rate of photosynthesis at low light intensity. (***3mks***)

e) Give an explanation for the shape of the curve described in (d) above. (***2mks***)

f) What is the relationship between light intensity and the rate of photosynthesis? (***1mk***)

g) i) What is the role of water during photosynthesis? (***1mk***)

ii) Mention one other external factor which affect the rate of photosynthesis. (***1mk***)

5. a) Giving examples in each case, explain the following. (***6mks***)

i. parasitism

ii. symbiosis

iii. commensalisms

b) During an ecological study at Kasese, the following data was obtained.

Type of organism	Number
Kite	2
Locust	Many
Snakes	40
Grass plants	Very many
Chameleon	100

Use the data in the table to answer the questions that follow.

i. Draw an ecological pyramid to represent the data. ***(2mks)***

ii. Name the trophic levels on the pyramid. ***(2mks)***

iii. Draw a food chain to show the feeding relationship between the organisms.(***2mks***)

iii. Describe what would happen if all the chameleons died. (***4mks***)

c) In the same area, other organisms were caught the following day and these included toads, rats and termites. Using this information and that in the table, name and draw a suitable diagram to show the feeding relationship that exists in that ecosystem. (***4mks***)

6. The table below shows the percentage composition of inhaled and exhaled air, in a human being at rest and also during exercise. Use the information in the table to answer questions that follow.

	Water vapour	Nitrogen	Carbondioxide	Oxygen
Inhaled air at rest	Variable	79%	0.03%	20.96%
Exhaled air at rest	0.8%	79%	4.1%	16.2%
Exhaled air during exercise	0.92%	79%	4.5%	15.58%

(a) State the differences in composition between in haled air and exhaled air at rest. ***3mks***

(b) Give a reason for each difference stated in (a) above. ***6mks***

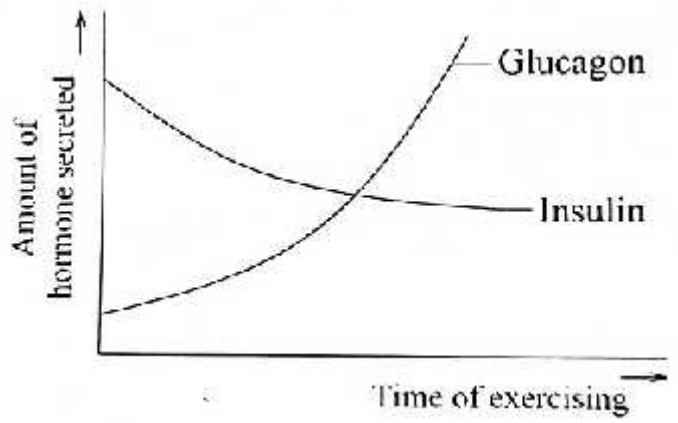
(c) State the changes that occur in the composition of exhaled air in a human being who is previously at rest, then takes an exercise. ***3mks***

(d) Give a reason why each change stated in (c) occurs. ***3mks***

(e) During exercise, the breathing rate increases. From the information provided, suggest why this happens. ***3mks***

(f) Why is the percentage of nitrogen constant in inhaled and exhaled air? ***2mks***

7. The figure below is a graph showing the effect of prolonged exercise on the secretion of insulin and glucagon hormones in a human being.



(a) Explain the variations in insulin and glucagon during the exercise.
   (i) Insulin ***(4mks)***
   (ii) Glucagon ***(4mks)***

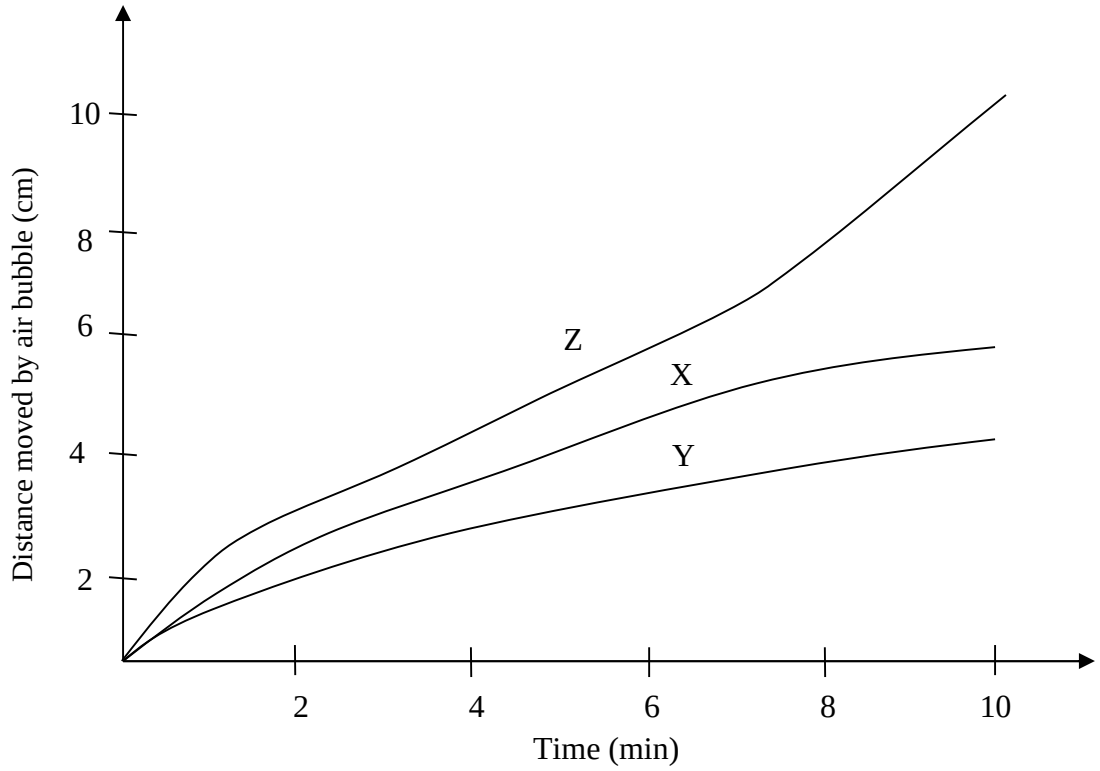
(b) Suggest and explain how the concentration of the two hormones would vary if the individual swallowed much glucose after the exercise.
   (i) Insulin ***(3mks)***
   (ii) Glucagon ***(3mks)***

(c) Briefly explain three ways by which the skin helps in temperature regulation during cold conditions. ***(6mks)***

8. Three equal sized shoots X, Y and Z bearing the same number of leaves from similar herbaceous plants were treated as follows.
   X – Had the upper epidermis of all its leaves covered with petroleum jelly.
   Y – Had the lower epidermis of all its leaves covered with petroleum jelly.
   Z – All its leaves were left uncovered.

   The three shoots were cut under water and each placed in one of the three identical potometers. All the potometers were then left under a shade. After 5 minutes, the potometer bearing shoot Z was transferred to a sunny place. The movement of the air bubble in each potometer was recorded every minute for 10 minutes. The results are shown in figure 4.

Use the information to answer the qusetions that follow.



a) Describe the pattern of movement of the air bubble in each of the three potometers during the time of the experiment.
   (i) X ***2mks***
   (ii) Y ***2mks***
   (iii) Z ***4mks***

b) Explain the pattern of movement of the air bubble in each potometer.
   (i) X ***2mks***
   (ii) Y ***2mks***
   (iii) Z ***5mks***

c) Why were similar shoots and potometers used and all the three potometers placed under a shade? ***1mk***

d) The movement of the air bubble in the potometer is a measure of water uptake rather than water loss, why is this so? ***2mks***

9. Science students in S.4 carried out an experiment in the laboratory and came up with the following results.

Substrate concentration (mg)	50	100	200	300	400	500	600	650	700
Time in seconds	30	40	60	82	105	120	145	155	160

(a) (i) Using the information in the table above, construct a graph to show the rate of reaction in relation to substrate concentration.
(ii) How does the rate of reaction vary with substrate concentration as indicated on your graph?

(b) (i) What is the effect of contained increased substrate concentration enzyme activity?
(ii) Explain your answer in part b (i) above in relationship to the structure of an enzyme.

(c) Using the graph, state the time it takes for the given substrate concentrations below to react completely.
(i) 150gm (ii) 450gm

10. The results below were obtained in a class experiment to investigate how water loss varies throughout the day in tropical plans.

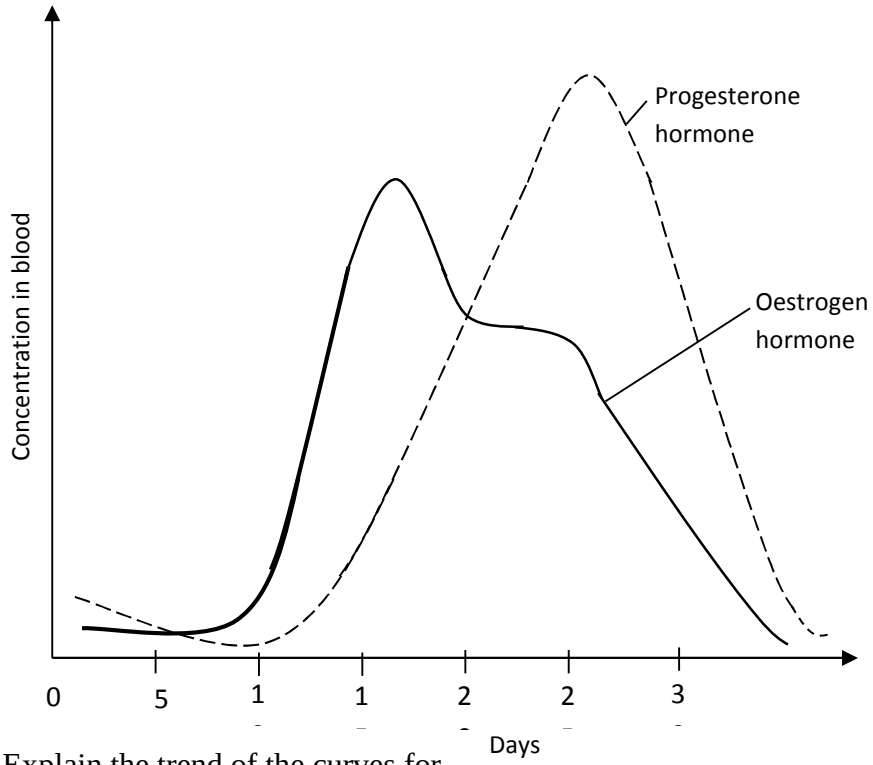
Time of day	2.00	6.00	8.00	10.00	12.00 noon	1.00	2.00	3.00	4.00	6.00	8.00	12.00 minight
Water loss												

(a) (i) Plot a graph of water loss in tropical plant against time.
(ii) At what time of the day was the water loss $210gm^{1}\ hr^{-1}$?

(b) Account for the amount of water lost between.
(i) 2.00am and 6.00am (ii) 6.00am and 1.00pm (iii) 1.00pm and 6.00pm

(c) (i) What set of apparatus could have been used in the experiment?
(ii) What would be the effect of putting an electric fan near the experimental plant? Give reasons for your answer.

11. The graph below shows the changes in the concentrations of progesterone and oestrogen in a monthly period of an adult female. Use the information given to answer the questions that follow;



a) Explain the trend of the curves for

i) Oestrogen (***4mks***)

ii) progesterone (***3mks***)

b) Describe the process that occurs between day 1 and day 5. (***3mks***)

c) At around what day from the graph is the level of oestrogen highest. (***1mk***)

d) State two functions of the hormones

i) oestrogen (***2mks***)

ii) progesterone (***2mks***)

e) What is being explained by the graph? (***1mk***)

f) State two other hormones produced during the process in (e) above and their functions

i) Hormone ***(½ mk)***

Function ***(1mk)***

ii) hormone ***(½mk***)

Function (***1mk***)

12. In an investigation on a process, three water weeds were placed in different troughs and treated differently as shown in the table below. After two days, the leaves of the weeds were tested for starch. The following results were obtained.

13.

Trough	Treatment	Starch test
1	Pond water at 25^{o}C with normal day length light	Starch present
2	Pond water at 25oC and kept in a dark place	Starch absent
3	Pond water at 10oC and kept in normal day light	Starch absent

(a) Name the process being investigated in the above experiment. ***(1mk)***

(b) (i) Why did the leaves of the water weed in trough 1 have starch? ***(2mks)***

(ii) Which factors were changed in ***(2mks)***

Trough 2 ……....

Trough 3 …….

(c) (i) How does the factor you have mentioned for trough 2 affect the process being investigated? ***(3mks)***

(ii) How does the factor you have mentioned for trough 3 affect the process being investigated? ***(3mks)***

(d) (i) Name the reagent used to test for starch …… ***(1mk)***

(ii) State any four adaptations of a leaf for the process named in 31(a) above. ***(8mks)***

14. Six identical potato cylinders measuring 2.0cm in length were each placed in different concentration of sugar solution. After two hours, the potato cylinders were removed from the solutions and remeasured. The table below shows the results.

Concentrations of sugar solutions mol l^{-1}	Length of potato cylinders after 2 hours (cm).	Difference in length of potato cylinders after 2 hours (cm)
0.1	2.40	
0.2	2.25	
0.3	2.15	
0.4	2.05	
0.5	1.98	
0.6	1.02	

a) Complete the table by filling in the difference in length of each potato cylinder after 2 hours. (***3mks***)

b) Plot a graph of difference in length after 2 hours against concentration of sugar solutions (***5mks***)

c) (i) What was the effect of the concentration of the sugar solutions on the length of the potato cylinders? (***4mks***)

(ii) Explain why the concentration of the sugar solutions affected the length of the potato cylinders as stated in (c) (i). (***3mks***)

d) (i) From your graph, determine the concentration of the sugar solution that would give no difference in length of a potato cylinder. (***1mk***)

(ii) Explain what happens in a potato cylinder when no change in length occurs. (***2mks***)

e) State one other observation other than change in size, which would be made on the potato cylinders. (***2mks***)

15. An experiment was set up to investigate the rate of transpiration using a potometer, under different conditions. At the beginning of the experiment, a leafy shoot on the potometer was kept in a room of still air, and the distance travelled by air bubbles was recorded at every 5-minutes interval for 15 minutes, a fan was switched on so that a current of air was created in the room. The speed of the fan was set at different levels and the distance travelled by the air bubbles was recorded for each level. The results of the experiment are shown in the table below.

Time/minutes	**Distance travelled by air bubbles/cm**	**Transpiration rate/cm min^{-1}**
5	0.20	
10	0.90	
15	2.00	
20	4.50	
25	6.50	
30	9.50	

a) Complete the table by calculating the rate of transpiration. ***(3mks)***

b) Draw a suitable graph showing how transpiration rate changed with time. ***(9mks)***

c) Explain the relationship shown by the graph. ***(5mks)***

d) If the experiment is continued for another 30 minutes by switching off the fan, state the change in the rate of transpiration, and a reason for the change. ***(2mks)***

e) Explain what might happen if the shoot on a potometer was wrapped with a dry transparent bag containing a small amount of dehydrated calcium chloride.***(4mks)***

16. The following results were obtained from a study of the population growth of fruit flies, *Drosophila.*

Time (weeks)	1	2	3	4	5	6	7	8	9	10
No. of flies	20	44	82	145	221	275	320	312	295	270

a) (i) On the graph paper provided, plot the graph of *drosophila* population against time. ***(9mks)***

(ii) Describe the trend of the graph during the 10 weeks. ***(3mks)***

(iii) Explain the trend of the graph. ***(3mks)***

(iv) Give two reasons for the change which took place after seven weeks. ***(2mks)***

b) At the seventh week, it was observed that some of the flies were red-eyed and others white eyed. In the previous generation, however, all the flies were red eyed.

(i) If the two alternative eye colours are inherited according to the Mendelian laws, which one of them is recessive? ***(1mk)***

(ii) How many of the flies counted at the seventh week were red-eyed? Show your working. ***(2mks)***

17. The information below was collected by a geneticist concerning the number of individuals with their corresponding heights in a given population.

	Number of Individuals of('000)	1.5	2.0	5.0	9.0	16.0	22.0	14.0	4.0	3.0
a) i)	Height (cm)	155	160	167	170	173	176	185	191	195

Using the information provided, plot a suitable graph to represent the data. (***9mks***)

ii) From the graph, determine the number of individuals measuring 180cm in height. (***1mk***)

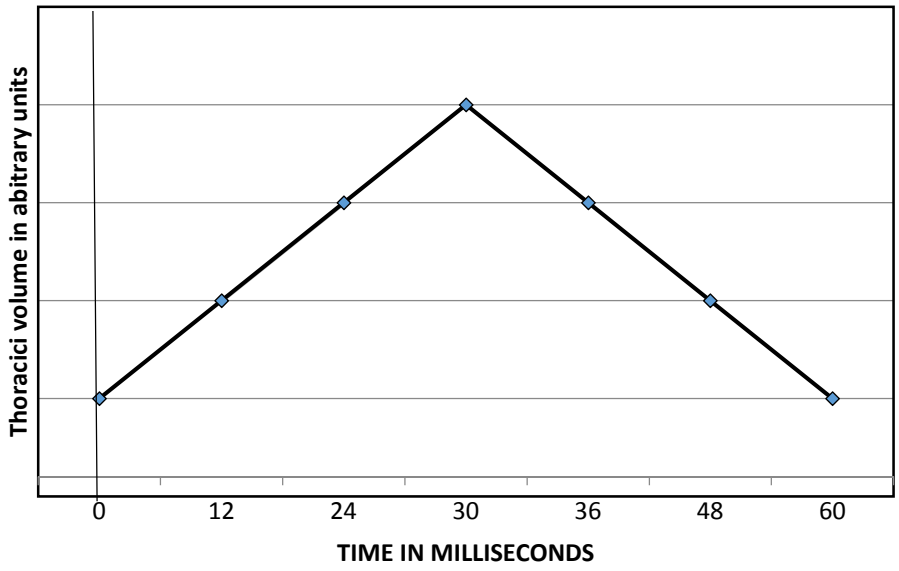
b) (i) Describe how the number of individuals varied with height (***3mks***)

ii) Which type of variation is exhibited by the individuals regarding the character in question? (***1mk***)

iii) Apart from height, outline three other characters that show similar behaviour in man. (***3mks***)

iv) State three properties of the characters you have just mentioned in (b) (iii) above (***3mks***)

18. Figure below is a graph that shows the variation of thoracic volume with time of ventilation for an individual at rest.



a) Describe the shape of the graph in figure (V) above (***2mks***)

b) State the events that lead to the shape of the graph described above. (***2mks***)

c) Describe the events that lead to the shape of the graph between

i) 0-30 milliseconds (***4mks***)

ii) 30 – 60 milliseconds ***(5mks***)

d) State the adaptations of gaseous exchange surfaces of a frog to their functions (***7mks***)

19. An experiment was carried out to investigate the effect of sodium chloride solution on red blood cells. The red blood cells were placed in sodium chloride solutions of different concentrations and some red blood cells burst in the solution. The percentage of cells which burst in each solution was determined and the results were recorded as in table below.

Sodium chloride concentration ($g/100cm^3$)	**Percentage of red blood cells which burst.**
0.33	100
0.36	91
0.38	82
0.39	69
0.42	30
0.44	15
0.48	0

a) Explain why red blood cells burst when placed in some solutions of sodium chloride.

(4mks)

b) In the space provided, plot a graph of percentage of red blood cells which burst, the sodium chloride concentrations. (***6 ½ mks)***

c) From your graph determine the concentration of the sodium chloride solution in which the burst cells were equal to the intact cells. ***(1mk)***

d) Explain the results obtained at the following concentrations of sodium chloride solutions.

(i) $0.33g/100cm^3$ ***(3 ½ mks)***

(ii) $0.48g/100cm^3$ ***(3mks)***

e) Explain what would happen to the red blood cells if they were placed in sodium chloride solution of $0.5g/100cm^3$ ***(2mks)***

20. The table below shows the change in mass of starch and proteins of a typical pea seed during the first 20 days of germination.

Food substances in the seed	Days of germination					
	0	4	8	12	16	20
Starch (mg)	60	56	32	8	5	4
Protein (mg)	28	21	11	5	3	2

a) Using the same axes, draw two graphs to show the change in mass of starch and protein during the first 20 days of germination of the seed, in the space provided. ***(8mks)***

b) How are the changes in mass of starch and protein;
   (i) Similar? ***(2mks)***
   (ii) Different? ***(2mks)***

c) Explain why the mass of starch and proteins changes in the germination seed. In each case state the reactions that result into the changes. ***(4mks)***

d) Suggest two ways in which the products from each of starch and proteins maybe used in the germinating seed.
   (i) Starch ***(2mks)***
   (ii) Proteins ***(2mks)***

21. Table 1 shows the body surface area and volume of two land mammals **A** and **B.** Table 2 shows the rate of metabolism in arbitrary units, of the two animals at varying environmental temperatures.

Table 1

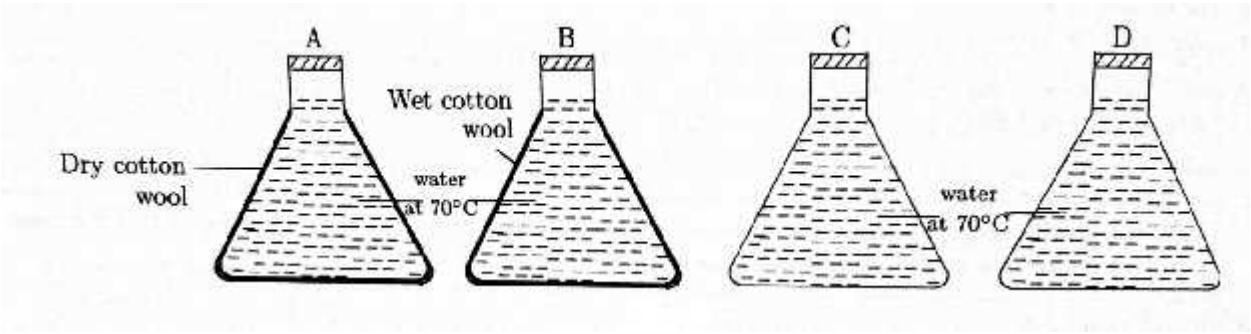
Mammal	Surface area (m^2)	Volume (m^2)
A	1.2	0.92
B	0.6	0.18

Table 2

Environmental Temperature (^oc)	**Metabolic rate** ***(arbitrary units)***	
	Mammal **A**	Mammal **B**
16	10.5	12.9
18	8.9	10.9
20	7.5	9.2
22	6.4	7.8
24	5.6	6.7
26	5.0	5.8

a) From table 1
   (i) Work out the surface area: volume ratio of each mammal. ***(2mks)***
   (ii) State the structural difference between mammal **A** and **B**. ***(2mks)***
b) Using the space provided, plot on the same graph the metabolic rate of the two animals against environmental temperature. ***(7mks)***
c) From your graph determine the metabolic rate of each mammal at environmental temperature of 25^{o}C. ***(2mks)***
d) (i) How does the environmental temperature affect the metabolic rate of the mammals? ***(2mks)***
e) Explain why variation of temperature affect the metabolic rate of the mammals as stated in c(i) above. ***(2mks)***
f) From the information provided explain why at any environmental temperature, the metabolic rate of mammal **B** is higher than that of mammal **A**. ***(3mks)***

22. The figure below shows four flasks **A, B, C, D** each filled with hot water at 70^{o}C and left to cool. Flask A insulated with dry cotton wool, flask B with wet cotton wool, flask C is not insulated and D is smaller in size and not insulated. The flasks represent mammalian bodies.



The table below shows the temperature in each flask in the figure above, recorded at 10 minutes interval for 30 minutes.

Flask	**Temperature (o^{o}C) at 10 minutes interval**			
	0(min)	10(min)	20(min)	30(min)
A	70	66	63	60
B	70	50	38	30
C	70	60	53	48
D	70	53	40	38

Study the information and answer the questions that follow:
a) For each flask, draw a graph to show the changes in temperature with time in the space provided using the same axes. ***(6mks)***
b) Calculatethe average rate of cooling in each flask. ***(4mks)***

c) Explain the rate of cooling in;

(i) Flask A ***(2mks)***

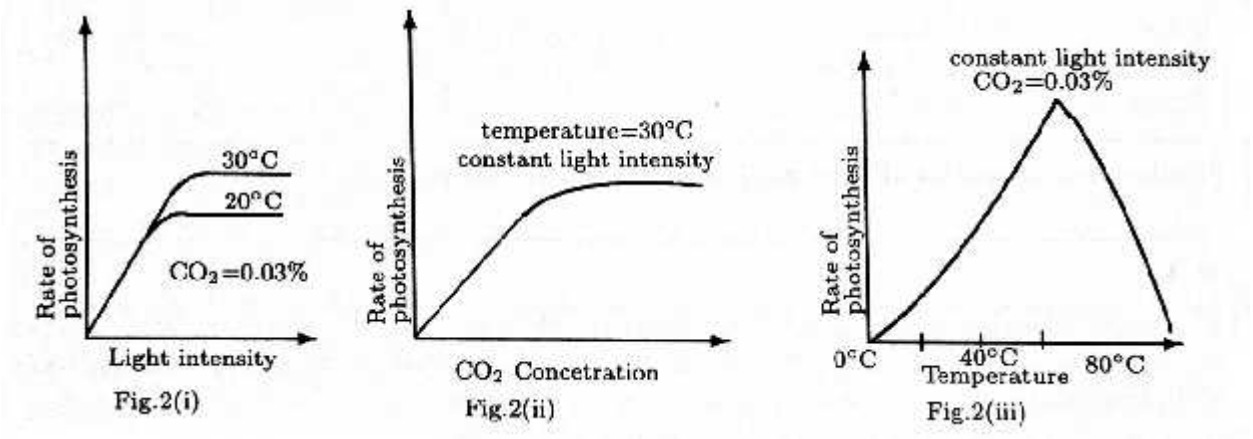
(ii) Flask B ***(3mks)***

(iii) Flask C ***(2mks)***

(iv) Flask D ***(2mks)***

d) From the information, state two factors that affect the rate of cooling from a body ***(1mk)***

23. Figure 2(i), (ii), and (iii) show the rate of photosynthesis under different conditions.



a) State what each figure shows.

(i) Figure 2(i) ***(2mks)***

(ii) Figure 2((ii) ***(2mks)***

(iii)Figure 2 (iii) ***(2mks)***

b) Describe what happens in each figure.

(iv)Figure 2(i) ***(2mks)***

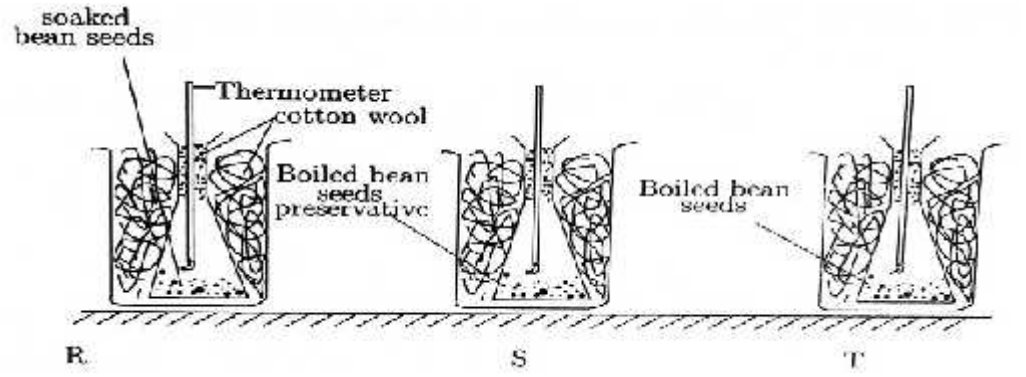
(v) Figure 2((ii) ***(3mks)***

(vi)Figure 2 (iii) ***(3mks)***

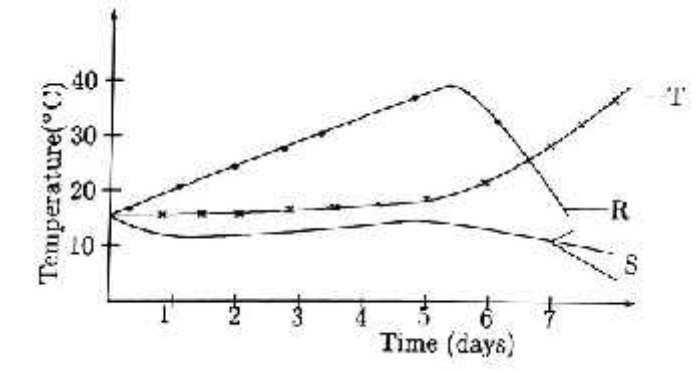
c) Explain the shape of figure 2(iii) ***(2mks)***

d) From figure 2(i), 2(ii) and 2(iii), state the factors that affect the rate of photosynthesis. ***(3mks)***

24. A student carried out an experiment using the set up figure below. In set **R**, bean seeds soaked in water were used. In **S**, boiled bean seeds sprinkled with a preservative were used, while in **T,** boiled been seeds without the preservative were used.



The temperature in each set was recorded for a week. The results obtained are shown in the figure below.



a) State the aim of the experiment. ***(2mks)***

b) Using the information provided, explain the changes in temperature in set **R** and **T**;

(i) from day 0 to day 5 ***(6mks)***

In **R**

In **T**

(ii) after day 5 ***(4mks)***

In **R**

In **T**

c) Explain why there was no significant changes in temperature in **S** for the whole week. ***(2mks)***

d) Suggest one way the above set up could be improved for the better results. Give reasons for the suggested improvement. ***(2mks)***

e) What other changes would occur in the consumption of air in the set up **R** and **T** during the experiment? ***(4mks)***

25. The table below shows the results of an experiment carried out to measure the rate of transpiration on the upper and lower epidermis of three species of plants A, B and C that have different number of stomata on upper and lower epidermis.

Feature	**Plant species**					
	A		**B**		**C**	
	Upper	Lower	Upper	Lower	Upper	Lower
Number of stomata	6	30	0	90	0	40
Transpiration rate in arbitrary units	12	15	0	40	20	40

a) Describe the distribution of the stomata in the upper and lower epidermis of each plant species. ***(3mks)***

Species A

Species B

Species C

b) Explain the relationships between stomata distribution and the rate of transpiration for each plant species. ***(10mks)***

c) What would happen to the rate of transpiration if the upper epidermis is smeared with Vaseline? ***(3mks)***

Species A

Species B

Species C

d) With a reason which plant species will be well suited for desert conditions. ***(2mks)***

e) Apart from stomatal distribution, state any other two ways desert plants use to minimize water loss. ***(2mks)***

26. A hungry person had a meal after which the concentration of glucose and amino acids in the blood were determined. This was measured hourly as blood passed through the hepatic portal vein (H.P.V) and leg (iliac) vein (I.V). The results are shown in the table below.

Time in hours		0	1	2	3	4	5	6	7
Concentration of glucose in mg/cm^3	H.P.V	85	85	140	130	110	90	90	90
	I.V	85	85	125	110	90	90	90	90
Concentration of amino acids in mg/cm^3	H.P.V	1.0	1.0	1.0	1.5	1.5	3.0	2.0	1.0
	I.V	1.0	1.0	1.0	1.5	3.0	2.0	1.0	1.0

a) On the same axes, plot a graph to show how the concentration of the H.P.V and I.V vary during the period of investigation. ***(7mks)***

b) Explain the variation in the concentration of glucose in the H.P.V from;

(i) 0 – 1 hour ***(2mks)***

(ii) 1 – 2 hours ***(2mks)***

(iii) 2 – 4 hours ***(2mks)***

(iv) 5 – 7 hours ***(2mks)***

c) Explain the difference in the concentration of glucose in the H.P.V and I.V between 2 and 4 hours. ***(3mks)***

d) Using the data provided, explain why the concentration of amino acids in the H.P.V took longer to increase than glucose? ***(2mks)***

27. The table below shows the effect of pH on the rate of an enzyme catalyzed reaction.

pH of solution	**Rate of product formation (mg/min)**
1	0
2	0
3	1
4	3
5	7
6	10
7	12
8	11
9	12
10	7

a) (i) Using the results in the table above, plot a graph of rate of product formation against pH of solution. ***(7mks)***

(ii) From your graph, determine the rate of product formation at pH of 5.5. ***(1mk)***

b) (i) From the graph, describe how the rate of product formation changes with the pH of solution. ***(4mks)***

(ii) Explain why the rate of product formation changes with the pH as described in b(i) above. ***(4mks)***

c) (i) In which part of the mammalian alimentary canal would you expect to find the enzyme? ***(1mk)***

(ii) Give a reason to support your answer in c(i) above. ***(1mk)***

(iii) Besides pH, give **four** other factors that affect the rate of enzyme catalyzed reaction. ***(2mks)***

28. In 1905 the number of lions reduced in a park after their relocation to other parks. The number of kobs in the park were then monitored and their estimated numbers recorded for the years 1905 – 1937. The results are shown in the table below. Study the information and answer questions that follow.

Year	1905	1910	1915	1920	1925	1927	1930	1932	1935	1937
Number of kobs	1000	2200	5350	9500	12200	6200	3000	1500	980	1020

a) Draw a graph to represent the information in the table, in the space below. ***(8mks)***

b) Describe how the population of the kobs varied with time. ***(6mks)***

c) Suggest two reasons that could have caused the changes in the kobs' population;
   (i) from 1905 – 1925 ***(2mks)***
   (ii) from 1925 – 1937 ***(2mks)***

d) (i) From the data, suggest the approximate number of kobs that could be sustained in the park naturally. ***(1mk)***
   (ii) Give a reason for your answer. ***(1mks)***

29. Forest air was analyzed and the daily variation of the composition of carbondioxide in it in 24 hours of the day was determined and recorded in the table below.

Time of the day (hours)	6a.m	12 midday	6p.m	9p.m	3a.m
Percentage composition of CO_2	0.06	0.04	0.03	0.35	0.055

a) In the space provided, use a line graph to represent the information in the table above. ***(5mks)***

b) Describe your graph, from;
   (i) 6 a.m to 6 p.m ***(1mk)***
   (ii) 6 p.m to 3 a.m ***(1mk)***

c) Explain your graph from;
   (i) 6 a.m to 6 p.m ***(4mk)***
   (ii) 6 p.m to 3 a.m ***(4mk)***

d) Describe how plants growing in forest are adapted for gaseous exchange. ***(5mks)***

30. In an experiment, a naked human being was put in a room of 45^{o}C, then the internal body temperature, skin temperature and rate of sweating were measured at time intervals. Internal temperature measurements were taken at the eardrum. Ice was swallowed at 10 minutes and 33minutes. Study the data carefully and answer the questions that follow.

Time (mins)	0	5	10	15	20	25	30	35	40	45
Internal body temperature	38	38	33	35	34	35	38	38	35	32
Skin temperature	36	36	36	38	38	37	36	36	38	38
Rate of sweating.	15	15	15	12	10	16	20	22	20	15

a) Plot the above on the same axes ***(9mks)***

b) Describe the relationship between time and;
   (i) Internal body temperature and skin temperature. ***(1½ mks)***
   (ii) Internal body temperature and rate of sweating. ***(1½ mks)***
   (iii) Skin temperature and rate of sweating. ***(1½ mks)***

c) Give an explanation for your description in;

(b)(i) above ***(1½ mks)***

(b)(ii) above ***(1½ mks)***

(b)(iii) above ***(1½ mks)***

d) Why does the internal body temperature decrease when ice is swallowed? ***(1mk)***

e) What temperature regulatory mechanism is in the above experiment? ***(1mk)***

31. Table below shows some results from a series of experiments with a potometer. Each experiment lasted 20 minutes. Study it and use it for answering the questions that follow.

	Experiment 1		Experiment 2		Experiment 3	
	Room temperature + bright sun light.		Room temperature + bright sunlight + fan		Room temperature in darkness.	
	Start (cm^3)	Finish (cm^3)	Start (cm^3)	Finish (cm^3)	Start (cm^3)	Finish (cm^3)
Reading 1	0.8	3.4	0.7	4.3	0.4	1.5
Reading 2	1.1	4.2	0.6	5.1	1.2	2.1
Reading 3	0.6	3.3	0.5	4.7	0.3	1.6
Reading 4	1.3	4.9	1.1	5.8	0.9	1.5
Reading 5	1.4	4.4	0.9	6.1	1.2	2.1

a) Calculate the average rate of transpiration in each experiment;

Experiment 1 ***(4mks)***

Experiment 2 ***(4mks)***

Experiment 3 ***(4mks)***

b) Which factors are being investigated in the experiment? ***(2mks)***

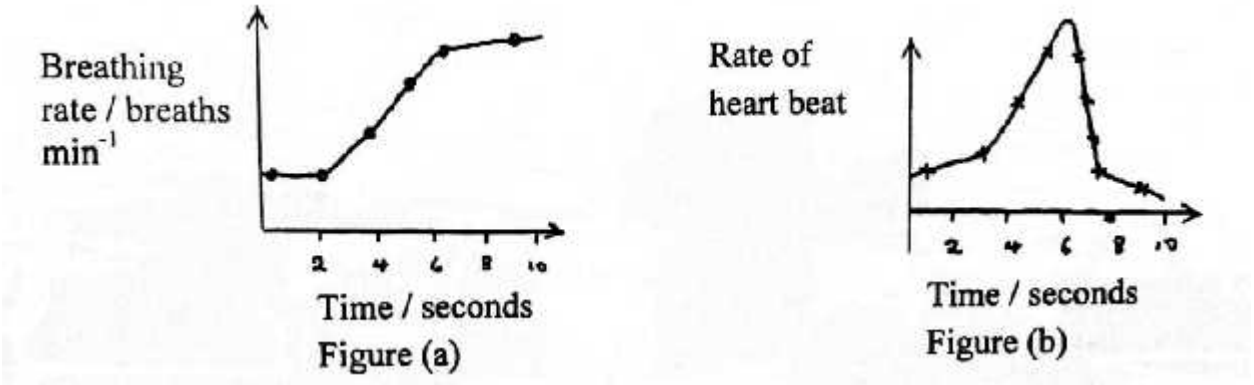
c) Explainthe differences in the rate of transpiration;

Experiment 1 ***(2mks)***

Experiment 2 ***(2mks)***

Experiment 3 ***(2mks)***

32. A study was carried out on a human being who was under an exercise. The changes in the breathing rate and rate of heart beat were monitored. The results are shown in figure 3 (a) and (b).



a) What was the purpose of this study? ***(3mks)***

b) Describe what is happening in each figure;
   (i) Figure (a) ***(3mks)***
   (ii) Figure (b) ***(4mks)***

c) Give an explanation for the observation shown in figure (a). ***(3mks)***

d) From figure (b), explain why the rate of heart beat increases during exercise. ***(5mks)***

e) Apart from those in figures (a) and (b), what else would occur in human body during exercise? ***(2mks)***

33. Table below shows soil capillarity between soil A and soil B. Study it and answer the answer the questions that follow:

Type of Soil	**Soil A**	**Soil B**
Time (Hours)	Rise in volume	Rise in volume
0	5	10
1	25	22
1.2	30	24
2	35	25
3	40	26
4	42	26

a) Plot a graph of volume of water rise against time in hours on same axes for soil A and B. ***(10mks)***

b) Find the level of water rise for soil A and Soil B at 0.8 hours. ***(1mk)***

c) Describe the shape of curve for;
   Soil A. ***(3mks)***
   Soil B ***(4mks)***

d) With a reason suggest the type of soil with small air spaces. ***(2mks)***

33. The table below shows the skin surface area, body volume and rate of metabolism of five adult mammals A, B, C, D, and E.

Mammal	Skin surface area (m^2)	Body volume (cm^3)	Rate of metabolism ($k\ m^{-2}h^{-1}$)	Skin surface area to volume ratio
A	1.2	0.2	100.2	
B	3.0	0.7	88.3	
C	4.1	1.1	72.0	
D	6.1	2.5	68.1	
E	7.5	5.0	56.3	

a) Complete the table by calculation the skin surface area to volume ratio for each mammal ***(2½mks)***

b) On the graph paper, plot a graph of skin surface area to volume ratio against body volume of the animals. ***(7½mks)***

c) Describe the relationship between body volume and;
   (i) Skin surface area to volume ratio. ***(2mks)***
   (ii) Rate of metabolism. ***(2mks)***

d) Explain the relationship between rate of metabolism and skin surface area to volume ratio. ***(3mks)***

e) (i) If mammal A and E were living under same conditions, suggest one structural differences that would exist on the surface between the two animals. ***(1mk)***
   (ii) Give a reason for your answer in e(i) above. ***(2mks)***

End