QUESTIONS ON GRAPHS AND DATA RELATED

QUESTION 1.

In an experiment carried out in a tropical country, carbon IV oxide concentration was measured around a plant in open air at two hour intervals for a period of 24 hours. The results were shown in the table below.

Time	Percentage of carbon IV oxide concentration (X 10^{-2})
3 a.m.	3.40
5 a.m.	3.60
7 a.m.	3.90
9 a.m.	3.20
11 a.m.	2.95
1 p.m.	2.90
3 p.m.	2.90
5 p.m.	2.92
7 p.m.	3.02
9 p.m.	3.10
11 p.m.	3.20
1 a.m.	3.30
3 a.m.	3.40

(a) Using the data, plot a graph of a carbon IV oxide concentration against time on the grid provided (6 marks)

(b) Calculate the rate of change in carbon IV oxide concentration between 4 a.m. to 7 a.m. (3 marks)

(c) Give a reason of the change in carbon IV oxide concentration between the following times (6 marks)

(i).7 a. m. to 11 p.m. (ii).12 noon to 4 p.m. (iii). 5 p.m. and 5 a.m.

(d). The experiment was repeated on another day and the results obtained were different.

(i). Name two environmental factors that were likely to have affected the results (2 marks)

(ii). State how each of the factors you named in d(i) above could have affected the results (2 marks)

QUESTION 2.

In an experiment, the energy required by persons of different sizes was determined. The weight and the amount of energy their bodies used at rest were measured. The results were shown in the table below.

Weight of individuals	Amount of energy used per kg of body weight per day (kj)
5	300
15	200
25	150
35	130
45	115
55	105
65	100
75	95

(a). Using suitable scale, draw a graph of the amount of energy used per kg (6 marks)

(b). From the graph, determine the difference in energy requirements between

(i). 10 kg and 20 kg (1 mark)

(ii). 60 kg and 70 kg (1 mark)

(c). Why did individuals with smaller sizes require more energy per kg of body weight than those with larger sizes? (3 marks)

(d). Use the graph to determine the energy requirement for an infant whose body weight is 2.5kg (2 marks)

(e). (i). How would the results differ if the experiment was to be repeated using reptiles instead of human beings? (1 mark)

(ii). Give reasons for your answer in e (i) above (3 marks)

(f).Name two classes of food that provide energy to the body (2 marks)

(g). Name the class of food that provides energy to a mammal during starvation (1 mark)

QUESTION 3.

(a). The graph below represents the growth of a pollen tube in an experiment

Insert graph

(i). At what intervals was the growth of the pollen tube measured? (1 mark)

(ii). What was the length of the pollen tube at 90 minutes? (1 mark)

(iii). At what time was the length of the pollen tube 18mm? (1 mark)

(iv). With a reason describe the growth pattern of the pollen tube

Between 0 to 120 minutes

Reason

Between 120 – 180 minutes

Reason

(v). State the importance of the growth of pollen tube to the plant

(vi). Describe how the growth region of a root can be determined using the following:-

Fine thread, marking ink, germinating bean seedlings, blotting paper, ruler marked in mm, pins, cork, a boiling tube and moist cotton wool.

QUESTION 4.

The graph below shows the concentration of carbon IV oxide in a maize field during a 24-hour period.

Insert graph

(a). What was the percentage of carbon IV oxide in the maize field at

(i). 1 a.m. (1 mark)

(ii). 12 noon (1 mark)

(b). Account for the result obtained between

(i). Midnight to 6 a.m. (3 marks)

(ii). 6 a.m. to 12 noon (3 marks)

(c). (i). Suggest the expected results if the maize plants were exposed to light of same intensity as daylight from 6 p.m. to 6 a.m. (2 marks)

(ii). Give a reason for your answer in c (i) above (2 marks)

(d). Apart from light, name three environmental factors that would affect carbon IV oxide concentration in the maize field

(e). Suggest what would happen to the carbon IV oxide concentration if all the maize plants were removed from the field (1 mark)

(f). Give a word equation for the process that was responsible for the production of carbon IV oxide in the maize field (4 marks)

QUESTION 5.

The glucose level in mg 100ml of blood of three people A, B and C who had been fasting for 12 hours was determined. The people were then fed on equal amounts of glucose and the levels of glucose determined at 30 minutes intervals for two hours.

Insert graph

(a). If the normal glucose level in a healthy person is between 80 and 100mg per 100ml of blood, which one of the graphs represents the data for a person who is

(i). Healthy (1 mark)

(ii). Mildly diabetic (1 mark)

(iii). Severely diabetic (1 mark)

(b). When was the blood glucose level in person B equal to that of person A? (2 marks)

(c). Account for the level of glucose in person C.

(i). During the first 30 minutes

(ii). Between 60 and 120 minutes

(d). Account for the glucose level in person B at the end of two hours

(4 marks)

(e). What is the biological significance of maintaining a relatively constant sugar level in a human body?

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QUESTION 6.

In an experiment 900 viable seeds of a certain plant species were divided into groups of 100 seeds each. Each group of seeds was placed at different temperatures but same conditions of air and moisture. The percentage germination was determined after 10 days. The table below shows percent germination at various temperatures.

Temp ^{O}C	0	5	10	15	20	25	30	35	40
Percentage germination	0	0	2	5	16	50	84	30	2

(a). Using a suitable scale, draw a graph of percentage germination against temperature (6 marks)

(b). Account for percent germination at

(i). $5^{O}C$ (3 marks)

(ii). $30^{O}C$ (3 marks)

(iii). $40^{O}C$ (3 marks)

(c). Explain the role played by each of the following factors in the germination of seeds

(i). Water

(ii). Air

QUESTION 7.

A biologist carried out a study to investigate the growth of a certain species of herbivorous bony fish and the factors influencing plant and animal life in four small lakes A, B, C and D. The lakes were located in the same geographical area. Two of the lakes A and B were found to contain hard water due to the presence of high content of content of calcium salts. Lakes C and D were found to have soft water with low content of calcium salts. The mean body length of 2 year old fish, amount of plant life and invertebrate biomass in each lake were determined. The data was as shown in the table below.

Lakes	Mean body length of 2 year of fish (cm)	Type of water	Amount of plant life (g/m^3 of water)	Invertebrate biomass (g/m^3 of water)			
				Insects	Snails	Crabs	Worms
A.	31.2	Hard	1050	11	300	10	180
B.	28.6	Hard	950	72	100	9	90
C.	18.4	Soft	1.2	97	0	2	20
D.	16.3	Soft	0.5	99	0	1	10

(a). Describe the procedure that may have used to determine the mean body length of the fish. (6 marks)

(b). What are the likely reasons for the difference in the mean body length of the fish living in lakes A and D. (4 marks)

(c). Suggest one reason for the absence of snails in lakes C and D (1 mark)

(d). (i). Name any <u>six</u> Abiotic (physical) factors that are likely to influence the plant and animal life in lake A (3 marks)

(ii). Explain how each of the factors named in d (i) above may influence the plant and animal life in lake A (6 marks)

QUESTION 8.

An investigation was carried out between 1964 and 1973 to study the changes of fish population in a certain small lake. Four species of fish A, B, C and D were found to live in this lake.

In 1967, a factory was built near the lake and was found to discharge hot water into the lake raising the average temperature from $25^{O}C$ and $30^{O}C$.

In 1967, sewage and industrial waste from a nearby town was diverted into the lake.

In 1969, discharge of hot water, sewage and industrial waste into the lake was stopped.

The fish populations during the period of investigation are shown in the table below.

FISH SPECIES	FISH POPULATIONS DURING PERIOD OF INVESTIGATION						
	1964	1966	1968	1970	1971	1972	1973
A.	6102	223	20	106	660	4071	7512
B.	208	30	11	22	63	311	405
C.	36	100	0	0	0	0	0
D.	4521	272	23	27	79	400	617

(a). (i). In which year were the fish populations lowest? (1 mark)

(ii). State the factors that might have caused the lowest fish populations during the year you have stated in a (i) above.

(iii). Explain how each factor you have stated in a (ii) above could have brought about the changes in fish populations (1 mark)

(b). (i). What is the difference in the rate of population recovery of species A and D? (1 mark)

(ii). Suggest two biological factors that could have led to this difference (2 marks)

(c). (i). State a method that might have been used in estimating the fish populations in the lake.

(ii). State one disadvantage of the method you have stated in C (i) above.

QUESTION 9.

The amount of blood flow through various parts of a mammalian body was

measured in cubic centimetres per minutes at rest and also during different physical activities. The results are as shown in the table below:

Blood flow in cm^3 / min			
Part of body	**At rest**	**During light exercise**	**During strenuous exercise**
Heart muscle	200	300	1050
Gut	1300	1000	400
Skeletal muscle	1100	5050	23,000
Kidneys	900	650	250
Skin	400	1300	600

(a). Calculate the percentage change in the blood flow through the skeletal muscle and gut when mammal was subjected to strenuous exercise from rest

(i). Skeletal muscle (2 marks)

(ii). Gut (2 marks)

(b). Account for the difference in the amount of blood flow through the gut and skeletal muscle

(i). At rest (4 marks)

(ii). During strenuous exercise (3 marks)

(c). How does the heart increase blood flow to some parts of the body during exercise? (2 marks)

(d). Explain the results obtained for the skin

(i). At rest (2 marks)

(ii). During light exercise (2 marks)

(e). Name three substances that are removed from the body by the kidneys

QUESTION 10.

Two persons X and Y drunk volumes of concentrated solution of glucose. The amount of glucose in their blood was determined at intervals. The results are shown in the table.

Time (minutes)	Glucose level in blood (mg / 1000cm^3)	
	X	Y
0	87	84
15	112	123
30	139	170
45	116	188
60	100	208
90	95	202
120	92	144
150	88	123

(a). On the grid provided plot graphs of glucose level in blood against time on the same axes (7 marks)

(b). What was the concentration of glucose in the blood of X and Y at the 20th minute? (2 marks)

(c). Suggest why the glucose level in person X stopped rising after 30 minutes while it continued raising in person Y.

(d). Account for the decrease in glucose level in person X after 30 minutes while it continued rising in person Y (2 marks)

(e). Name the compound that stores energy released during oxidation of glucose (1 mark)

(f). Explain what happens to excess amino acids in the body

QUESTION 11.

In an experiment maize grains were soaked in different concentrations of solutions X and Y for 24 hours. In the control experiment the seeds were soaked in distilled water for the same period of time. The seeds were placed on moist cotton wool in different Petri dishes. They were left to germinate and grow for 10 days after which the percentage germination was determined. The average lengths of shoots and roots were also determined. The results were as shown in table A and B below.

Table A.

Concentration of solution X (%)	% Germination	Growth of seedlings after 10 days (Average length in mm)	
		Shoots	Roots
80	33	3	8
60	52	5	9
40	75	7	17
20	87	16	38
10	92	18	40
Distilled water	95	28	64

Table B.

Concentration of solution Y (%)	% Germination	Growth of seedlings after 10 days (Average length in mm)	
		Shoots	Roots
80	0	0	0
60	0	0	0
40	12	3	4
20	42	4	5
10	90	12	42
Distilled water	95	29	63

(a). What was the effect on solution X on

(i). Germination of the maize grains (2 marks)

(ii). Growth of maize seedlings (6 marks)

(b). Compare the growth of seedlings whose grains were previously soaked in 80% and 10% of solution Y (3 marks)

(c). Explain how percentage germination in this experiment was determined (3 marks)

(d). From the results shown in tables A and B, what conclusions can be drawn

about solution X and Y? (2 marks)

(e). Other than moisture and solution X and Y, what other conditions were necessary for germination of the maize grains? (2 marks)

(f). State two ways in which indole acetic acid (IAA) influences growth in plants (2 marks)

QUESTION 12.

In an experiment to investigate the effect of heat on germination of seeds, eleven bags each containing 50 bean seeds were placed in a water bath maintained at $90^{O}C$.

After every 2 minutes, a bag was removed and the seeds contained in it planted. The number that germinated was recorded. The procedure used for the beans was repeated for Acacia seeds. The results obtained were as shown in the table below.

Time (min)	Number of seeds that germinated	
	Bean seeds	Acacia seeds
0	50	0
2	50	0
4	46	1
6	35	2
8	10	28
10	1	36
12	0	41
14	0	44
16	0	47
18	0	48
20	0	50

(a). Using a suitable scale and on the same axes draw graphs of time in hot water against the number of seeds that germinated for each plant
(8 marks)

(b). (i). After how many minutes would you expect 50% of Acacia seeds exposed to the hot water to germinate? (1 mark)

(ii). What was the minimum number of minutes after exposure of bean seeds to hot water was there no germination? (1 mark)

(c). (i). From the graphs, which one of the two types of seeds was more sensitive to heat influence on germination? (1 mark)

(ii). Give a reason for your answer in c (i) above (1 mark)

(d)Explain why the ability of the

(i). Bean seeds to germinate declined with time of exposure to heat
(2 marks)

(ii). Acacia seeds to germinate improved with time of exposure to heat
(3 marks)

(d). What would be expected if the temperature of the water was maintained at **(i).** **$\underline{100^{o}C}$** (2 marks)

(ii). **$\underline{5^{o}C}$** (2 marks)

QUESTION 13.

The graph below represents increase in the number of yeast cells over a period of 48 minutes.

Insert graph

(a). Name the type of curve shown (1 mark)

(b). Determine the number of yeast cells after 26 minutes (1 mark)

(c). Work out the rate of cell division between 24 and 28 minutes (2 marks)

(d). After how long was the population of yeast cells 128? (1 mark)

(e). Name the phase of the curve labelled (1 mark)

(i). A to B

(ii). B to C (2 marks)

(f). Give reasons for the shape of the graph between points C and D (3 marks)

(g). State five factors which would cause human population growth to assume the shape of the graph curve between points B and C.(5 marks)

(h). Describe how the quadrat method can be used to estimate the population of various species of plants in a given habitat. (5 marks)

QUESTION 14.

A culture of bacteria was incubated in nutrient agar at $35^{O}C$ samples were taken at intervals in order to estimate the number of bacteria in the population. The data obtained is shown in the graph below.

Insert graph

(a). When was the population of bacteria 750 million? (2 marks)

(b). Account for the shape of the graph between

(i). A and B (3 marks)

(ii). B and C (4 marks)

(iii). C and D (2 marks)

(c). Give three reasons for the shape of the curve between D and E (2 marks)

(d). (i). Suggest what would happen to the population of the bacteria if the temperature was lowered to $0^{O}C$ after incubating (1 mark)

(ii). Give a reason for your answer in d(i) above (1 mark)

(e). Give three reasons why it is important to control human population growth rate in Kenya. (3 marks)

QUESTION 15.

An experiment was carried out to determine the growth rates of a variety of bamboo and a variety of maize plants in two adjacent plots. The average height and average dry weight of plants from the two populations were determined over a period of twenty weeks. The data is as shown in the table below.

Age in weeks	BAMBOO		MAIZE	
	Average height (m)	Average weight (gms)	Average height (m)	Average weight (gms)
2	1.3	52	0.3	20
4	4.0	182	0.5	29
6	8.2	445	0.8	57
8	12.1	682	1.2	78
10	13.9	801	1.7	172
12	14.1	957	1.9	420
14	14.3	1025	2.1	704
16	14.4	1062	2.1	895
18	14.6	1127	2.1	926
20	14.6	1229	2.1	908

(a). Between which two weeks did the greatest increase in weight occur in (i). Bamboo plants (1 mark)

(ii). Maize plants (1 mark)

(b). (i). Which of the two types of plants had a higher productivity by the end of the experiment? (1 mark)

(ii). Give a reason for your answer in b (i) above

(c). Between weeks 14 and 18, the average height of the maize plants remained constant while the average dry weight is increased. Explain this observation. (4 marks)

(d). Suggest how the change in the average dry weight in bamboo and maize

plants would have been at week 22 if the experiment was continued.
(2 marks)

(i). Bamboo

(ii). Maize

(e). Why was it appropriate in this experiment to use

(i). Dry weight instead of fresh weight

(ii). Weight and height

(f). Describe how the average height and average dry weight of the plants were determined in this experiment.

Average height (2 marks)

Average dry weight (4 marks)

(g). Give a reason why secondary thickening does not occur in bamboo and maize plants. (1 mark)

QUESTION 16.

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

Time (hours)	Concentration of contents in hepatic portal vein (mg/100ml)		Concentration of contents in the iliac vein of the leg (mg/100ml)	
	Glucose	Amino acids	Glucose	Amino acids
0	85	1.0	85	1.0
1	85	1.0	85	1.0
2	140	1.0	125	1.0
3	130	1.5	110	1.5
4	110	3.0	90	3.0
5	90	2.0	90	2.0
6	90	1.0	90	1.0
7	90	1.0	90	1.0

(a). Using the same axes draw graphs of concentration of glucose in the hepatic portal vein and the iliac vein in the leg against time. (7 marks)

(b). Account for the concentration of glucose in the hepatic portal vein from

(i). 0 – 1 hour (2 marks)

(ii). 1 – 2 hours (3 marks)

(iii). 2 – 4 hours (3 marks)

(iv). 5 – 7 hours (2 marks)

(c). Account for the difference in the concentration of glucose in hepatic portal vein and the iliac vein between 2 and 4 hours. (2 marks)

(d). Using the data provided in the table explain why the concentration of amino acids in the hepatic portal vein took longer to increase. (1 mark)

QUESTION 17.

An experiment was carried out to investigate haemolysis of human red blood cells. The red blood cells were placed in different concentrations of sodium chloride solution. The percentage of haemolysed cells was determined. The results were as shown in the table below.

Salt concentration g / 100cm^3(%)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Red blood cells haemolysed (%)	100	91	82	69	30	15	0

(a). (i). Using a graph paper plot a graph of haemolysed red blood cells against salt concentration. (6 marks)

(ii). At what concentration of salt solution was the proportion of

haemolysed cells equal to non-haemolysed cells? (1 mark)

(iii). State the percentage of cells haemolysed at salt concentration of 0.45 percent (1 mark)

(b). Account for the results obtained at

(i). 0.33 percent salt concentration

(ii). 0.48 percent salt concentration

(c). What would happen to the red blood cells if they were placed in 0.50 percent salt solution? (1 mark)

(d). Explain what would happen to onion epidermal cells if they were placed in distilled water. (5 marks)

QUESTION 18.

The numbers of different types of animals supported by a square kilometre in two terrestrial ecosystems are shown in the table below.

Type of ecosystem	Type of animal	Number of animals supported per square km.
Acacia Savannah	**Domestic animals**	
	Cattle	7
	Goats	30
	Sheep	10
	Wild animals	
	Thomson's gazelles	450
	Eland	20
	Wild beast	60
Bush land	**Domestic animals**	
	Cattle	2
	Goats	15
	Sheep	5
	Wild animals	
	Thomson's gazelles	200
	Eland	12
	Wild beast	10

(a). (i). Which domestic animal is better adapted to both ecosystems? (1 mark)

(ii). Give a reason why the animal in

(b). (i). Above is better adopted to the two ecosystems (1 mark)

(c). Why are cattle and sheep fewer in the bush land than in the savannah?

(1 mark)

(d). (i). Name suitable methods that were used to estimate the population of domestic animals (1 mark)

(ii). Give a reason why the method named for wild animals in c (i) above is suitable (1 mark)

(d). State three methods which could be used to determine the diet of wild animals in an ecosystem (3 marks)

(e). Name four biotic factors that could have regulated the animal population in both ecosystems. (4 marks)

(f). State four human activities that affect populations of animals in game parts (4 marks)

(g). What is the importance of national parks to a nation? (3 marks)

QUESTION 19.

An experiment was carried out to investigate the nutritional value of two dry powder animal feeds X and Y over a period of six months. Twenty 5 months old castrated goats were used. The goats were divided into two equal groups A and B. The animals in group A were fed on feed X throughout the experiment while those of group B were feed on feed Y.

The feeds were supplemented with dry hay and water. The average body weight of each group of goats and the weight of the dry powder feeds were determined and recorded each month.

The faeces produced by each group was dried and weighted and the average dry faecal output per month was recorded.

The results are shown below.

Months since commencement of the experiment	GROUP A			GROUP B		
	Average total weight of goats (Kg)	Average weight of total feed (Kg)	Average monthly dry faecal output (Kg)	Average total weight of goats (Kg)	Average weight of total feed (Kg)	Average monthly dry faecal output (Kg)
0	20.4	26.7	10.5	20.5	35.4	16.5
1	22.5	27.5	10.7	19.4	34.3	17.7
2	24.5	25.8	10.3	19.0	35.2	17.2
3	26.3	18.5	8.8	18.5	36.1	17.5
4	28.0	16.6	7.2	17.1	36.0	16.9
5	29.4	16.3	6.0	16.3	35.8	16.8
6	29.5	16.1	5.6	15.6	35.0	16.6

(a). What is the relationship between the amount of feed and the faecal output?
(1 mark)

(b). Work out the average increase in weight for the animals in group A during

(i). <u>The first four months</u> (2 marks)

(ii). <u>The last two months</u> (2 marks)

(c). Account for the average increase in weight for the goats in group A during

(i). <u>The first four months</u> (1 mark)

(ii). <u>The last two months</u> (2 marks)

(d). (i). Which of the two fees is more nutritious? (1 mark)

(ii). Give a reason for your answer in d (i) above (3 marks)

(e). State four uses of digested food in the bodies of animals.(4 marks)

(f). State four uses of water in the bodies of animals (4 marks)

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QUESTION 20.

Three twigs of approximately the same leaf surface and from the same plant species were used in an experiment and their rates of transpiration measured. Each twig was treated as follows:

Twig 1 was completely covered with polythene bag

Twig 2 was kept near a rotating fan

Twig 3 was kept in open still air

The average reading of each twig was recorded as shown in table below.

Time of the day in hours	Distance moved by air bubble (mm)		
	Twig 1	Twig 2	Twig 3
08.00	2.0	2.0	2.0
09.00	2.4	3.0	2.5
10.00	2.6	4.2	3.4
11.00	2.7	5.4	4.4
12.00	2.8	7.1	5.5
13.00	2.9	9.6	7.0
14.00	2.9	13.1	9.5
15.00	2.9	16.6	11.5
16.00	2.9	18.1	13.0
17.00	3.0	19.0	13.6
18.00	3.1	19.0	13.6

(a). Using a suitable scale and on the same axes plot graphs for the three twigs (8 marks)

(b). Name the instrument that was used to measure the rate of transpiration in the twigs (1 mark)

(c). (i). Name the environmental conditions that brought about the difference in rates of transpiration in twigs 1 and 2 (2 marks)

(ii). Explain how the conditions stated in c (i) above affect the rate of transpiration in twigs 1 and 2 (3 marks)

(d). What was the purpose of twig 3 in the experiment? (1 mark)

(e). State the advantages of transpiration to a mesophyte. (2 marks)

QUESTION 21.

Some students used a model to demonstrate the effect of sweating on human body temperature. Two boiling tubes A and B were filled with hot water.The temperature of water in the tubes was taken at the start of the experiment and then at 5 minutes interval. The surface of tube A was continuously wiped with a piece of cotton wool soaked in methylated spirit. The results obtained are shown in the table below.

Time (minutes)	Temperature ^{O}C in tubes	
	A	B
0	80	80
5	54	67
10	40	59
15	29	52
20	21	47
25	18	46

(a). On the same axes plot graphs of temperature of water in the tubes against time (7 marks)

(b). At what rate was the water cooling in tube A? (2 marks)

(c). Why was tube B included in the set up (1 mark)

(d). Account for the rate of cooling in tube A (1 mark)

(e). State two processes of heat loss in tube B (2 marks)

(f). What would be the expected results in tube A was insulated? (1 mark)

(g). What would the insulation be comparable to in:

(i). Birds (1 mark) **(ii).** Mammals (1 mark)

(h). Name the structures in the human body that detects

(i). External temperature changes (1 mark)

(ii). Internal temperature changes (1 mark)

QUESTION 22.

During germination and growth of a cereal, the dry weight of endosperm, the embryo

and the total dry weight were determined at two day intervals.

The results are shown in the table below.

Time after planting (days)	Dry weight of endosperm (mg)	Dry weight of embryo (mg)	Total dry weight (mg)
0	43	2	45
2	40	2	42
4	33	7	40
6	20	17	37
8	10	25	35
10	6	33	39

(a). Using the same axis, draw graphs of dry weight of endosperm, embryo and the total dry weight against time.

(b). What was the total dry weight on day 5?

(c). Account for

(i). Decrease in dry weight of endosperm from day 0 to day 10

(ii). Increase in dry weight of embryo from day 0 to day 10

(iii). Decrease in total dry weight from day 0 to day 8

(iv). Increase in total dry weight after day 8

(d). State two factors within the seed and two outside the seed that cause dormancy

(i). Within the seed

(ii). Outside the seed

(e). Give two characteristics of Meristematic cells.

QUESTION 23.

The table below shows the number of two species of wild games in Nairobi National Park over a period of one year. The populations of animals were made on monthly basis.

Month	Giraffe	Zebra
July 1978	96	239
August	79	585
September	75	895
October	87	755
November	93	480
December	99	80
January 1979	120	216
February	96	330
March	99	293
April	71	230
May	135	88
June	104	452
July	135	1,275

(a). (i). Which wild game was greatly affected by climatic changes over the period of study?

(ii). Give a reason for your answer in a (i) above.

(b). (i). Name a suitable method that was used to estimate the population of the two species of wild game

(ii). Give a reason why the method named in b (i) above is suitable

(c). Account for the stable giraffe population during the time of study

Giraffes are browsers. They feed on acacia which are drought resistant.

(d). Name four biotic factors that could have regulated the population of zebras during period of study

(e). What is the importance of having National Parks to a nation?

QUESTION 24.

An experiment was carried out to investigate the population growth of mice under laboratory conditions. The procedure was as follows: Twenty young mice were placed in a cage. The amount of food available to the mice each day was kept constant. The results obtained were as shown in the table below.

Time in months	**0**	2	4	6	8	10	12	14	16	18
Number of mice	20	20	65	115	310	455	450	190	145	160

(a). Using a suitable scale, plot a graph of number of mice against time

(b). With reference of the graph, account for the changes in mice population between

(i). 0 to 2 months

(ii). 2 to 10 months

(iii). 10 to 12 months

(iv). 12 to 16 months

(c). (i). Between which two months was the population change greatest?

(ii). Calculate the rate of population change over the period you have given in c (i) above.

(d). What population changes would be expected if the investigation was continue for a further 24 months.

(e). The Government of Kenya is very much concerned about the increased population in the country and how the increase can affect the socio-economic status of the Kenya people.

State five ways in which the Government is trying to improve the economy of the country and the life of the common man in general.

QUESTION 25.

The table below shows the percentage of sucrose in sugarcane at different stages of growth.

WEEK OF GROWTH	PERCENTAGE OF SUCROSE
1	11.5
2	12.0
5	13.5
16	15.2
20	14.9
25	13.8
30	13.5
35	13.0

(a). (i). On the graph paper provided draw a line graph using the data

(ii). What is the percentage of sucrose during the 13^{th} week?

(iii). What conclusion can be drawn from the graph about the best time for harvesting sugarcane?

(b). (i). Different regions of a plant grow at different rates. Describe how you would use the stem of a named potted seedling to test the truth of this statement.

(ii). What process do cells undergo to bring about growth and development of a plant?

(iii). Name four plant hormones that influence growth and development in plants.

(c). Explain how sucrose is digested absorbed and assimilated in man.

QUESTION 26.

An experiment was done to find out the effect of light intensity on the rate of photosynthesis. The light intensity in the table is in arbitrary units and the rate of photosynthesis was determined by measuring the volume of oxygen given out in cm^3 in a given time. The results are shown below.

Light intensity	1	2	3	4	5	6
Rate of photosynthesis	25	60	75	80	80	80

(a). (i). Using the above data plot a graph of the rate of photosynthesis against light intensity

Total 6 marks

(ii). From your graph what is the optimum light intensity?

(b). Other than the above factor name four other factors that affect the rate of photosynthesis.

(c). Briefly explain two ways in which light facilities the process of photosynthesis

(d). How is a herbivore like a cow adapted to its mode of nutrition?

QUESTION 27.

In an experiment, Tradescantia plants with purples leaves were kept in the dark for about one hour. Strips of leaves approximately 5mm by 12mm from these plants were then cut and floated with the lower epidermis down on the experimental solutions in Petri dishes. One experimental solution was 15mM potassium chloride and the other was 150mM sodium chloride. The dishes were then placed in light and the temperature kept at $20^{O}C$ after 5 minutes, a leaf strip was removed from each experimental solution, quickly blotted dry and the percentage number of open stomata was found after counting under a microscope. This procedure was repeated with other strips from the same experimental solutions at intervals of 10 minutes. The results are shown in the table below.

Time (minutes, floating on solution	5	15	25	35	45	55
% open stomata in KCL solution (15mm concentration)	0	0	20	76	82	86
% open stomata in NaCl solution (150mm concentration)	0	0	6	22	42	45

(a). Plot graphs using the same axes and suitable scale for the percentage of open stomata against time for treatment in each of the solutions, potassium chloride and sodium chloride.

(b). Why was it necessary to keep the plants in the dark for a period of time before the experiment?

(c). Using the graphs you have plotted, give possible explanations for the behaviour of the guard cells during this experiment.

(d). What do your think would happen if the experiment had been carried out in the dark?

(e). With respect to leaf structure only, state five ways in which plants living in arid areas minimize excessive loss of water.

QUESTION 28.

In an experiment three healthy rabbits were fed on equal amounts of carbohydrates. After one hour the glucose concentration in the blood was measured at 30 minutes intervals for three hours. The results were as shown in the table below.

Glucose concentration / Rabbit	Initial	30 mins	60 mins	90 mins	120 mins	150 mins	180 mins
P	1.60	1.55	1.43	1.36	1.30	1.19	1.11
Q	1.49	1.39	1.39	1.32	1.27	1.20	1.09
R	1.57	1.39	1.33	1.27	1.18	1.10	0.99
Means	1.55	1.44		1.32	1.25	1.06	

(a). (i). Calculate the mean concentration of glucose in mg per ml of blood at 60 and 180 minutes. Leave the answer in your working. Do not record your answers in the table.

(ii). On the grid provided plot a graph of the mean glucose concentration against time.

(iii). What was mean glucose concentration in the blood after 75 minutes?

(iv). Why was it necessary to use three rabbits in the experiment?

(v). Suggest a reason why the initial concentration of glucose in the three rabbits was not the same

(vi). Account for the difference in mean glucose concentration during the period

(b). Name two end – products of digestion other than those of carbohydrates.

(c). What is the fate of glucose manufactured in the leaves of plants?

(d). How does a person die from carbon monoxide poisoning?

QUESTION 29.

The changes in impala population in a national park was studied over a period of 30 years between 1965 and 1995 surrounding the national park is a ranching area which is accessible to the animals from the park. The impala population changes were as shown in the table below.

Time	1965	1970	1975	1980	1985	1990	1995
Population of impala	500	800	2750	6500	10000	2750	2000

(a). Using a suitable scale, draw a graph of the population of the impala against time.

(b). Name the phase of the curve between

(i). 1965 to 1970

(ii). 1970 to 1985

(c). Account for the shape of the graph between

(i). 1970 and 1985

(ii). 1985 and 1990

(d). Suggest two methods one would use to investigate feeding habits of impala.

QUESTION 30.

An experiment was done to determine the effect on rate of urine production of a man after drinking one litre of water. The results obtained were tabulated as shown below.

Time in hours	0	1	2	3	4	5	6	7	8
Rate of urine production in ml/hr	80	20	420	440	140	90	80	30	65

(a). Using the data above draw a graph showing the effect on the rate of urine production after drinking one litre. (6 marks)

(b). Account for the production of urine between

(i). 1 – 2 hours (2 marks)

(ii). 3 – 4 hours (2 marks)

(c). Between which time interval was the rate of change (2 marks)

(i). Highest:

(ii). Lowest:

(d). In which ways is the pituitary gland involved in the change in (b) (i) above

(e). Give two functions of the mammalian kidney (2 marks)

(f). Give two characteristics of the nephrons of fresh water animals (2 marks)

QUESTION 31.

An experiment was carried out to investigate the effect of hormones on growth of lateral buds of three pea plants.

The shoots were treated as follows:

Shoot A – Apical bud was removed

Shoot B – Apical bud was removed and gibberellic acid placed on the cut shoot

Shoot C – Apical but was left intact

The lengths of the branches developing from the lateral buds were determined at regular intervals.

The results obtained are shown in the table below

Time in days	**Length of branches in millimetre**		
	Shoot A	**Shoot B**	**Shoot C**
0	3	3	3
2	10	12	3
4	28	48	8
6	50	90	14
8	80	120	20
10	118	152	26

(a). Using the same axes, draw graphs to show lengths of branches against time. (8 marks)

(b). (i). What was the length of the branch in shoot B on the 7^{th} day? (1 mark)

(ii). What would be the expected length of the branch developing from shoot A on the 11^{th} day? (1 mark)

(c). Account for the results obtained in the experiment (6 marks)

Graph A:

Graph B:

Graph C:

(d). Why was the shoot C included in the experiment? (1 mark)

(e). What is the importance of gibberellic acid in agriculture? (1 mark)

(f). State two physiological processes that are brought about by the application of gibberellic acid on plants. (2 marks)

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QUESTION 32.

Two persons A and B were given an identical meal rich in carbohydrates. The concentration of insulin in their blood was then measures at regular intervals for 150 minutes. The table below shows the results.

Time (mins)	0	15	30	45	60	75	90	105	120	135	150
Concentration of insulin in blood plasma of person A (units)	0.8	0.9	1.2	1.4	1.5	1.1	1.5	1.0	1.6	1.3	1.3
Concentration of insulin in blood plasma of person B (units)	1.2	1.2	7.5	7.8	8.0	6.7	6.7	5.2	4.2	3.2	3.0

(a). On the same axes, draw graphs of concentration of insulin of persons A and B against time. (7 marks)

(b). (i). Which person is likely to be a diabetic (1 mark)

Give a reason for your answer (1 mark)

(c). Account for the concentration of insulin of person B (6 marks)

0 – 15 minutes

15 – 30 minutes

(d). Apart from regulation of sugar level in blood, state other functions of the liver.

QUESTION 33.

The data below shows the rate of photosynthesis at different temperatures in attached leaves of three East African plants (*Crotalaria, Gynandropsis* and *Amaranthus* species) respectively. The three species were grown outside with the same illumination while water and carbon IV oxide are not limiting factors in the experiment.

The rate of photosynthesis was expressed in terms of carbon iv oxide uptake in mg / mm^2 / hr at various temperatures as shown in the table below.

Temperature ^oC	**Rate of photosynthesis mg / mm^2 / hr**		
	Gynandropsis sp	***Crotalaria sp***	***Amaranthus sp***
5	-	20	-
10	55	40	10
15	50	49	27
20	60	64	42
25	80	48	55
30	85	45	54
35	80	42	50
40	73	31	45
45	66	15	40
50	2	-	11

(a). Using the same axes and the data given above draw, the graphs of the rate of photosynthesis against temperature. (8 marks)

(b). Using the graph in (a) above, indicate the optimum temperature for the Gynandropsis and Amaranthus species (2 marks)

(i). Gynandropsis;

(ii). Amaranthus;

(c). Give a reason why Gynandropsis and Amaranthus could not carry out

photosynthesis at $5^{O}C$ (1 mark)

(d). What are the possible ecological habitats of the following plants

(2 marks)

(i). Amaranthus:

(ii). Crotalaria:

(e). (i) At what temperature was the amount of carbon iv oxide around the leaf of Gynadropsis highest? (1 mark)

(ii). What raw material is required in the light stage of photosynthesis (1 mark)

(f). Name the parts of the chloroplast in which the following stages of photosynthesis take place (2 marks)

(i). Light stage: **(ii). Dark stage:**

(g). State one structural difference and one similarity between a chloroplast and a mitochondrion (2 marks)

(i). Difference

(ii). Similarity

(h). State the role of light energy in photosynthesis (1 mark)

QUESTION 34.

An investigation was carried out in a malaria infested area. The result obtained was tabulated as in the table below.

Month	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Type A Mosquito	400	300	250	200	200	150	180	300	500	720	900	500
Type B Mosquito	500	700	1000	700	520	400	400	500	300	250	200	400
No. of malaria cases	90	100	120	110	105	100	90	85	80	80	90	100

(a). Using the data given draw a graph using the same axis to represent the information. (8 marks)

(b). (i). During what period of the year was the least number of malaria cases treated? (1 mark)

(ii). During what period of the year was the highest number of malaria cases treated? (1 mark)

(c). (i). Which of the two types of mosquitoes was responsible for the occurrence of malaria?

(ii). Give reasons for your answer in (c) (i) above (2 marks)

(d). Malaria parasite is transmitted through a vector. Name this vector and the parasite (2 marks)

(e). State five ways of controlling the vector that transmits the malaria parasite

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QUESTION 35.

In an investigation, 16g and 64g of maize flour were placed in two separate boxes labelled A and B respectively. An equal number of flour beetles were introduced into each box at the same time. Both boxes were kept under similar conditions. The beetles were counted at intervals and results tabulated as below.

Time (days)	Number of beetles	
	A	B
0	20	20
5	20	20
40	200	300
60	550	800
80	560	1300
100	650	1750
120	640	1600
135	650	1900
150	645	1500

(a). Using the same axes, plot two curves to represent the results (8 marks)

(b). (i). What was the number of individual populations in the two boxes on the 90^{th} day? (1 mark)

(i). Number in box A **(ii). Number in box B**

(c). On which day was the population difference greatest? (1 mark)

(d). Account for the shapes of the two curves between

(i). Day 0 and 5 (3 marks)

(ii). Day 40 and 80

(e). State the limiting factor on day 120 affecting both cases. (1 mark)

(f). Other than the limiting factor stated in (e) above, give two other limiting factors that can affect the population of beetles in the experiment above.

QUESTION 36.

The table below shows how the quantities of sweat and urine vary with external temperature.

External temperature	0	5	10	15	20	25	30	35
Urine cm^3/h	100	90	80	70	60	50	40	30
Sweat $cm^{3/}h$	5	6	10	15	30	60	120	200

(a). Plot the quantities of urine and sweat produced against the external temperature.

(b). At what temperature are the amounts of sweat and urine produced equal?

(c). (i). What happens to the amount of sweat produced as the temperature rises?

(ii). Explain your observation in c (i) above

(d). Explain the observation made on the amount of urine produced as the temperature increases.

(e). Explain how hair and blood vessels help in temperature regulation when it is cold.

(i). Hair

(ii). Blood vessels

QUESTION 37.

Average temperature of a group of students, toads and environment were taken at intervals of four hours and recorded as shown in the table below. Study the table below and answer the questions that follow.

Time in hours		07.00	11.00	15.00	19.00	23.00	03.00	07.00
Temperature in ^{O}C	**Students**	36.9	37.0	36.6	36.8	38.0	37.0	37.0
	Toads	13.4	17.4	26.0	19.2	16.0	13.0	13.4
	Environment	16.4	20.0	27.8	22.0	19.2	15.8	16.0

(a). Plot the curves of students, toads, and environment on the grid provided.

(b). (i). Comment on the relationship of toad's body temperature and that of the environment.

(ii). Explain the relationship you have stated in b (i) above.

(c). Explain the advantage that the student's body has over that of the toad in relation to the environmental temperature.

(d). Explain the role of the brain in temperature regulation in man.

(e). The experiment was repeated using aquatic frog instead of a toad. The body temperature variations of the frog and the toad differed greatly. Explain the difference in temperature variations.