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70 BIOLOGY GRAPHICAL QUESTIONS

Prefer Calling Sir Obiero Amos @ 0706 851 439 for Marking Schemes

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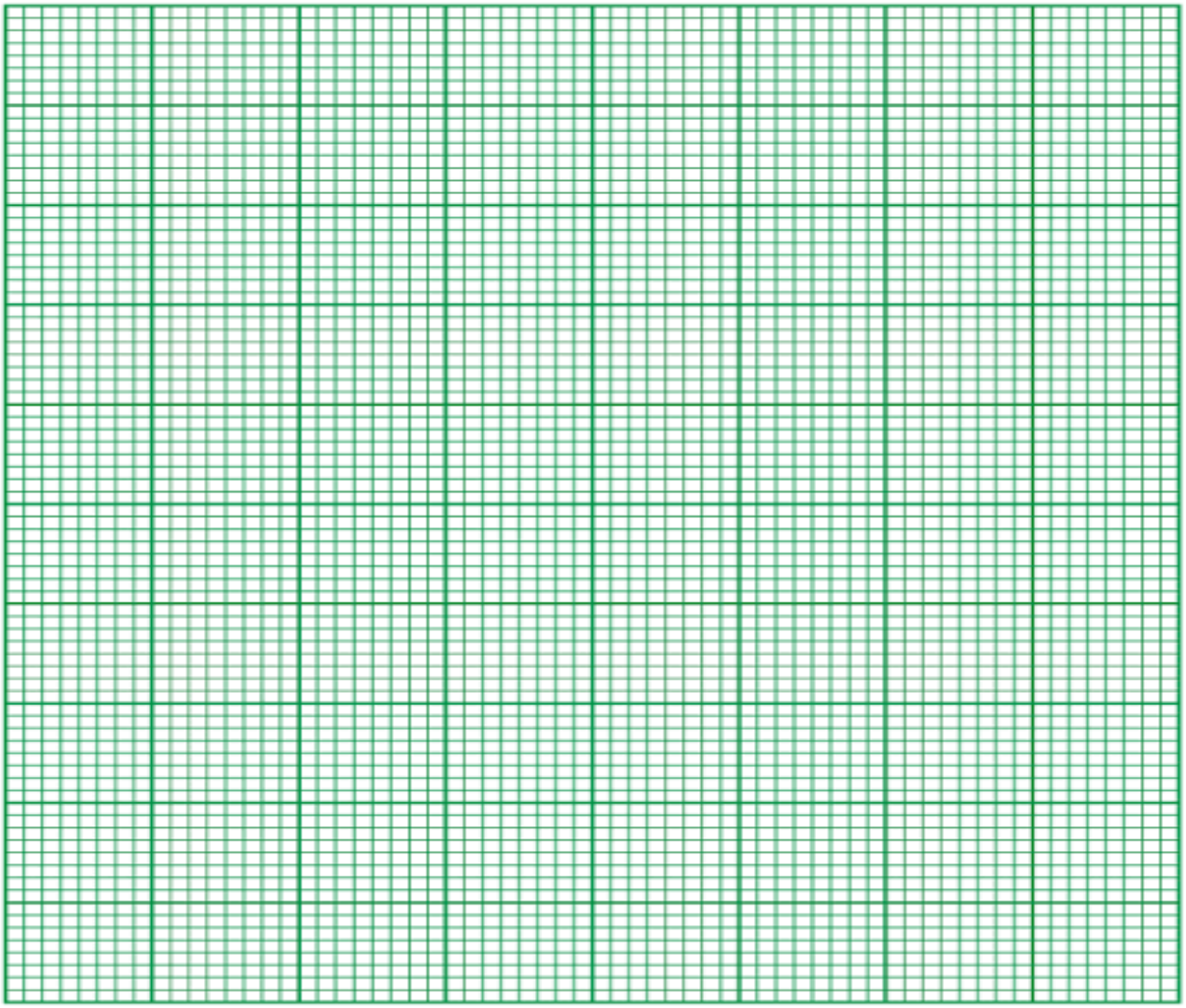
QUESTION NO. 01

1. The table below shows the population of a housefly *Musca domistica* which is parasitized by wasps of species *Nasonia Spp*. The investigation of their population growth pattern was carried out for 70 weeks. In these experimental space and physical factors were assumed not to be limiting.

Time in weeks	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Musca domestica	40	70	110	260	350	480	400	395	350	40	60	140	250	240	230
Nasonia spp	10	20	30	45	100	200	300	380	410	250	60	20	40	200	280

(a) Using the readings in the table, plot graphs on the same axis of population growth of organisms against time. (8mks)



(b) Account for the growth of

(i) *Musca domestica* between 10^{th} week – 25^{th} week (1mk)

(ii) *Nasonia species* between 40^{th} week – 50^{th} week (1mk)

(c) What is the population of?

(i) *Nasonia Spp* on the 62nd week (1mk)

(ii) *Musca domestica* on the 4th week (1mk)

(d) Bemex, another parasite of housefly was introduced into the ecosystem. Giving a reason what will be the effect on the population of

(i) Housefly *Musca domestica* (2mks)

(ii) *Nasonia Spp* (2mks)

(e) In estimating the population of *Musca domestica* in the experiment above, capture-recapture method was used. **Describe** the procedure which was followed. (4mks)

QUESTION NO. 02

2. In an ecological study, a grass hopper population and that of crows was estimated in a certain grassland area over a period of one year. The results are as shown in the table below.

Month	J	F	M	A	M	J	J	A	S	0	N
Number of adult grasshoppers $xl0^2$	90	20	11	25	2500	1652	120	15	10	35	192
Number of crows	4	2	0	1	8	22	7	2	1	1	5
Amount of rainfall	20	0	55	350	520	350	12	10	25	190	256

(i) **What** is the relationship between the rainfall and grasshopper population? (1mk)

(ii)(a) **Account** for the relationship stated in a (i) above. (3mks)

(b) Explain the relationship between the grasshopper population and that of the crows. (3mks)

(c) If the data was used in the construction of pyramid of numbers, **what** would be the trophic level of; (3mks)

i. Grasshopper

ii. Crows

iii. The grass in the study area

(d) If the area studied was one square kilometer, **state**;

(i) One method that could have been used to estimate the crow population. (1mk)

(ii) One method that could have been used to estimate the grasshopper population. (1mk)

(e) Suggest what would happen if a predator for grasshoppers entered the study area. (2mks)

(f) What is meant by the term carrying capacity? (1mk)

(g) Why would the carrying capacity of wild animals in woodland grassland be higher than that of cattle? (2mks)

(h) What is an ecosystem? (3mks)

QUESTION NO. 03

3.An experiment was carried out whereby three healthy rats were fed on equal amounts of glucose. After half an hour, the glucose concentration per ml. of blood was measured at 15 minutes intervals for three hours. The following results were obtained.

Glucose conc. mg/ml / Rats	**0 min**	**15 min**	**30 min**	**45 min**	**60 min**	**75 min**	**90 min**
A	0.800	0.774	0.715	0.680	0.650	0.595	0.555
B	0.745	0.695	0.695	0.660	0.635	0.600	0.545
C	0.795	0.695	0.665	0.635	0.590	0.550	0.495
Mean	0.780	0.720	0.691	-	0.625	-	0.532

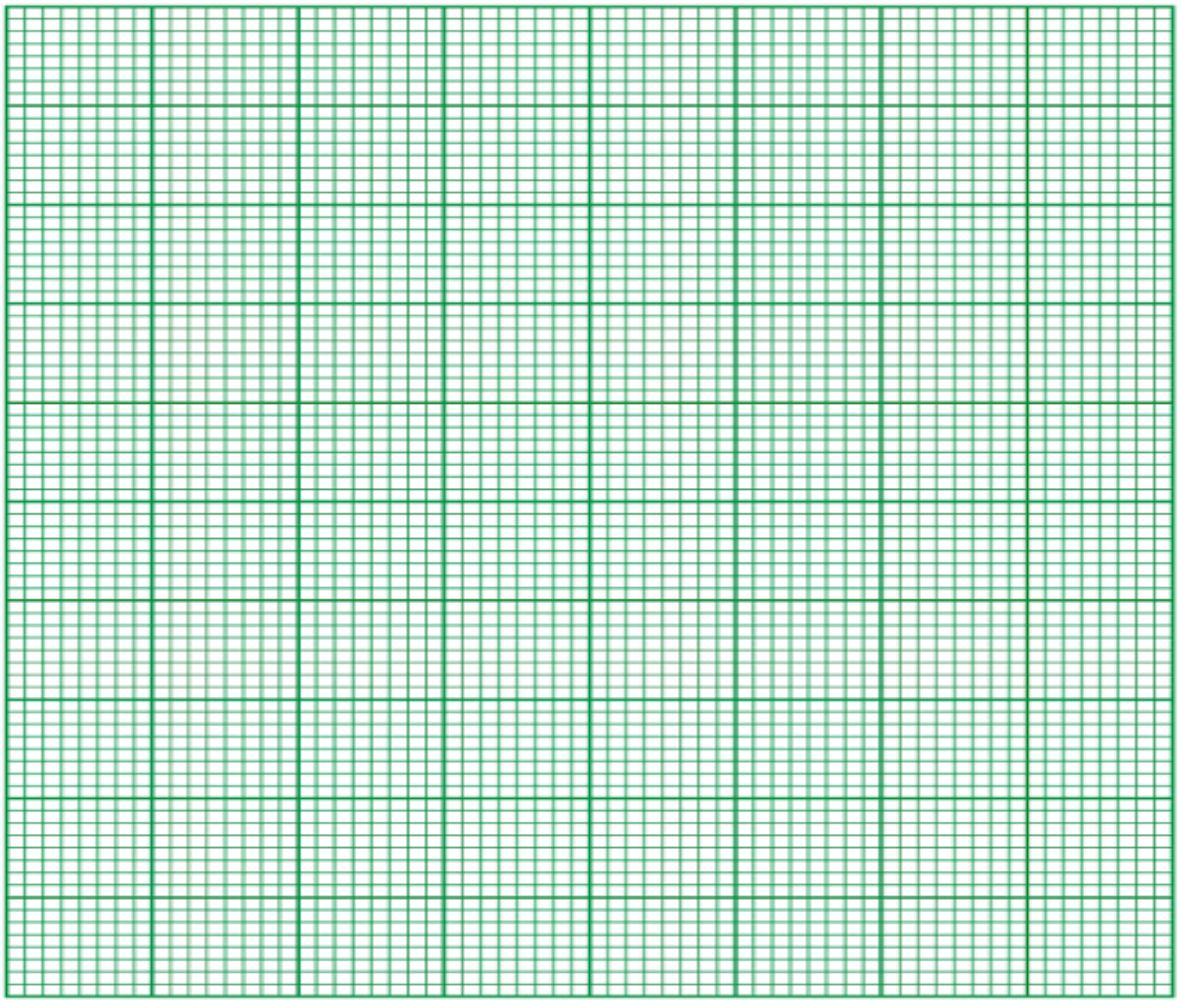
a) i) Calculate the mean concentration of glucose in mg per ml of blood at 45 and 75 minutes.

Record your answer on the table. (2mks)

ii) On the graph paper provided, plot a graph of the mean glucose concentration against time. (6mks)

iii) What was the mean glucose concentration in the blood after 37.5 minutes? (1mk)

iv) Give a reason why it was necessary to use three rats in the experiment instead of one. (1mk)



v) Why was the initial concentration of glucose in the rats not the same? (2mks)

vi) Account for the difference in mean glucose concentration during the period. (3mks)

b) Give two reasons why glucose is the main respiratory substrate. (2mks)

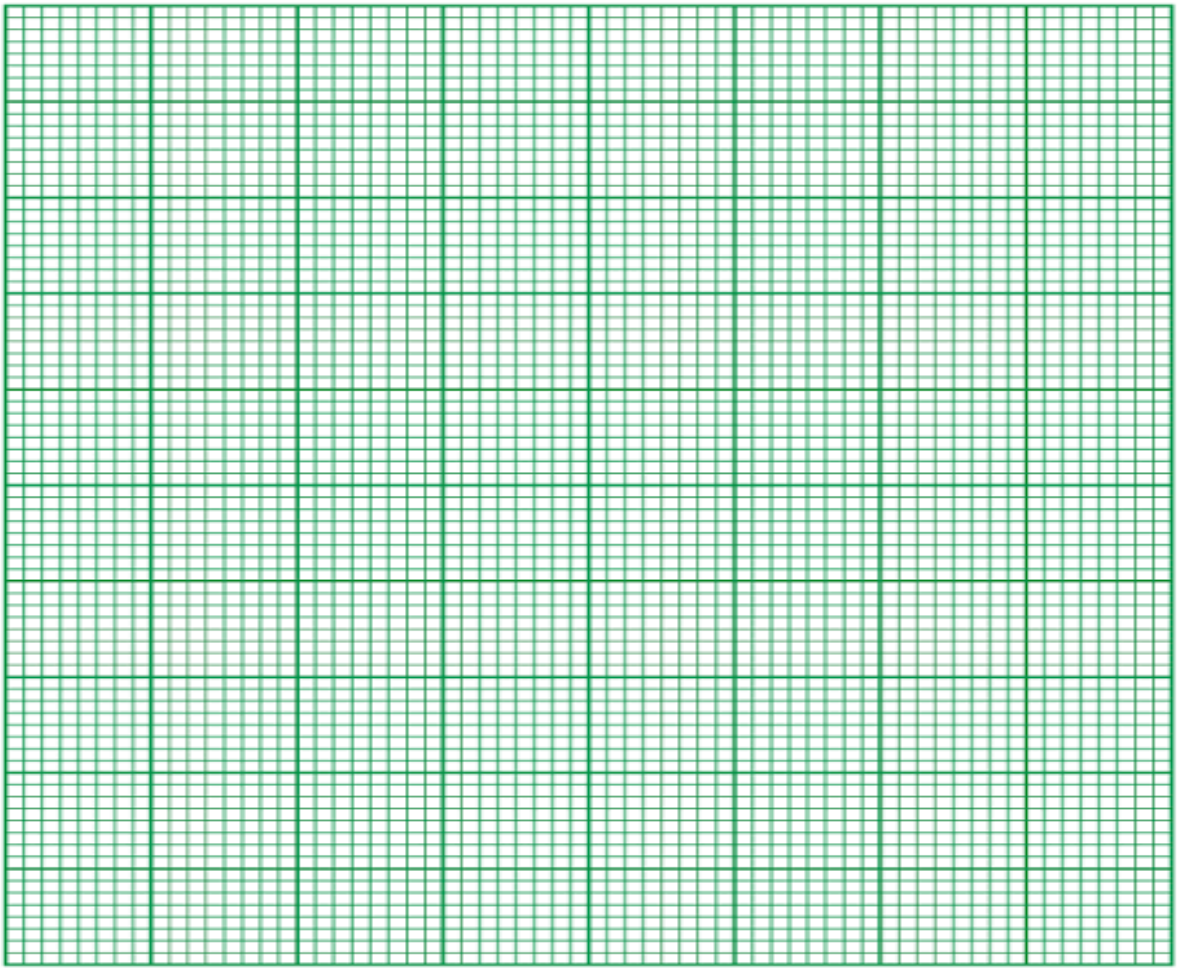
c) Give three ways in which glucose is assimilated in the body (3mks)

QUESTION NO. 04

4. Ten young rats 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 rats	10	10	55	105	300	445	440	180	135	150

a) Using a suitable scale, plot a graph of a number of rats against time (6mks)



b) With reference to the graph, account for the changes in rat population between

i) 0 to 2 months (1mk)

ii) 2 to 10 months (2mks)

iii) 10 to 12 months (2mks)

iv) 12 to 16 months (2mks)

c)i) Between which two months was the population change greatest. (1mk)

ii) Calculate the rate of population change over the period you have given in a) above (2mks)

d) Briefly describe how you would use the capture – recapture method to estimate the population of grasshoppers. (4mks)

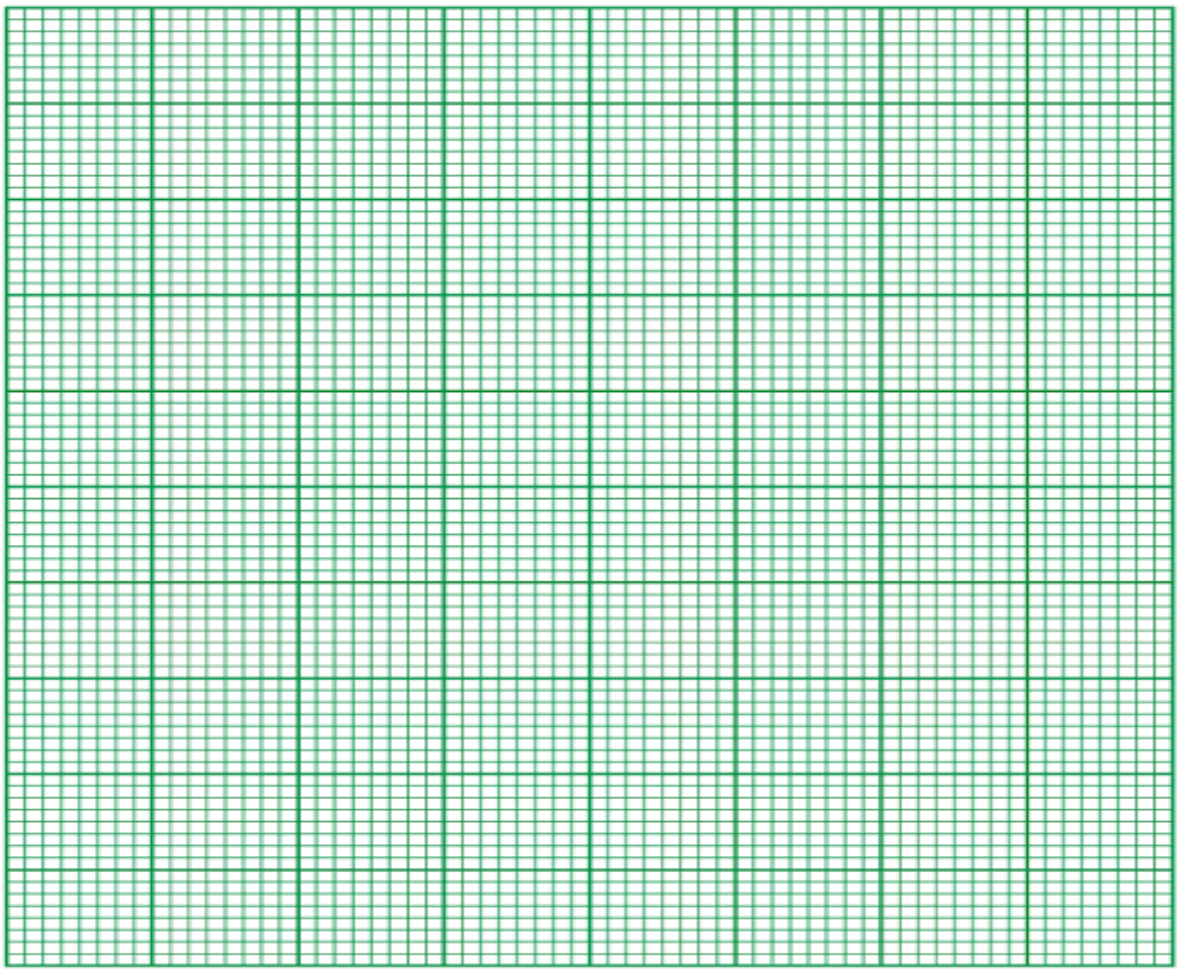
QUESTION NO. 05

5.An experiment was carried out to investigate the effect of heat on germination of seeds. Ten bags each containing 60 pea seeds were placed in water-bath maintained at 85^0C. After an interval of two minutes a bag was removed and seeds planted.

The number that germinated was recorded. The procedure used for pea seeds was repeated for wattle seeds. The results were tabulated as in the table below.

Time (Minutes)	Number of seeds that germinated	
	Garden pea seeds	Wattle seeds
0 – 2	60	0
2 – 4	60	0
4 – 6	44	1
6 – 8	40	2
8 – 10	36	28
10 – 12	11	36
12 – 14	2	41
14 – 16	1	44
16 – 18	1	47
18 – 20	0	49
20 – 22	0	49

a) Using a suitable scale and on the same axes, draw graphs of time in hot water against number of seeds that germinated for each plant. (7mks)



b) i) After how many minutes would you expect 50% of wattle seeds exposed in hot water to germinate. (1mk)

ii) What was the minimum number of minutes after exposure of garden pea seeds to hot water was there no germination. (1mk)

c) From the graph, which of the **<u>two</u>** types of seeds was more sensitive to heat influence on germination. Why? (1mk)

d) Explain why the ability for the:

i) Garden pea seeds to germinate declined with the time of exposure to heat. (3mks)

ii) Wattle seeds to germinate increased with time of exposure to heat. (2mks)

e) What results would be expected if the temperature of water was maintained at temperatures.

i) Above 85^0C (1mk)

ii) At 5^0C (1mk)

f) Apart from temperature state three internal factors necessary for seed germination. (3mks)

QUESTION NO. 06

6. The table below shows the rate of enzyme activity at different pH values.

pH	Rate of Product formation (mg/hr)
1	8.0
2	10.0
3	10.0
4	6.0
5	3.3
6	2.0
7	1.0
8	0.3
9	0.0
10	0.0

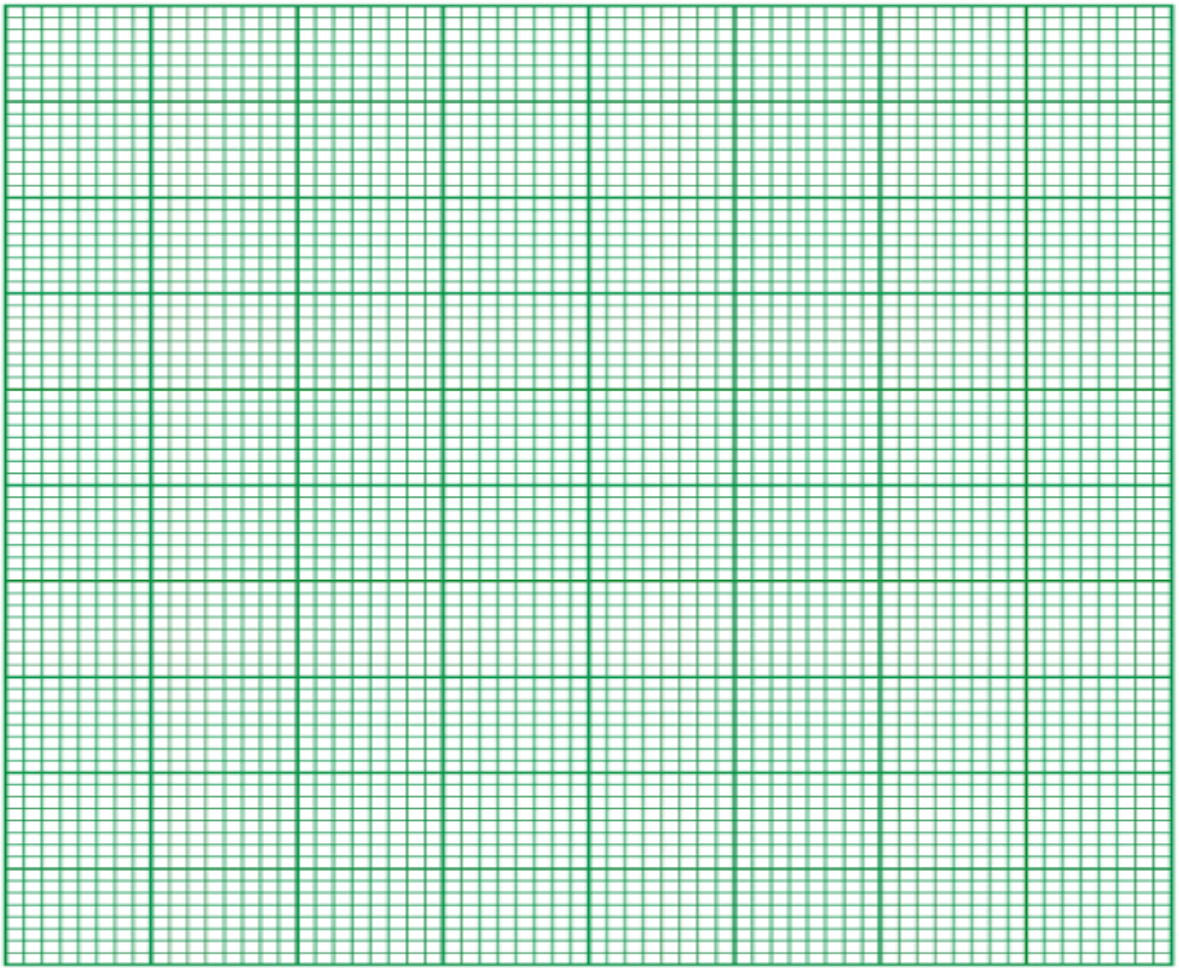
a) Using a suitable scale, draw a graph of the rate of product formation against pH (6mks)

b) Account for the rate of product formation between

i) pH 1 and 3 (2mks)

ii) pH 5 and 8 (2mks)

iii) pH 9 and 10 (2mks)



c) What is the optimum pH value for this enzyme (1mk)

d) Suppose this enzyme is a digestive in what part of the alimentary canal would it be found (1mk)

i) Give a reason for your answer (2mks)

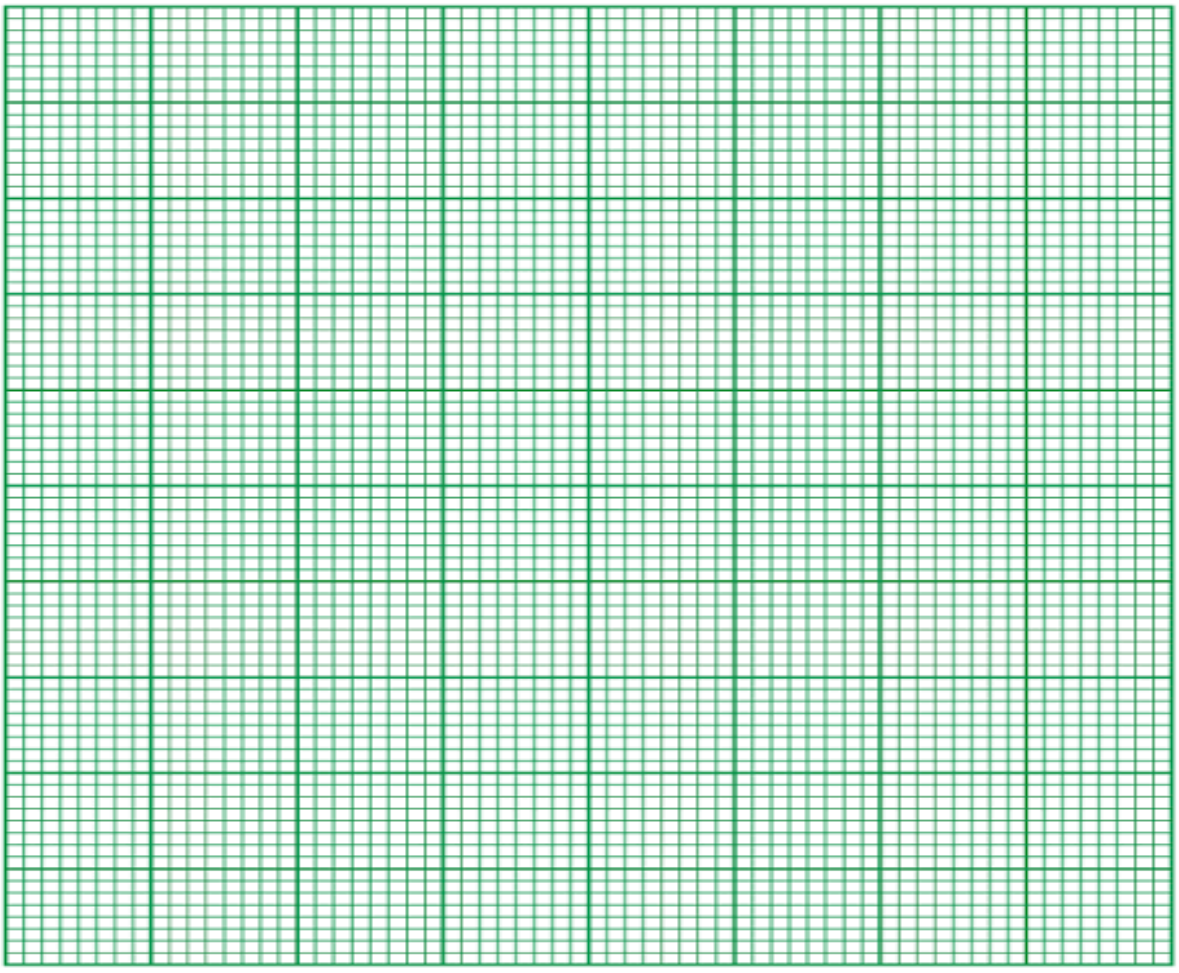
e) Apart from the pH, state four other factors that may affect the rate of enzyme activities (4mks)

QUESTION NO. 07

7. The data below was obtained from an experiment designed to measure the velocity of flow of water during the course of a single day in the xylem of two trees of the same species.

Time of day/hr		0300	0600	0900	1200	1500	1800	2100	2400	0300	0600
Velocity of flow/cm hr^{-1}	Eucalyptus species	0	45	125	140	135	85	45	25	5	0
	Acacia species	-	5	105	135	110	45	30	25	10	0

a) Using the same axes, draw graphs to show the velocity of flow against time. (8mks)



b) At what time of the day was the velocity of flow same for the species? (1mk)

c) Account for the shape of the graphs of eucalyptus. (4mks)

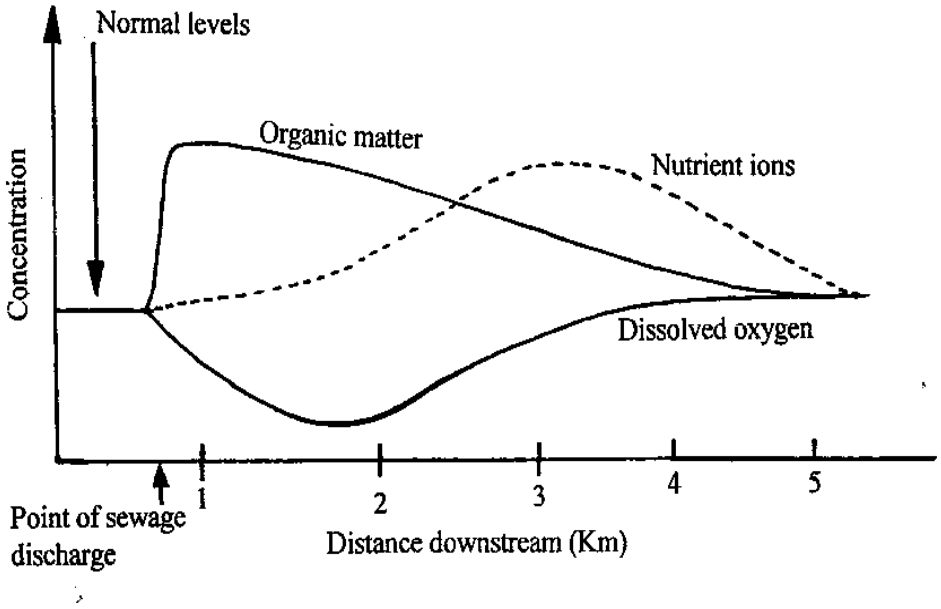
d) What forces move the water through the plant? (4mks)

e) Determine the rate of flow at 1900 hours. (2mks)

f) Suggest two features of Acacia that lead to the difference in the velocity of flow. (2mks)

QUESTION NO. 08

8. The figure below shows the changes in the concentration of various substances in a river following the discharge of untreated sewage into it. Study it and answer the questions that follow



a) Account for the changes in the concentration of:

i) Organic matter (3mks)

ii) Nutrient ions (2mks)

iii) Dissolved oxygen (4mks)

b) Describe the changes you would expect to observe with respect to:

i) Fish population (3mks)

ii) Water plants and photosynthetic algae (4mks)

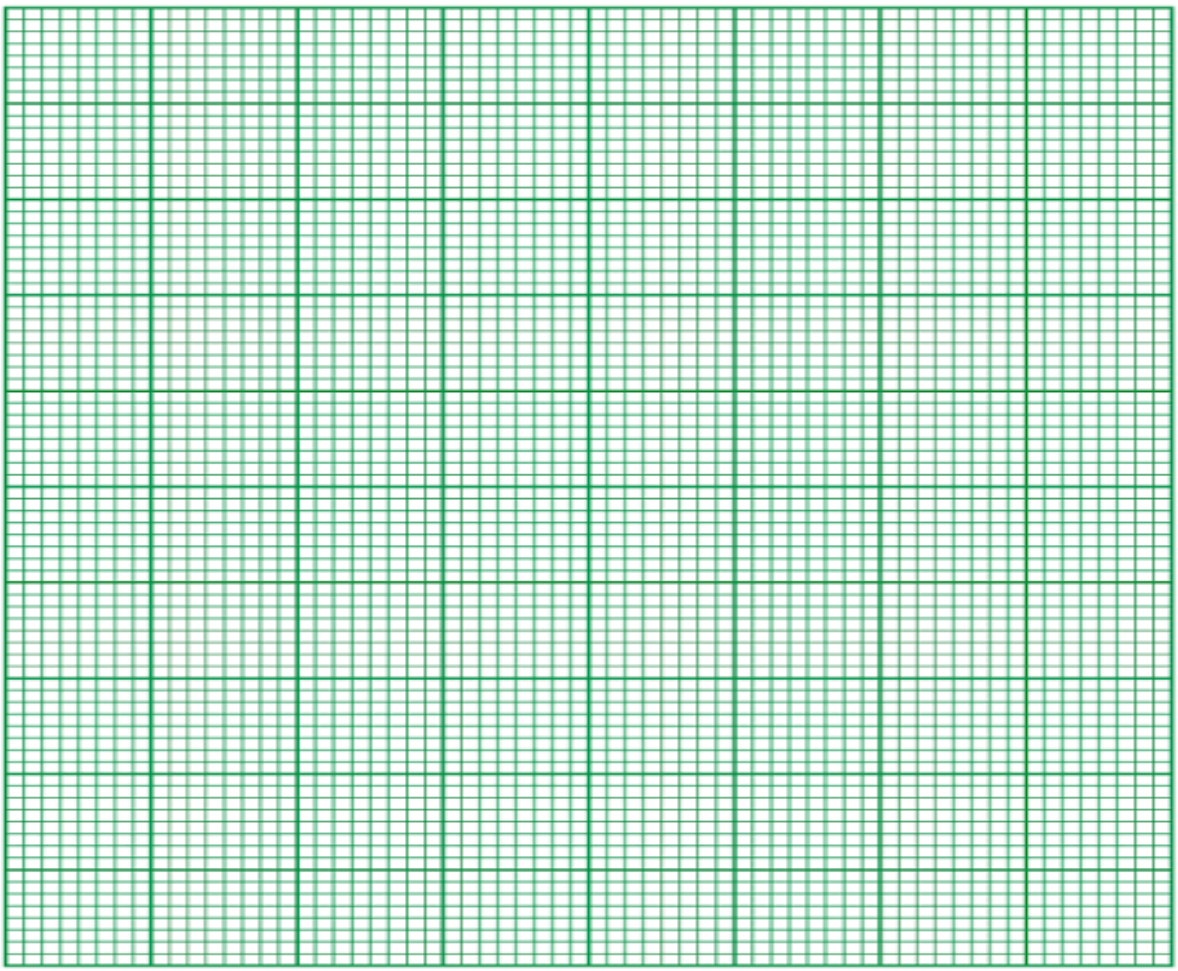
c) State four ways of controlling the type of pollution illustrated above (4mks)

QUESTION NO. 09

9. In the experiment, the population growth of yeast cells in a Petri dish was determined over a period of 75 minutes. The results below were obtained.

Time in minutes	Number of yeast cells
0	4
5	6
10	8
15	10
25	30
30	50
35	80
40	120
45	140
50	150
55	160
65	166
75	166

a) Using a suitable scale, plot a graph of number of cells against time in minutes (6 marks)



b) Name the type of the curve you have drawn above (1 mark)

c) Determine the number of yeast cells after 37 minutes (1 mark)

d) After how long was the population of yeast cells 144? (1 mark)

e) Work out the rate of cell division between 32 minute and 42 minute (2 marks)

f) Account for the shape of graph between 45^{th} minute and 60^{th} minute (3 marks)

g) In a field study to estimate the population of grasshoppers in the school field of 4 km^2, 60 grasshoppers were caught using sweep nets, marked with red paint and released back to the field. The following day students went back with their sweep nets and caught 100 grasshoppers, in which 20 were found to be already marked.

i) Calculate the population size of grasshoppers in the field

(2 marks)

ii) Calculate the population density of the grasshoppers in the field

(2 marks)

iii) What factors would maintain the population of grasshoppers and yeast cells at the carrying capacity. (2 marks)

QUESTION NO. 10

10. An experiment was set up to investigate the effect of light on the rate of photosynthesis in the shoot of a water weed. The shoot was immersed in a 2% sodium hydrogen carbonate solution. The gas given off by the shoot was collected for five minutes at different light intensities and the volume measured. The results obtained are shown in the table below.

Light intensity(arb units)	**1**	**2**	**3**	**5**	**10**	**20**	**30**	**40**	**50**
Gas collected (cm^3/5minutes)	**0.35**	**0.6**	**0.85**	**1.20**	**1.55**	**1.70**	**1.80**	**1.79**	**1.79**

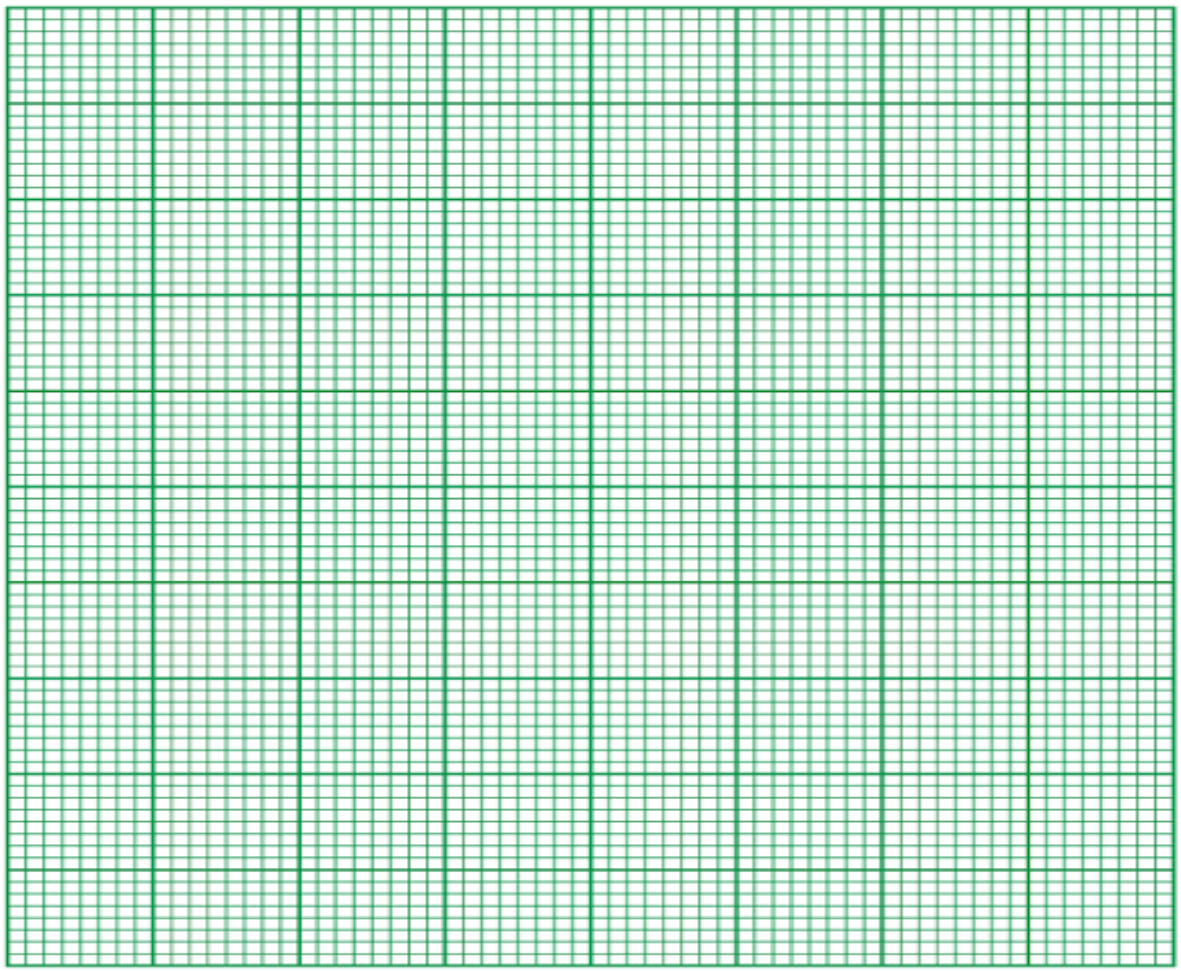
a) Using the data given in the table, plot a graph of volume of the gas collected against the light intensity (6mrks)

b) Account for the rate of gas production in the following intervals of light intensity.

i) 1 - 10 (2mrks)

ii) 30 - 50 (2mrks)

c) What is the use of sodium hydrogen carbonate in this experiment. (1mrk)



d) State the products of light stage of photosynthesis. (2mrks)

e) State the functions of each of the products of the dark stage of photosynthesis in man (3mrks)

f) Why are plants referred to us as producers in an ecosystem.(2mrks)

(g) Other than light intensity, name **two** other factors that affect the rate of photosynthesis. (2mrks)

QUESTION NO. 11

11. An investigation was carried out between 2003 and 2012 to study the changes of fish population in a certain small lake. Four species of fish, **T, W, M, P** were found to live in this lake. In 2004 a factory was built near the lake raising the average temperature from 25^{o}C to 30^{o}C. In 2005 sewage and industrial waste from a nearby town was diverted into the lake. 2007, discharge of hot water, sewage and industrial waste into the lake was stopped. The fish population during the period of investigation are shown in the table below.

Fish species	2003		2005	2007	2009	2010	2011	2012
T	5900		200	17	100	700	4300	8000
W	300		25	8	19	60	400	508
M	30		120	0	0	0	0	0
P	4300		260	25	30	35	510	807

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

(ii) State the factors that might have caused the lowest fist population during the year you have stated in (a)(i) above (3marks)

(iii) Explain how each factor you have stated in (a)(ii) above could have brought about the changes in fish population (6marks)

(b) (i) What is the difference in the rate of population recovery of species T and P? (3marks)

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

(c) (i) State a method that might have been used in estimating the fish population in the lake? (1mark)

(ii) State one advantage of the method you have stated in (c) (i) above (1mark)

(iii) State three limitations of the method named in (c) (i) above.

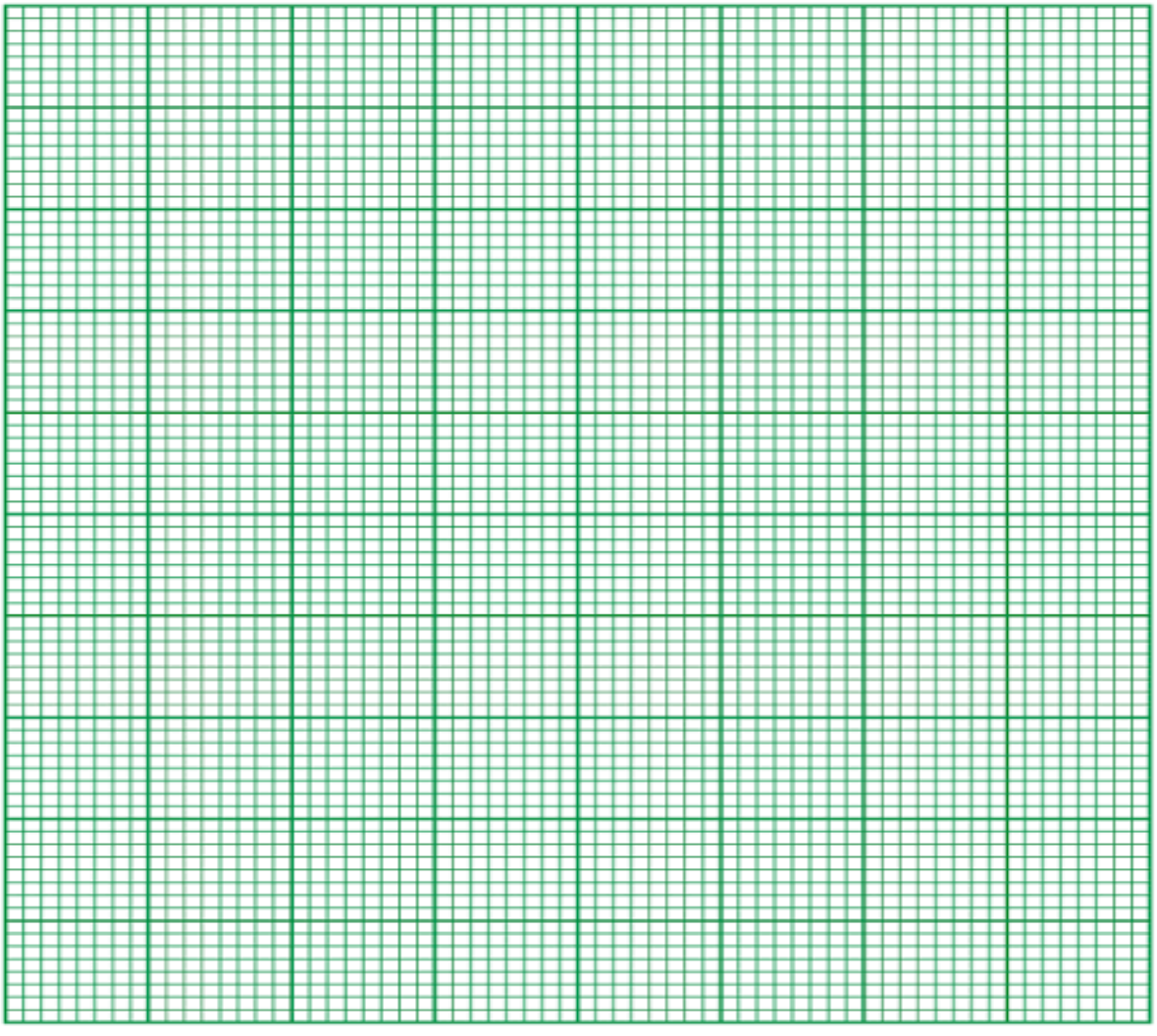
. 3mrk

QUESTION NO. 12

12. The relationship between oxygen concentration, sugar consumption and potassium ion uptake in isolated wheat roots was determined. The results obtained were tabulated as shown below. The loss of sugar and potassium uptake or gain are in arbitrary units.

		Percentage oxygen in aerotun stream						
		0	5	10	15	20	30	100
Sugar loss		15	20	43	45	45	44	43
Potassium ion gain		5	55	70	75	75	72	70

(a) Plot graphs of sugar loss and potassium ions gain against oxygen concentration on the same axes. (6mks)



(b) Name the process by which potassium ions is taken by the roots. Give reason for your answer (4mks)

(c) Account for sugar loss and potassium ions gain.

(i) 0% oxygen concentration (2mks)

(ii) Between 5% and 20% oxygen concentration (2mks)

(d) Suggest **two** factors necessary for the above process apart from oxygen (2mks)

(e) State **two** ways by which the process above can be stopped (2mks)

(f) Name two main areas in a mammalian body where the above process occurs. (2mks)

QUESTION NO. 13

13. During germination and growth of a cereal, the dry weight of the endosperm, the embryo and 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) On the same axes, draw graphs of dry weight of endosperm, embryo and the total dry weight against time. (7mks)

b) What was the total dry weight on day 5? (1mk)

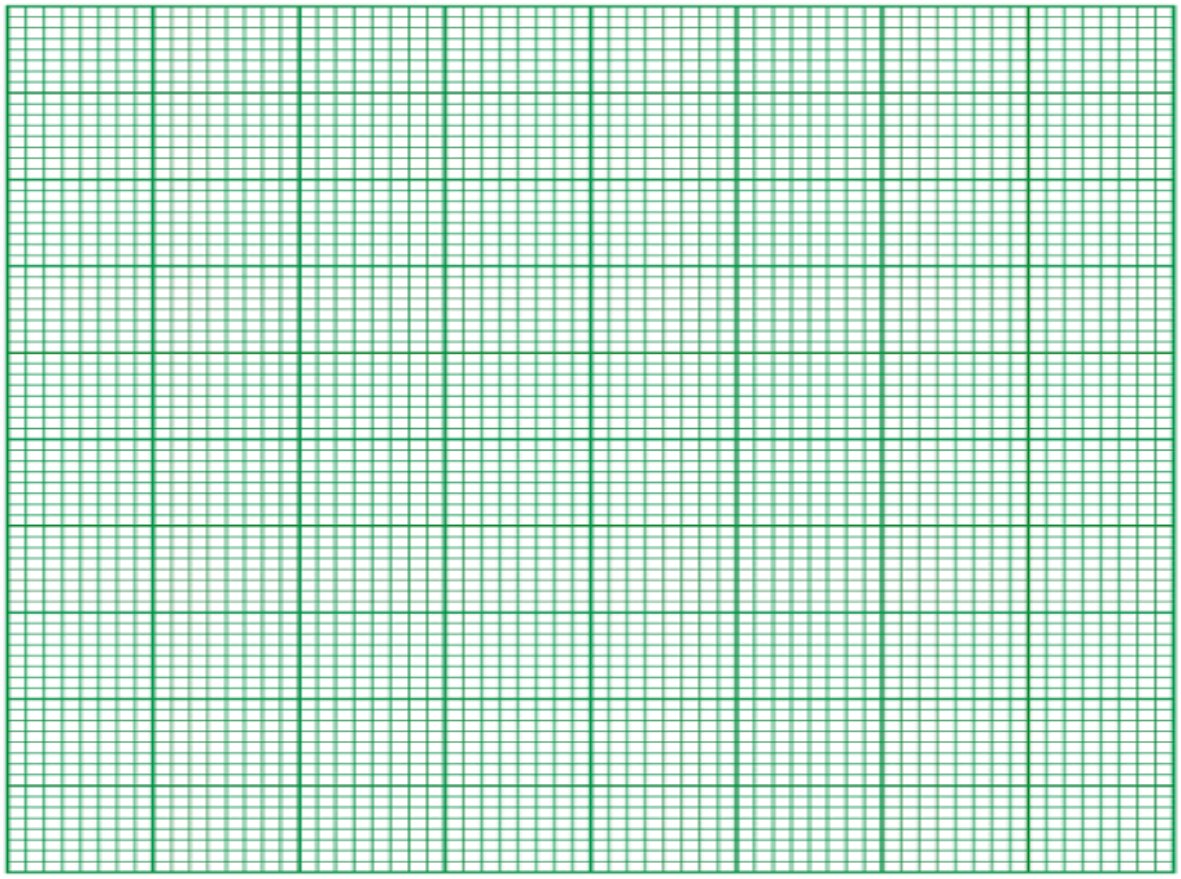
c) Account for

i) Decrease in dry weight of endosperm from day 0 to day 10. (2mks)

ii) Increase in dry weight of embryo from day 0 to day 10. (2mks)

iii) Decrease in total dry weight from day 0 to day 8. (1mk)

iv) Increase in dry weight after day 8. (1mk)



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

i) Factors within the seed. (2mks)

ii) Factors outside the seed. (2mks)

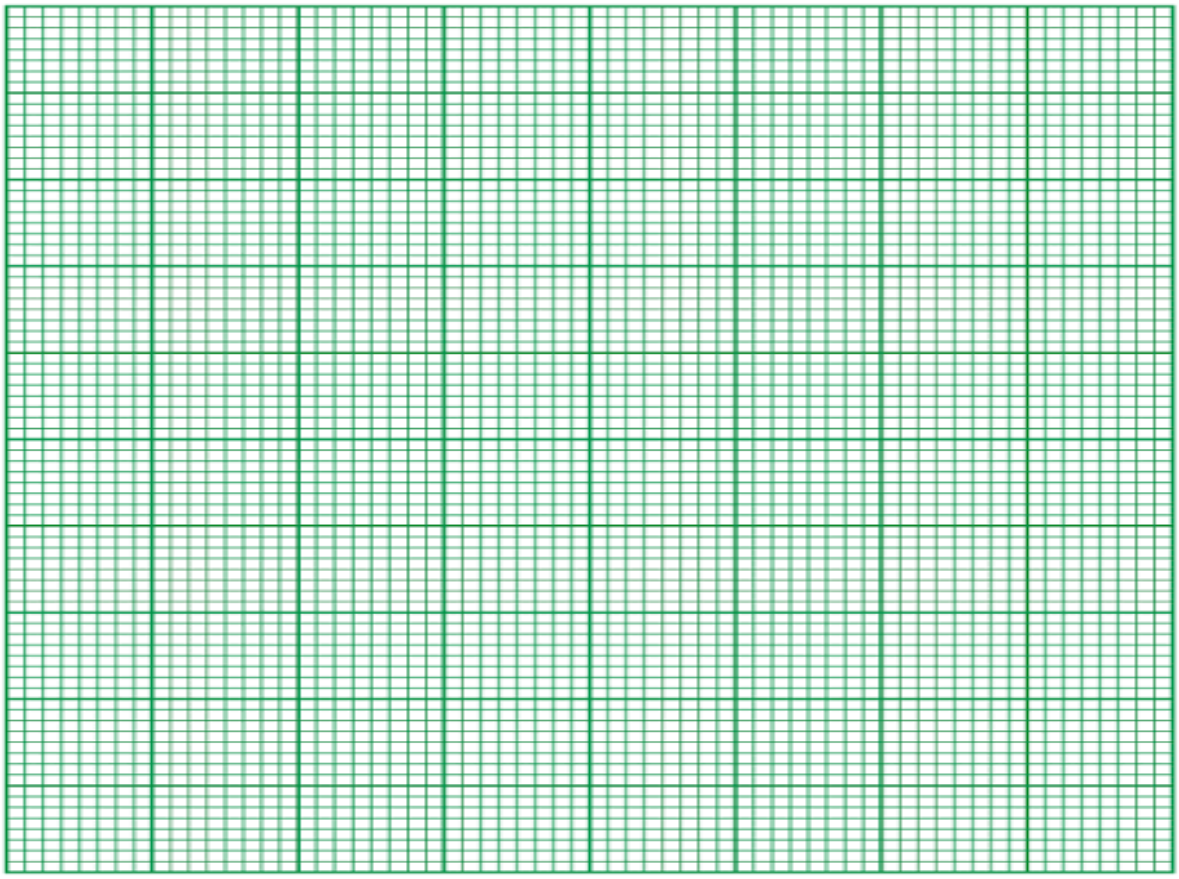
e) Give **two** characteristics of meristematic cells. (2mks)

QUESTION NO. 14

14.A group of students carried out a study of the population growth of flour weevils. They put 16grams of maize flour into two equal boxes **K** and **L** respective . They then introduced equal numbers of weevils into the boxes. The boxes were kept under similar environmental conditions. The weevils were counted at intervals and the results recorded in the table below.

No. of days after introduction of weevils	Approximate No. of weevils present.	
	K	**L**
0	20	20
5	20	20
40	200	300
60	550	800
80	560	1300
100	650	1750
120	640	1750
135	650	1740
150	645	1748

(a) Using a suitable scale, draw two graphs on the same axes from the results in the table. Plot approximate number of weevils present on the Y – axis (Use graph paper provided) (8mks)



b). What were the approximate number of weevils present in the two boxes on the 70th day. (2mks)

Number in **K:**

Number in **L:**

(c)(i)On what day was the population of weevils in **K** 580. (1mk)

(ii)Between which days was the population difference greatest (1mk)

(d) Account for the shape of graph **L** between day 5 and day 100.(4 mks)

(e) State factors that would make the human species assume the graph curve above in **K.**(4mks)

QUESTION NO. 15

15. In an experiment to investigate the effects of light intensity on the rate of photosynthesis, a shoot of elodea (water weed) was used. The shoot was immersed in 2% sodium hydrogen carbonate solution maintained at 15^{o}C in an apparatus which allowed for collection of a gas evolved from the shoot. The gas given off was collected for five minutes at each light intensity and its volume recorded as shown below.

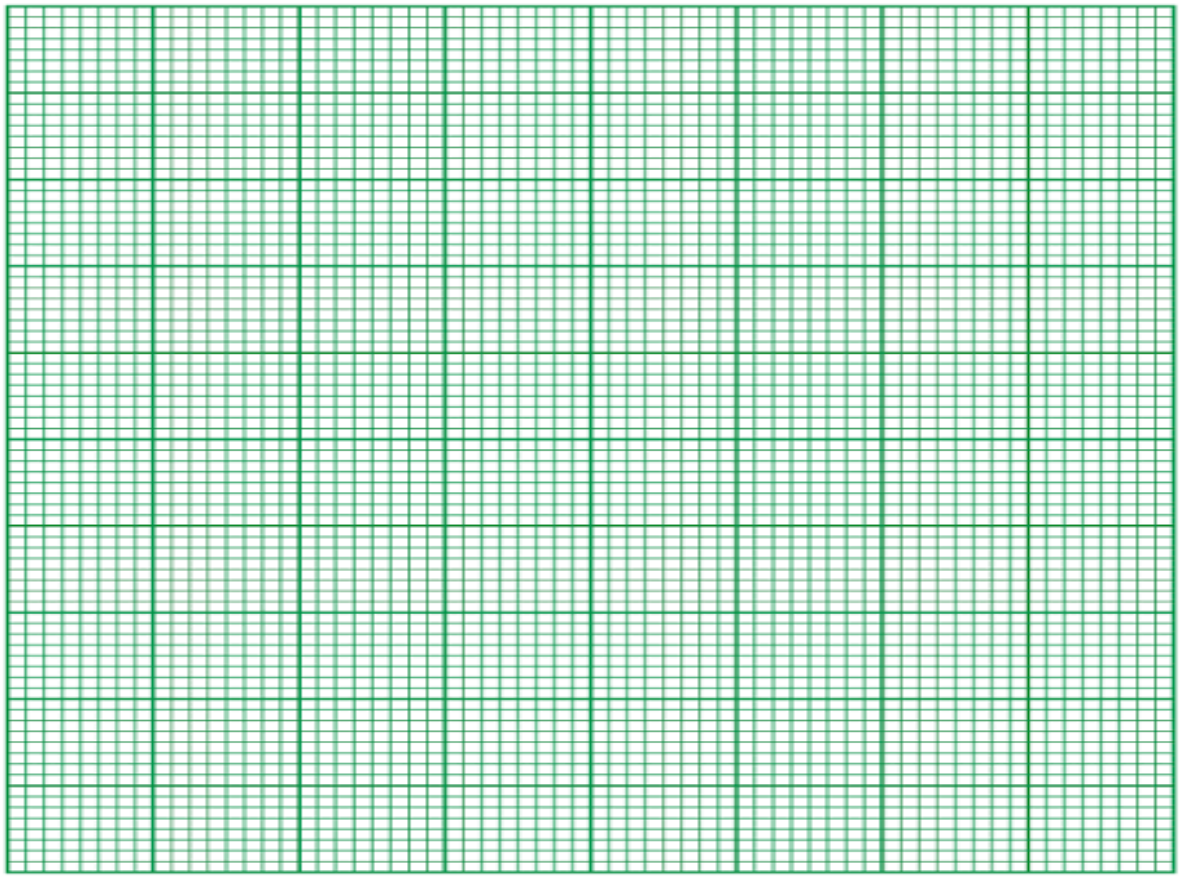
Light intensity (arbitrary units)	1	2	4	7	12	18	26	37	46
Gas evolved (cm^3 per 5 min)	0.45	0.70	0.95	1.40	1.75	1.82	1.90	1.90	1.90

(a) Using the data given in the table plot a suitable graph of gas evolved against light intensity (6mks)

(b) Account for the rate of gas evolved

(i) 1 and 18 arbitrary units (3mks)

(ii) 26-46 arbitrary units (2mks)



(c) Explain why a green leaf is normally tested for the presence of starch instead of glucose (2mks)

(d) How is the dry mass of a leaf determined (3mks)

(e) Describe how the chloroplast is adapted to its functions (4mks)

QUESTION NO. 16

16. (a) An experiment was carried out to investigate the population of a certain micro-organism. Two Petri-dishes were used. Into the petridish labelled **M**, $60cm^3$ of a culture medium was placed while $30cm^3$ of the same culture medium was placed in Petri-dish labelled **N** equal numbers of micro organisms were introduced in both Petri dishes. The set ups were then incubated at 35^0C. The number of micro-organisms in each was determined at irregular intervals for a period of 60 hours. The results were as shows in the table below.

Relative number of microorganisms	**M**	40	40	180	280	1200	1720	1600	1840	1560	600
	N	40	40	120	200	680	560	560	600	600	400
Time in hours		0	5	10	15	23	30	35	42	45	60

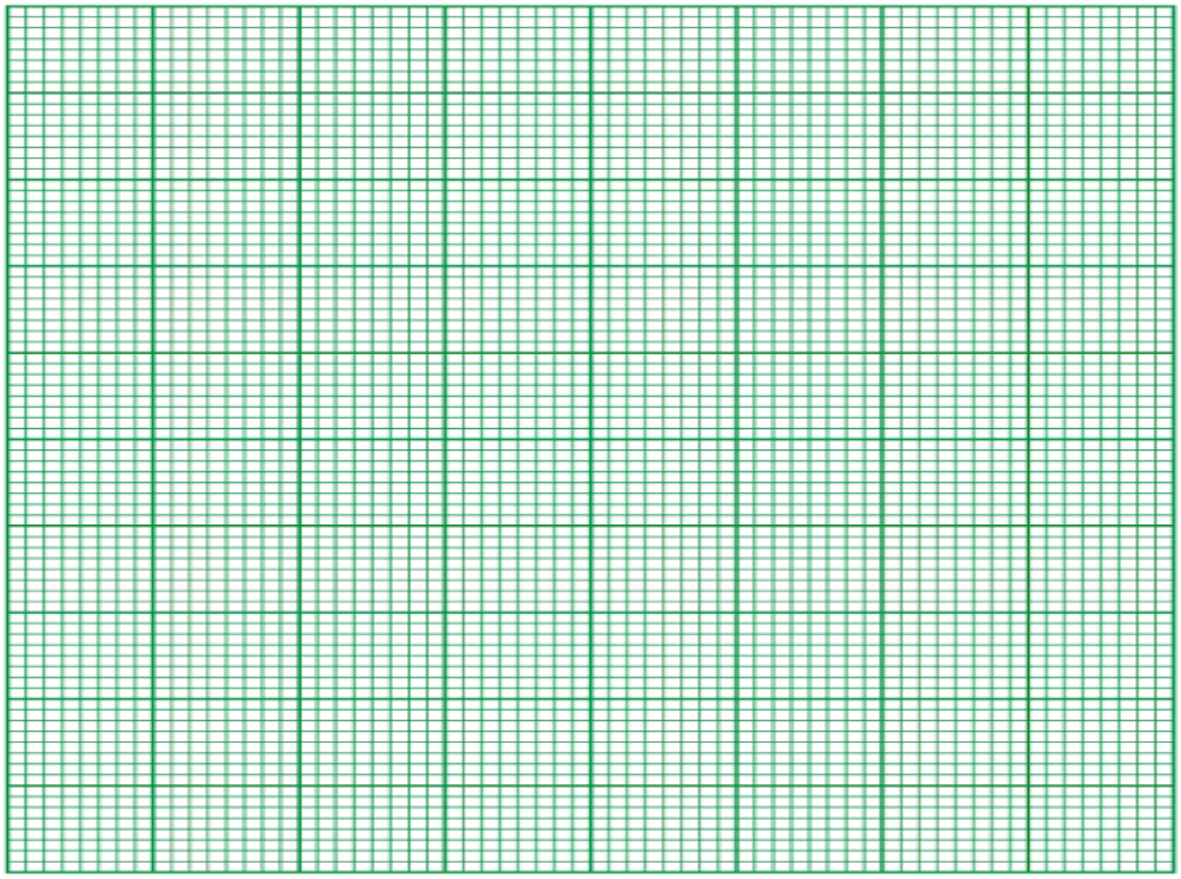
(i) On the same axes, draw the graphs of relative number of microorganisms against time on the grid provided. (7mks)

(ii) After how many hours was the difference between the two populations greatest? **(1mk)**

(iii) Work out difference between the two populations at 50 hours. **2mks**

(iv) With a reason state the effect on the population of microorganisms in petridish **M** if the temperature was raised to 60^0C after 20hours. 2mks

(v) Account for the shape of the curve for population in petridish **N** between 46 hours and 59 hours. **(3mks)**



(b) Explain how the osmotic pressure of the mammalian blood is maintained constant. (5mks)

QUESTION NO. 17

17. Two persons **A** and **B** drunk volumes of concentrated solutions of glucose. The amounts of glucose in their blood was determined at intervals. The results are shown in the table below.

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

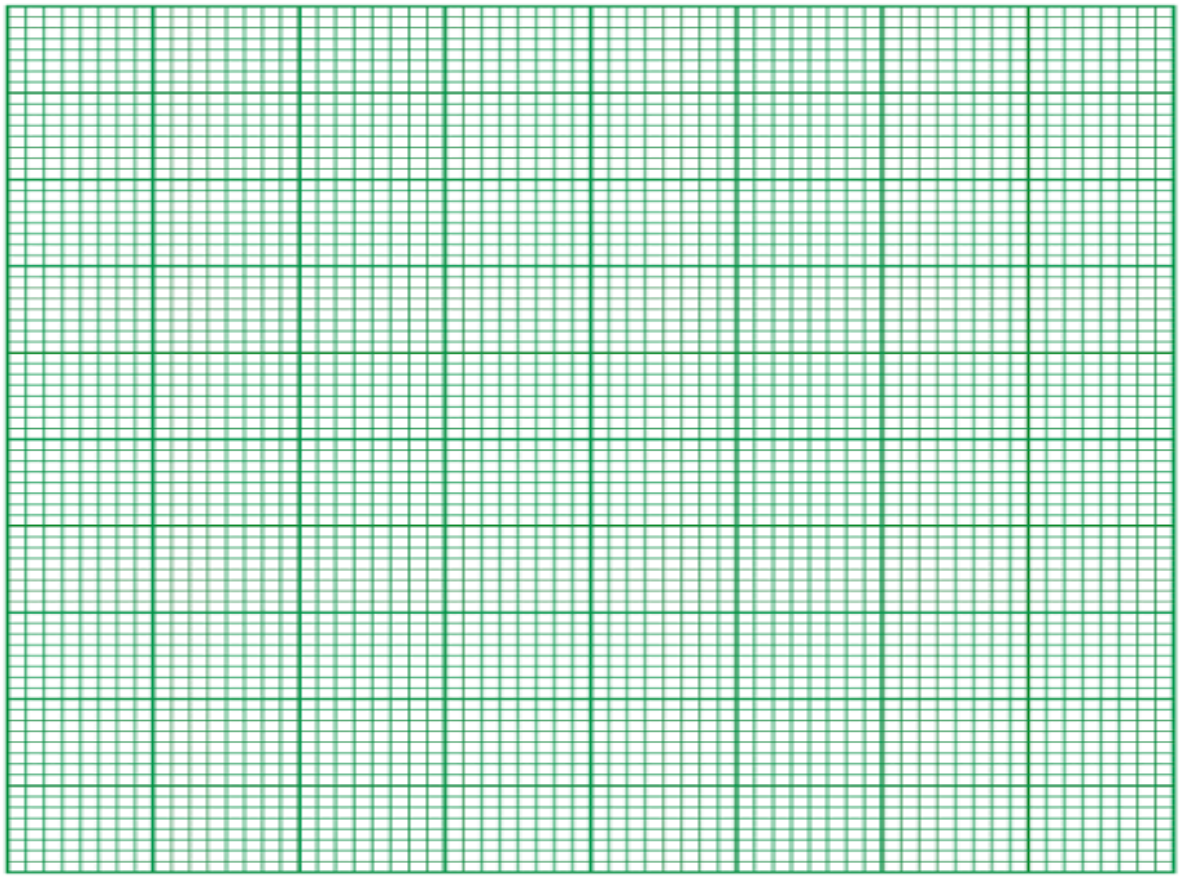
(a) On the grid provided, plot graphs of glucose level in blood against time on the same axes. (7marks)

(b) What was the concentration of glucose in the blood of person **A** and **B** at the 20th minute? (2 marks)

A.

B.

(c) Suggest why glucose level in person **A** stopped rising after 30 minutes while it continued to rise in person **B**. (2marks)



(d) Account for the decrease in glucose level of person **A** after 30 minutes and person **B** after 60 minutes. (4marks)

A.

B.

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

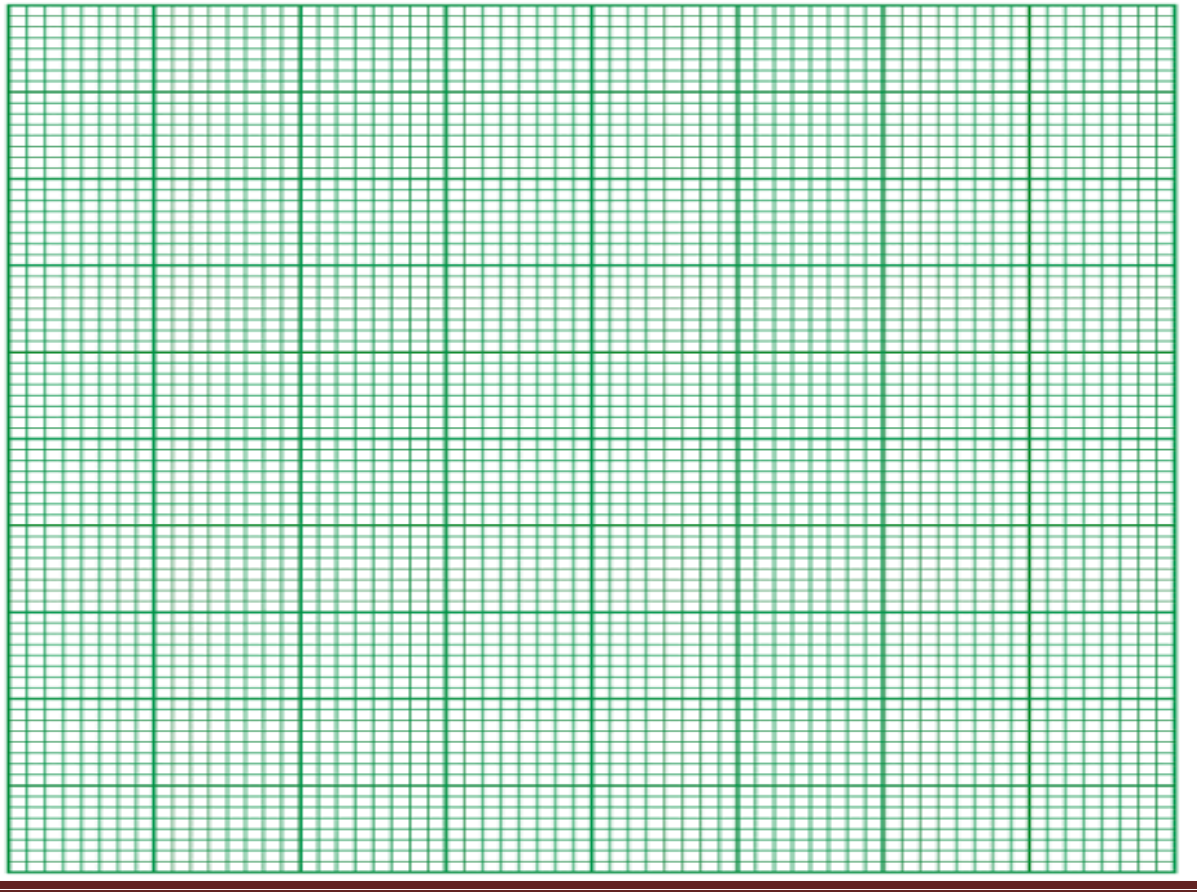
(f) Explain what happens to the excess amino acids in the body. (4marks)

QUESTION NO. 18

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

External temperature °C	Urine cm^3/hr	Sweat cm^3/hr
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

(a) On the same graph, plot the quantities of urine and sweat produced against the external temperature. (7mks)



(b) At what temperature are the amounts of sweat and urine produced equal? (1mk)

(c) What happens to the amount of sweat produced as the temperature rises? Explain the observation. (3mks)

(d) Explain the observation made on the amount of urine produced as the temperature increases. (3mks)

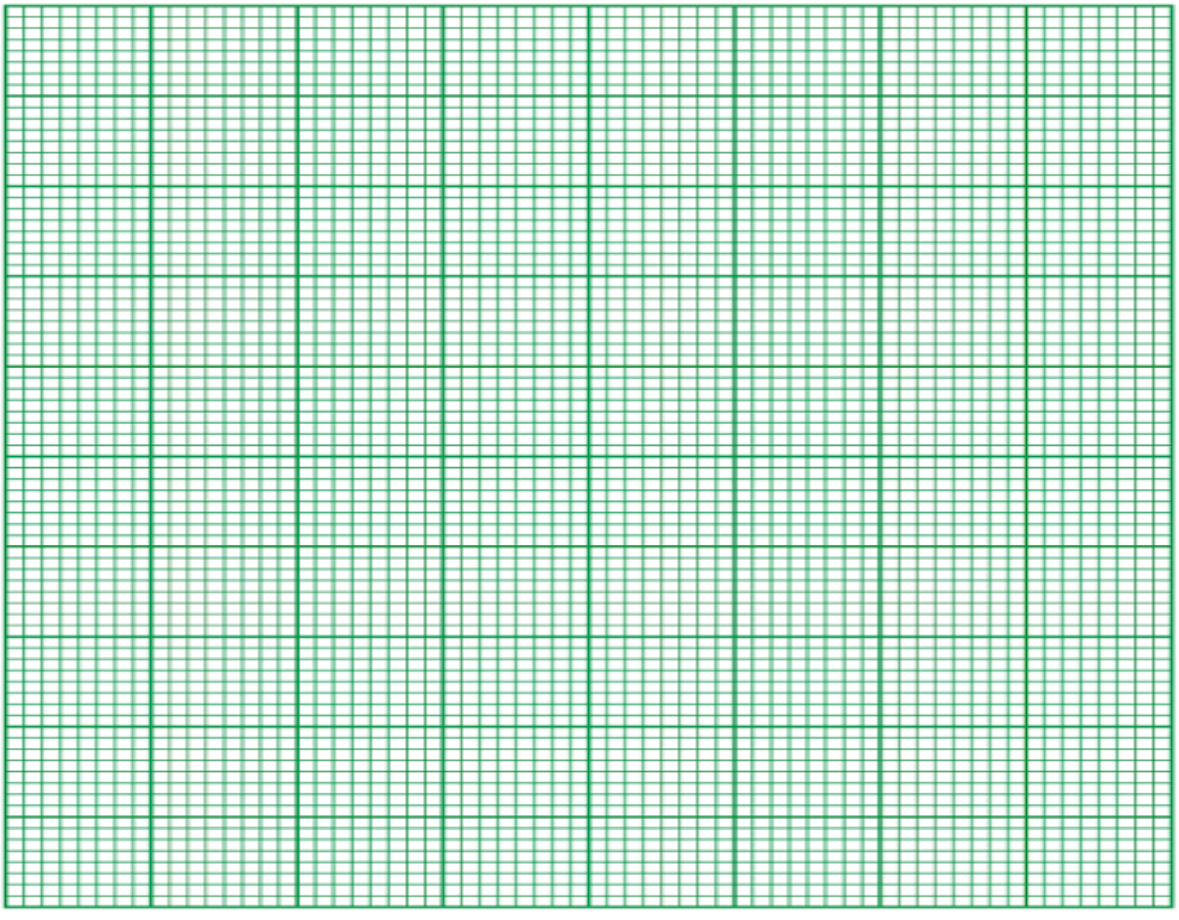
(e) How is the skin adapted for temperature regulation? (6mks)

QUESTION NO. 19

19. During germination and growth of a cereal, the dry weight of endosperm, the embryo and total dry weight were determined at two-day intervals. The results are shown in the table below.

Time after planting	Dry weight of endosperm	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 axes, draw graphs of dry weight of endosperm, embryo and the total dry weight against time. (8mks)



(b) What is the total dry weight on day 5? (1mk)

(c) Account for:

(i) Decrease in dry weight for endosperm from day 0 to 10. (2mks)

(ii) Increase in dry weight of embryo from day 0 to 10. (2mks)

(iii) Decrease in total dry weight from day 0 to day 8. (2mks)

(iv) Increase in total dry weight after day 8. (1mk)

(d) State **<u>one</u>** cause of dormancy: (2mks)

(i) Within a seed

(ii) Outside the seed

QUESTION NO. 20

20. You have been provided with the data below on the growth of mice population. The population starts with two sexually mature mice, a male and a female. Every time they reproduce they reproduce in litter of six (3 males and 3 females) at 7 weeks intervals. Assume that they take 14 weeks to sexually mature and produce. They only die of old age when they are 3 years old.

The following table shows population growth and litter production.

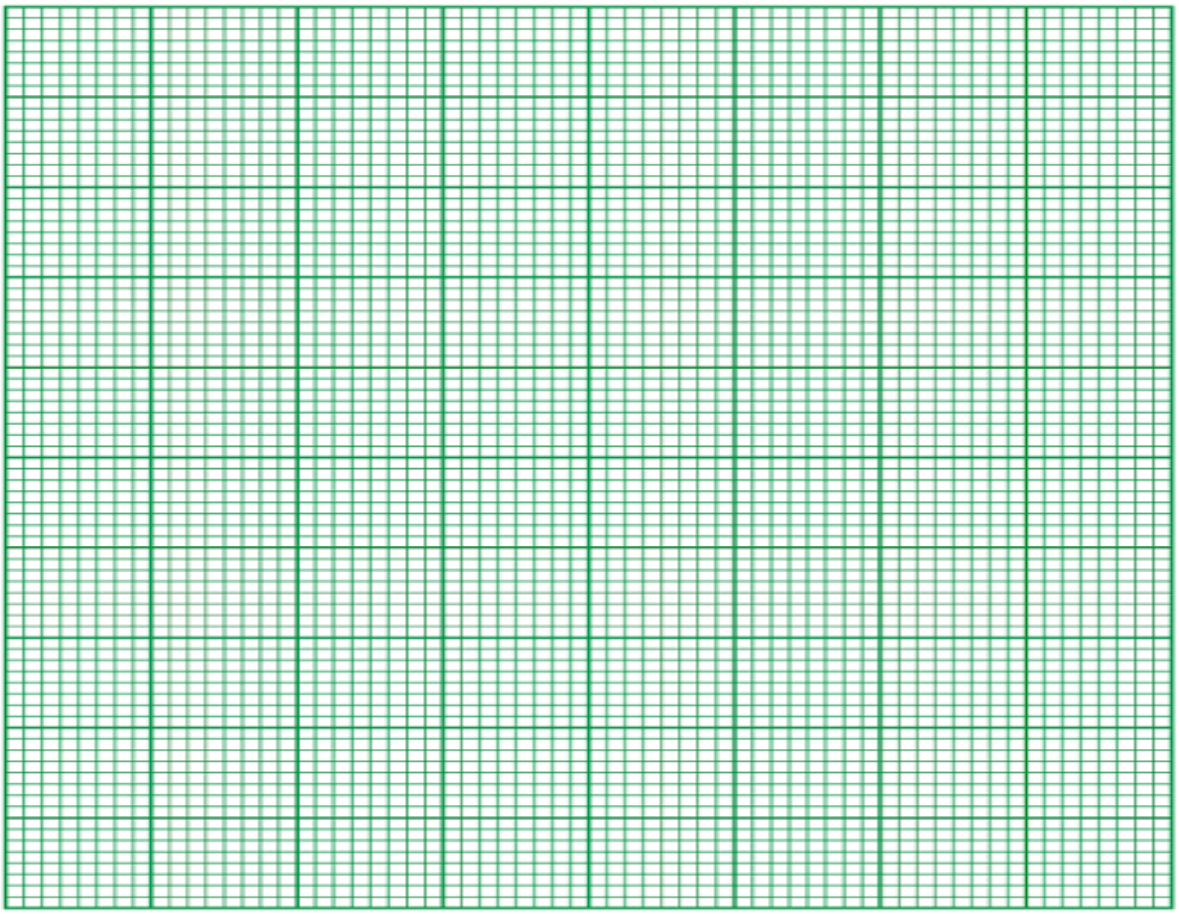
Time interval in weeks	0	7	14	21	28	35	42	49
Mice population	2	8	14	28	62	104	146	260
Litter population	0	6	6	24	24	42	42	114

(a) Using the same axis draw graphs of population of mice and litter against time. (8 marks)

(b)(i) How many times has the first litter of mice reproduced.(1 mark)

(ii)How many times has the third litter of mice reproduced? (1 mark)

(c) State **four** factors that may have affected the population growth of mice. (4 marks)



(d) Explain the shape of the litter curve. (4 marks)

(e) How many pairs of mice reproduced between 14 - 21st weeks and 42 - 49 weeks? (2 marks)

(i) Between 14 – 21st weeks.

(ii) Between 42 – 49 weeks.

QUESTION NO. 21

21. In an experiment, a plant was exposed to different light intensities and a range of carbon (IV) oxide concentration in a green house. Rate of photosynthesis was then determined using the product formed. The product was measured in mg-sec(s).

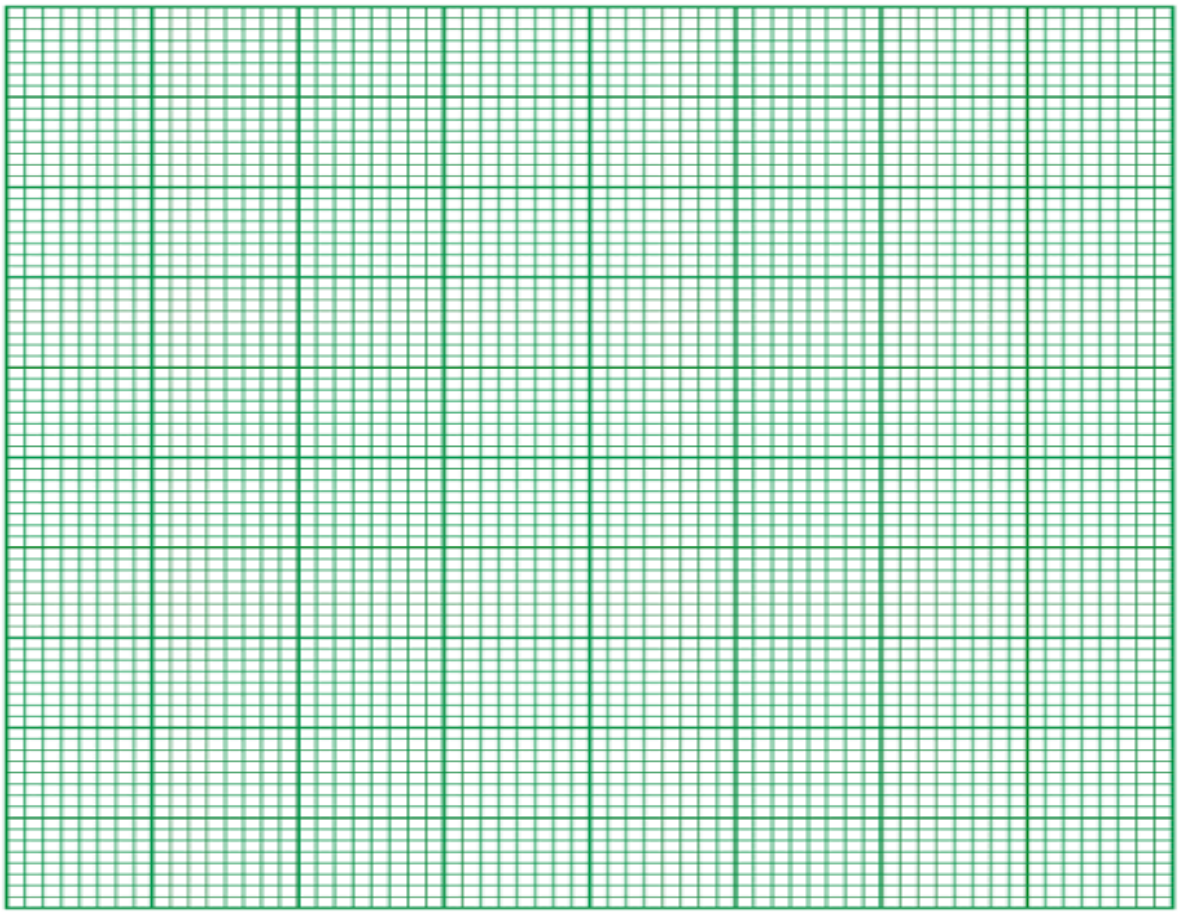
CO_2 concentration in air %	0	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20
Dim light	0	28.5	37.0	44.0	50.0	55.0	55.5	55.5	55.5	55.5	55.5
Bright light	0	42.0	59.0	77.0	90.5	98.0	101.0	101.0	101.0	101.0	101.0

(a) Plot a graph of rate of photosynthesis against carbon (IV) oxide concentration. (7mks)

GRAPH

(b) (i)At what interval of carbon (IV) oxide was the rate of photosynthesis determined? (1mk)

(ii) The amount of carbon (IV) oxide in the atmosphere air is about 0.03%. What was the rate of photosynthesis at this concentration in dim light? (1mk)



(c) Suggest the factors which was limiting the rate of photosynthesis between 0.12 and 0.20% carbon (IV) oxide in:

(i) Dim light. (2mks)

(ii) Bright light. (2mks)

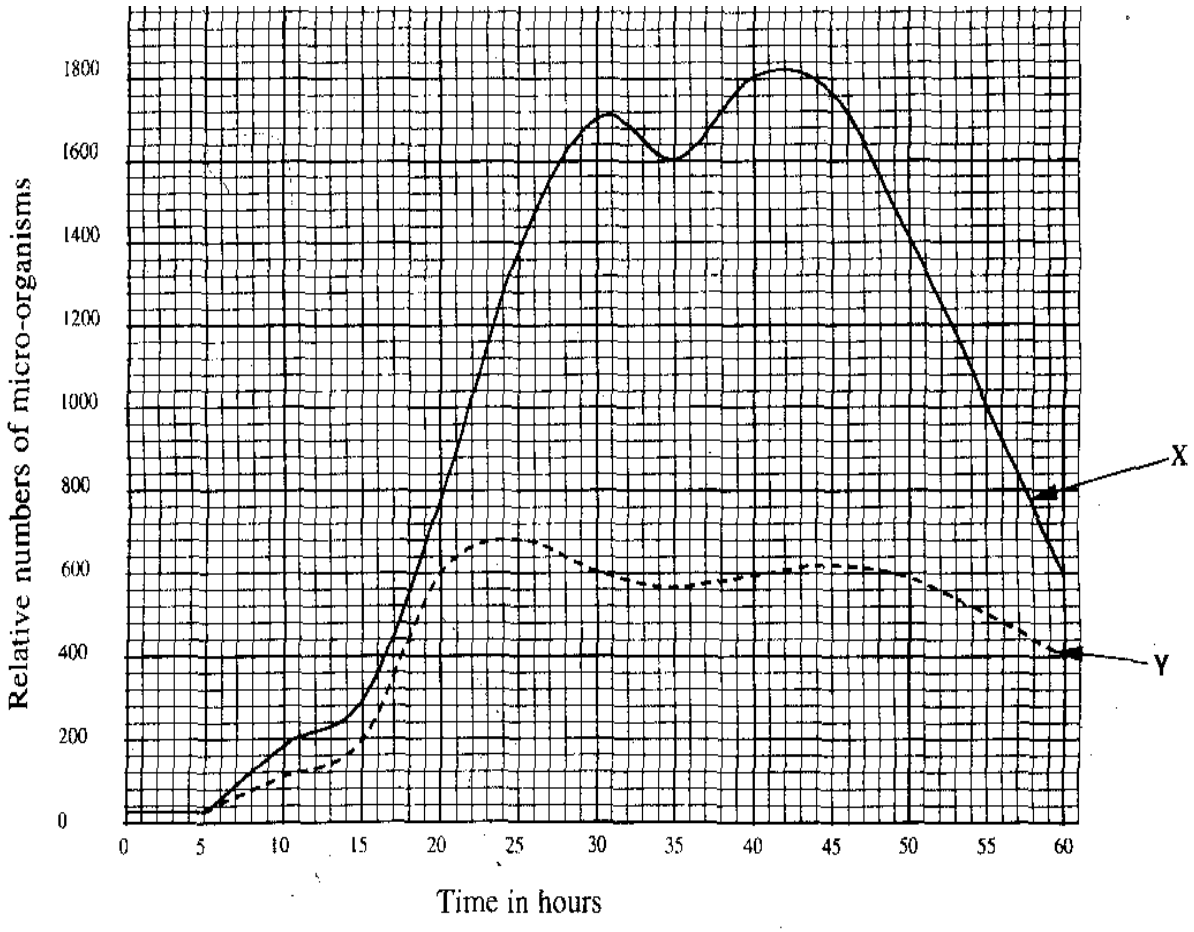
(d) (i) Explain the advantages of the leaf being broad and flat. (2mks)

(ii) What is the fate of excess products of photosynthesis? (2mks)

(e) Describe how photosynthesis theory accounts for changes on stomata rhythm during the day. (5mks)

QUESTION NO. 22

22. An experiment to investigate the population of a certain type of micro-organism was carried out. Two petri-dishes labeled X and Y were used into the petri-dish labeled X, 60ml of a culture medium were added while 15ml of the same culture medium were placed in the petri-dish labeled Y. Equal numbers of micro-organisms were introduced in both petri-dishes. The set-ups were incubated at 35°C. The number of micro-organisms in each petri-dish was determined at regular intervals for a period of 60 hours. The results were as shown in the graph below.



[a] At what intervals were the numbers of micro-organisms determined. [1 mark]

[b] After how many hours was the population in each petri-dish highest? Indicate the population in each case

Petri-dish X**:** [2 marks]

Time**:**

Population**:**

Petri-dish Y**:** [2 marks]

Time**:**

Population**:**

[c]. After how many hours was the difference in the two populations greatest?

[d]. Account for the shape of curve Y between.

[i]. 0 – 5 hours [2 marks]

[ii]. 5 - 25 hours [2 marks]

[iii]. 25 – 50 hours [2 marks]

[e]. Account for the high numbers of micro-organisms in petri-dish X after 25 hours. [2 marks]

[f]. With reasons give the effects on the population of micro-organisms if after 10 hours the petri-dishes were kept at;

[i]. 10°C

Reason [2 marks]

[ii]. 60°C

Reason [2 marks]

QUESTION NO. 23

23. Two persons X and Y drunk volume of concentrated solutions of glucose. The amount of glucose in their blood was determined at intervals. The results are as shown in the table below.

Time (Min)	Glucose level in blood (mg/100cm^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

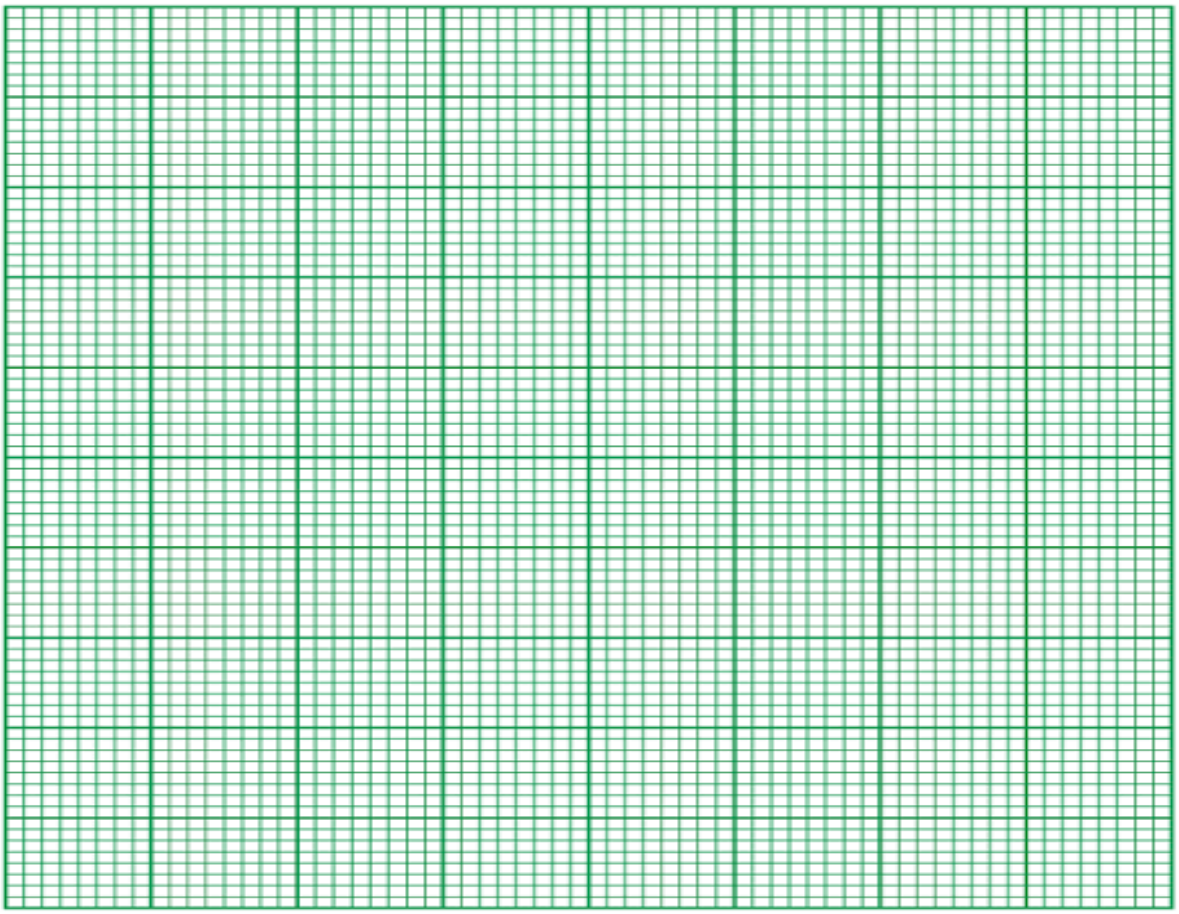
a) On the grid provided, plot graphs of glucose level in the blood of X and Y against time, on the same axis. (8mks)

(b) What was the concentration of glucose in blood of X and Y at 20th minote? (2mks)

X:

Y:

(c) Suggest why the glucose level in person X stopped rising after 30 minutes while that of person Y kept on rising. (2mks)



(d) Account on decrease in glucose level in person X after 30 minutes and Y after 60 minutes. (4mks)

(e) Name the compound that stores energy released during oxidation of glucose in cells (1mk)

(f) Explain what happens to excess amino acids in man (2mks)

(g) State the assimilation of fatty acids and glycerol in man (1mk)

QUESTION NO. 24

24. A group of students did an experiment to estimate the population of grasshoppers in a plot. They swept the ground ten times with a net and recorded the number of grasshoppers in each of the ten samples. The table below shows the results obtained.

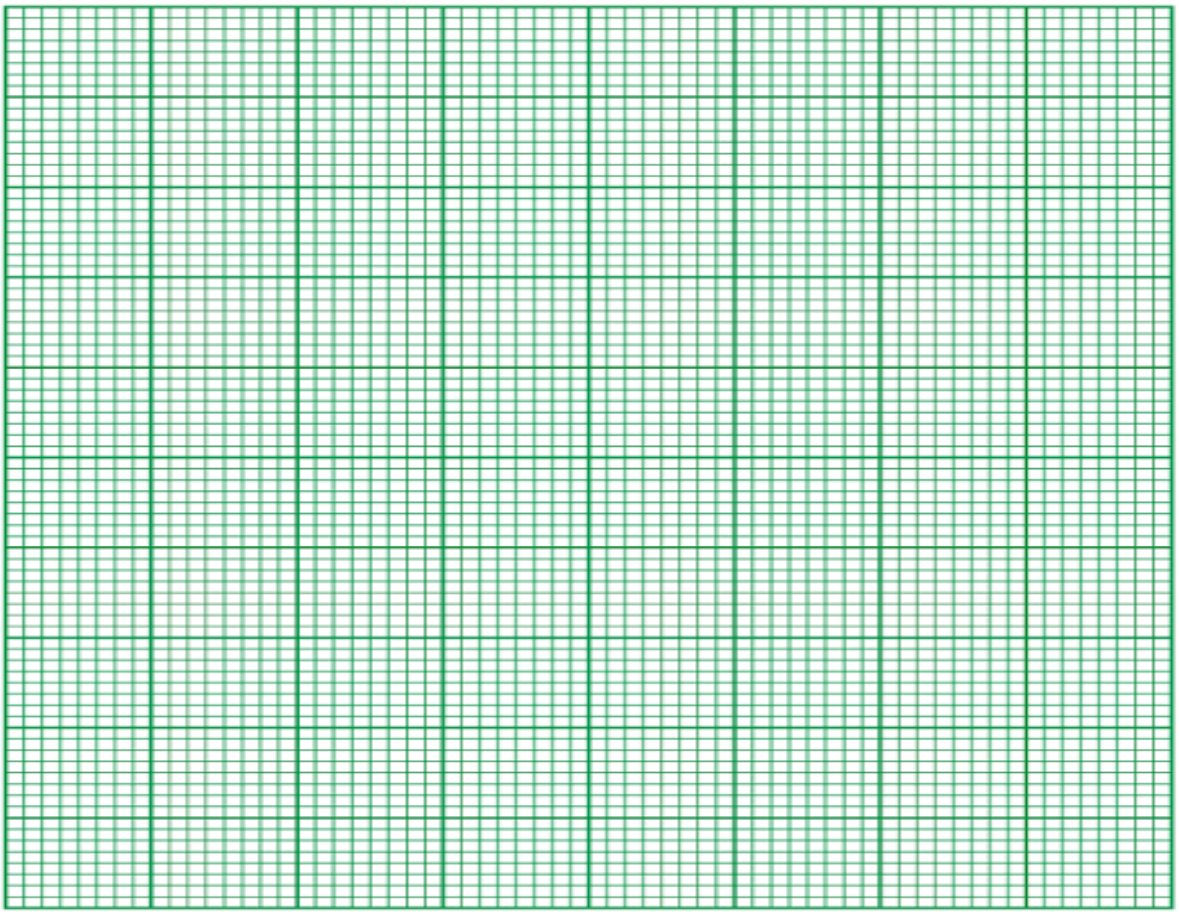
Sample number	No of grasshopper	Cumulative total
1	35	35
2	31	66
3	28	94
4	23	117
5	20	
6	18	
7	15	
8	11	
9	8	
10	6	

(a) Complete the cumulative total column in the results table.(3 marks)

(b) (i) On the grid provided plot the number of grasshoppers collected per sample against the cumulative total. (6 marks)

GRAPH

(ii) From your graph estimate the population of grasshoppers in the plot.



(c) The number of grasshoppers in this study cannot be adequately determined by this method. What would you consider to be the two main sources of error in this method?

(d) A fish farmer wanted to know the number of fish in his pond. He collected ten fish from the pond and labelled each by tying a tag lag label on its fin, and returned the fish to the pond to mix with other fish. When he later collected a sample of 50 fish from the same pond, he found out that 4 of them had tag labels.

(i) From the information estimate the total number of fish in the pond. Show your working. (4 marks)

(ii) What assumption is made in this method of estimating size of population? (2 marks)

QUESTION NO. 25

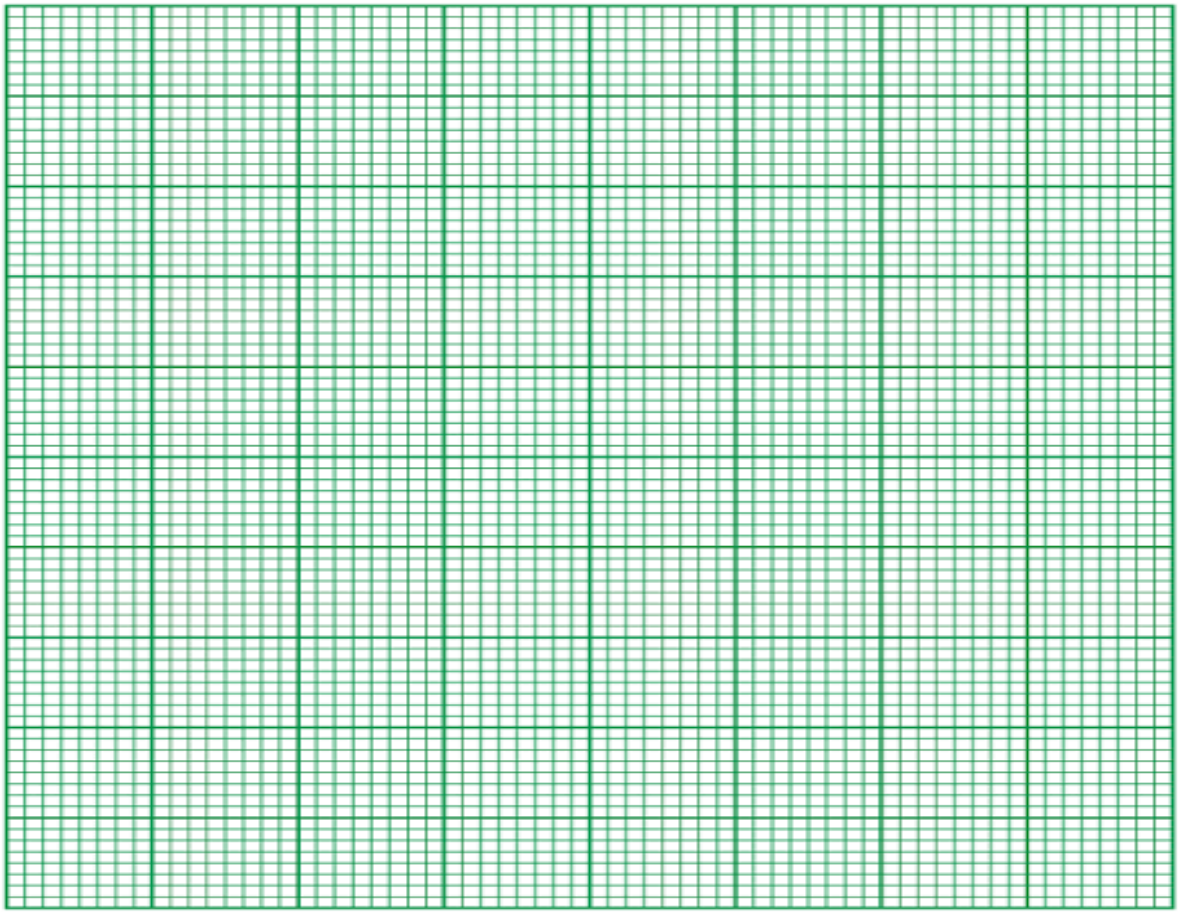
(25) The cells of Tradescantia plant were found to have an average diameter of 2.5ΩM. The cells were placed in varying concentrations of sugar solution. The diameter of the cells in each solution was determined and results obtained were as shown below.

Percentage of sugar concentration	Diameter of cell (MM)
1	5.0
5	4.0
10	3.0
15	2.0
20	1.5
25	1.0

a) Draw a graph of diameter of cells against percentage of sugar concentration on the graph provided. (6 marks)

b) From the graph determine the concentration of the cell sap. (1 mark)

c) Give an explanation for the average diameter of cells placed in 2.5% sugar solution. (4 marks)



d) Describe the difference in appearance between cytoplasm before and after cells being placed in 25% sugar solution. (2 marks)

e) Account for the appearance of red blood cells when viewed under light microscope after they were placed in 25% sugar solution and left for 10 minutes. (3 marks)

f) State the importance of the process under investigation to the plants. 4mrks

QUESTION NO. 26

(26) The table below shows the changes observed in the dry weight (in milligrams) of a barley seedling, its embryo and endosperm during the first ten days after the onset of germination.

	DRY WEIGHT IN MILLIGRAMS		
TIME (DAYS)	**EMBRYO**	**ENDOSPERM**	**WHOLE SEEDLING**
0	2	41	45
2	2	39	43
4	7	32	41
6	15	21	38
8	22	11	35
10	35	6	43

(a) Using a suitable scale on the same axis, plot graphs of dry weight of embryo endosperm and whole seedling against time. (8 mks)

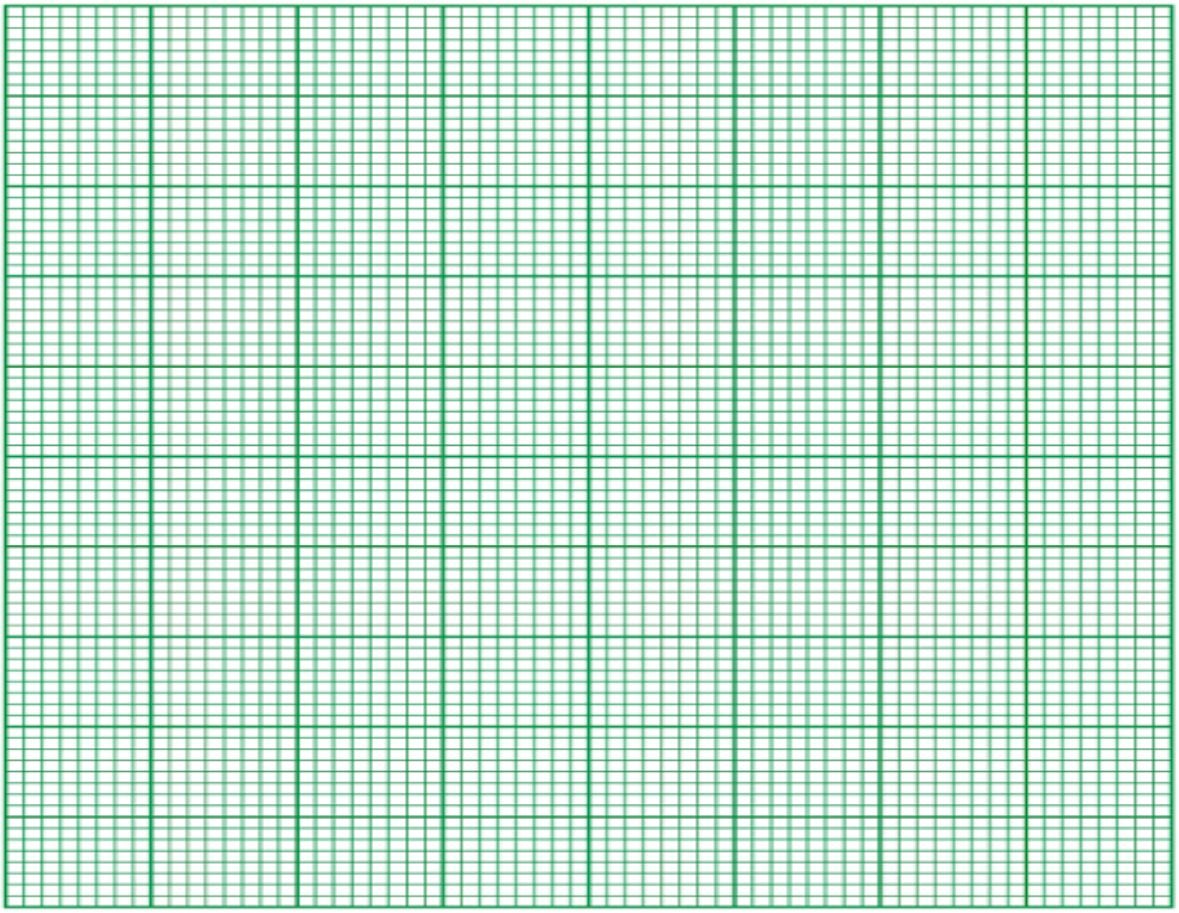
GRAPH

(b) State and account for the changes in dry weight shown by:

(i) Embryo (4 mks)

(ii) Endosperm (4 mks)

(c) Explain the role of water during germination. (4 mks)



QUESTION NO. 27

27. The relationship between oxygen concentration and sugar consumption in isolated roots of sorghum was determined. The results are shown in the table below. The loss of sugar and potassium uptake are in arbitrary units.

% Oxygen concentration

	0	5	10	15	20	100
Sugar loss	15	20	42	45	45	48
Potassium gain	5	55	70	73	75	70

(a) Plot graphs of sugar loss and potassium gain against percentage of oxygen concentration in the same axis. (6mks)

GRAPH

(b) Name the process by which potassium is taken in by root hairs. Give reasons for your answer.

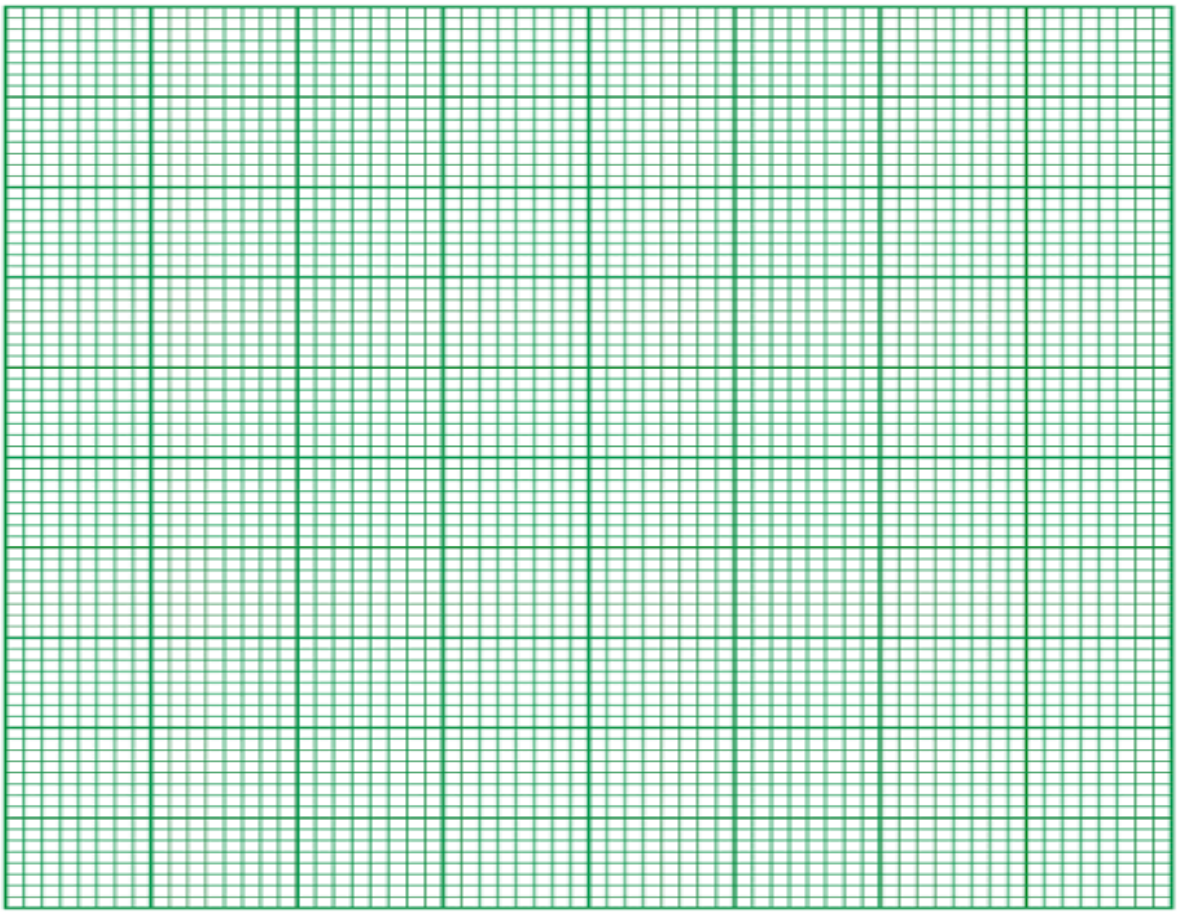
Process: 1mk)

Reasons. (1mk)

(c) Account for the sugar loss and potassium gain at:

(i) 0% oxygen concentration. (2mks)

(ii) Between 5% and 20% oxygen concentration. (2mks)



(d) Apart from oxygen concentration, give **two** other factors that are necessary for the above process. (2mks)

(e) State **two** ways in which you can stop the above process from taking place. (2mks)

(f) Name **two** main areas in the mammalian body where the above process is involved. (2mks)

QUESTION NO. 28

28. A man carried out an experiment to find out the effect of water and 0.9% salt solution on urine production.on the first day he drunk one liter of water(X).on the second day he repeated the experiment but instead of water,he drunk one litre of 0.9% salt solution(Y).
The experimental results are shown in the table below.

Time (hours)		0.0	1.0	1.5	2.5	4.5	5.5	6.5	7.5
Amount of urine produced in cm^3 per hour	X	80	60	360	520	60	100	40	60
	Y	40	40	40	45	100	60	80	100

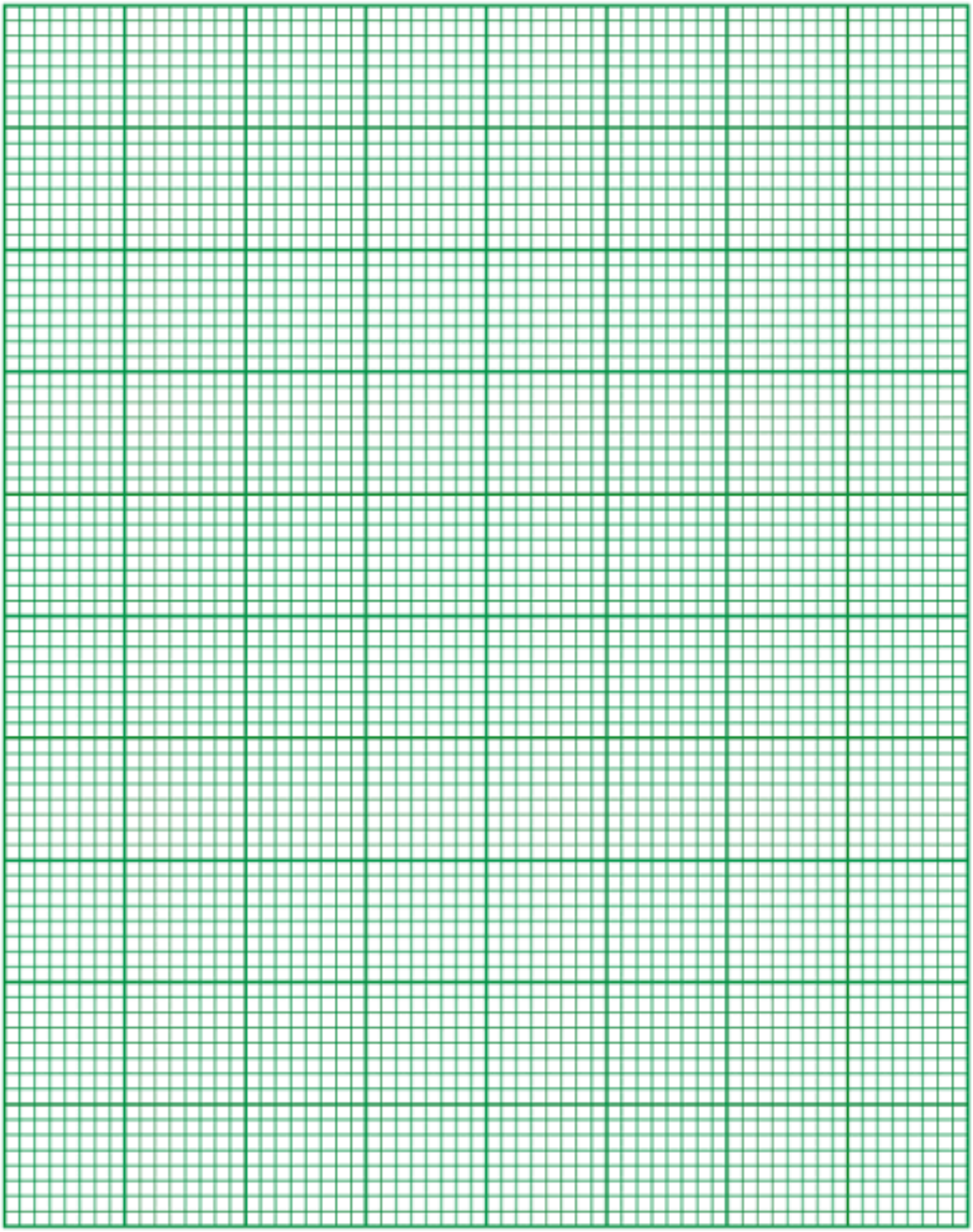
a) Using a suitable scale draw graphs of urine produced in cm^3 per hour against time. (8mks)

GRAPH

b). From the graph determine the:

(i)Amount of urine produced in the second hour when the man had drunk. (1mk)

(ii)The rate of urine production between the first and second hour after the man had drunk one liters of water. Show your working.



(c) What does the shape of the curve representing column X tell us about the rate of urine production?

d) Explain the differences between the rate of production in graph X and Y. (2mks)

e) Why do you think drinking one liter of (0.9%) sodium chloride solution made little difference to the output? (2mks)

f. What does the comparisons of the results of the experiment indicate about the effect of the Kidneys on the osmotic pressure of the blood plasma? (2mks)

g. What does the results of the experiment indicate about the effect of the kidneys on the volume of blood plasma? (2mks)

QUESTION NO. 29

29. An experiment was carried out to investigate the effects 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 bud was left intact.

The length of branches developed from lateral buds was determined at reular intervals.

The results obtained are as shown in the table below:

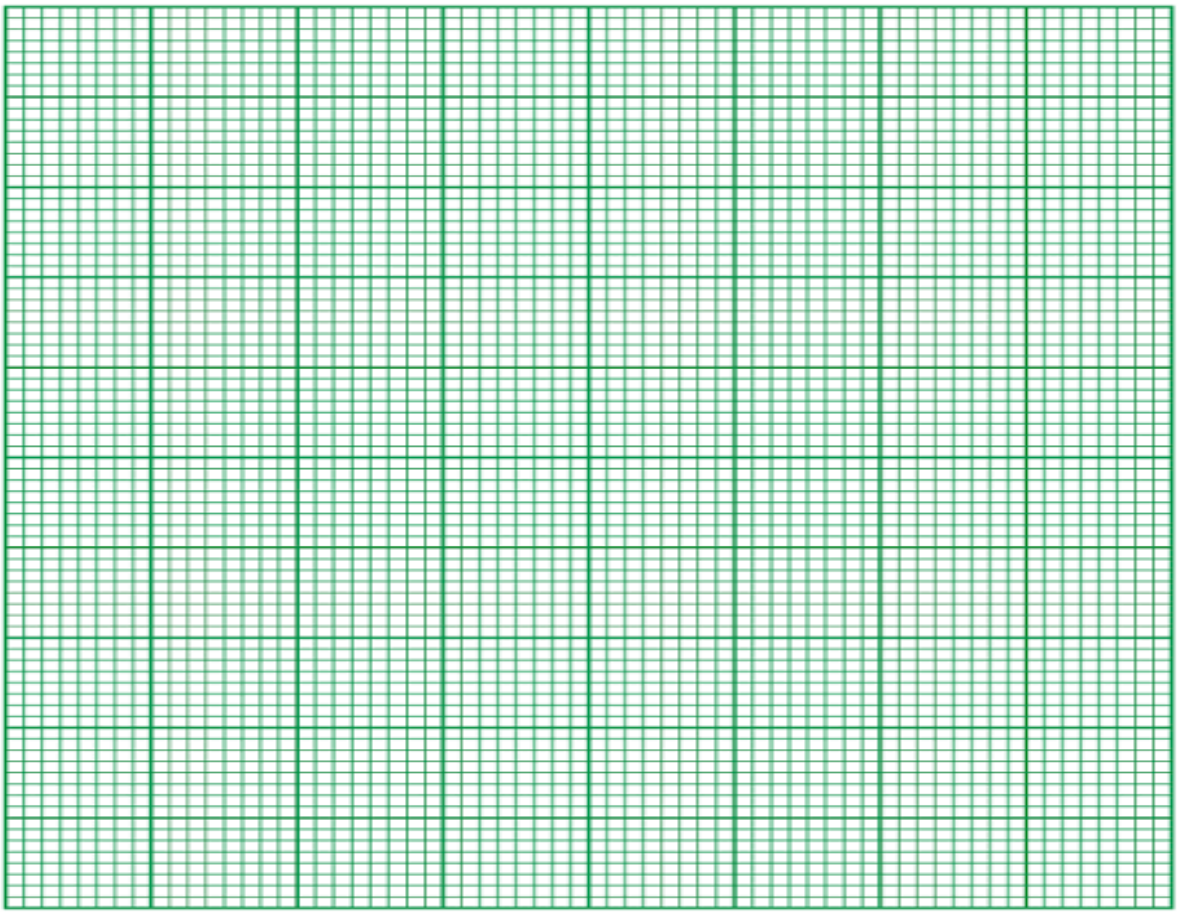
	Length of Shoot in millimeters		
Time in days	Shoot A	Shoot B	Shoot C
0 2 4 6 8 10	3 10 28 50 80 118	3 12 48 90 120 152	3 3 8 14 20 26

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

GRAPH

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

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



(c) Account for the result obtained in the experiment. (6mks)

(d) Why was Shoot C included in the experiment? (1mk)

(e) What is the importance of gibberellic acid in Agriculture? (1mk)

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

QUESTION NO. 30

30. 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 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

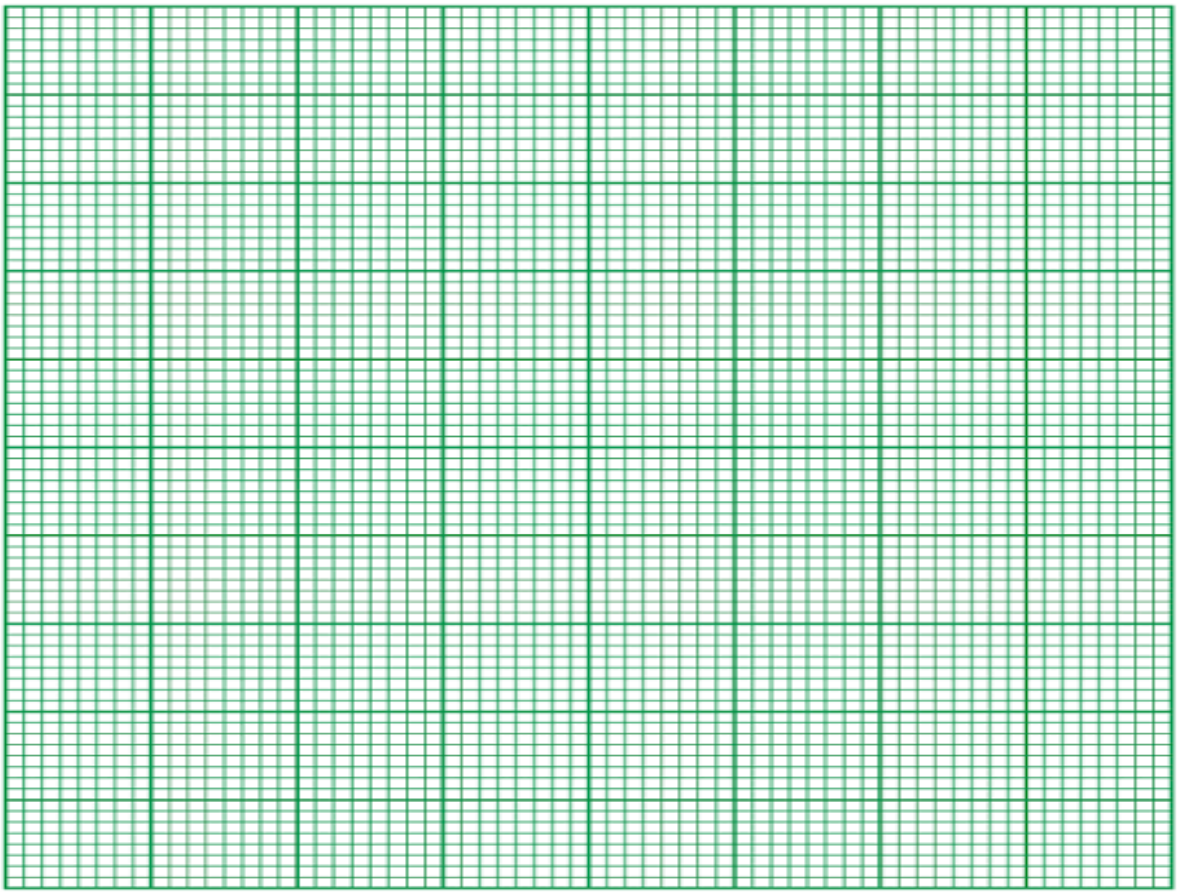
Time (minutes)	Temperature °C in A	Temperature °C in B
0	80	80
5	54	67
10	40	59
15	29	52
20	21	47
25	18	46

(a) On the same axes plot graphs of temperature of water in the tubes against time. (6mks)

GRAPH

(b) At what rate was water cooling in tube A. (1mk)

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



(d) Account for the rate of cooling in tube A. (3mks)

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

(f) What would be the expected results in tube A if it was insulated? (1mk)

(g) What would the insulation be compared to in: (2mks)

(i) Bird
(ii) Mammals

(h) Name the structure in human body that detect:(2mks)

(i) External temperature changes.

(ii)Internal temperature changes.

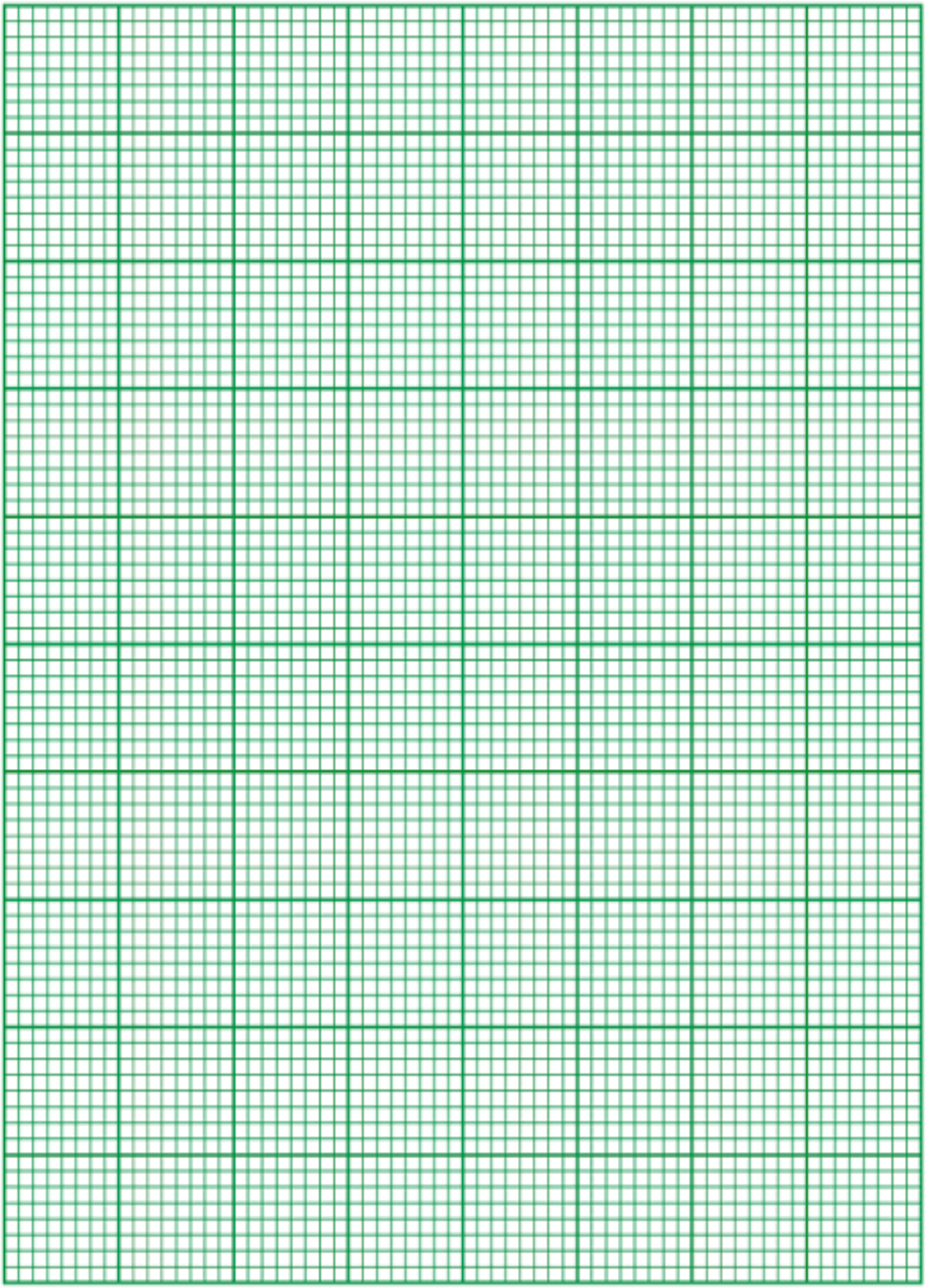
QUESTION NO. 31

6. An experiment was carried out to investigate the effect of temperature on the rate of reaction catalyzed by an enzyme. The results are shown in the table below.

Temperature (^{0}C)	Rate of reaction in mg of products per unit time
5	0.2
10	0.5
15	0.8
20	1.1
25	1.5
30	2.1
35	3.0
40	3.7
45	3.4
50	2.8
55	2.1
60	1.1

(a)On the grid provided, draw a graph of rate of reaction against temperature. (6mks)

GRAPH



QUESTION NO. 32

32.

Time (hrs)	Blood glucose (Mg/100ml)	
	Person A	**Person B**
0	90	120
1	220	360
2	160	370
3	100	380
4	90	240
5	90	200
6	90	160

a) Draw a graph of blood sugar levels of persons **A and B** against time on the same axis. (7marks)

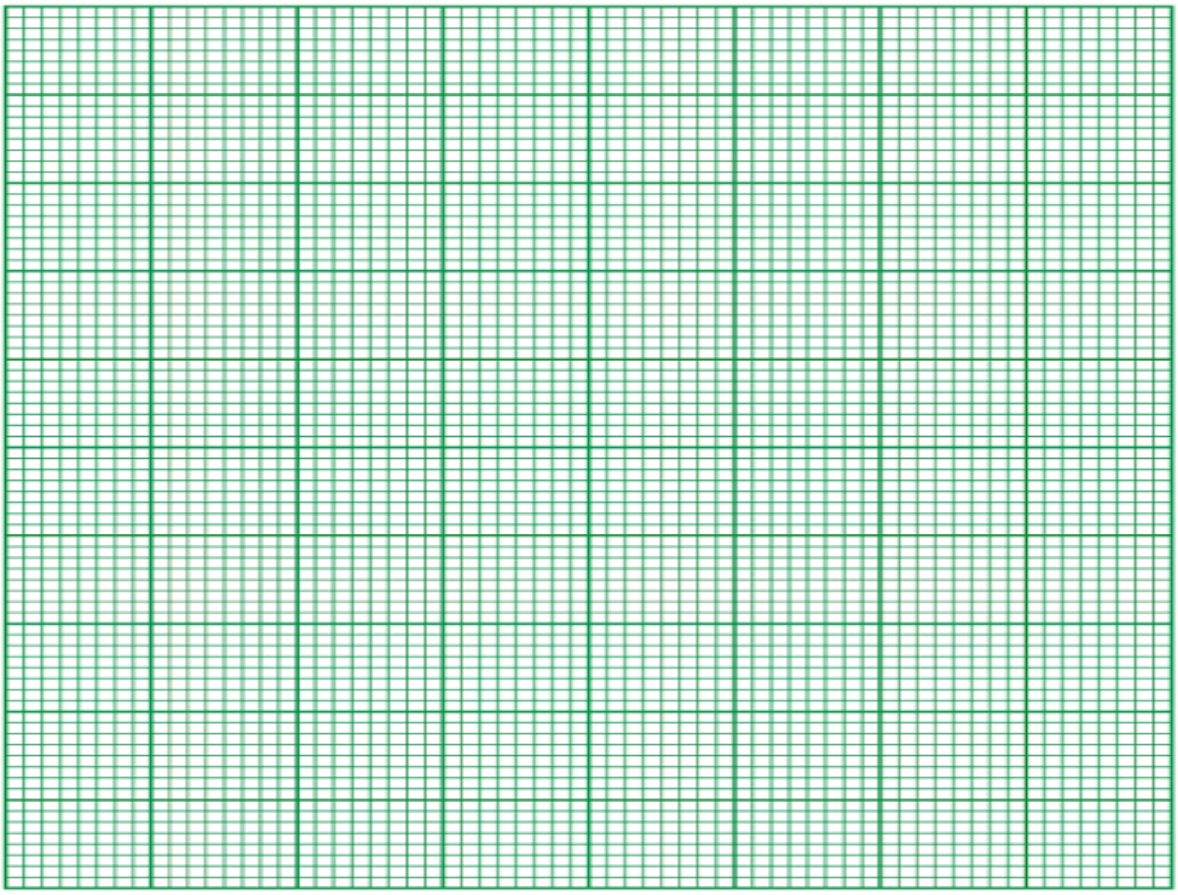
GRAPH

b) Explain each of the following observation:-

i) Blood sugar level increased in person **A** between 0 and 1hr. (2mark)

ii) The blood sugar level dropped in person **A** between 1 and 4 hours. (2marks)

iii) From the graph, what is the normal blood glucose sugar level for human beings? (1mark)



c) Suggest a reason for the high sugar level in person **B.** (2marks)

d) How can high blood sugar level in person **B** controlled? (1mark)

e) What is the biological significance of maintaining a relatively constant sugar level in a Human being? (3marks)

f) Account for the decrease in the blood glucose level of person **B** after 4hours. (2marks)

QUESTION NO. 33

33. The mean dry weight (mg) of germinating wheat grains was worked out for a whole grain(total dry weight),endosperm and embryo.The means were determined at two days interval for fourteen days. The results are as tabulated below.

Time(days)	Dry weight(mg)		
	Endosperm	Embryo	Total
0	47	5	52
2	44	5	49
4	39	8	47
6	22	17	39
8	10	28	38
10	4	35	39
12	2	42	44
14	2	44	46

(a) Using the same axis ,draw graphs for dry weight of endosperm, embryo and total against time (8mks)

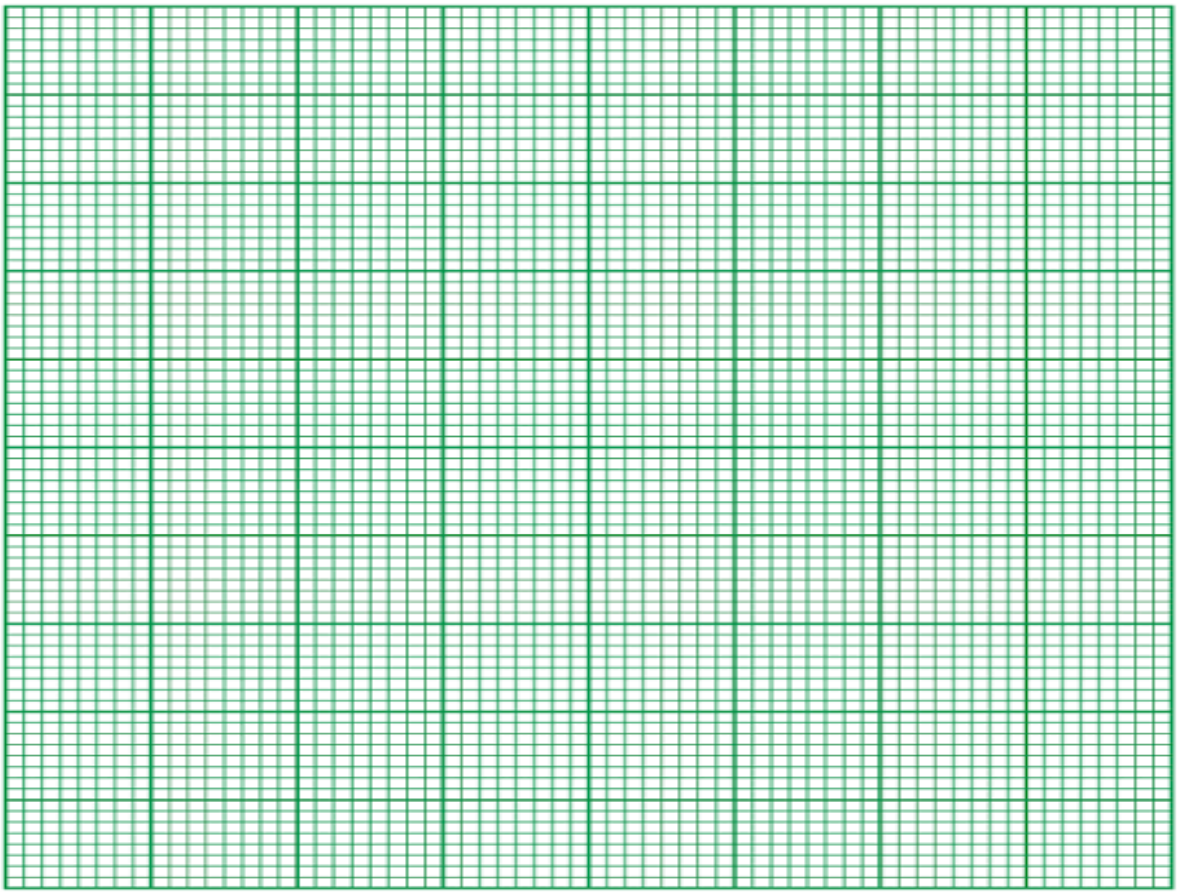
GRAPH

(b) What was the average dry weight of embryo on day II? (1mk)

(c) Account for the shape of the curve for

(i) Embryo from day 2 to day 12 (2mks)

(ii) Total dry weight (gm) from day 0 to day 14 (2mks)



(d) After how long was the dry weight of

(i) Endosperm 30g? (1mk)

(ii) Embryo 35g ? (1mk)

(e) (i) Explain the role of water in seed germination (3mks)

(ii) Other than water, what two environmental factors are required for seed germination? (2mks)

QUESTION NO. 34

34. The glucose level in mg per $100cm^3$ of blood was determined in two person Y and Z. Both had stayed for six hours without taking food. They were fed on equal amount of glucose at the start of the experiment .The amount of glucose in their blood was determined at intervals .The results are shown in the table below.

Times in minutes	Glucose level in blood in mg /$100cm^3$	
	Y	Z
0	85	78
20	105	110
30	105	110
45	130	170
60	100	195
80	93	190
100	90	140
120	90	130
140	88	120

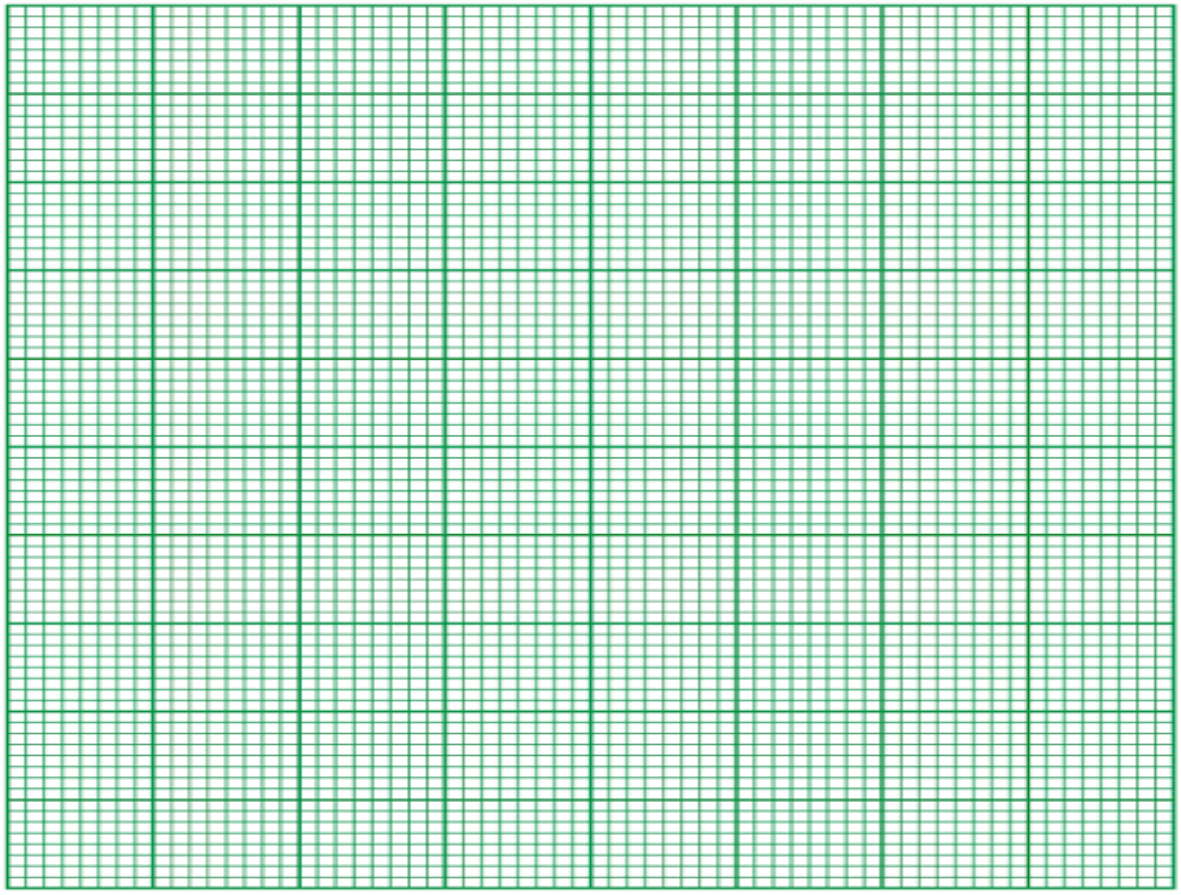
a) On the grid provided, plot graphs of glucose levels in blood against time on the same axes. (7mks)

GRAPH

b) What was the concentration of glucose in the blood of Y and Z at the 50^{th} minute? (2mks)

Y.

Z.



c) Account for the level of glucose in present Y

i) During the first 45 minutes. (2mks)

ii) After 45^{th} minute to the end. (4mks)

d) Account for the decrease in glucose level person Z after 60 minutes. (2mks)

e) Low blood sugar level in harmful to the body .Explain. (3mks)

QUESTION NO. 35

35. An investigation was carried out between 1964 and 1973 to study the changes in fish population in a certain lake. Four species of fish A, B, C and D were found to live in the lake. In 1965, a factory was built near the lake and was found to discharge hot water in the lake raising the temperature from 25^{o} c to 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 population during the period of investigation

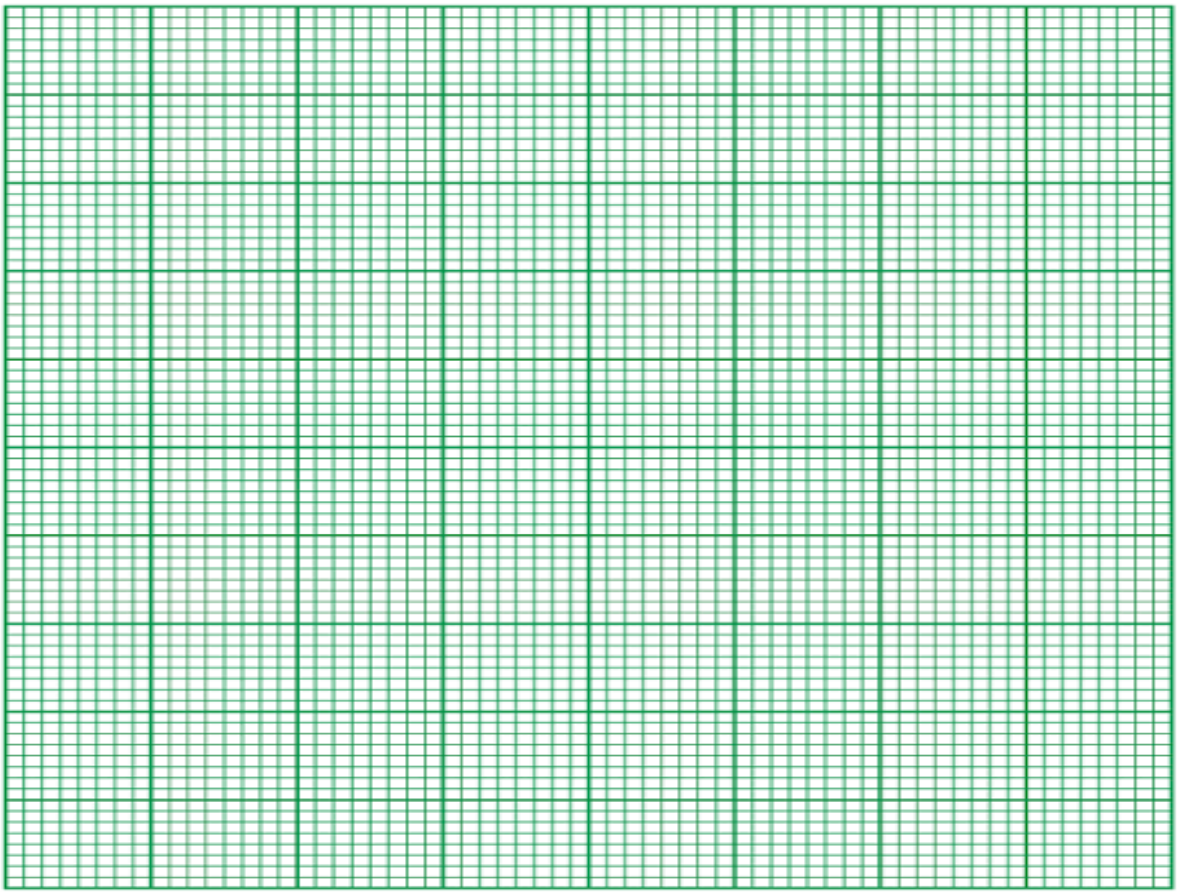
Fish species	1964	1966	1968	1970	1971	1971	1973
A	6102	223	20	106	660	4071	7512
B	208	30	11	22	63	311	405
C	36	100	0	0	0	0	0
D	4521	272	23	27	79	400	617

a) (i) In which year was the fish population lowest? (1mrk)

(ii)***State*** the factors that might have caused the lowest fish populations during the year you have stated in (a) (i) above. (3mrks)

(iii)Explain how each factor you have stated in (a) (ii) above could have brought about the changes in the fish populations. (11mks)

(iv) Why did fish species C remain 0 after 1969? (1mrk)



b). Other than the factors stated in (a) (i) above, state other four that may affect the population of fish in the lake. (4mrks)

QUESTION NO. 36

36. The table below shows the population of a housefly *musca domestica* which is parasitized by wasps of species Nasonia spp. The investigation of their population growth pattern was carried out for 70 weeks. In these experimental space and physical factors were assumed to be limiting.

Time in weeks	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Musca domestica	40	70	110	260	350	480	400	395	350	40	60	140	250	240	230
Nasonia Spp.	10	20	30	45	100.	200	300	380	410	250	60	20	40	200	280

a) Using the readings in the table, plot graphs on the same axis of population growth of organisms against time.(8 marks)

GRAPH

b) Account for the growth of

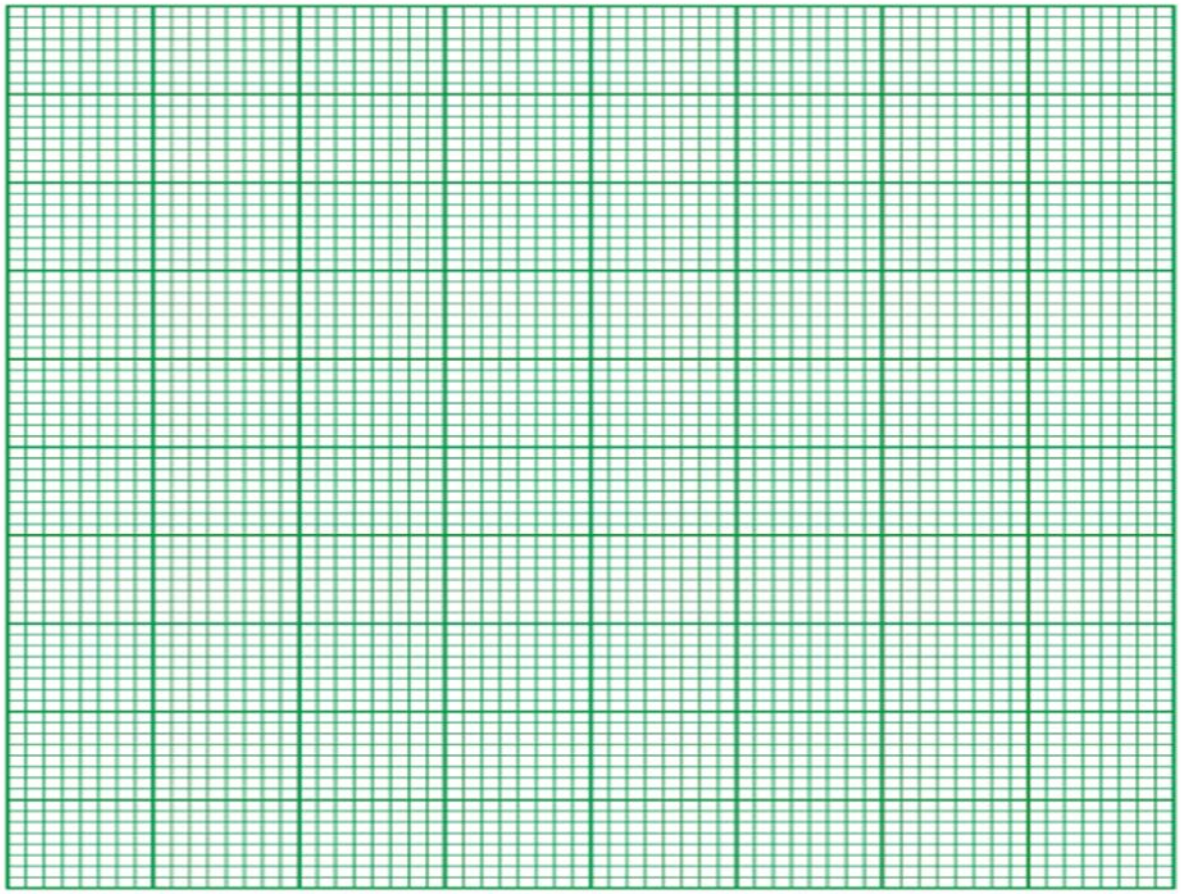
i) *Musca domestica* between 10th week — 25th week. (1 mark)

ii) Nasonia species between 40th week –50th week. (1 mark)

c) What is the population of?

i) Nasonia spp. on the 62nd week? **(**1 mark)

ii) *Musca doniestica* on the **4th** week? (1 mark)



d)Bemex, another parasite of housefly was introduced into the ecosystem. Giving a reason; what will be the effect on the population of

i) Housefly *Musca domestica.* (2 marks)

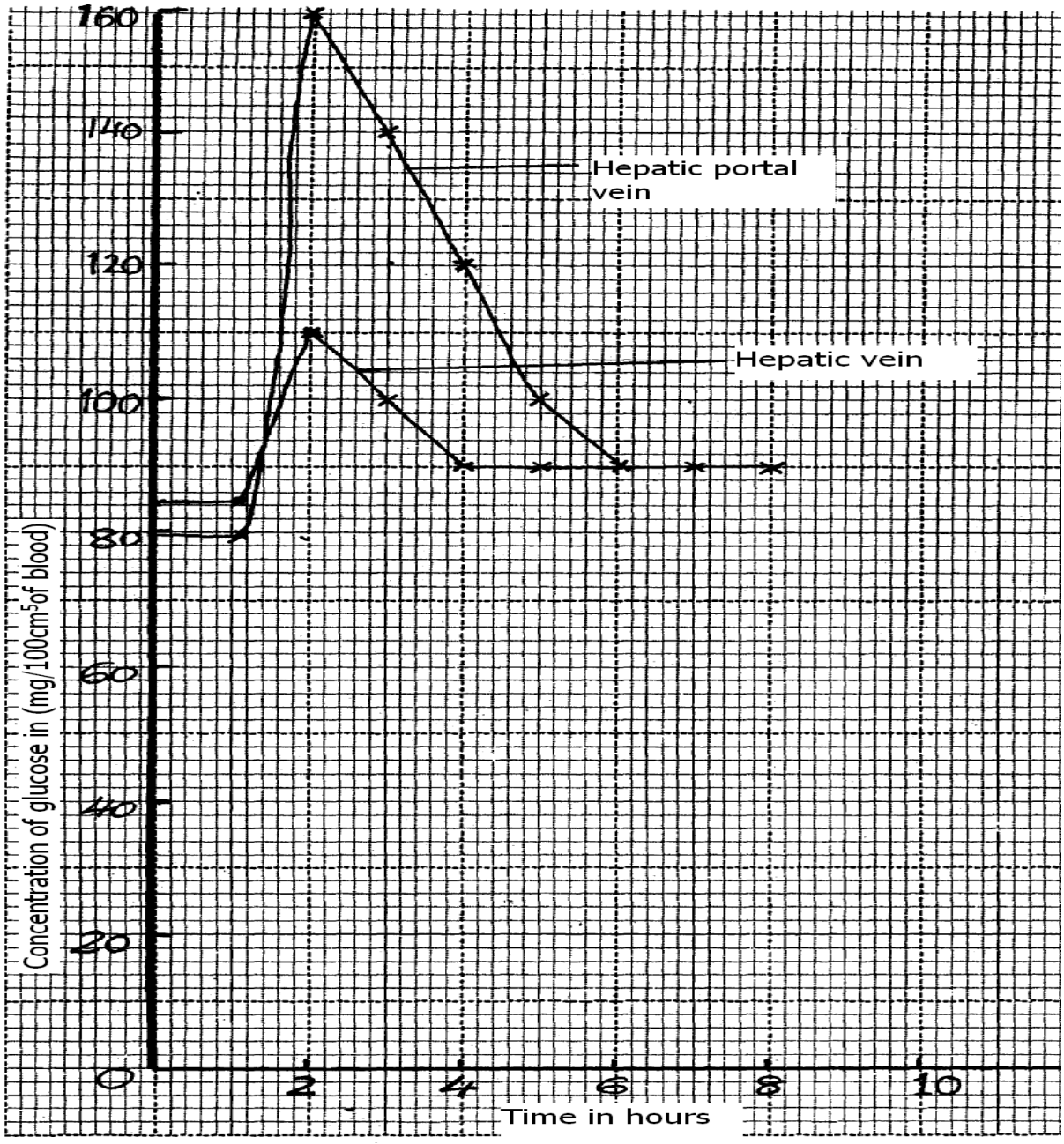
ii) Nasonia Spp. (2 marks)

e) In estimating the population of *Musca domestica* in the experiment above. Capture-mark release recapture method was used. Describe the procedure which was followed. (4 marks)

QUESTION NO. 37

37. A man was starved for 24hours.He was then served with a balanced diet after which the concentration of glucose in the hepatic and hepatic portal veins were determined at interval of 1 hour for the next 8 hours after the meal.

The results were as shown in the graph below.



(a) From the graph state the normal concentration of glucose in man. 1mk

(b) Determine the concentration of glucose after 2 ½ hrs. (2mks)

(c) Calculate the rate of glucose between 1 - 2 hours in hepatic portal vein. (2mks)

(d) Account for the blood sugar level in hepatic portal vein and hepatic vein between; (4mks)

(i) 0- 1hour

(ii) 2 - 4 hours. (6mks)

(e) A patient was found to produce urine that tasted sweet. Name the disease he was likely to be suffering from. (1mk)

(f) How would you test for the disease in your school laboratory. (3mks)

(g) What advice would you give to a patient whose blood contains abnormal high levels of urea. (1mk)

QUESTION NO. 38

6. Carbohydrates used during respiration and those formed during photosynthesis by a certain plant was measured over a period of 24 hours at an interval of 3 hours

Time of day	12AM	3AM	6AM	9AM	12PM	3PM	6PM	9PM	11PM
Carbohydrates formed during photosynthesis (mg)	0	0	5	30	60	30	5	0	0
Carbohydrates used during respiration (mg)	10	10	10	10	10	10	10	10	10

Using the same axes,

(a) Plot a graph of carbohydrate formed during photosynthesis and carbohydrate used during respiration against time. (7mks)

GRAPH

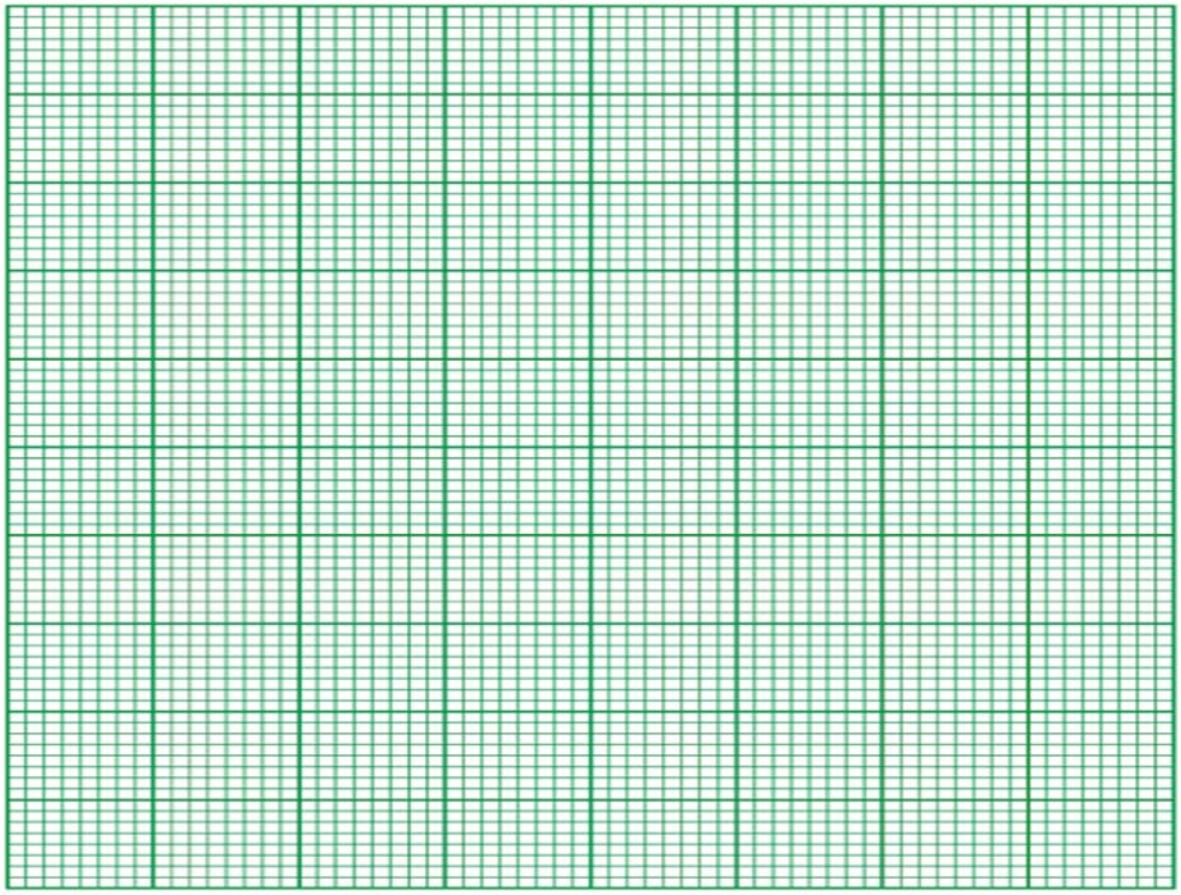
(b) Calculate the net carbohydrate formed by the plant. (2mks)

(c) At what time of the day do the light compensation points occur? (2mks)

(d) Account for the shape of graph on carbohydrates.

(i) Between 12.00a.m and 3a.m. (2mks)

(ii) Between 3.00a.m to 12.00 noon. (2mks)



(e) How could foggy weather influence the net amount of carbohydrates formed over the 24-hour period? (1mk)

(f) Give other external factors apart from temperature and light intensity that influence the rate of photosynthesis. (2mks)

(g) In which form are carbohydrates stored in

(i) Plant bodies. (1mks)

(ii) Fungi (1mk)

QUESTION NO. 39

39. Two sets of a pea seeds were germinated, set A was placed in normal daylight conditions in the laboratory while set B was placed in a dark cupboard. Starting a few days later the shoots lengths were measured twice daily and their mean lengths recorded as shown in the table below.

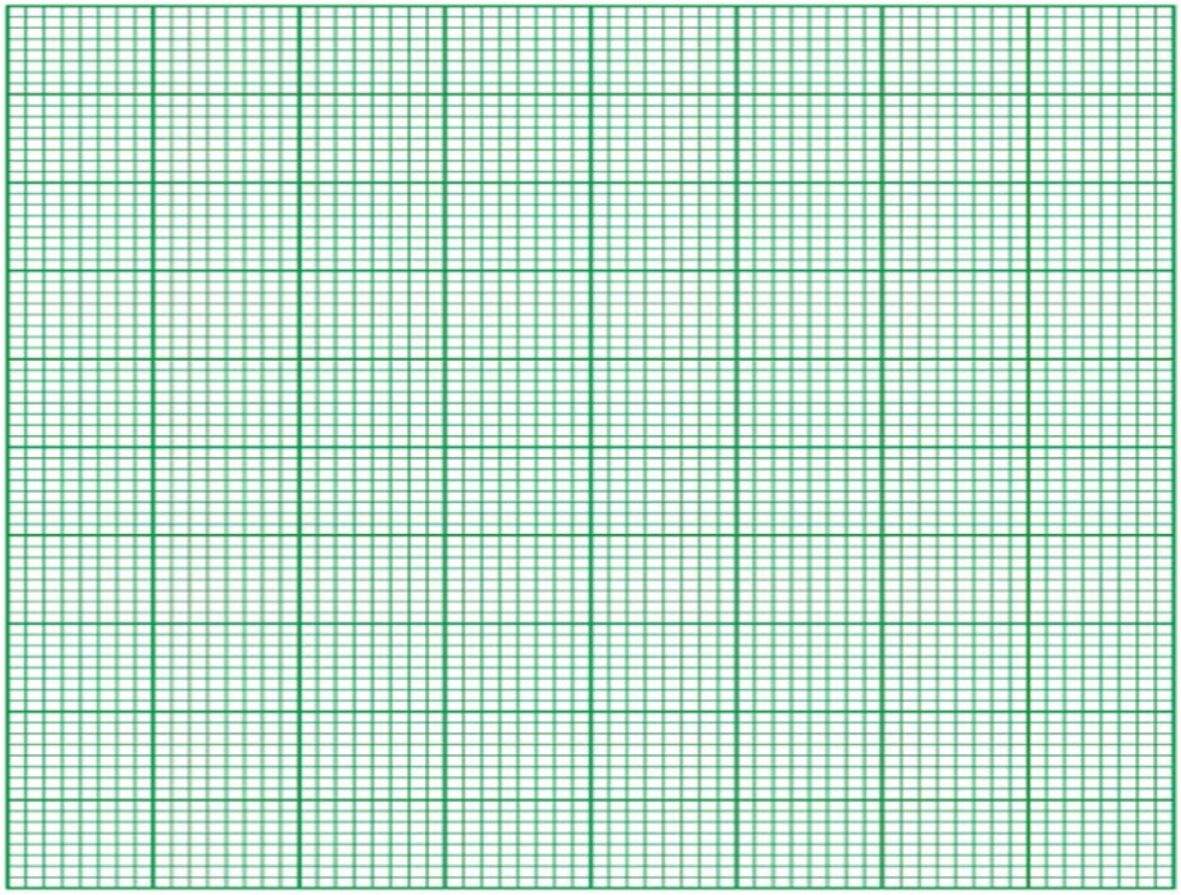
Time in hours	0	12	24	36	48	60	72	84
Set A length (mm)	12	14	20	23	28	31	47	54
Set B length (mm)	17	23	28	35	48	62	80	94

(a) Using suitable scale draw the graphs of the mean lengths in set A and B against time.

GRAPH

(b) From the graph state the mean shoot length of each set of seedling at the 66th hour (2mks)

(c) Account for the difference of curve B and A (3 mks)



(d) Explain what would happen to set up B if it were allowed to continue to grow under conditions of darkness (4mks)

(e) State three external conditions which should be constant for both set ups (3mks)

QUESTION NO. 40

40. An experiment was carried out to investigate the nutritional value of two dry powder animals feeds X and Y over a period of six months. Twenty 5 month's old castrated goats were use. The goats were divided into two equal groups A and B. The animal's in group A were fed on feed X throughout the experiment while those of group B were fed 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 weighed and the average dry faecal output per month was also recorded. The results are as shown below.

	GROUP	A		GROUP	B	
Months since commencement of the experiment	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	19.5	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	35.5	16.6

a) i)What is the relationship between the amount of feed and the faecal output (2 marks)

ii) Work out the average increase in weight for the animal's in group A during:

The first four months

The last two months (4 marks)

iii) Account for the average increase weight in goats in group A during:

The first four months

The last two months (4 marks)

iv) Which of the two feeds is more nutritious?

Give reason for your answer (2 marks)

b) Explain the digestion of lipids in humans (8 marks)

QUESTION NO. 41

41. The table below show the relative numbers of three main species of organisms in a pond.

Depth in meters		0.00	0.50	0.75	1.00	1.25	1.75	2.00	2.50	3.00
Number of organisms in thousands	**R**	0	0	0	0	8	25	34	15	0
	Q	20	160	190	165	115	10	0	0	0
	P	10	25	40	53	45	18	5	2	0

a) Using the same axes, draw the graphs to show number of organisms against depth. (8mks)

GRAPH

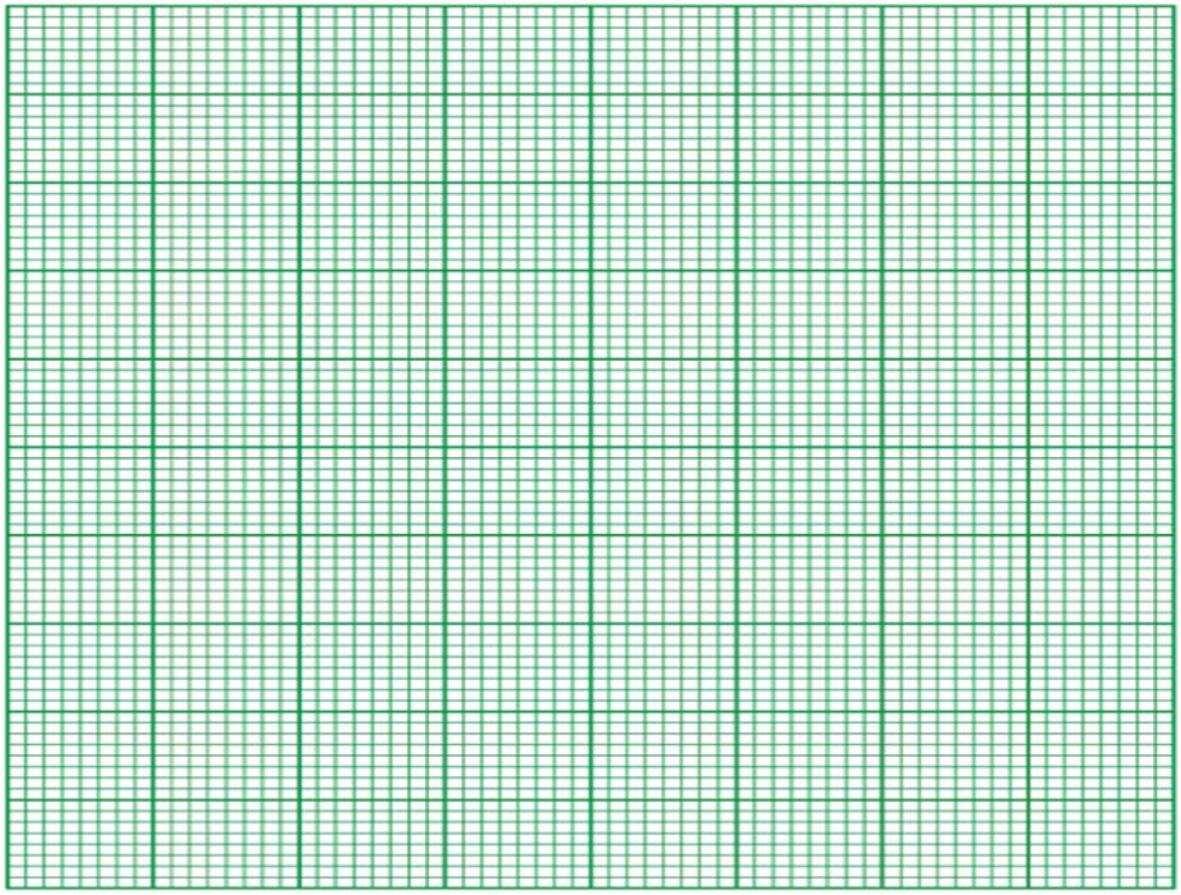
b) Which of the three species is widely distributed within the pond? (1mk)

(c) Giving a reason for your answer, which of the species is a producer?

Producer**.** (1mk)

Reason (1mk)

d) At which depth are the population of the species the same? (1mk)



e) Giving a reason for your answer which of the species is a primary and secondary consumer? (4mks)

Primary consumer.

Reason

Secondary consumer**.**

Reason

(f) Explain two ways in which the following are adapted to their functions.

(i) Palisade layer (2mks)

(ii) Cuticle (2mks)

QUESTION NO. 42

6. In an experiment to determine the effect of exercise on the concentration of lactic acid in blood, the following data was obtained. Study the data and use it to answer the questions that follow.

The lactic acid concentration was measured before, during and after the exercise.

Time minutes	**0**	**10**	**20**	**25**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Lactic acid conc. (arbituary units)	**0.5**	**0.5**	**5**	**13**	**12**	**8**	**6**	**4**	**3**	**2**	**1**	**0.9**

a) Using a suitable scale, plot a graph of the concentration of lactic acid against time. (6mks)

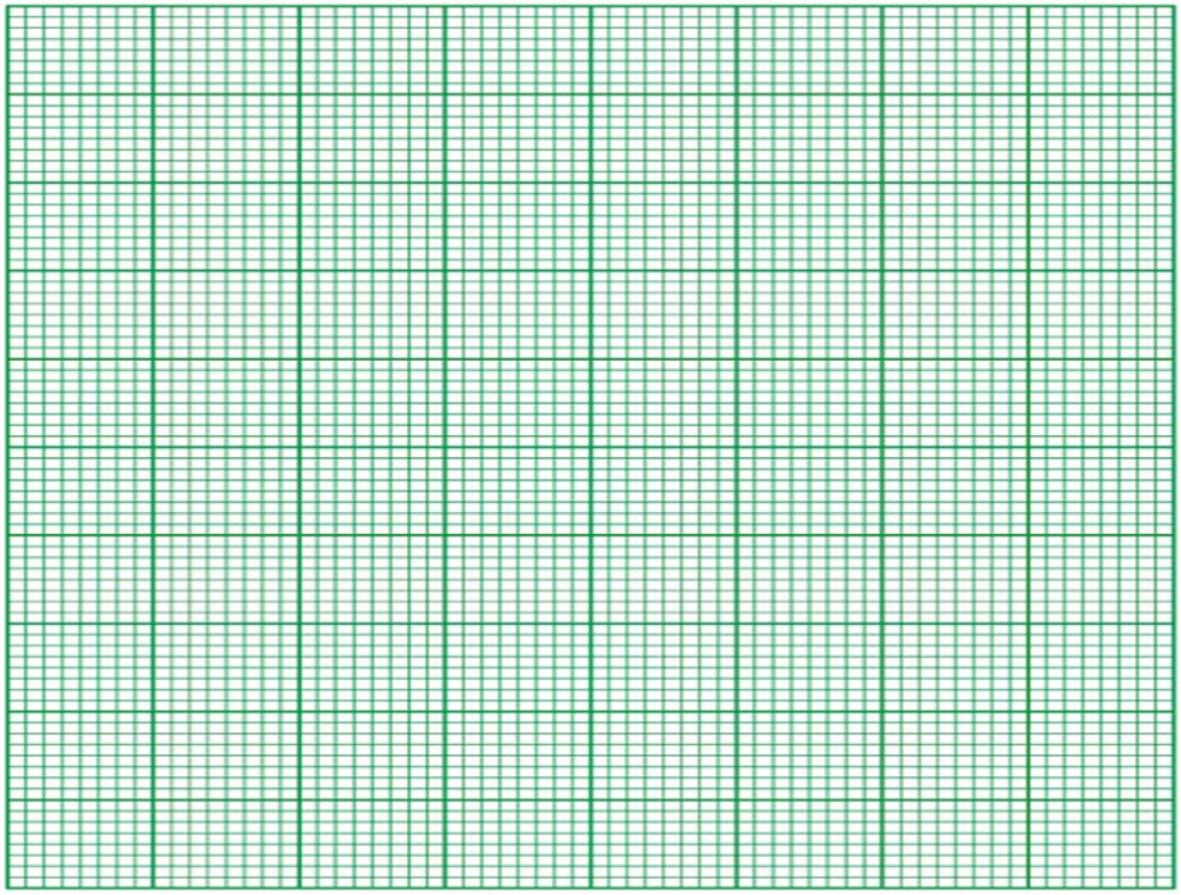
GRAPH

b) From the graph you have drawn determine

(i) The period of exercise . Explain. (2mks)

(ii) The time when oxygen debt occurred Explain. (2mks)

(iii) The duration it took to pay back the oxygen debt. Explain (2mks)



c) On the same set of axes plot a hypothetical curve for oxygen intake during the experiment period of 90 minutes. (2mks)

d) Why does lactic acid level usually continue to rise in the blood after exercise ceases. (2mks)

e) Suggest the **two** importance of anaerobic respiration to animals. (2mks)

f) What is oxygen debt? (2mks)

QUESTION NO. 43

6. The table below shows how the internal temperature two animals X and Y varied with the external temperature. The temperature was measured regularly and recorded for 12 hours in a day. Study the table and answer the questions that follow.

Time		6.0am	7.0am	8.0am	9.0am	I0.0am	11.0am	12.0	1.0pm	2.0pm	3.0pm	4.0pm	5.0pm
External temp. (°c)		2	10	15	18	24	30	35	37	39	28	25	20
Internal temp.(°c)	X	2	9	14	17.5	23	30	34	37	38	29	26	20
Internal temp.(°c)	Y	36	37	38	37	36	37	38	37	36	37	38	37

a) Using the same grid, draw graphs of external temperature, and internal temperature of animals X and Y

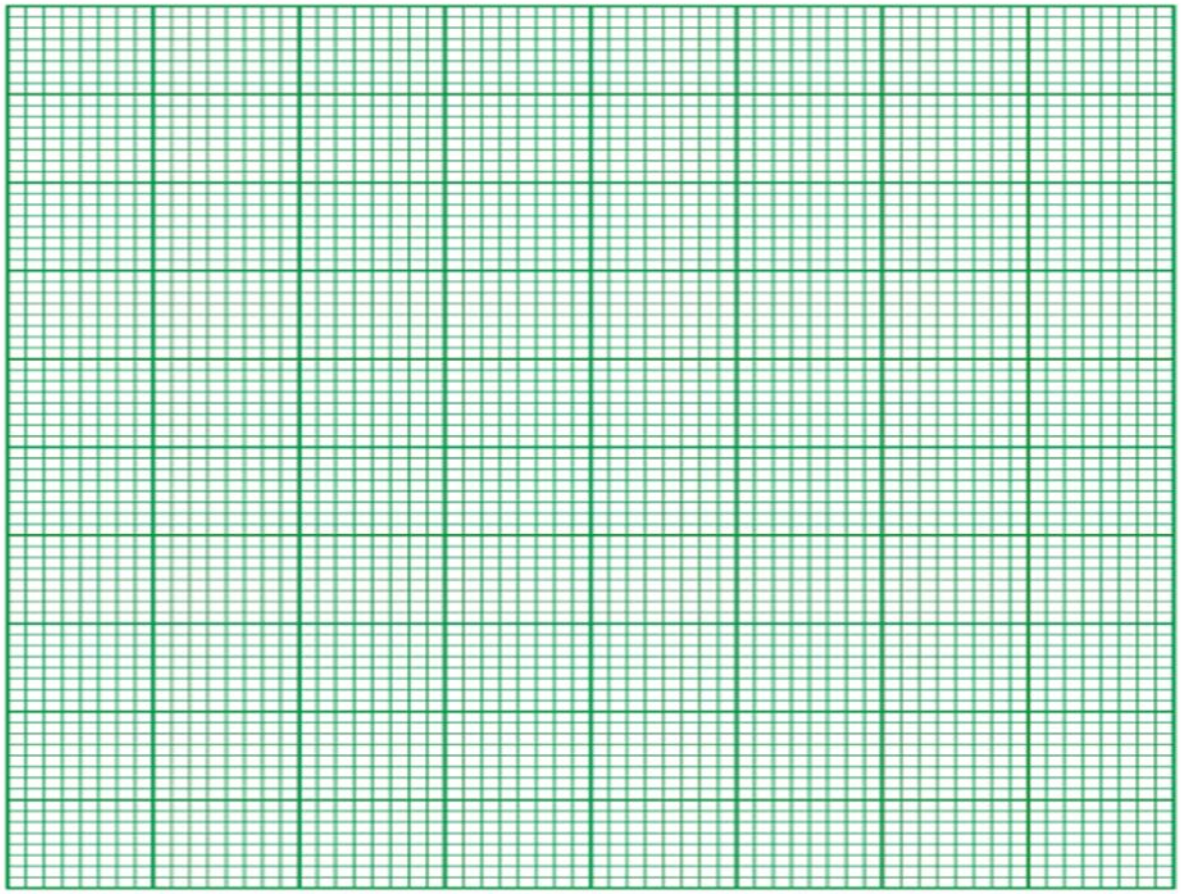
(Y-axes) against time (X-axes). (7mks)

GRAPH

b) Account for the variation of internal and external temperatures for the animals X and Y. (2mks)

X

Y



c) Identify the classification of organisms whose internal temperature varies as X and Y (2mks)

X

Y

d) Explain **two** ways used by organism Y to make its internal temperature vary as shown despite of changes in external temperature. (4mks)

e) Fish is one of the organisms which get adapted to live under varying external temperatures. Apart from being adapted to live under varying external temperatures, describe five other modifications that enable it to live in water successfully. (5mks)

QUESTION NO. 44

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

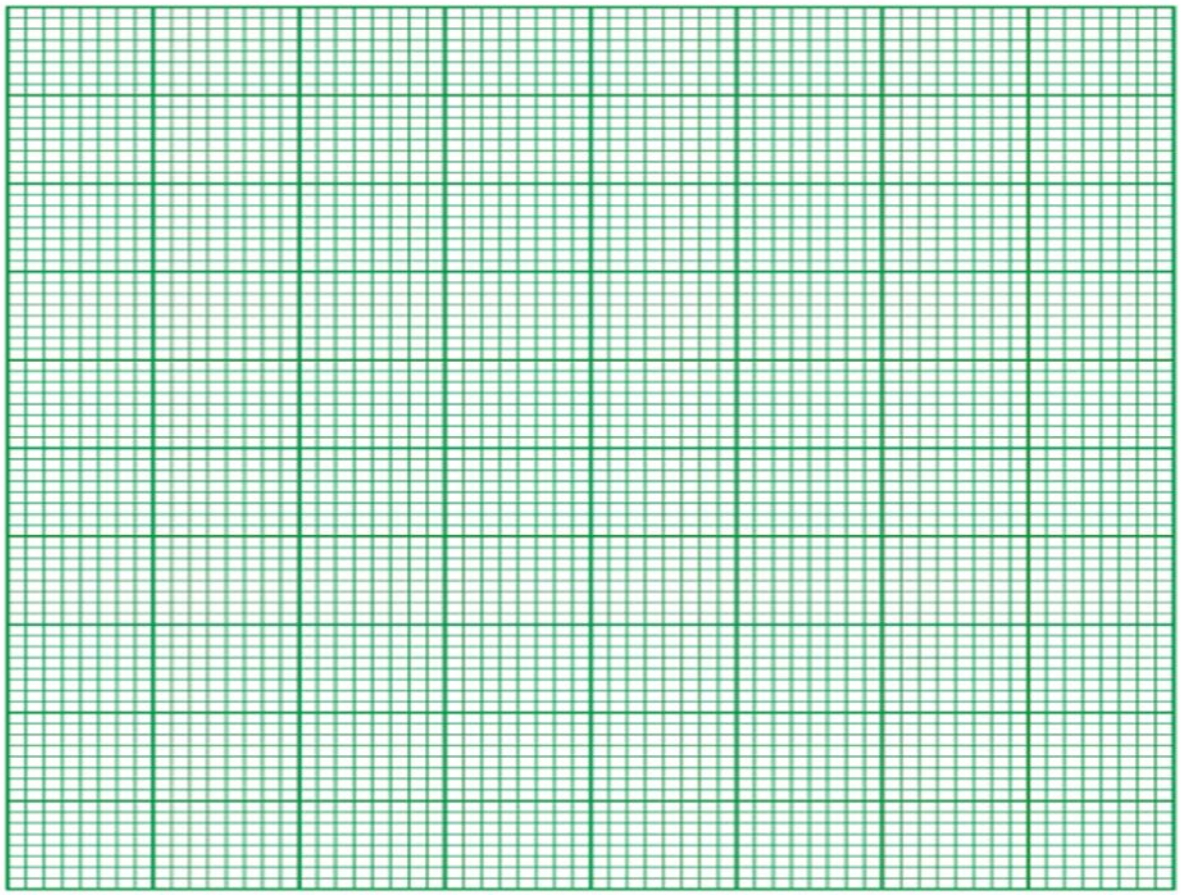
Salt conc. (g/100cm3)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Red blood cells haemolysed %	100	91	82	69	30	15	0

(a) (i) On the grid provided plot a graph of haemolysed red blood cells against salt concentration. (6mks)

GRAPH

(ii) At what concentration of salt solution was the proportion of haemolysed cells equal to non-haemolysed cells? (1mk)

(iii) State the percentage of red blood cells haemolysed at salt concentration of 0.45. (1mk)



(b) Account for the results obtained at:

(i)0.33% salt concentration (3mks)

(ii) 0.48% salt concentration (3mks)

(c) What would happen to the red blood cells if they were placed in 0.50% salt solution. (3mks)

(d) Explain what would happen to onion cells if they were placed in distilled water. (3mks)

QUESTION NO. 45

45 In an experiment to investigate the dry weight changes (in milligrams) of barley seedling, its embryo and endosperm during the first 10 days after the onset of germination. The results were as shown in the table below.

Time (days)	Dry weight of embryo	Dry weight of endosperm	Dry weight of whole seedling
0	2	41	45
2	2	39	43
4	7	32	41
8	15	21	38
6	22	11	35
10	35	6	43

(a) Using a suitable scale and on the same axes plot graphs of dry weight of embryo, endosperm andwhole seedling against time.

(8mks)

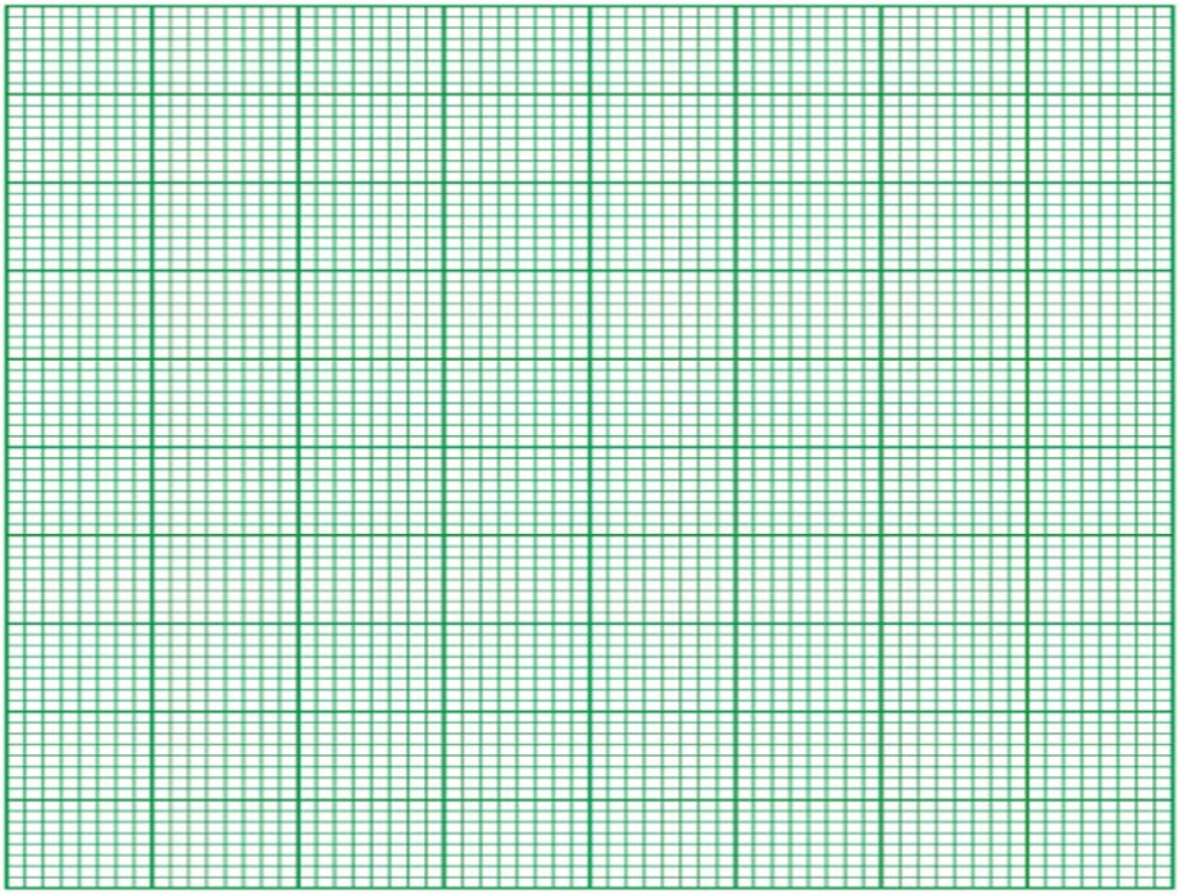
GRAPH

b) On which day was dry weight of endosperm same as that of embryo? (1mk)

(c) What was the dry weight of the endosperm and embryo on the 5^{th} day? (1mk)

Endosperm

Embryo



(d) Account for the change of dry weight of:

(i) Embryo between day 0-2 (2mks)

(ii) Embryo between day 2-10 (3mks)

(iii) Endosperm from day 0-8 (3mks)

(e) Name the structure that protects the radicle in hypogeal germination. (1mk)

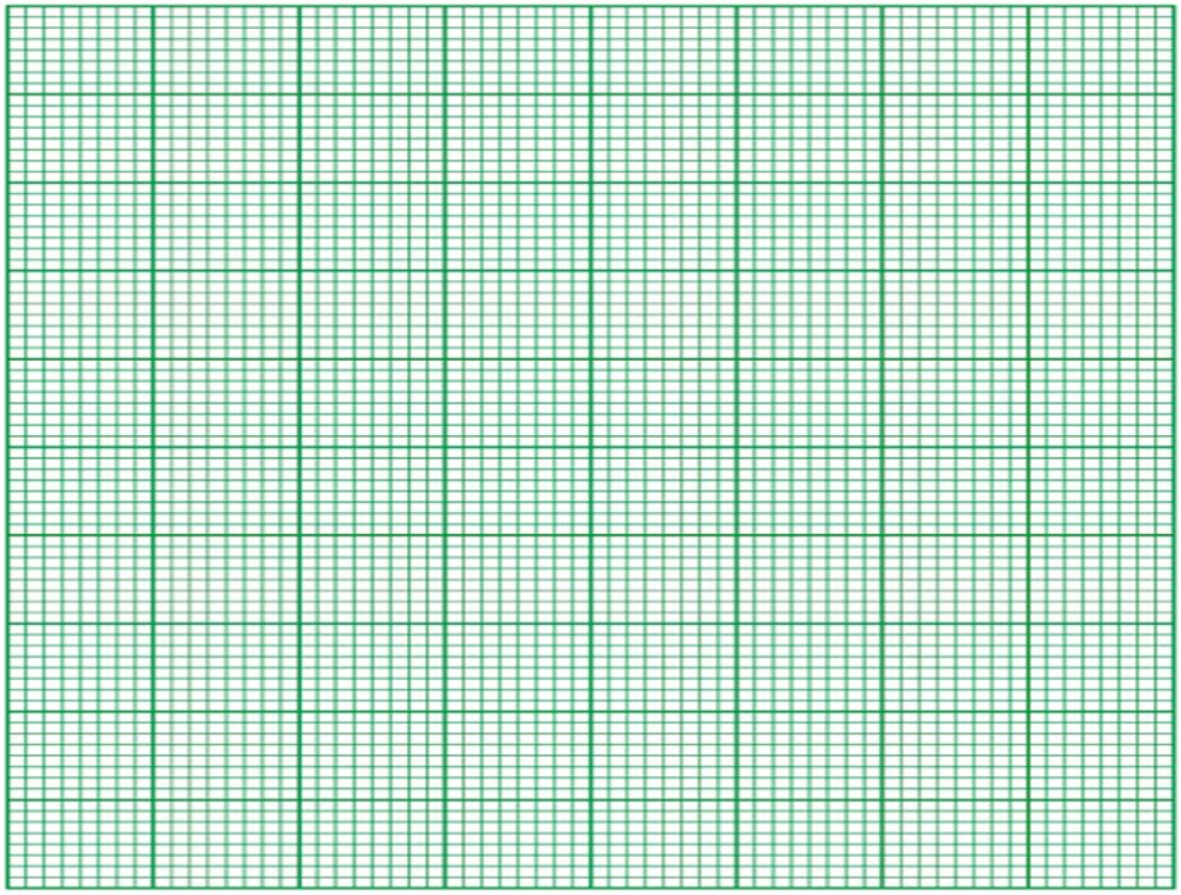
QUESTION NO. 46

46. The data below shows the rate of photosynthesis at different temperature in attached leaves of three East African plants. (Crotolaria, Gynandropsis and Amaranthus species) respectively which were grown outside with the same illustration while water and carbon (IV) oxide are not limiting factors in this experiment. Rate of photosynthesis was expressed interms of carbon (IV) oxide uptake in $mg/mm^2/hr$ at various temperatures as tabulated below.

Temperature ^oC	**Rate of photosynthesis ($mg/mm^2/hr$)**		
	Gynandropsis sp	**Crotolaris sp**	**Amaranthus sp**
5	-	20	-
10	22	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) Represent the results graphically (rate of photosynthesis against temperature)

MAKE A PROVISION FOR A GRAPH PAPER



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

Gynandropsis

Amaranthus

c) Give a reason why Gynandaropsis and Amaranthus could not function photosynthetically at 5^{o}C. (1mk)

d) What are the possible ecological habitats for the following plants 2mks

(i) Amaranthus

(ii) Crotolaria

e) At what temperature was the amount of carbon (IV) oxide around the leaf of Gynandropsis highest? (1mk)

f) What raw material is required in the light stage of photosynthesis. (1mk)

g) Name the parts of chloroplasts in which the following stages of photosynthesis take place. (2mks)

(i) Light stage

(ii) Dark stage

h) State **one** structural similarity and difference between chloroplast and mitochondria. (2mks)

Similarity

Difference

i)What is the compensation point of photosynthesis? (1mk)

QUESTION NO. 47

47. An experiment was carried out to investigate the effects 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.

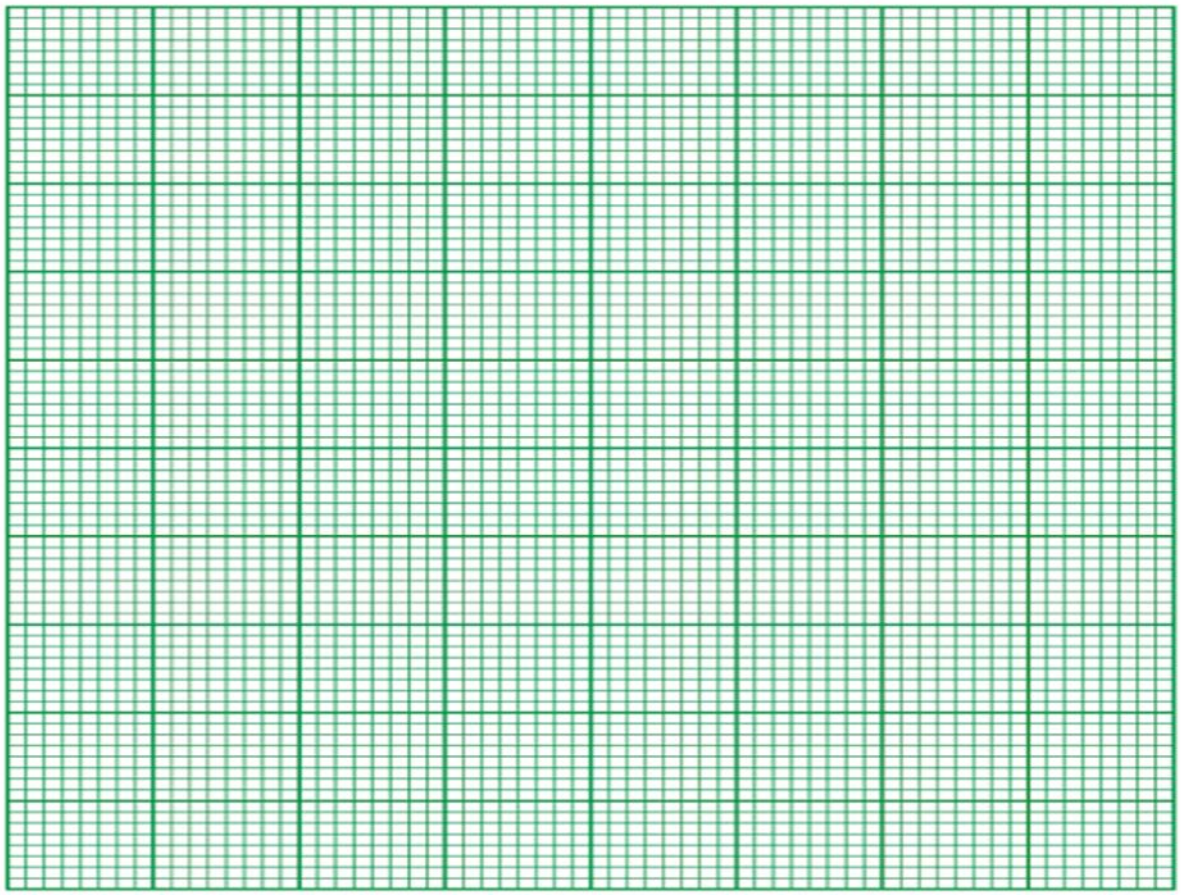
Shoot C - Apical bud was left intact.

The length of branches developed from lateral buds was determined at reular intervals.

The results obtained are as shown in the table below:

	Length of Shoot in millimeters		
Time in days	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 length of branches against time. (8mks)



(b) (i)What was the length of the branch in Shoot B on the 7th day?(1mk)

(ii) What would be the expected length of the branch developing from Shoot A on the 11th day? (1mk)

(c) Account for the result obtained in the experiment. (6mks)

(d) Why was Shoot C included in the experiment? (1mk)

(e) What is the importance of gibberellic acid in Agriculture? (1mk)

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

QUESTION NO. 48

48. Form three students in Mua secondary school studied the population growth of two species of flour beetles. T confusum and T. casteanum. The beetles were grown in a box with limited supply of maize flour. The box was kept in a warm place for 200 days. The beetles were counted at certain intervals and the results tabulated as shown below.

No of Days		0	10	50	60	80	100	120	140	180	200
No. of Beetles	T. confusum	20	20	30	80	130	150	162	60	160	160
	T. Casteanum	20	20	30	43	50	40	15	10	6	2

(a) Using the same axis draw the graphs of the number of beetles in the box against time (8mks)

GRAPH

(b) How many beetles were present on the 70^{th} day?

T. Confusum

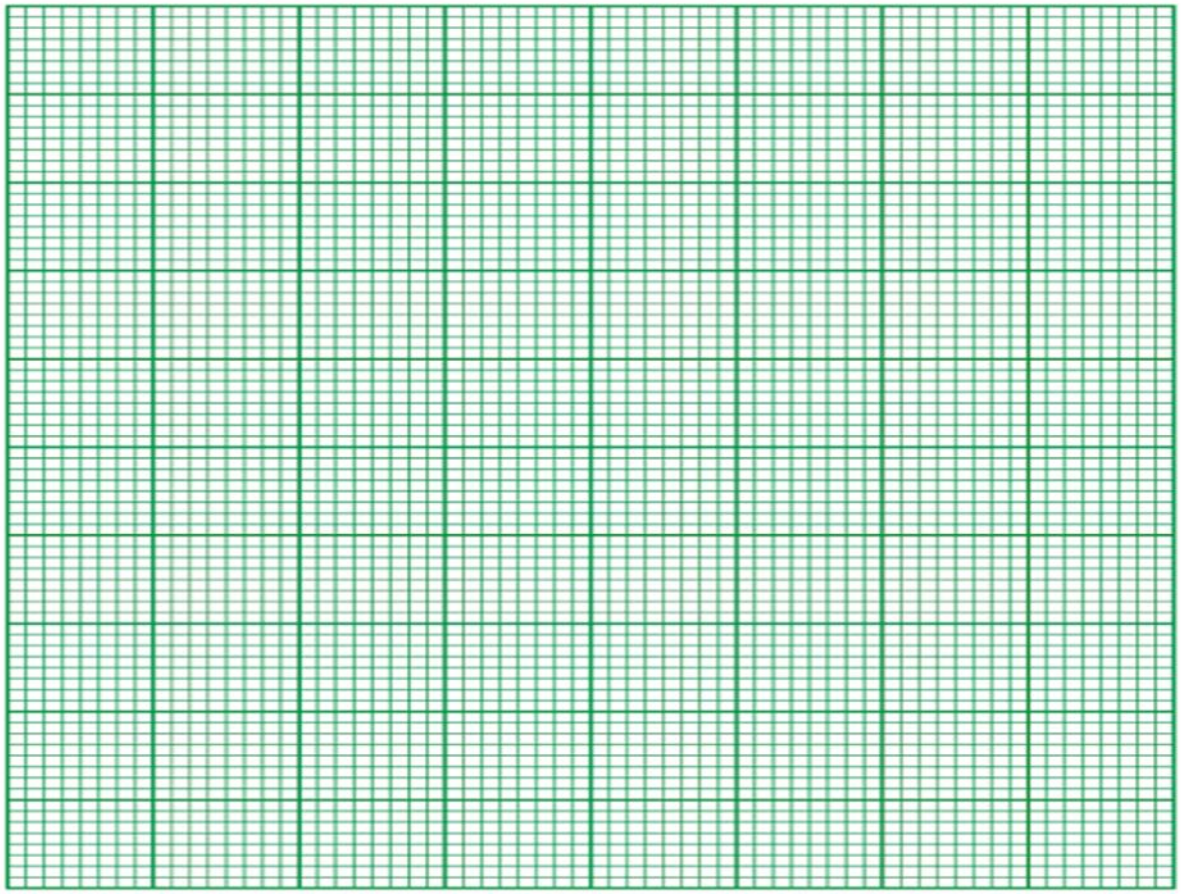
T. Casteanum (2mks)

(c) Account for the shape of T. confusum curve between day

(i) 0 -10 (2mks)

(ii) 60-80 (2mks)

(iii) 120-140 (2mks)



(d) (i) Suggest what happened to T. Casteanum between day 80 and 160 (2mks)

(ii) What biological phenomenon is represented by observation made in d(i) above (1mk)

(e) State one factor that may determine the distribution of animals in a given area (1mk)

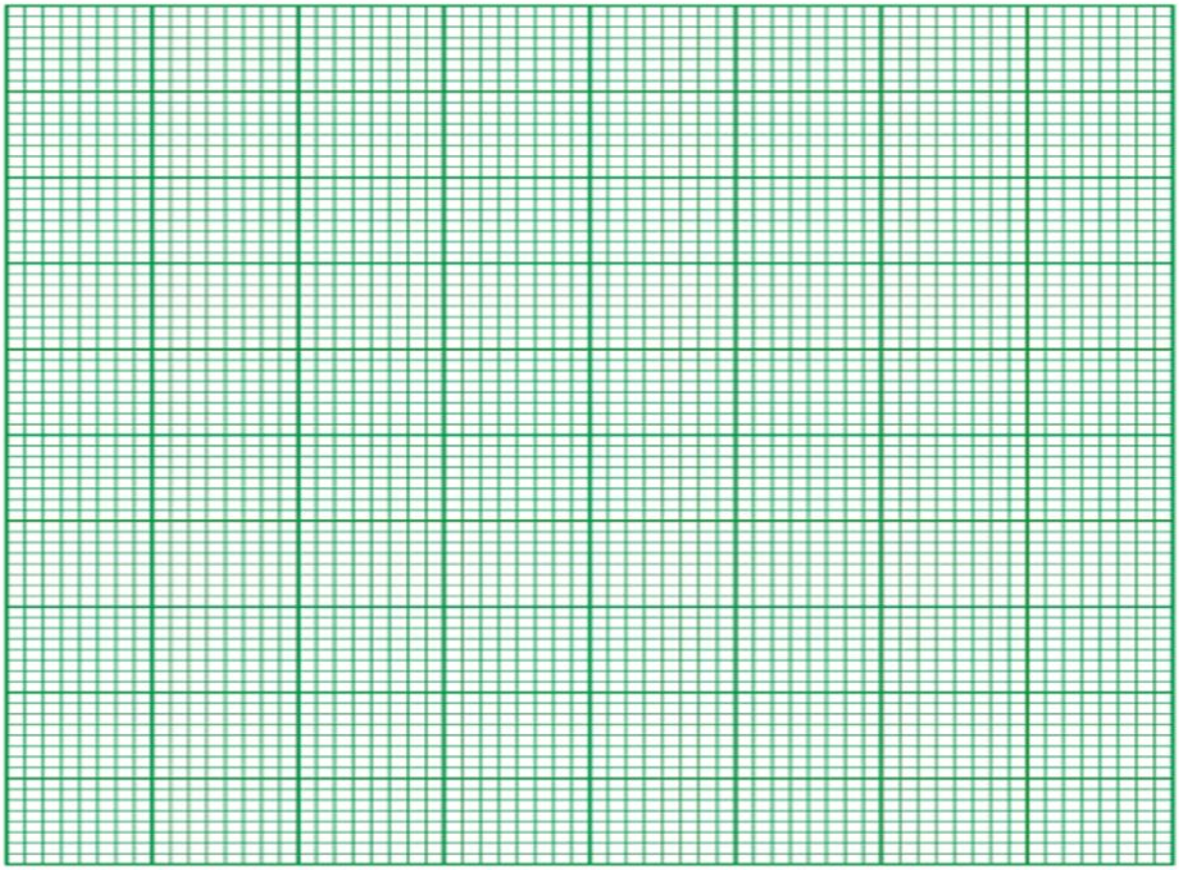
QUESTION NO. 49

49. A hungry person had a meal, after 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 (hrs)	Concentration of contents in the hepatic portal vein (mg / 100ml)		Concentration of contents in the iliac vein (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	1.5	90\	3.0
5	90	3.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0

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

GRAPH



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

i) 0 - 1hr (2Marks)
ii) 1 - 2hrs (3Marks)
iii) 2 - 4hrs (2 Marks)
iv) 5 - 7 hrs (2 Marks)

(c) Account for the difference in concentration of glucose in hepatic portal vein and the iliac vein between 2 and 4hrs. (3 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. (1Mark)

QUESTION NO. 50

50. The glucose level in mg per $100cm^3$ of blood was determined in two person Y and Z. Both had stayed for six hours without taking food. They were fed on equal amount of glucose at the start of the experiment .The amount of glucose in their blood was determined at intervals .The results are shown in the table below.

Times in minutes	Glucose level in blood in mg /$100cm^3$	
	Y	Z
0	85	78
20	105	110
30	105	110
45	130	170
60	100	195
80	93	190
100	90	140
120	90	130
140	88	120

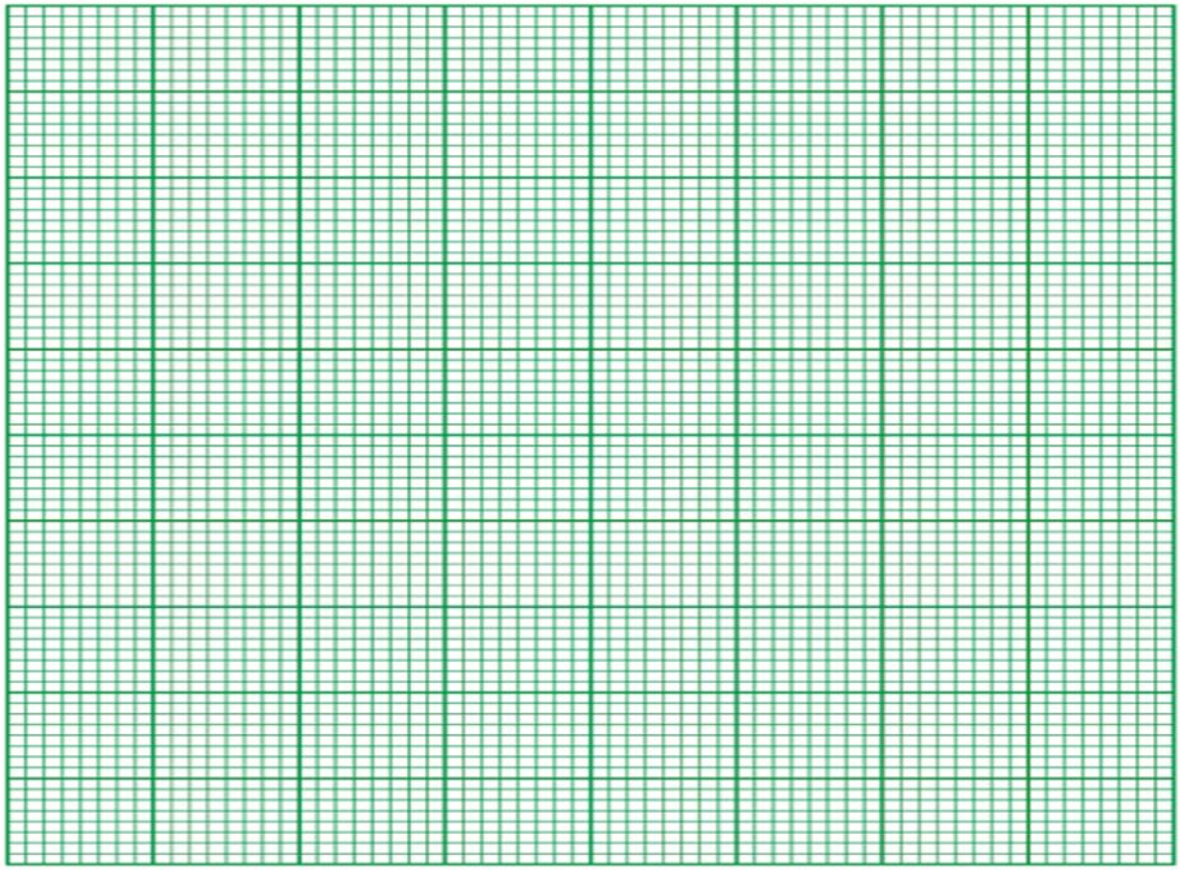
a) On the grid provided, plot graphs of glucose levels in blood against time on the same axes. (7mks)

GRAPH

b) What was the concentration of glucose in the blood of Y and Z at the 50^{th} minute? (2mks)

Y

Z



c) Account for the level of glucose in present Y

i) During the first 45 minutes. (2mks)

ii) After 45th minute to the end. (4mks)

d) Account for the decrease in glucose level person Z after 60 minutes. (2mks)

e) Low blood sugar level in harmful to the body. Explain. (3mks)

QUESTION NO. 51

51. An investigation was carried out between 1964 and 1973 to study the changes in fish population in a certain lake. Four species of fish A, B, C and D were found to live in the lake. In 1965, a factory was built near the lake and was found to discharge hot water in the lake raising the temperature from 25^{o} c to 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 population during the period of investigation

Fish species	1964	1966	1968	1970	1971	1971	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

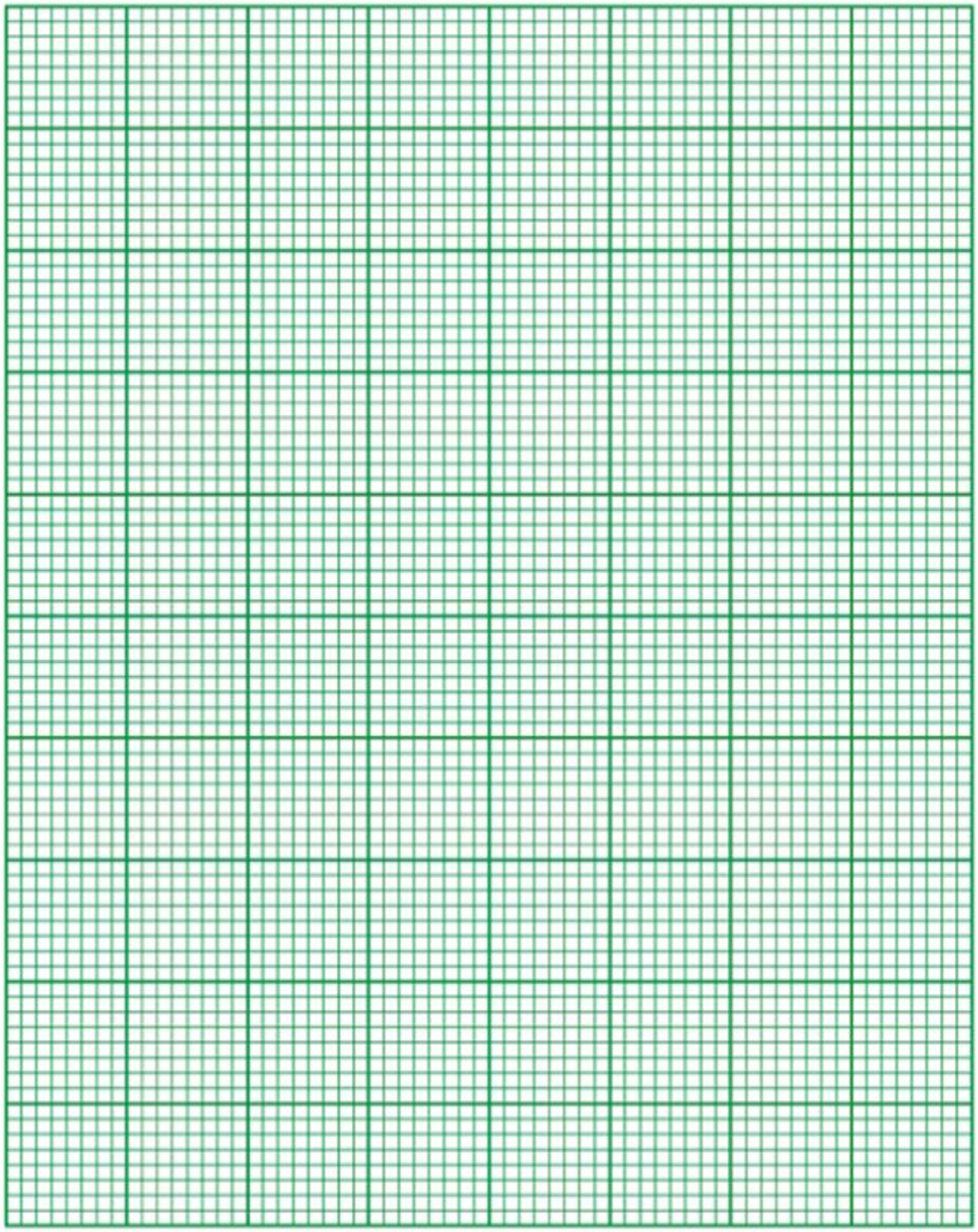
(a)

(i) In which year was the fish population lowest? (1mrk)

(ii)***State*** the factors that might have caused the lowest fish populations during the year you have stated in (a) (i) above. (3mrks)

(iii)Explain how each factor you have stated in (a) (ii) above could have brought about the changes in the fish populations. (11mrks)

iv) Why did fish species C remain 0 after 1969? (1mrk)



b). Other than the factors stated in (a) (i) above, state other four that may affect the population of fish in the lake. (4mrks)

QUESTION NO. 52

52. The table below shows the population of a housefly *musca domestica* which is parasitized by wasps of species Nasonia spp. The investigation of their population growth pattern was carried out for 70 weeks. In these experimental space and physical factors were assumed to be limiting.

Time in weeks	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Musca domestica	40	70	110	260	350	480	400	395	350	40	60	140	250	240	230
Nasonia Spp.	10	20	30	45	100.	200	300	380	410	250	60	20	40	200	280

a) Using the readings in the table, plot graphs on the same axis of population growth of organisms against time.(8 marks)

GRAPH

b) Account for the growth of

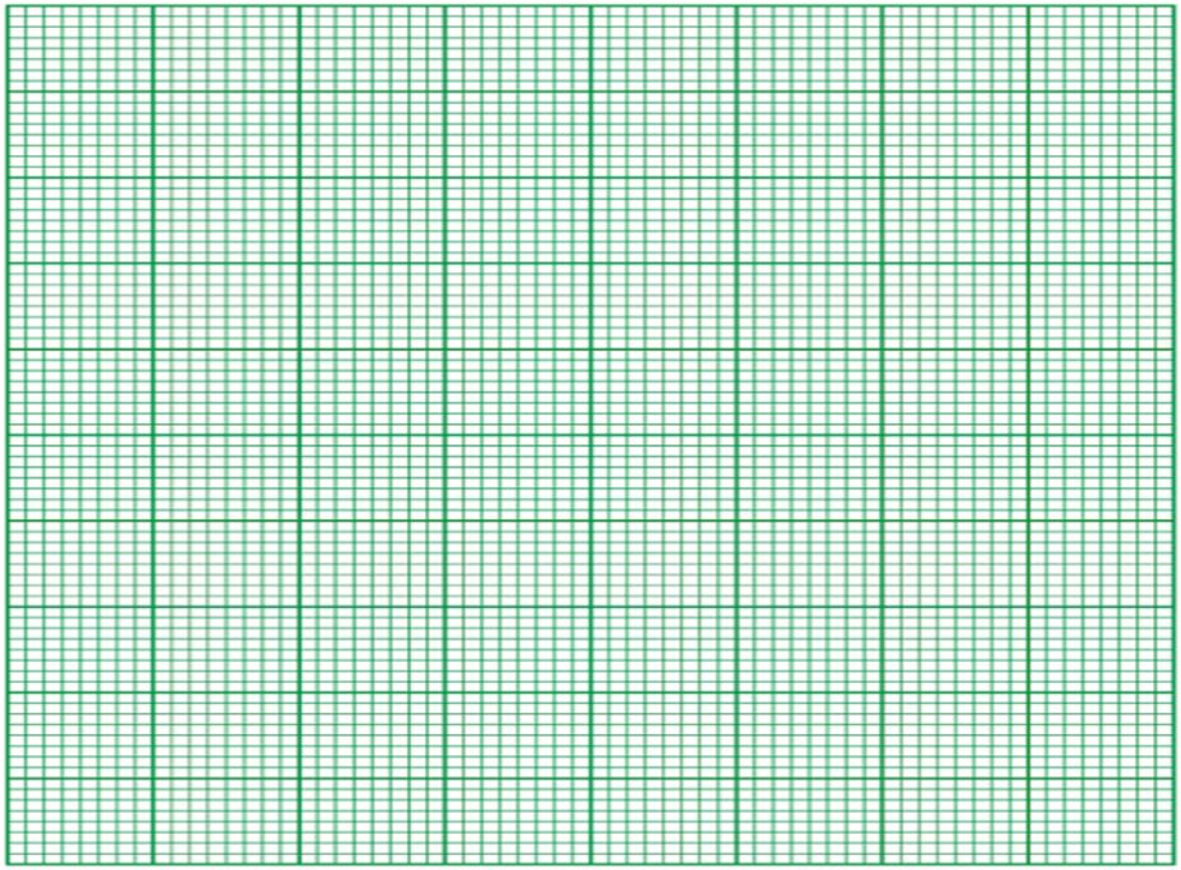
i) *Musca domestica* between 10th week — 25th week. (1 mark)

ii) Nasonia species between 40th week –50th week. (1 mark)

c) What is the population of?

i) Nasonia spp. on the 62nd week? **(**1 mark)

ii) *Musca doniestica* on the **4th** week? (1 mark)



d) Bemex, another parasite of housefly was introduced into the ecosystem. Giving a reason; what will be the effect on the population of

i) Housefly *Musca domestica.* (2 marks)

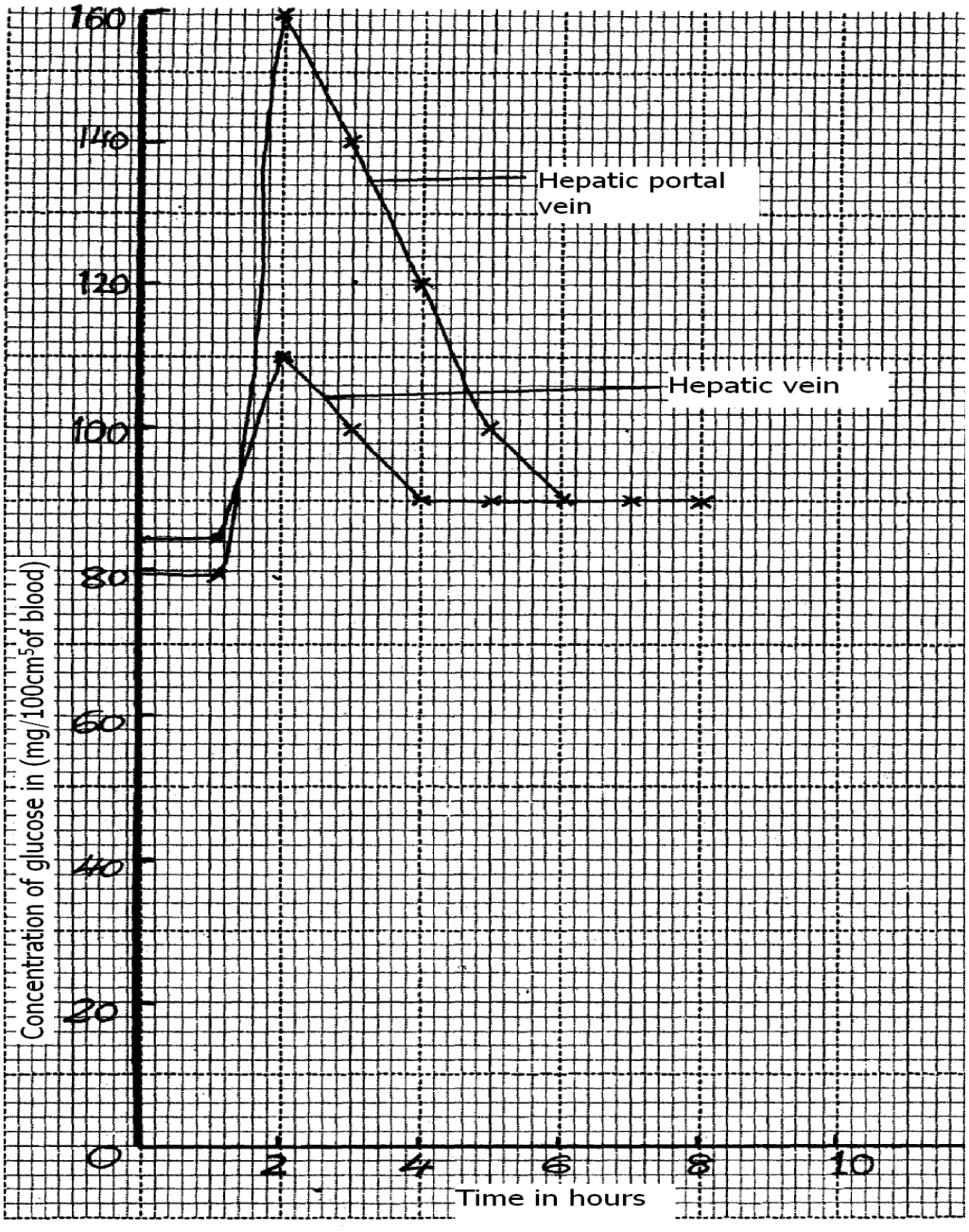
ii) Nasonia Spp. (2 marks)

e) In estimating the population of *Musca domestica* in the experiment above. Capture-mark release recapture method was used. Describe the procedure which was followed. (4 marks)

QUESTION NO. 53

53. A man was starved for 24hours.He was then served with a balanced diet after which the concentration of glucose in the hepatic and hepatic portal veins were determined at interval of 1 hour for the next 8 hours after the meal.

The results were as shown in the graph below.



(a) From the graph state the normal concentration of glucose in man. 1mk

(b) Determine the concentration of glucose after 2 ½ hrs. (2mks)

(c) Calculate the rate of glucose between 1 - 2 hours in hepatic portal vein. (2mks)

(d) Account for the blood sugar level in hepatic portal vein and hepatic vein between; (4mks)

(i) 0- 1hour

(ii) 2 - 4 hours. (6mks)

(e) A patient was found to produce urine that tasted sweet. Name the disease he was likely to be suffering from. (1mk)

(f) How would you test for the disease in your school laboratory. (3mks)

(g) What advice would you give to a patient whose blood contains abnormal high levels of urea. (1mk)

QUESTION NO. 54

54. Carbohydrates used during respiration and those formed during photosynthesis by a certain plant was measured over a period of 24 hours at an interval of 3 hours

Time of day	12AM	3AM	6AM	9AM	12PM	3PM	6PM	9PM	11PM
Carbohydrates formed during photosynthesis (mg)	0	0	5	30	60	30	5	0	0
Carbohydrates used during respiration (mg)	10	10	10	10	10	10	10	10	10

Using the same axes,

(a) Plot a graph of carbohydrate formed during photosynthesis and carbohydrate used during respiration against time. (7mks)

GRAPH

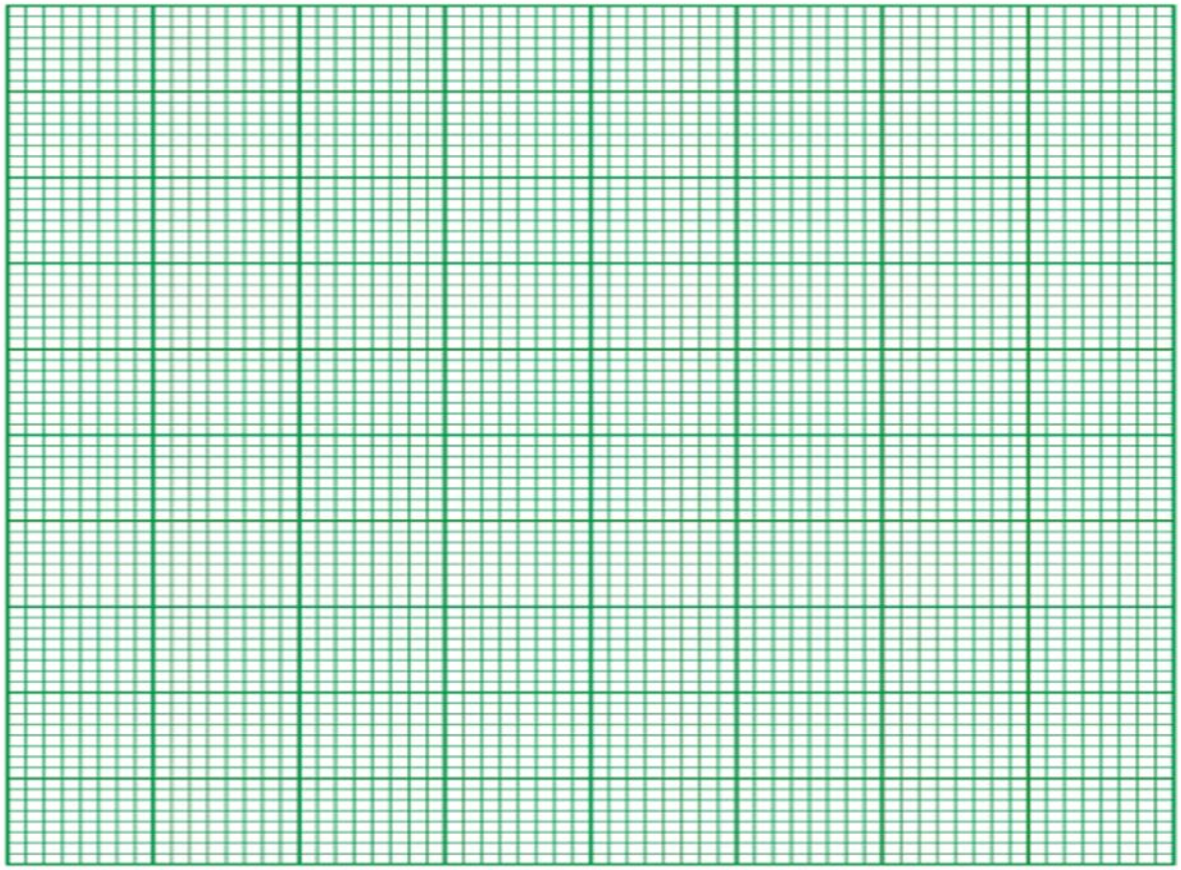
(b) Calculate the net carbohydrate formed by the plant. (2mks)

(c) At what time of the day do the light compensation points occur? (2mks)

(d) Account for the shape of graph on carbohydrates.

(i) Between 12.00a.m and 3a.m. (2mks)

(ii) Between 3.00a.m to 12.00 noon. (2mks)



(e) How could foggy weather influence the net amount of carbohydrates formed over the 24-hour period? (1mk)

(f) Give other external factors apart from temperature and light intensity that influence the rate of photosynthesis. (2mks)

(g) In which form are carbohydrates stored in

(i) Plant bodies. (1mks)

(ii) Fungi (1mk)

QUESTION NO. 55

55. In an experiment to investigate certain processes in a given plant species, the rate of carbon (iv) Oxide released and intake were measured over a long period of time. The results of the investigation were as shown below.

Time of the day (Hours)	6	8	10	12	14	16	18	20	22	24
Volume of carbon (iv) Oxide Consumed (mm^3/ min)	10	43	69	91	91	50	18	0	0	0
Volume of Carbon (iv) Oxide released (mm^3/ Min)	38	22	10	3	3	6	31	48	48	48

a) On the same axes draw graphs of volume of carbon (iv) oxide consumed and released against time. (7mks)

GRAPH

b) Name the chemical process changes represented by;

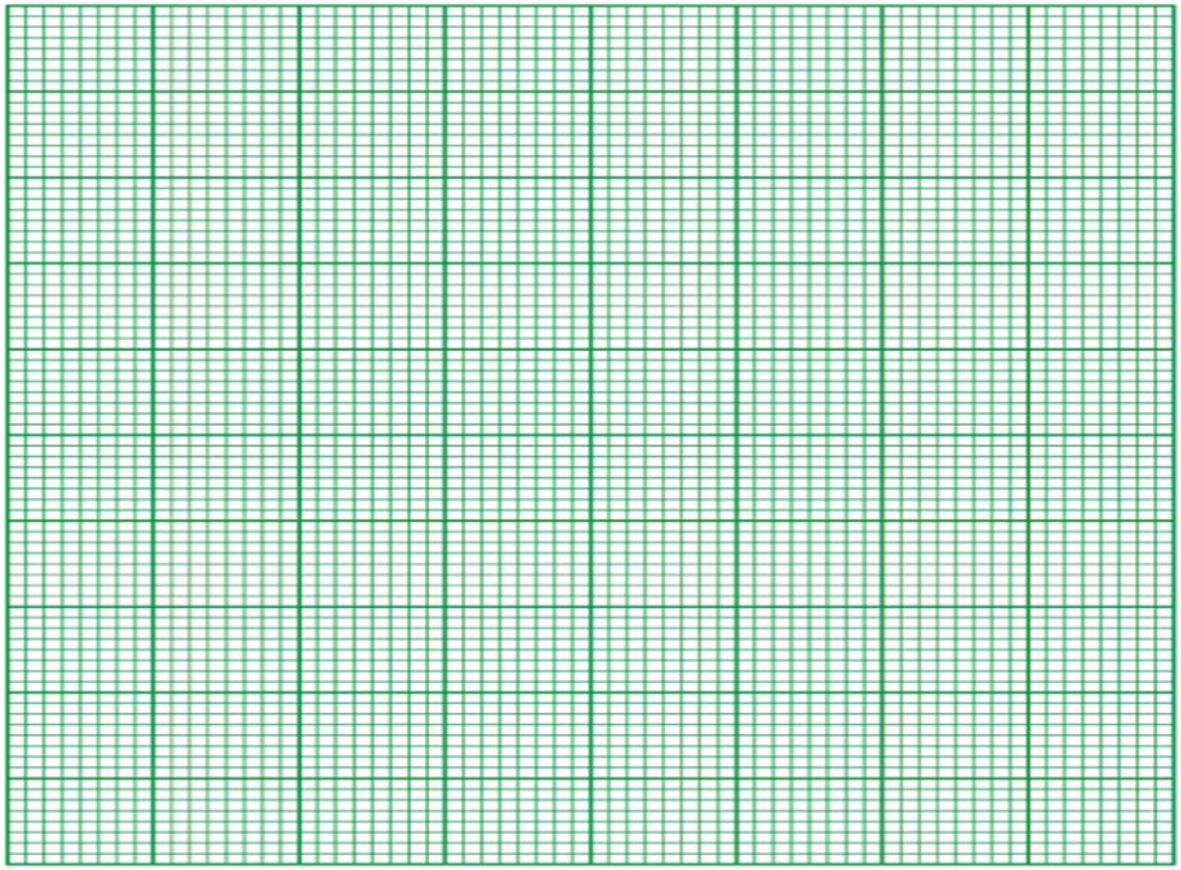
i) Carbon (iv) Oxide consumed (1mk)

ii) Carbon (iv) Oxide released (1mk)

c) Account for the shape of the curve for

i) Carbon (iv) oxide consumed (3mk)

ii) Carbon (iv) Oxide released (3mk)



d) i) What is meant by compensation point (1mk)

ii) From the graph, find the time of the day when the plant attained compensation point. (2mks)

f) Explain how temperature affects the rate of carbon (iv) oxide consumption in the plant. (2mks)

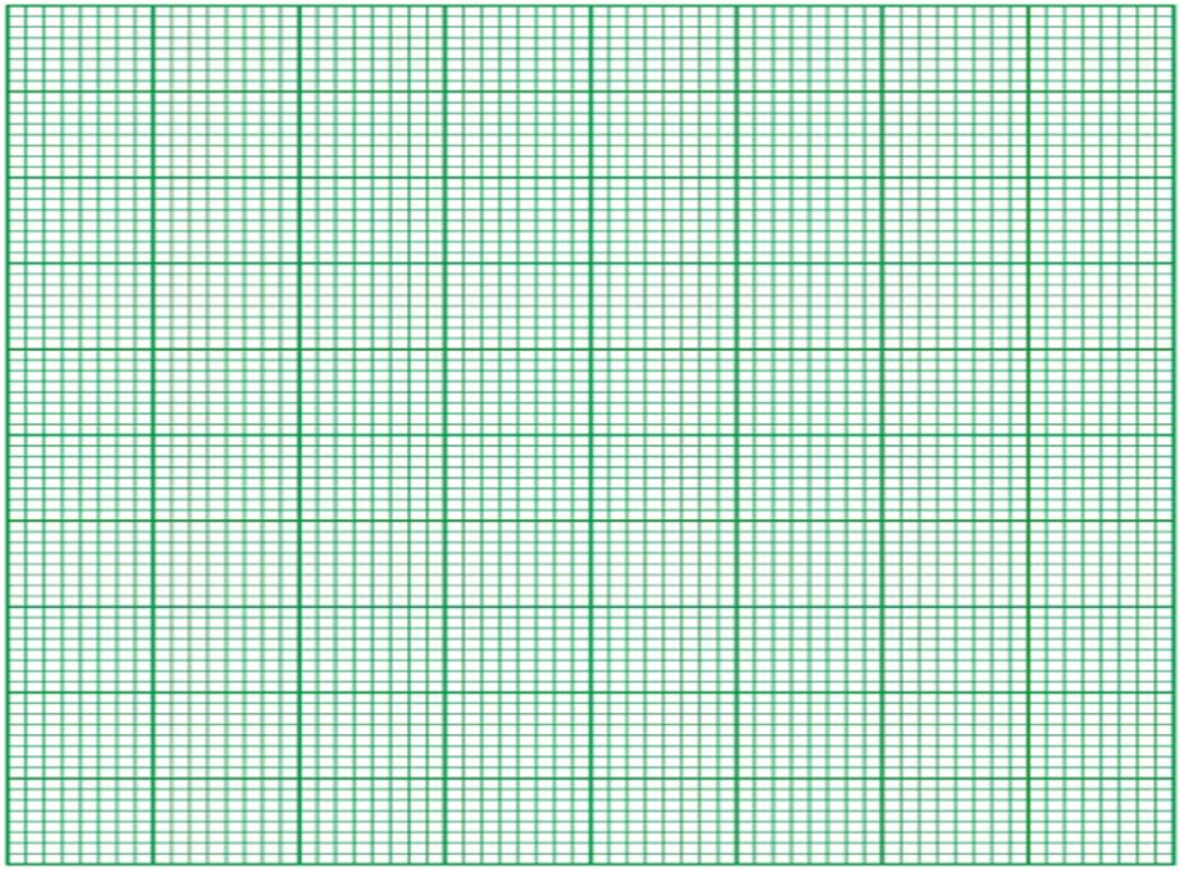
QUESTION NO. 56

56. In an experiment to determine the effect of ringing on the concentration of sugar in phloem, a ring of bark from the stem of a tree was cut and removed. The amount of sugar in **grams per** $16cm^3$ piece of bark above the ring was measured over a 24hour period. Sugar was also measured in the bark of a similar stem of a tree which was not ringed. The results are shown in the table below.

Time of the day	Amount of sugar in grams per	$16cm^3$ piece of bank
	Normal stem	Ringed stem
0645	0.78	0.87
0945	0.80	0.91
1245	0.81	1.01
1545	0.80	1.04
1845	0.77	1.00
2145	0.73	0.95
0045	0.65	0.88

(a) Using the same axes, plot a graph of the amount of sugar against time. (6mks)

GRAPH



(b) At what time was the amount of sugar highest in the-:

(i) Ringed stem. (lmk)

(ii) Normal stem. (lmk)

(c) How much sugar would be in the ringed stem if it was measured at 0345 hours? (lmk)

(d) Give reasons why there was sugar in the stems of both trees at 0645 hours. (2mks)

(e) Account for the shape of the graph for the tree ringed stem between

(i). 0645 hours and 1545 hours (3mks)

(ii) 1545 hours and 0045 hours (2mks)

(f) Name the structures in the phloem that are involved in the translocation of sugars. (2mks)

(g) Other than sugars name two compounds that are translocated in phloem. (2mks)

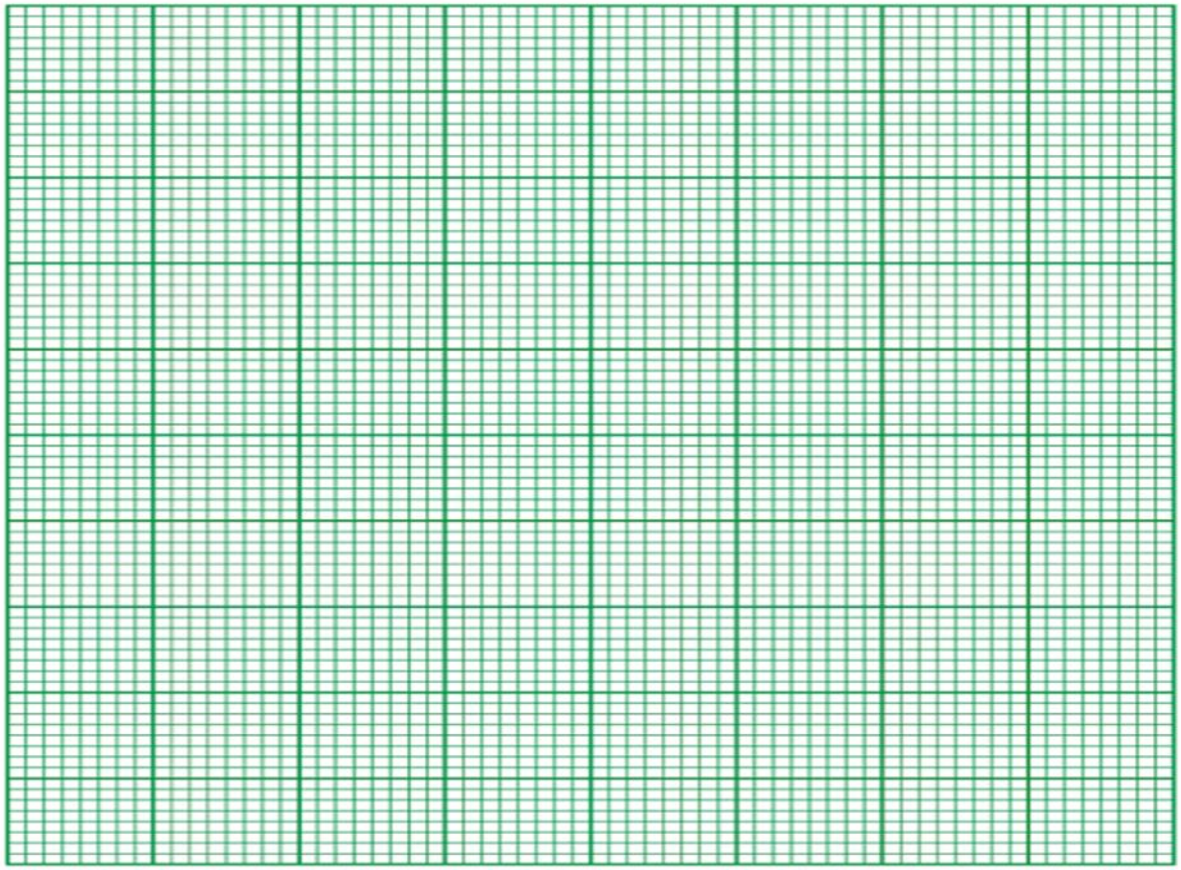
QUESTION NO. 57

57. Rice seeds were soaked overnight. Fresh mass and dry mass of a sample of 20 seeds was obtained and recorded in the table. The rest of the seeds were planted in a tray that had soil and well watered daily. Twenty of the seeds/seedlings were removed from the soil every two days for two weeks. Their fresh and dry mass were taken and recorded in the table as shown below.

Time in days	Fresh mass in (g)	Dry mass in (g)
0	14.0	4.0
2	18.0	3.5
4	24.5	2.5
6	32.0	1.5
8	38.5	2.0
10	41.0	3.0
12	43.0	4.5
14	45.0	6.0

a) Using the same axes, plot two graphs to represent changes in fresh and dry mass over the two –week period (7mrks)

GRAPH



b) What would be the fresh and dry mass of the seedlings at day 9. (2mrks)

i) Fresh mass

ii) Dry mass

c) Account for the change in fresh mass and dry mass between day 0 and day 6. (4mrks)

i) Fresh mass

ii) Dry mass

d) Explain the change in dry mass from day 8 (2mrks)

e) Explain why a sample of 20 seeds was used instead of one seed. (2mrks)

f) **State one** factor within and one factor outside the seed that cause dormancy. (2mrks)

i) Within the seed

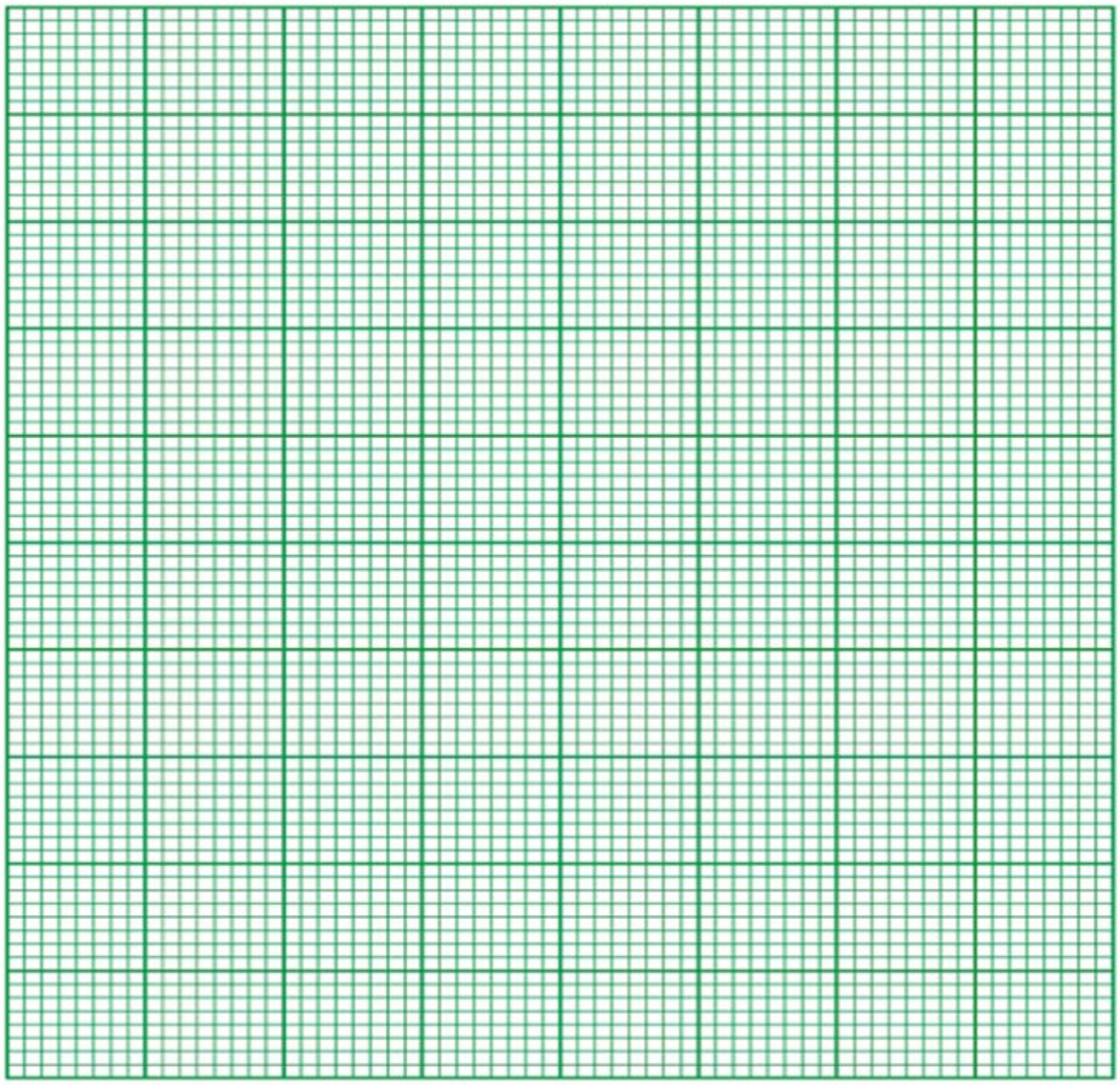
ii) Outside the seed

g) **Give one** characteristic of a meristematic cell (1mrk)

QUESTION NO. 58

58. The following data are results from an observation and measurement of daily growth in an organism over a period of 24 days of its development

a) Using a suitable scale draw graphs of width of head and length of femur against time on the same axis. (8mks)



b) i) Name the growth pattern represented by the graph.(1mk)

ii) With reference to your graph, identify the phylum to which the organism belongs. Give reasons for your answer. (2mks)

c) Account for the length of hind femur between

(i) day 3 and day 7 (2mks)

(ii) day 7 and day 10 (2mks)

d) State two hormones involved in the growth pattern represented by the graphs. (2mks)

e) State two advantages of metamorphosis in organisms. (2mks)

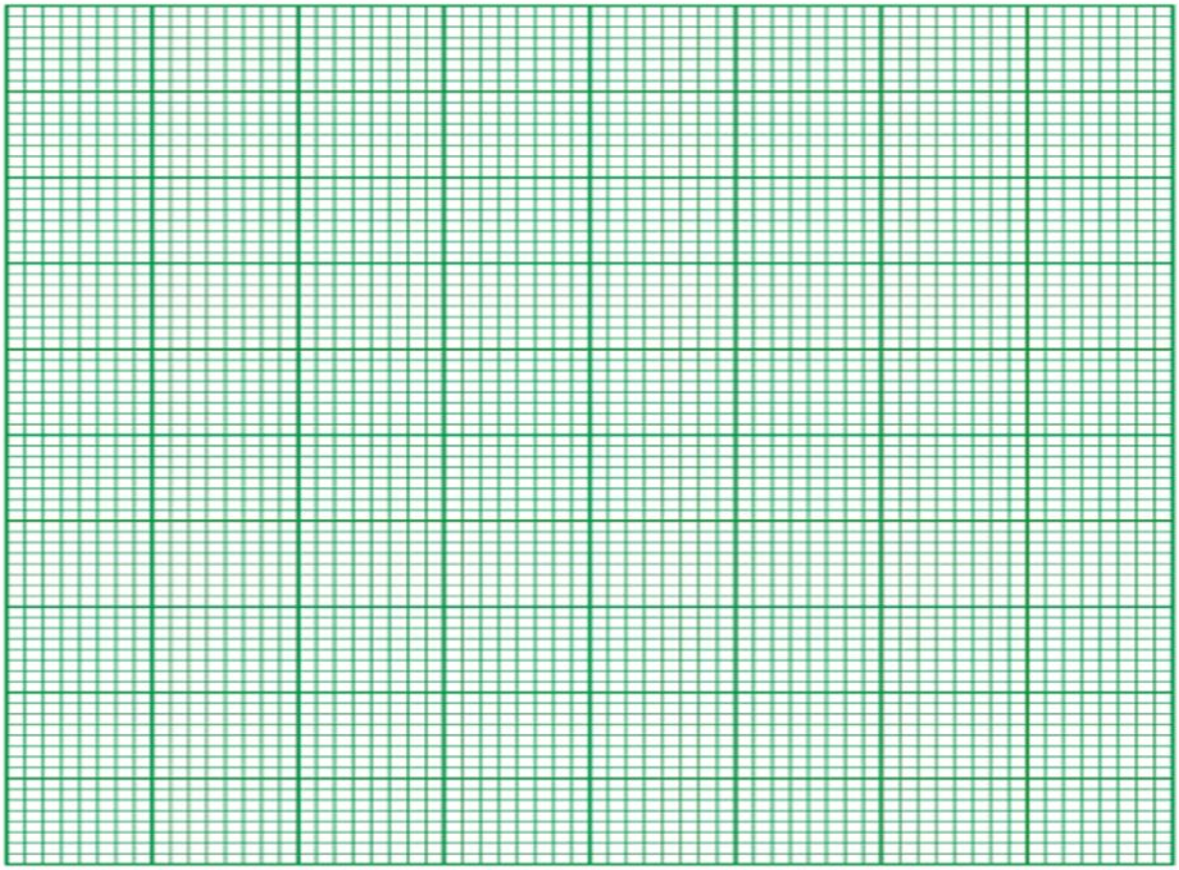
QUESTION NO. 59

59. A person had gone for 24 hours without food. Then he was served with a well balanced meal after which the concentration of glucose and amino acids in the blood were determined every one hour for the next 8 hours after the meal, the concentration were measured as blood passed through the hepatic portal vein and hepatic vein.

The results were as shown in the data below.

Time in hours	Concentration of	Glucose & amino	Acids in blood	(Mg/100 cm^3 of blood)
	HEPATIC	PORTAL VEIN	HEPAT IC	VEIN
	GLUCOSE	AMINO ACIDS	GLUCOSE	AMINO ACIDS
0	79	1.0	85	1.0
1	79	1.0	85	1.0
2	160	1.0	110	1.0
3	140	4.0	100	3.0
4	120	6.0	90	3.0
5	100	5.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0
8	90	1.0	90	1.0

(a) On the same axis plot graphs of glucose concentration in hepatic portal vein and hepatic vein against time. (7mks)



(b) Account for the difference in blood sugar level in hepatic portal vein and hepatic vein.

(i) Between 0-1 hours. (4mks)

(ii) Between 2-4 hours (5mks)

(c) (i) Give one reason that delayed increase in amino acids concentration in hepatic portal vein. (1mk)

(ii) Account for the difference in concentrations of amino acids in hepatic portal vein and hepatic vein between 3^{rd} -6^{th} hours (2mks)

(d) Name the enzyme that completes fat digestion in man (1mk)

QUESTION NO. 60

60. An experiment was carried out to investigate the nutritional value of two dry powder animals feeds X and Y over a period of six months. Twenty 5 month's old castrated goats were use. The goats were divided into two equal groups A and B. The animal's in group A were fed on feed X throughout the experiment while those of group B were fed 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 weighed and the average dry faecal output per month was also recorded. The results are as shown below.

	GROUP	A		GROUP	B	
Months since commencement of the experiment	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	19.5	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	35.5	16.6

a)

i) What is the relationship between the amount of feed and the faecal output (2 marks)

ii) Work out the average increase in weight for the animal's in group A during:

The first four months

The last two months (4 marks)

iii) Account for the average increase weight in goats in group A during:

The first four months

The last two months (4 marks)

iv) Which of the two feeds is more nutritious?

Give reason for your answer (2 marks)

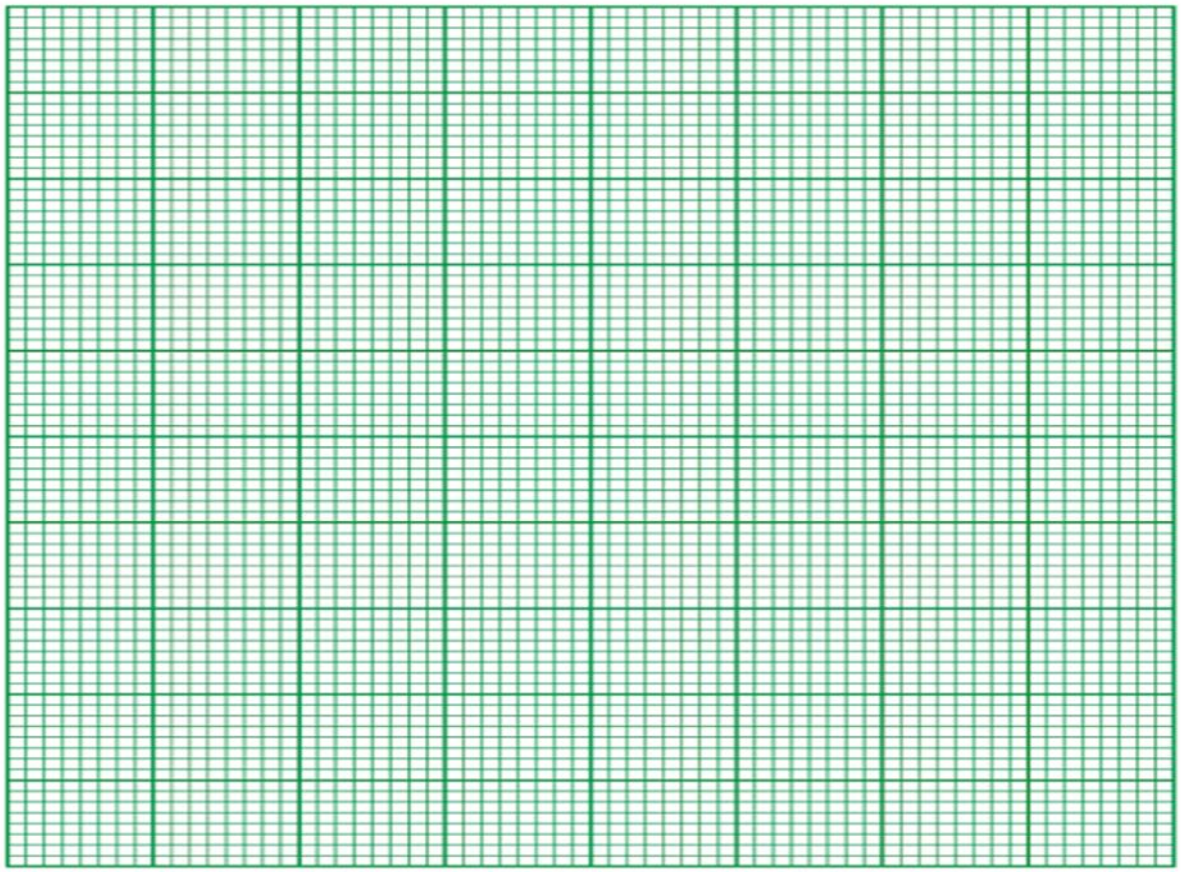
b) Explain the digestion of lipids in humans (8 marks)

QUESTION NO. 61

61. Two sets of a pea seeds were germinated, set A was placed in normal daylight conditions in the laboratory while set B was placed in a dark cupboard. Starting a few days later the shoots lengths were measured twice daily and their mean lengths recorded as shown in the table below.

Time in hours	0	12	24	36	48	60	72	84
Set A length (mm)	12	14	20	23	28	31	47	54
Set B length (mm)	17	23	28	35	48	62	80	94

(a) Using suitable scale draw the graphs of the mean lengths in set A and B against time.



(b) From the graph state the mean shoot length of each set of seedling at the 66th hour (2mks)

(c) Account for the difference of curve B and A (3 mks)

(d) Explain what would happen to set up B if it were allowed to continue to grow under conditions of darkness (4mks)

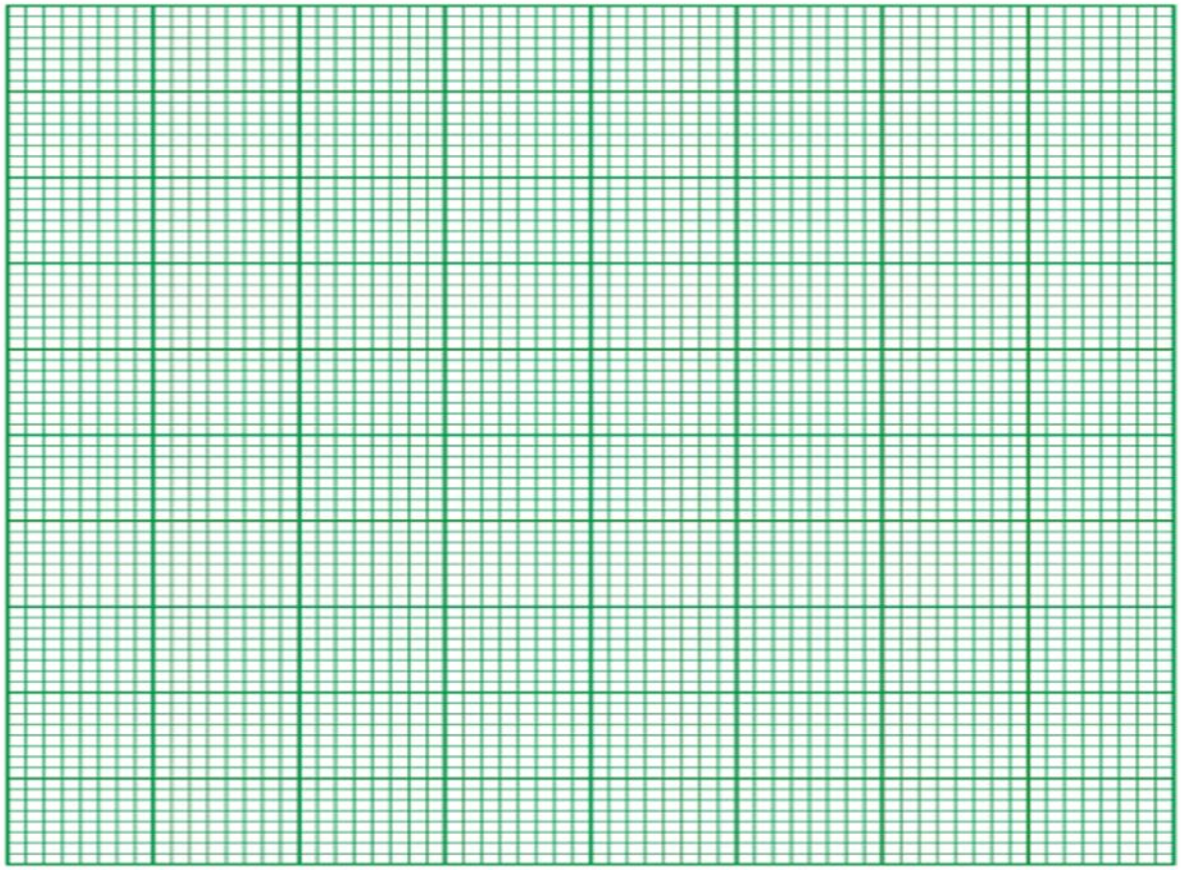
(e) State three external conditions which should be constant for both set ups (3mks)

QUESTION NO. 62

62. The mean dry weight (mg) of germinating wheat grains was worked out for a whole grain(total dry weight),endosperm and embryo.The means were determined at two days interval for fourteen days. The results are as tabulated below.

Time(days)	Dry weight(mg)		
	Endosperm	Embryo	Total
0	47	5	52
2	44	5	49
4	39	8	47
6	22	17	39
8	10	28	38
10	4	35	39
12	2	42	44
14	2	44	46

(a) Using the same axis, draw graphs for dry weight of endosperm, embryo and total against time (8mks)



(b) What was the average dry weight of embryo on day II? (1mk

(c) Account for the shape of the curve for

(i) Embryo from day 2 to day 12 (2mks)

(ii) Total dry weight (gm) from day 0 to day 14 (2mks)

(d) After how long was the dry weight of

(i) Endosperm 30g? (1mk)

(ii) Embryo 35g ? (1mk)

(e) (i) Explain the role of water in seed germination (3mks)

(ii)Other than water, what two environmental factors are required for seed germination? (2mks)

QUESTION NO. 63

63. An investigation was conducted to compare water rate of water loss from twigs of two different species of plants Q and L. the twigs had equal leaf surfaces. The results of the investigation were recorded in the below.

Time of the day	6 a.m	8 a.m	10 a.m	1 p.m	12 p.m	1 p.m	2 p.m	3 p.m	6 p.m	8 p.m	12 a.m
Water loss gh^{-h}	0	4	20	40	55	36	26	20	2	0	0
Water loss gh^{-h} Species L	8	20	39	131	198	182	130	81	45	12	12

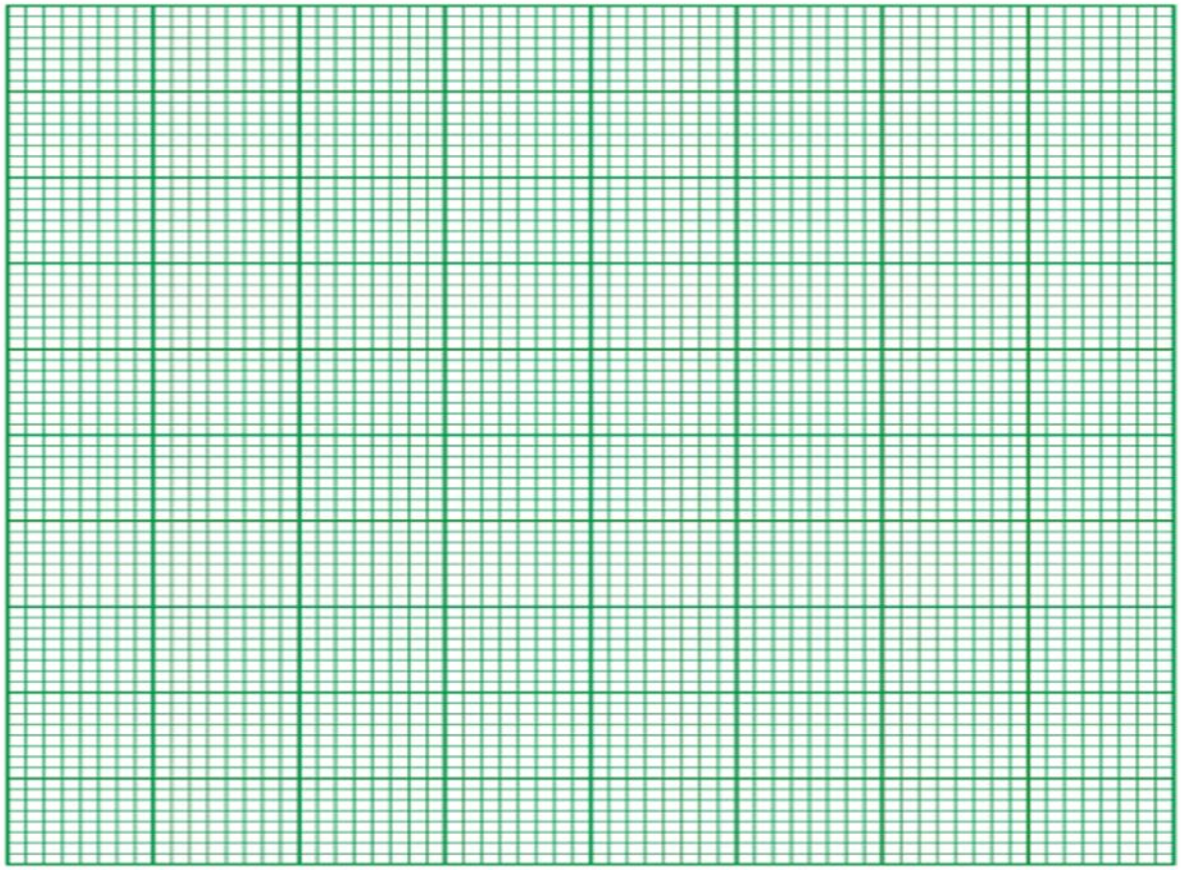
(a) On the graph paper provided on page 7, plot a graph of Water loss gh^{-h} against time for the two plants. (7 marks)

GRAPH

(b) Name the apparatus which might have been used to investigate the rate of water loss. (1 mark)

(c) State two precautions that were taken in setting up the experiment. (2 marks)

(d) Which of the plant species is likely to be adapted to arid conditions? Give a reason. (2 marks)



(e) Use the graph to answer the following questions:

(i) At what time of the day was $60gh^{-1}$ of water lost by plant species L?

(ii) What was the rate of water loss from plant species Q at 11.00 am? (1 mark)

(f) Account for the rate of water loss between 6.00 a.m. to 1.00 p.m. by plant species L. (4 marks)

(g) Suggest how the stomata of species Q are structurally adapted to water loss. (2 marks)

QUESTION NO. 64

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

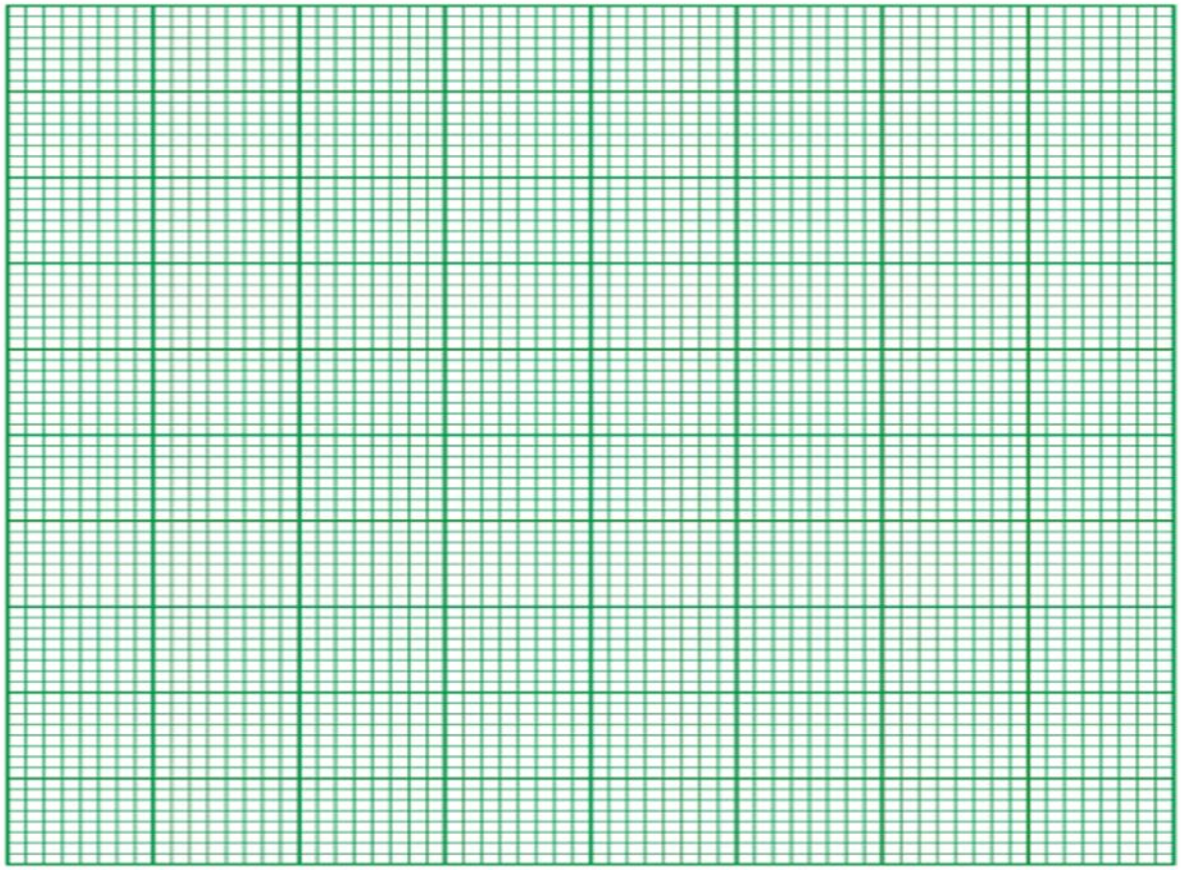
External temperature °C	Urine cm^3/hr	Sweat cm^3/hr
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

(a) On the same graph, plot the quantities of urine and sweat produced against the external temperature. (7mks)

GRAPH

(b) At what temperature are the amounts of sweat and urine produced equal? (1mk)

(c) What happens to the amount of sweat produced as the temperature rises? Explain the observation. (3mks)



(d) Explain the observation made on the amount of urine produced as the temperature increases. (3mks)

(e) How is the skin adapted for temperature regulation? (6mks)

QUESTION NO. 65

65. The data below shows results obtained from a plant species which was planted around a homestead to serve as a hedge. The hedge was divided into part I, II and III. The three parts were treated as indicated in the table and the results collected after 3 years

Part	Treatment	**Percentage cover in the 1st 2 metres from the ground**	**Average width in metres**	**Average height in metres**
I	Untrimmed throughout	3%	0.5	5.0
II	Trimmed twice annually	55%	0.9	3.5
III	Trimmed throughout	85%	1.5	2.5

a) Give three deductions one would draw from the above results 3mks

b) Explain the effects of the following on percentage cover; width of hedge and height of plants

(i) Lack of hedge trimming (3mks)

(ii) Frequent hedge trimming (4mks)

c) Using a germinating bean seedling with a 2cm long radical; describe how you would investigate the region of growth on the radical (5mks)

d) Name the kind of growth curve obtained

(i) for arthropods when changes in length of body plotted against time (1mk)

ii) Give reason as to why this kind of curve is obtained for arthropods (2mks)

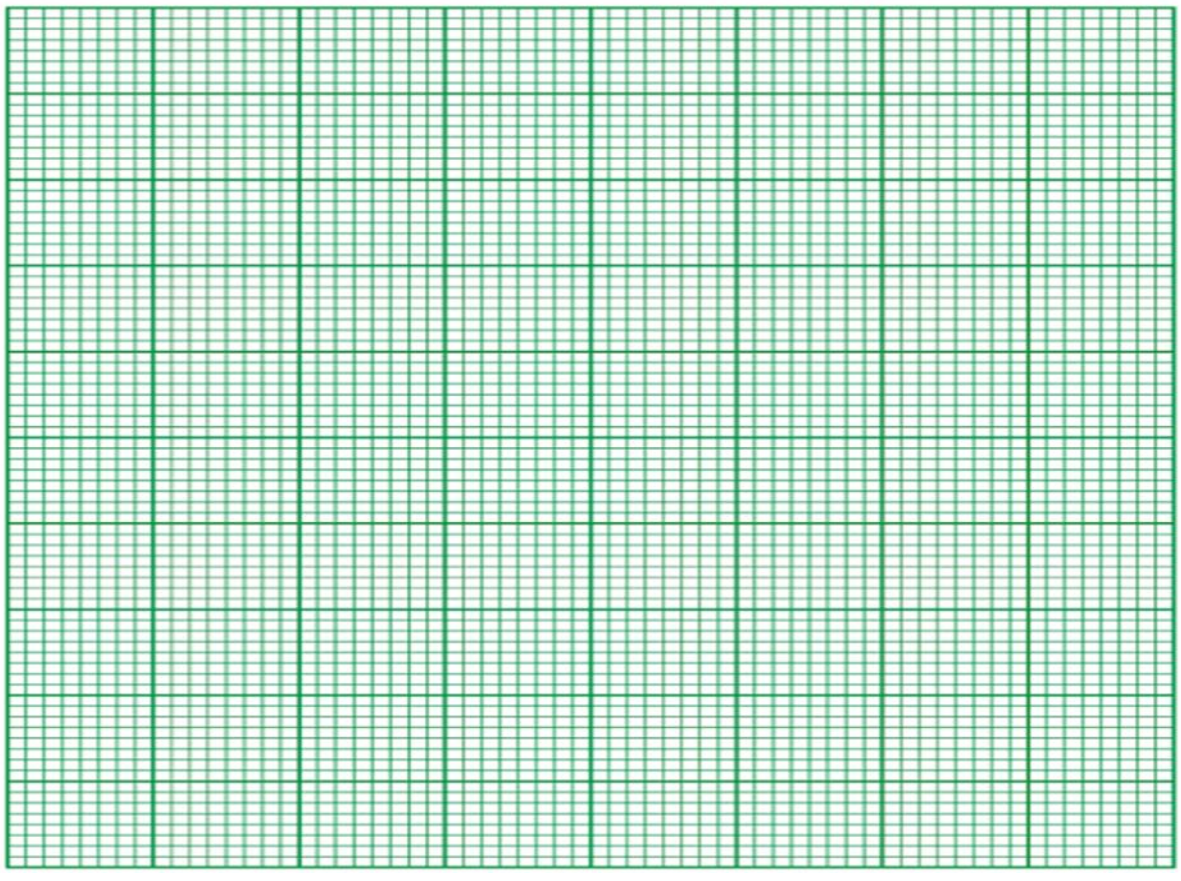
iii) Name the hormone that inhibits metamorphosis in insects and where it is produced

QUESTION NO. 66

66. A group of students estimated the population of the grasshoppers in the school compound. The table below shows the number of grasshoppers collected from the eight sites within the compound.

Site	1	2	3	4	5	6	7	8
No. of grasshoppers	250	50	190	220	85	300	175	30

a) Draw histograms to represent the number of grasshoppers collected from each site. (6mks)



b) The students caught 240 grasshoppers marked them and then released them. After five days they caught 160 grasshoppers and found that 40 were marked. Work out the grasshoppers population. (3mks)

c) Identify the method used in (b) above. (1mk)

d) Name the instrument the students used to collect and mark the grasshoppers. (2mks)

e) The students encountered a number of limitations. State any three of the limitations. (3mks)

f) The students observed the organisms and placed them into their correct phylum and class. (2mks)

i) Name; Phylum

Class

ii) What features were observed for the grasshoppers to be placed in their correct; (3mks)

Phylum

Class

QUESTION NO. 67

67. The glucose level in mg/100cm^3 of blood was determined in two persons Y and Z. Both had stayed for 6 hours without taking food. They were on equal amount of glucose at the start of the experiment. The amount of glucose in their blood was determined at intervals. The results are as shown in the table below:

Time (Mins)	Glucose level in Y	Blood in mg/100cm^3
0	85	78
20	105	110
30	116	130
45	130	170
60	100	195
80	93	190
100	90	140
120	90	130
140	88	120

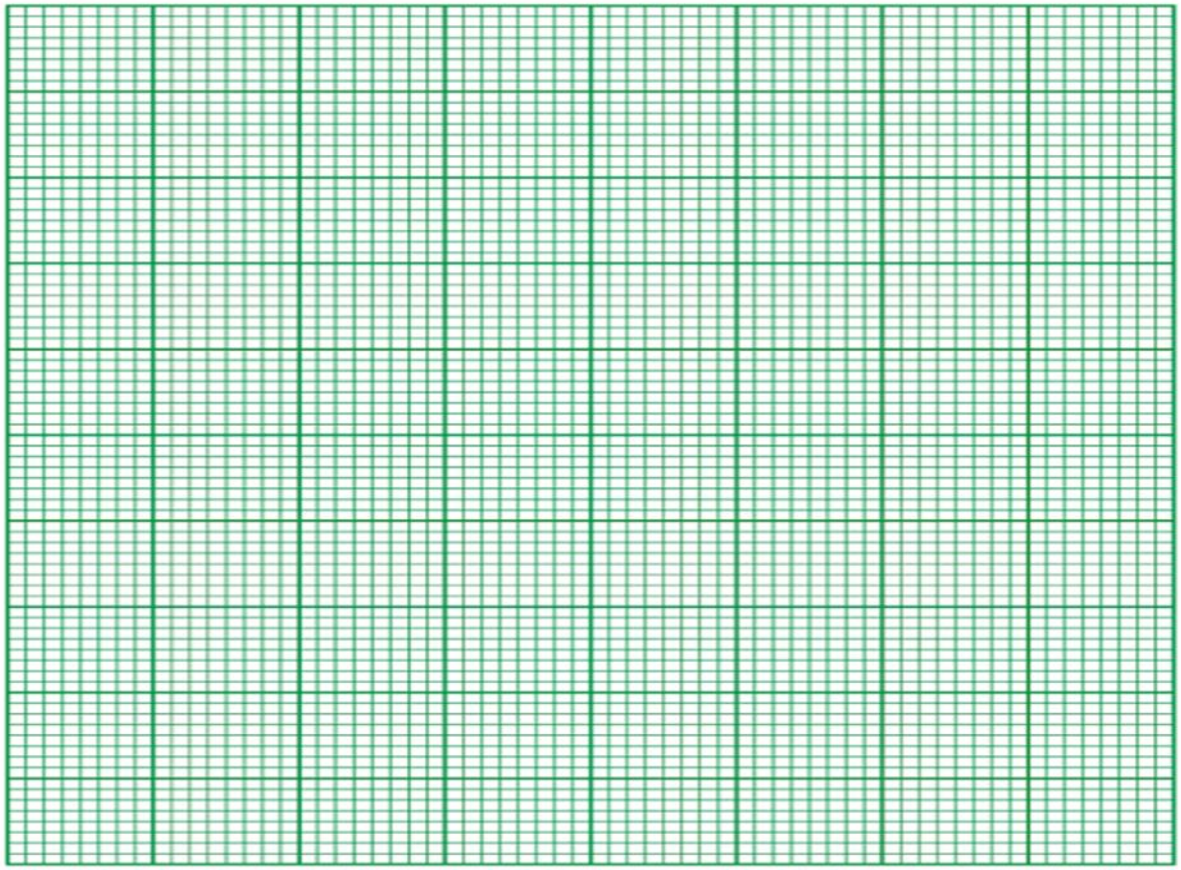
(a) On the same graph and on the same axis, plot a graph of glucose level in blood against time (7mks)

GRAPH

(b) What was the concentration of glucose in blood of person Y and Z at 50th minute? (2mks)

Person **Y**

Person **Z**



(c) Account for the level of glucose for a person Y

(i) During the first 45 minutes (2mks)

(ii) After 45th minute to the end (4mks)

(d) Discuss the effect of higher glucose level in blood above 90mg/100cm3 (3mks)

(e) State **two** advantages of homoitherms over paikilotherms (2mks)

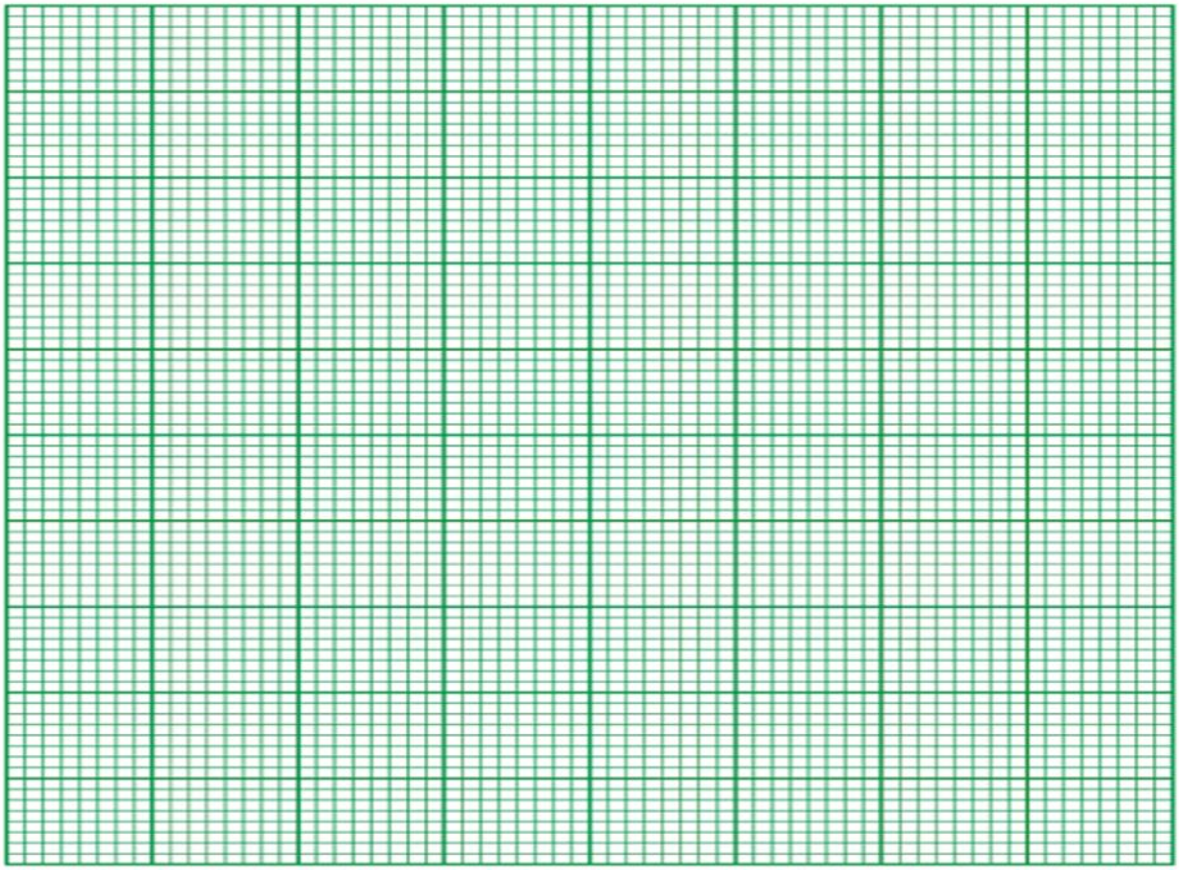
QUESTION NO. 68

68. A person had gone for 24 hours without food. Then he was served with a well balanced meal after which the concentration of glucose and amino acids in the blood were determined every one hour for the next 8 hours after the meal, the concentration were measured as blood passed through the hepatic portal vein and hepatic vein.

The results were as shown in the data below.

Time in hours	Concentration of	Glucose & amino	Acids in blood	(Mg/100 cm^3 of blood)
	HEPATIC PORTAL VEIN		HEPAT IC VEIN	
	GLUCOSE	AMINO ACIDS	GLUCOSE	AMINO ACIDS
0	79	1.0	85	1.0
1	79	1.0	85	1.0
2	160	1.0	110	1.0
3	140	4.0	100	3.0
4	120	6.0	90	3.0
5	100	5.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0
8	90	1.0	90	1.0

(a) On the same axis plot graphs of glucose concentration in hepatic portal vein and hepatic vein against time. (7mks)



(b) Account for the difference in blood sugar level in hepatic portal vein and hepatic vein.

(i) Between 0-1 hours. (4mks)

(ii) Between 2-4 hours (5mks)

(c) (i) Give one reason that delayed increase in amino acids concentration in hepatic portal vein. (1mk)

(ii) Account for the difference in concentrations of amino acids in hepatic portal vein and hepatic vein between 3^{rd} -6^{th} hours (2mks)

(d) Name the enzyme that completes fat digestion in man (1mk)

QUESTION NO. 69

69. In an experiment to determine the effect of ringing on the concentration of sugar in the phloem, a ring of bark from the stem of a tree was cut and removed. The amount of sugar in grammes per $16cm^3$ piece of bark above the ring was measured over a 24 – hour period. Sugar was also measured in the bark of a similar stem of tree of same species which was not ringed. The results are shown in the table below.

Time of the day	Amount of sugar in grammes per 16 cm^3 piece of bark	
	Normal stem	Ringed stem
6.45 A.M	0.78	0.78
9.45 A.M	0.80	0.91
12.45 P.M	1.81	1.01
3.45 P.M	1.80	1.04
6.45 P.M	1.77	1.00
9.45 P.M	0.73	0.95
12.45 A.M	0.65	0.88

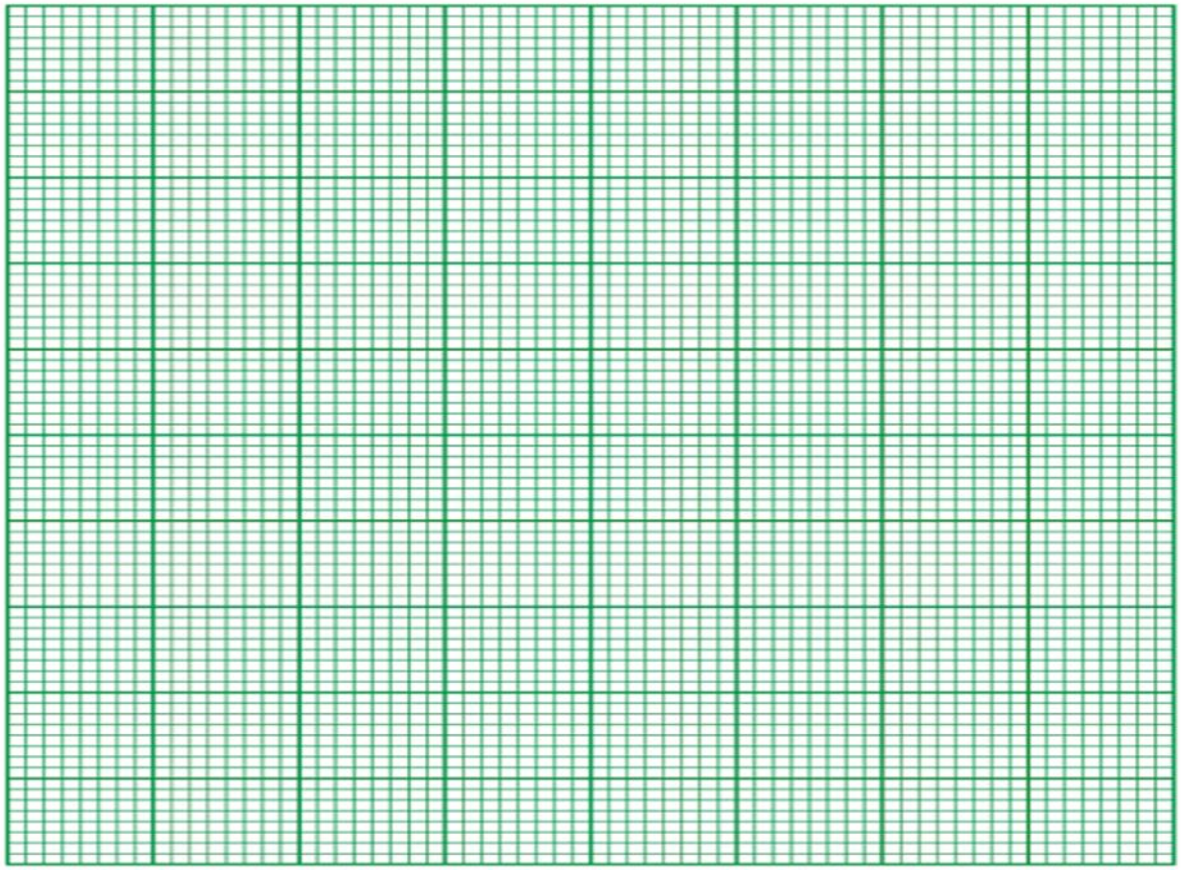
a) Using the same axis, plot graphs of the amount of sugar against time for both stems (6 marks)**GRAPH**

b) At what time was the amount of sugar highest in the.

i) Ringed stem. (1mark)

ii)Normal stem. (1 mark)

c)How much sugar would be in the ringed stem if it was measured at 3: 45 am. (1mark)



d) Give a reason why there was sugar in the stem of both trees at 6:45am.

(2marks)

e) Account for the shape of the graph for the tree with the ringed stem between: (3 marks)

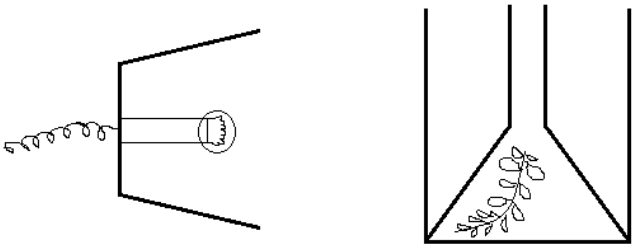
i) 6:45 and 3:45 am.

ii) 3:45 pm and 12:45 am. (2 marks)

f) Name the structures in the phloem that are involved in the translocation of sugars. (2 marks)

QUESTION NO. 70

1. The diagram below shows an experiment that was carried out to measure rate of photosynthesis in a water plant when exposed to different light intensities.



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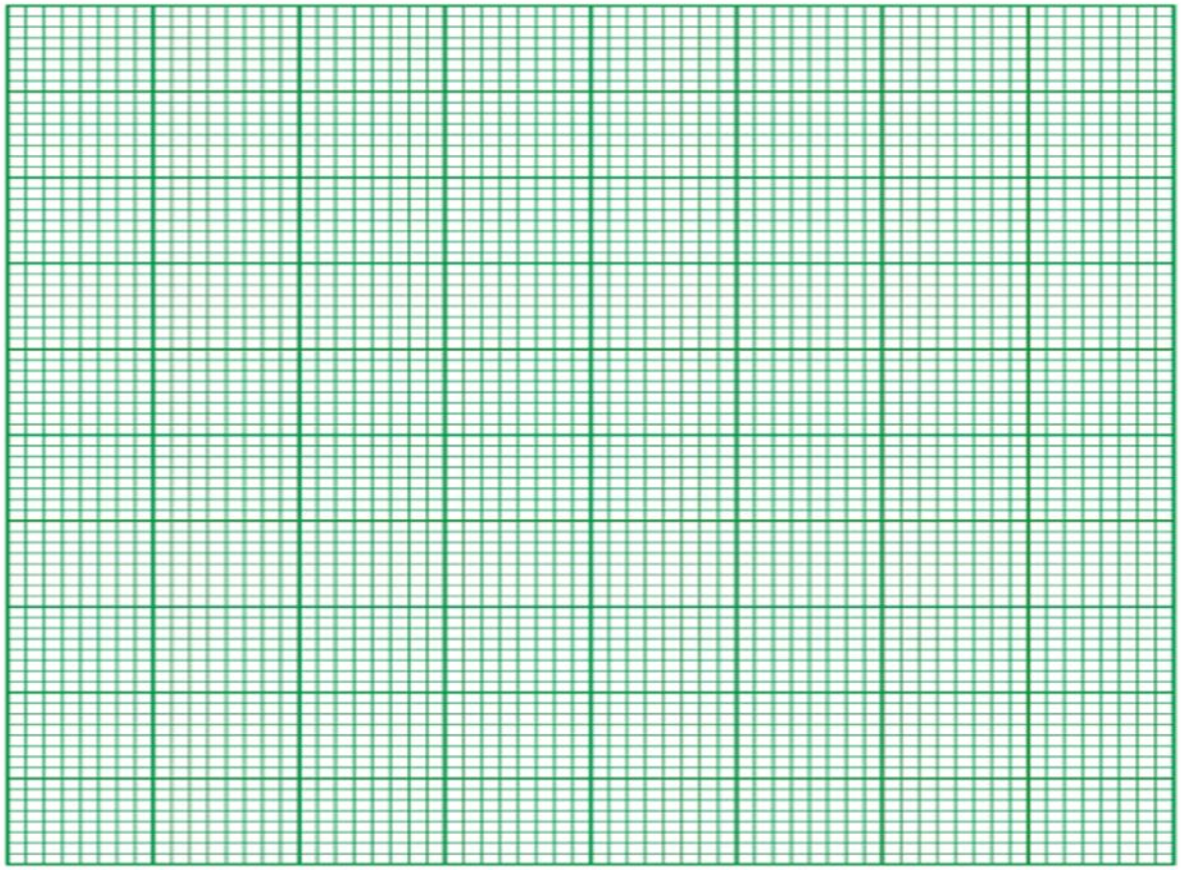
The shoot was exposed to different light intensities and the rate of photosynthesis estimated by counting the
number of bubbles of the gas leaving the shoot per minute. The results are tabulated below.

Number of bubble per minute	7	14	20	24	26	27	27	27
Light intensity (arbitrary units)	1	2	3	4	5	6	7	8

a) Draw the graph of the number of bubbles produced per minute against light intensity. (6 marks)

GRAPH



b) At what light intensity did the shoot produce

i) 18 bubbles per minute (1mark)

ii) 25 bubbles per minute (1mark)

c) Give two better ways of measuring the rate of photosynthesis other than counting bubbles produced per minute. (2 marks)

d) What is role of light intensity in photosynthesis (2marks)

e) Account for the expected results if the experiment was done at the following temperatures.

(i) 4^0c (2 marks)

(ii) 34^0 (2marks)

(iii) 60^0 (2marks)

f) Apart from light intensity and temperature, name other <u>two</u> factors that affect the rate of photosynthesis. (2marks)