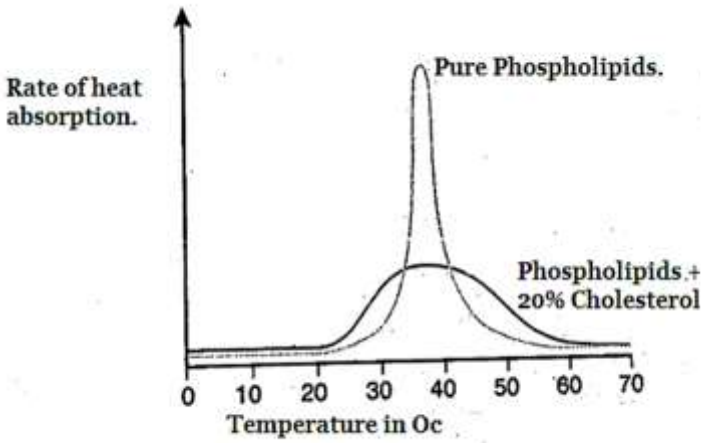
Comprehensive Biology Transformation Initiative, A' level Biology Seminar-2023.

1.0. The graph below shows the effect of temperature on the rate of heat absorption of pure phospholipid bilayer and one with 20% cholesterol added. Study it carefully and answer questions that follow.



a (i) Compare the rate of heat absorption by the pure phospholipids and one with 20% cholesterol.
(ii) Explain the rate of heat absorption by the pure phospholipids.
iii) Explain the reasons why heat absorption of the pure phospholipids differs from that of the 20% cholesterol.
b) Explain how phospholipid behaving like a liquid affects permeability of the plasma membrane.
c) Explain the importance of fluidity of the plasma membrane.

(KASHAKA GIRLS' SCHOOL)

2.0. Actively secreting cells growing in tissue culture were provided with a dose of radioactive amino acids for a very short period. At various times, samples of the cells were taken and homogenized and fractionated so that different parts of the cell could be measured for their radioactivity. The following table shows the results of the experiment.

	Radioactivity present in the following cell organelle		
Time for the radioactive amino-acid given in minutes	Rough endoplasmic reticulum	Golgi apparatus	Secretory vesicles
1	123	21	7
20	84	42	7
40	39	84	7
60	28	77	7
90	27	49	28
120	24	38	56
180	28	21	63
240	18	11	20

a) Using the data provided, draw a suitable graphical representation.
b) Describe the changes in the following organelles.
(i) Golgi apparatus
(ii) Secretory vesicles
(iii) Rough endoplasmic reticulum
c) Give a detailed account for the relationship among the three organelles.
d) Explain how the carbohydrates that make up the cell membrane function as informational molecules to the cell. (KYEIZOOBA)

3.0.a) Describe how the following non-specific immune defensive mechanisms combat pathogens in our bodies.

(i) Mechanical defence.
(ii) Biological defence.
(iii) Chemical defence.

b) Explain the significance of inflammation as a second line of defence in our bodies.

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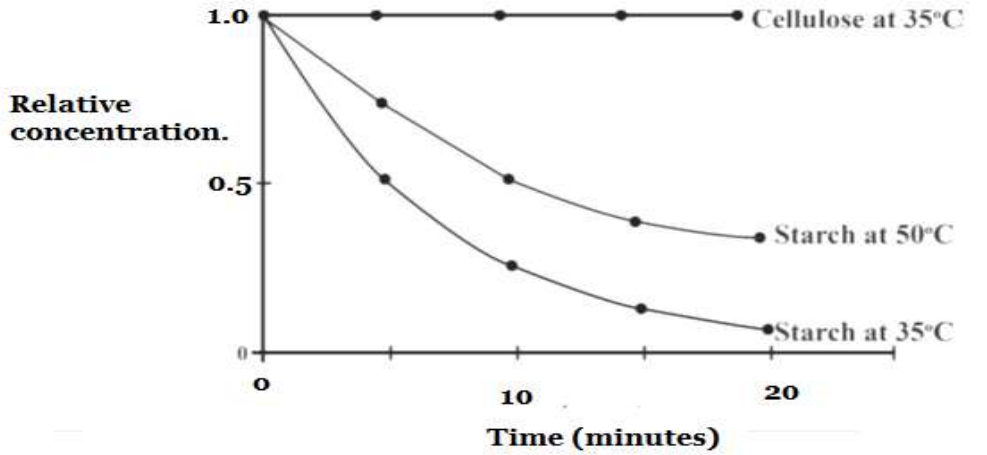
(MARY-CHAAPA)

4.0. In an experiment to investigate the reaction of Starch and cellulose. Starch and Cellulose were crushed in warm water and filtered to obtain the filtrate. Enzyme Amylase was added to separate filtrates of starch and cellulose. The concentration of starch was monitored at 35^0c and 50^0c while that of cellulose was monitored only at 35^0c. The results of the experiment are shown below. Study the graph carefully to answer questions below.



a) Compare the relative Concentrations of cellulose and Starch at 35^0c.

b) Describe the effect of Amylase enzyme on the relative concentrations of the following.

(i) Cellulose.

(ii) Starch.

c) Explain the effect of Amylase on the relative concentration of

(i) Starch at 50^0c

(ii) Cellulose at 35^0c

(iii) Starch at 35^0c

d)(i) Calculate the average rate of breakdown of starch by amylase for the first 1o minutes at both temperatures.

(ii) Suggest why cellulose and starch were crushed into a filtrate.

e) Explain the adaptations of the following to their roles.

(i) Starch

(ii) Cellulose. (KYEBAMBE GIRLS)

5.0 a)(i)Why are homeostatic mechanisms often described as detection-correction systems?

(ii) Explain how the Positive feedback mechanism in response to cold ambient temperatures occurs in elderly people.

b) Describe how the metabolic pathways show homeostasis at molecular level in a cell.

(KITAGATA SS)

6.(a) Describe mechanism of enzyme action using lock and key hypothesis.

(b) How are enzymes activities regulated in the cells?

7. (a) How is secretion of thyroxin regulated in human?

(b) Explain the effects of hormonal imbalances in human.

(c) Give the differences between hormonal and nervous coordination. (JOVOC)

8. (a) Describe problems associated with animal survival in terrestrial environments.

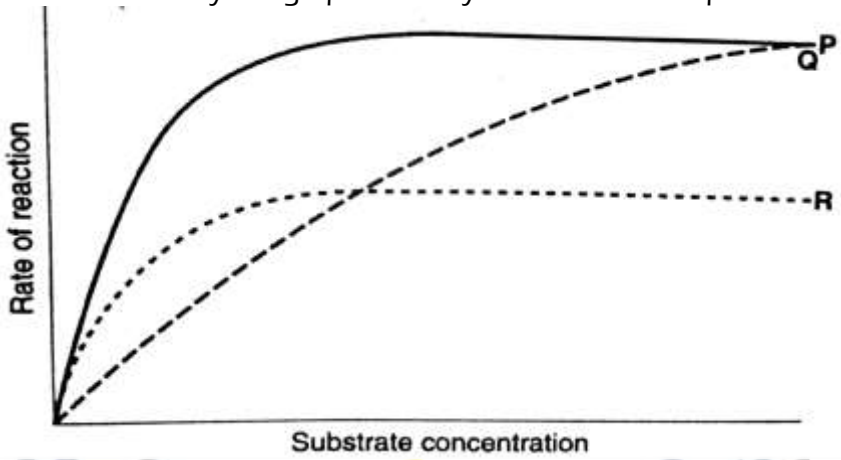
b) For each problem, explain its evolutionary solutions. (RUTOOMA SS)

9a) what is Pulmonary ventilation?

b(i) Describe factors that increase pulmonary ventilation during an exercise

(ii) Suggest why mountaineers have to ascend slowly.

10.0.The figure below shows the effects of non-competitive (R) and competitive inhibitor (Q) on the rate of enzyme activity. Also included is the rate without the inhibitor (P). The other variables were maintained constant. Study the graph carefully and answer the questions very well.

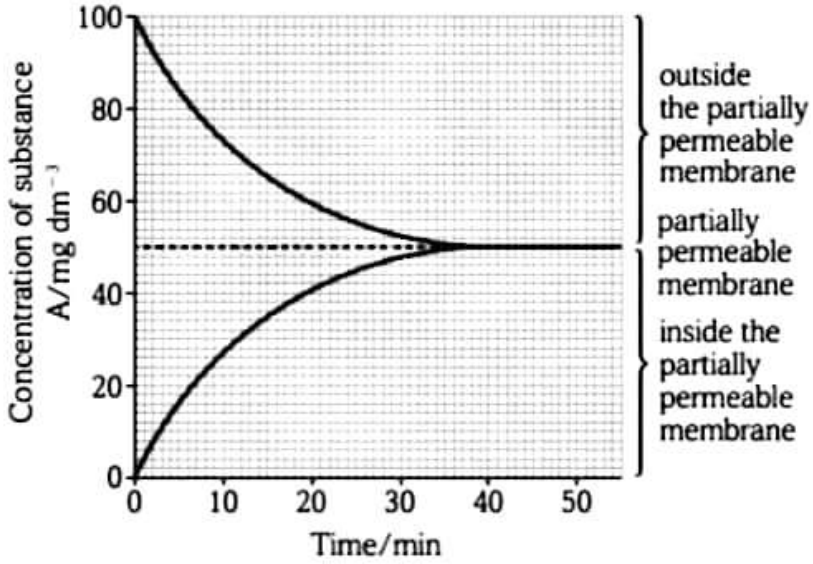


a(i)Compare the rate of reaction with competitive and non-competitive.

(ii) Explain the trend of the rate of reaction under the following

a) Competitive inhibitor.
b) Non-competitive inhibitor.
c) Explain why the reaction was determined when there were no inhibitors.
d) State the significance of the inhibitors. (TOURISTS CITY SCHOOLS)

11.0. The graph below shows the changes in concentration of substance A on the inside and outside of a partially permeable membrane, during a 50 minute period.



a) Describe the relationship between the concentration of substance A inside and outside the cell membrane.
b) Explain the relationship between concentration of A inside and outside the membrane.
c) Name the process being investigated and evidence.
d) The plasma membranes consist of a phospholipid bilayer in which proteins are interspersed. The table shows the percentage masses of proteins, lipids and carbohydrates in four different

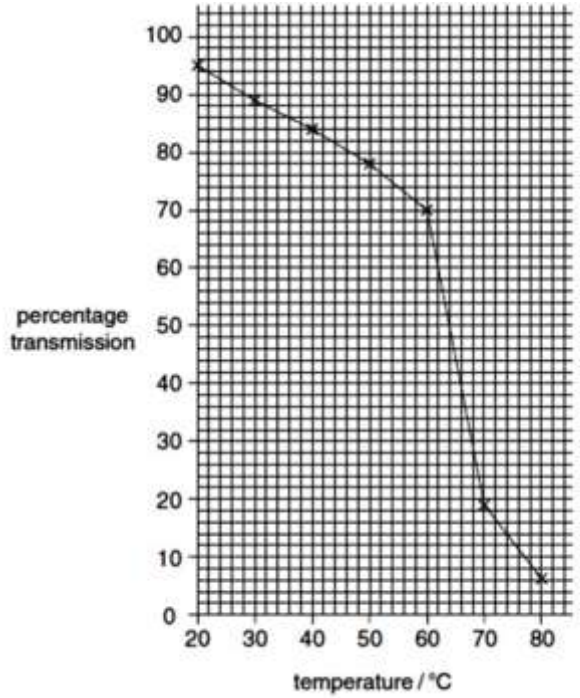
membranes.

Membrane	Percentage mass		
	Protein	Lipid	Carbohydrate
A	18	79	3
B	51	49	0
C	52	44	4
D	76	24	0

(i) Calculate the mean ratio of proteins to lipids in the four membranes.
(ii) Describe the function of the following chemicals in the plasmalemma.
a) Carbohydrates
b) Lipids
c) Proteins
(iii) Suggest why plasma membrane D has much higher protein content than A.

(ST. JUDE SS MASAKA)

12.0. Student investigated the effect of temperature on the beetroot tissue. Beetroot contain a dark red pigment Betalain which is stored in their vacuoles. The student • Cut beetroot tissue into cubes of the same size • Washed the cubes thoroughly in distilled water •Placed the same number of cubes in distilled water at seven different temperatures. After 30 minutes, the samples of water were removed and placed in calorimeter to measure transmission of light. The results are shown in the figure 4.0A below.



a(i) Using Fig 4.0A, describe the shape of the curve.

b) Account for the shape of the curve.
C(i) With reasons, suggest the Critical temperature .

d(i) Suggest
(i) why the beetroot cubes were washed in running distilled water.
(ii) Suggest why the samples where all put into the calorimeter for readings after 30 minutes of the experiment.

13.(a)Describe the a process by which light is converted into energy molecules in plants.
(b). How are the energy molecules used in formation of starch in C3 plants?
(c). Explain the physiological advantages of C4 plants in photosynthesis. **(WELDEN)**

14.a)Describe the properties of the Cell Membrane.
b (i) Explain the advantages of the mothers' Milk being made up of lactose instead of glucose.
(ii) Describe how the tertiary structure of enzymes is formed. **(ST. JUDE SS. MASAKA)**

15. In Uganda, water hyacinths, **Echhornia crassipes** has become a serious pest. An investigation was carried out to find out if the beetle could be used to control water hyacinths. Water hyacinths were grown individually in pots in a **glass house**. Two pairs of beetles, **Neochetina Eichhormiae** were added to each potted plant. The graph in figure **3.5** shows the leaf area of plants in these pots and in the control pots, at monthly intervals. In 1974 some of the beetles were released in an area infested with water hyacinths. The graph in figure 3.4 shows changes in the area covered by water hyacinth following the introduction of the beetle.

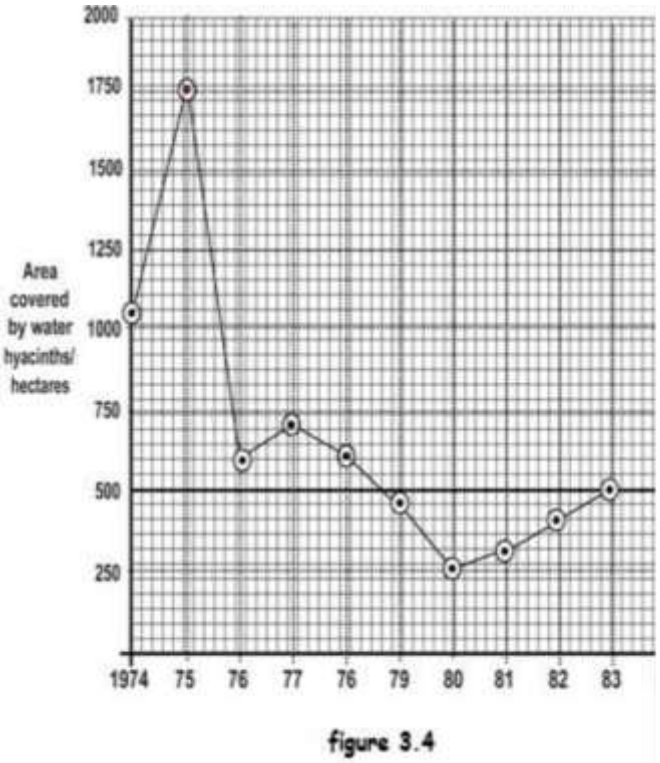


figure 3.4

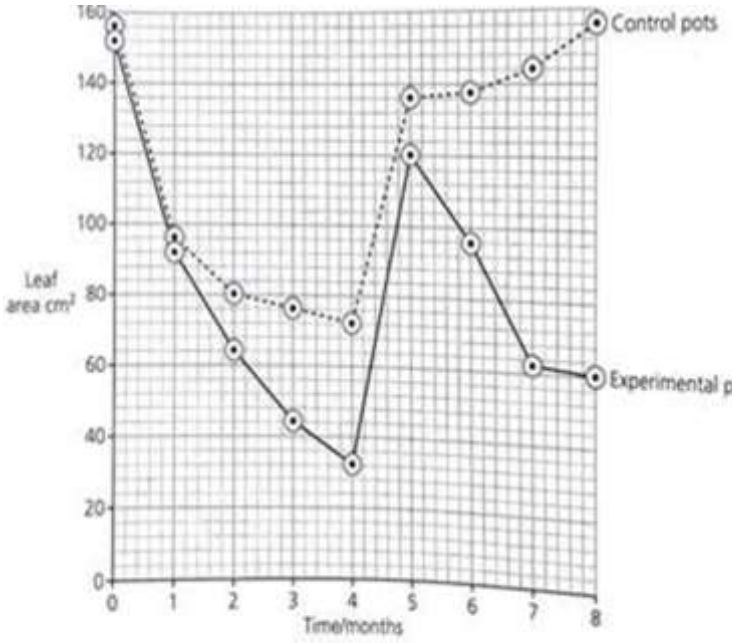


figure 3.5

a) From figure 3.5 compare the changes in the leaf area of the control and experimental pots.
(b) From figure 3.4 and 3.5, describe the changes in the area of water covered by water hyacinth
(i) Figure 3.4
(ii) Figure 3.5 experimental pots
(c) From the information provided, suggest explanations for the change in the area covered in the following
(I) Figure 3.4
(II) Experimental pots
(d) What are the ecological effects of the water hyacinth on Lake Victoria?
(e) What are the advantages of employing biological control as a means of checking the population of the water hyacinth?
(f) Suggest if the results obtained in figure 3.5 confirms beetle as an efficient control of water hyacinths. **(KINONI HIGH SCHOOL- ACTIVISTS)**

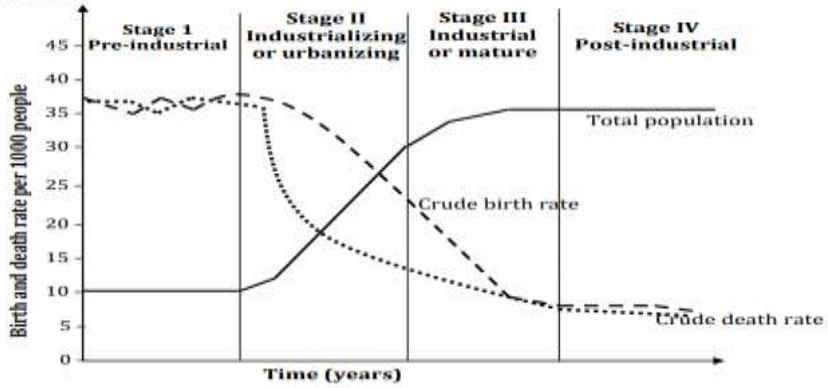
16(a) Explain how population of a species is regulated by negative feedback in an ecosystem.
(b) Describe flow of energy in terrestrial ecosystem.
(c) Explain how plants are adapted to survive in aquatic habitat.
(KITAGATA SS)

17.(a) How do plants overcome the challenges of lack of locomotion?
(b) Describe how support is achieved in different plants.

(ST. MARY'S KYAMUHUNGA)

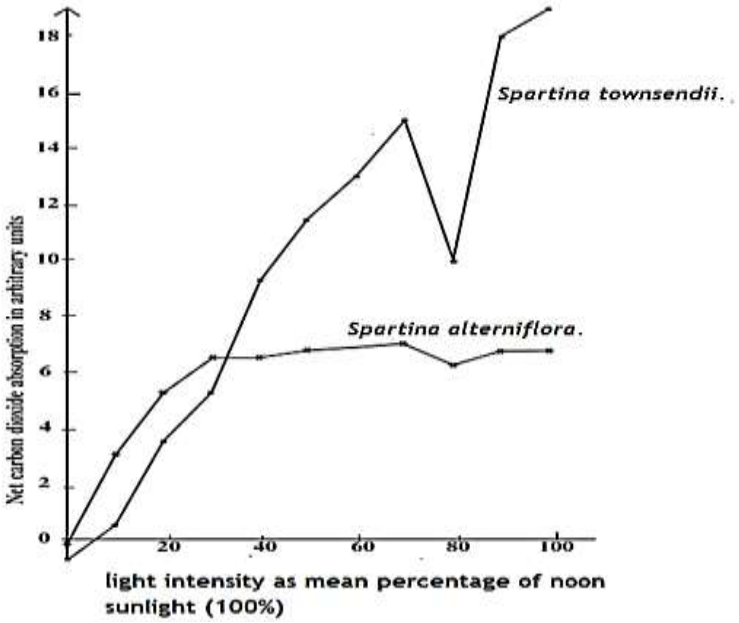
18.0.Figure 8. shows graph of demographic transition model of high birth and death rates and the total population with time in different stages (I – IV) of industrialization. Use the figure below to answer questions that follow.

Figure 8.



a) Compare the changes in birth rates and death rates in each stage of industrialization.
b) Explain the trends in the following in each stage of industrialization.
(i) Birth rates. (ii) Death rates. (iii) Total population.
c) Describe the effect of industrialization on survival of different organisms.
d) Suggest measures to overcome the likely dangers of industrialization to nature.

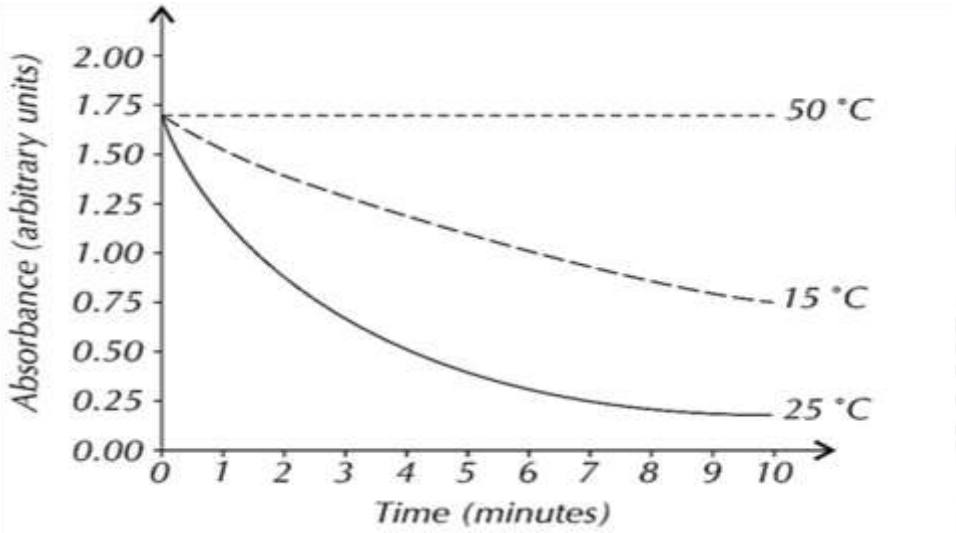
19.0. A study was conducted on two species of Cord-grasses growing in different habitats on Mudflats, *Spartina alterniflora* and *Spartina townsendii*. The net carbondioxide absorption of each species was determined with varying light intensity with other factors kept unaltered. The results are plotted in the figure below.



a) Compare the effect of light intensity on the net carbon dioxide absorption in the two species of Cord-grasses.
b) Explain the differences in the effect of light intensity on the rate of carbon dioxide uptake.

C)(i) Suggest what would happen if the two species were grown in the same habitat.
(ii) Determine the compensation point for each species.
d) Outline the adaptations of Cord grasses to mudflats. (CHAAPA. THE BULLS)

20.0. DCPIP is an artificial hydrogen acceptor that can be used to measure the rate of photosynthesis. When DCPIP is reduced it turns from blue to colourless. A scientist used DCPIP to investigate the rate of photosynthesis in plant chloroplasts at three different temperatures. DCPIP was incubated with liquid extracts of chloroplasts for 10 minutes. Every minute, the absorbance of the solution was measured. All conditions except the temperature were kept the same. The results are shown in Figure 1



(i) Compare the absorbance of solutions incubated at 15^0c and 25^0c.
(ii) Describe the change in the absorbance with time for each solution
a) At 50^0c
b) At 15^0c
(iii) (ii) Explain the rate of change in the absorbance with time for each test tube in b(i)
(iv) Suggest (i) what would happen to absorbance in each of the solution if the experiment was continued for more 15 minutes.
a) at 50^0c
b) at 15^0c
c) at 25^0c
(v) How absorbance of the solution was measured?
(vi) Why measuring the change in absorbance of solutions overtime is a suitable way of measuring the rate of photosynthesis?
(vii) Calculate the rate of photosynthesis of the solution incubated at 250c for the first 3minutes of the experiment. (PLUS TWO SCHOOL)

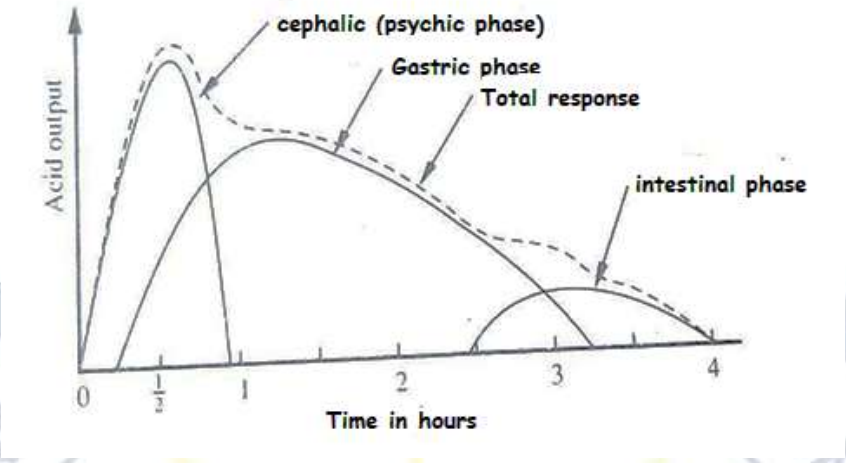
21. In Uganda, Lake Nabugabo separated from Lake Victoria thousands of years ago. There are five species of cichlid fish of the genus Haplochromis in Lake Nabugabo, each descended from a different species in the main lake, Lake Victoria.

(a) Suggest how analysis of DNA or proteins might be used to supply additional evidence that the Lake Nabugabo fish have descended from ancestors in Lake Victoria.

(b) Explain how the splitting of the fish population into Lake Nabugabo and Lake Victoria populations has led to the formation of the separate species.

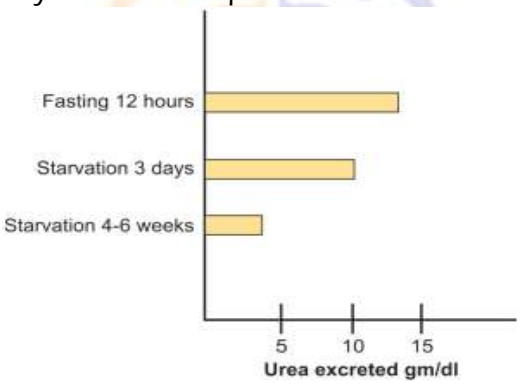
(NYAMITANGA SS)

22.0.The Figure below shows the phases of gastric secretion related to acid output in a human during digestion. Study the graph below and answer questions that follow.



(i) Account for the changes in the acid out-put of the three phases with time.
(ii) Describe the role of nervous and hormonal in control of digestion of food.

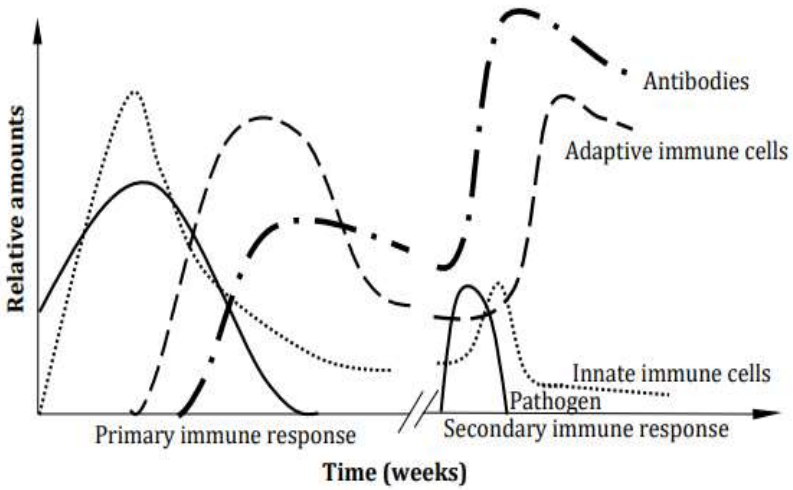
23.0. The figure below shows changes in the amount of urea excreted with the number of days of starvation. Study it carefully and answer questions that follow.



(i) Comment on the changes in the amount of urea excreted with increasing period of starvation.
(ii) Suggest explanations for the above changes in urea excreted with increasing days of starvation.

24.0. A Pathologist injected pathogens of COVID-19 virus in to an individual and the victim was immediately treated and vaccinated with a COVID-19 vaccine and the person recovered. After recovery, the same pathogens were after sometime, injected in to the same individual. The relative amounts of the pathogens, innate immune cells, adaptive immune cells and antibodies in the body of an individual were analyzed after treatment and vaccination and after the second infection phase. The information obtained was presented on the graph in Figure 1. below. Use the graph to answer questions that follow.

Figure 1:



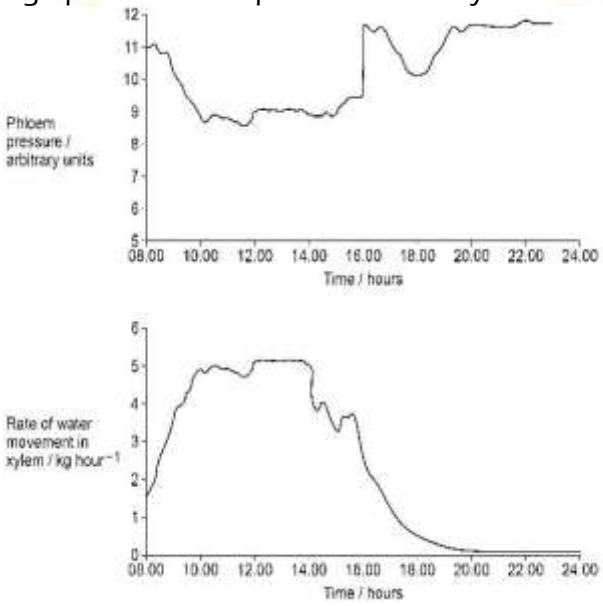
a) Explain the following trends during the primary immune response from the graph. (i) Relative amount of pathogens.
(ii) Relative amount in innate immune cells.
(iii) Delay in the production of antibodies.

b) Compare the relative amounts of the following between primary immune response and the secondary immune response
(i) Pathogens (ii) Antibodies (iii) Innate immune cells

c) Explain differences in the relative amounts of the following between primary response and secondary immune responses. (i) Antibodies (ii) Innate immune cells

d) Describe how T-cells regulate the immune system. (NTUNGAMO HIGH SCHOOL)

25.0. Scientists measured changes in the phloem pressure and changes in the rate of water movement in the xylem of a willow plant at intervals during a day. The results are shown in the figure below. Study the graph to answer questions carefully.



a(i) Compare the changes in the phloem pressure with the rate of water movement in the xylem as the day progresses.

b(i) Describe the relationship between phloem pressure and rate of water movement in the xylem in this plant.

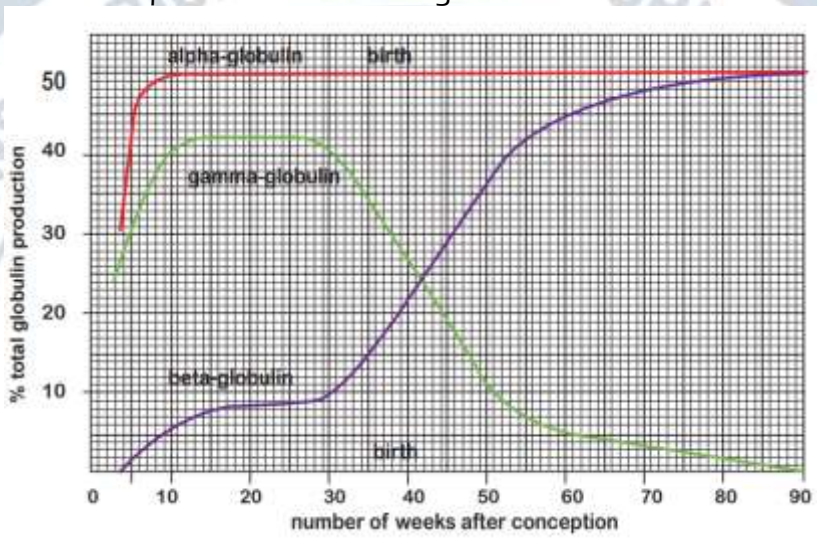
(ii) Explain the relationship between phloem pressure and rate of water movement in the xylem of this plant.

C(i) Explain the changes in the rate of water movement in the xylem 8 marks

d(i) Explain the effect of stripping some bark from a huge mature tree affect the transport in the phloem, xylem and plant

(ii) Explain why phloem pressure reduced during the hottest part of the day.

26.0. A haemoglobin is made up of four polypeptide chains each known as a globulin. In adult humans two polypeptides in a haemoglobin molecule are alpha-globulin and two-beta globulin molecule. In other words, 50% of the total haemoglobin in all haemoglobin is alpha and 50% is beta. In a human foetus, however, the haemoglobin is different, with much of the beta-globulin being replaced by the third type gamma-globulin. Fetal haemoglobin has a greater affinity for oxygen than adult haemoglobin. The changes in production of the three types of globulin during early human development are shown in figure 2.



a) Describe the percentage changes in the total globulin production with weeks after conception.
b) Compare the changes in total globulin for gamma and beta with weeks after conception.
c) Comment on the percentage globulin production with weeks after conception.

(ST. MARY'S KYAMUHUNGA)

27.0. In an experiment to investigate the properties of skeletal muscles, skeletal gastrocnemius was carefully removed from the frog. The muscle was placed in a buffered, well oxygenated saline solution and held by its tendons so that the changes in the tension can be measured by stimulating muscle using electric shocks to its motor nerve as shown in the fig 1.0A

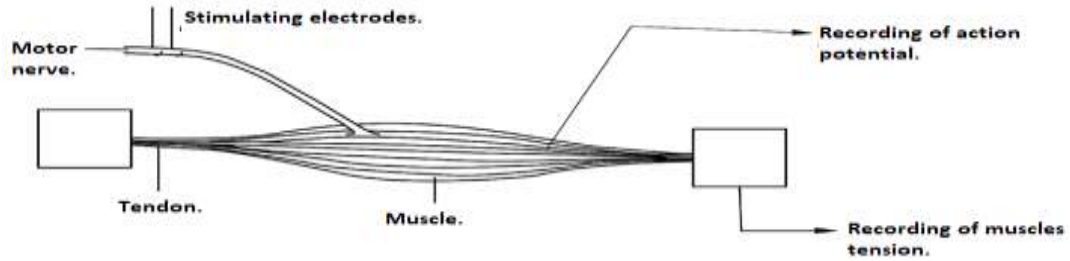


Fig 1.0A

Fig 1.0B shows the relationship between this contraction and action potential triggered by stimulus. Study the figures carefully and answer questions .

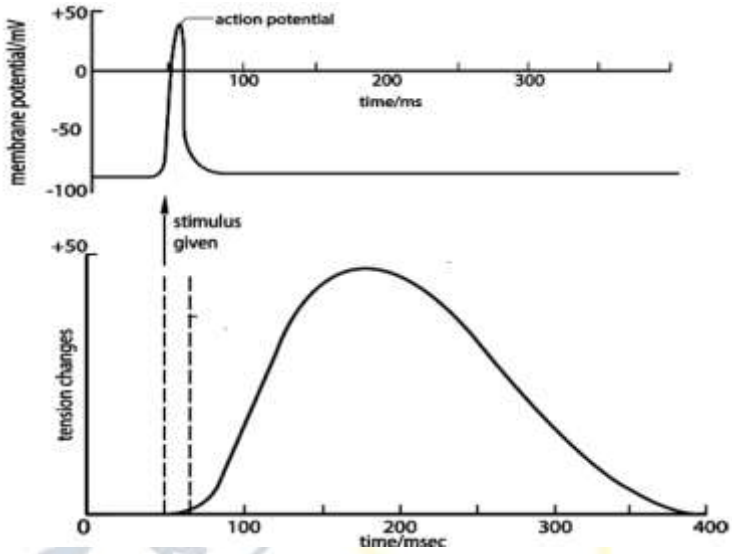
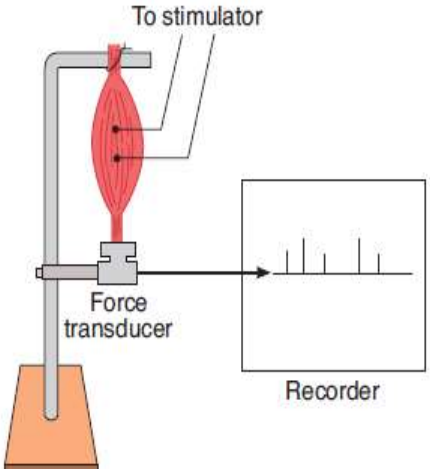
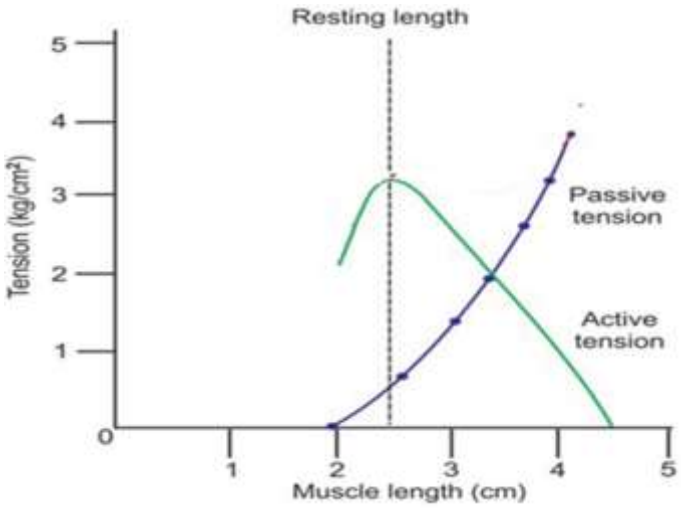


Fig 1.0B

a) Compare the Curve for the action potential with that of the tension changes.
b(i) Describe the relationship between action potential and tension.
c) Account for
(i) the relationship between action potential and tension changes.
(ii) Time course of contraction is much slower than action potential.
d(i) Explain why the muscle was bathed with a buffered, well oxygenated saline solution.

28.0. The graph below shows a length-tension curve of skeletal gastrocnemius muscles bathed in a well oxygenated saline solution. The origin of the muscle is fixed to a rigid station on the platform, whilst the insertion is hooked up to a movable lever. The length of the muscle can be varied by changing the distance between its two attachments. At each length, the passive tension is measured, the muscle is then stimulated electrically, and the active tension is calculated. Study the set up and the graph below to answer questions appropriately.





(i)Compare the passive with active tension
(ii)Account for the changes in the tension

a) Passive tension.
b) Active tension.

29.0. Researchers performed experiments to investigate the effect of testosterone intensities in Yarrow's spiny lizard, *sceloporous jarovii* in inducing the complex behavioral patterns of guarding their habitats. Two groups consisting of 10 male lizards were chosen and fed very well. In one group testosterone implants were put under the skin while the other group did not have the implants. Results of the experiments are shown in the figures below. Carefully study the figures and answer questions that follow.

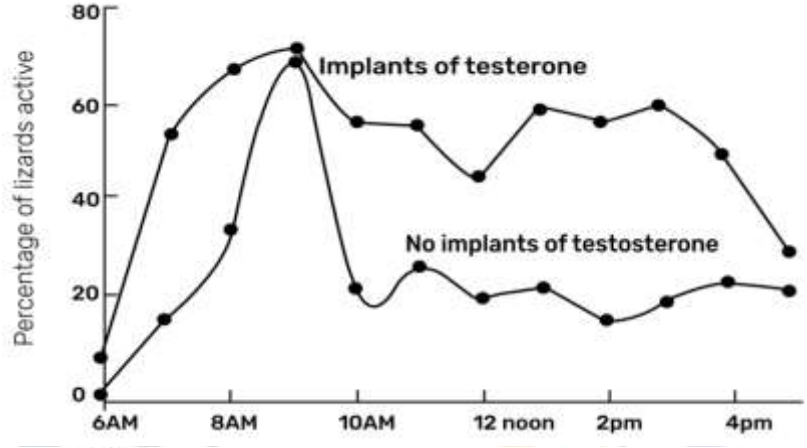


Fig 1.0A

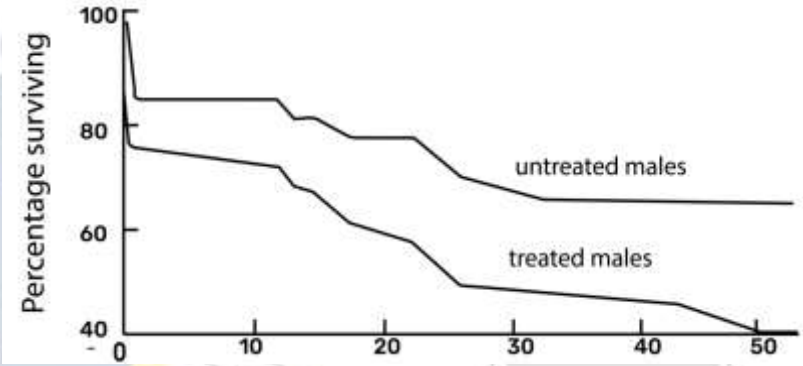


Fig 2.0 B

(a)(i) From fig 1.0A compare the percentage activity of lizards with implants and those lacking.
(ii) Explain the Comparisons given above in (a)(i)
(b) From the information provided in fig 2.0B.
(i) Account for the initial decrease in the survival of the two groups of Lizards.
(ii) Explain why the treated individual percentage survival falls to zero while that of the untreated doesn't?
(iii) Suggest the reason for the fluctuation in the percentage survival from 10 days to 20 days after receiving the implants.
(c)State the behavior(s) and explain their evolutionary significances. **(ST. THOMAS)**

27.0. Prokaryotes are found throughout the biosphere.
(a) Explain adaptations found in various prokaryotes for diversified life.
(b) Discuss three ways in which prokaryotes continue to have ecological impact today.
(STANDARD COL. NTUGAMO)

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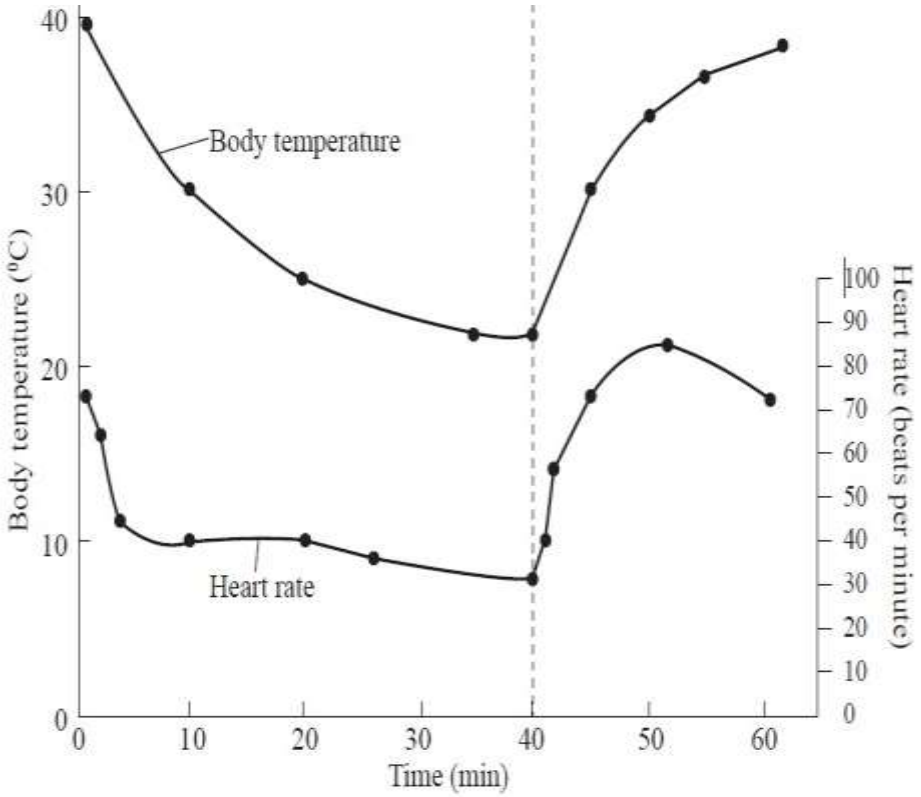
30.0. Galapagos-archipelago is an oceanic island formed by volcanic eruption. Marine iguana lizard, *Ambylrhynchus cristatus* is an endemic species which is adapted to survive in these conditions. In an investigation, the heart rate of marine iguana was measured at different body temperatures. Study the graph and relate it with the behaviors of iguana lizard to answer questions below.



a) Compare the variations in the body temperature and heart rate of the marine iguana lizard.
b) Describe the changes in the following variables
(i) Body temperature (ii) Heart rate
c) Provide an account for the variations in the following variables under investigations (i) Heart rate
(ii) Body temperature
d) Comment on the significance of the changes in the heart rate during the first 40 minutes of the study.
e) The rocky shores inhabited by the Iguana lizard reach a temperature of 400c or more. Suggest examples of behavioural mechanisms that would enable the iguanas reach and maintain its body temperatures at about 370c.
f) With reasons, State the thermal classifications of the Marine Iguana lizard

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31.0. Fig 2.0 A, shows the relative rate at which fluid flows through each part of a nephron. If water flows into an impermeable tube such as a hosepipe, it will flow out of the far end at the same rate that it flows in. However, this clearly does not happen in a nephron. Consider what happens in each region, and suggest an explanation for the shape of the

Fig 2.0 B

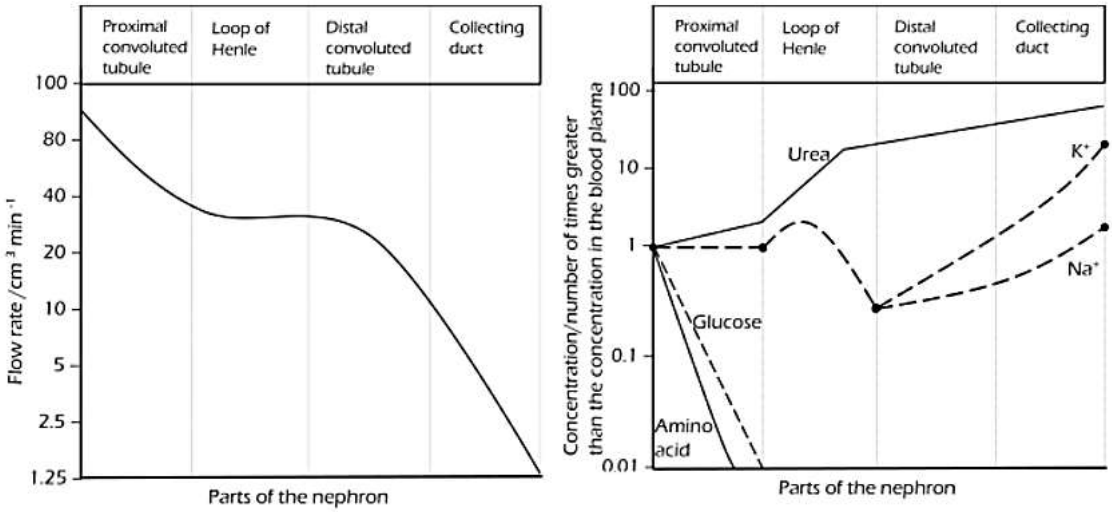


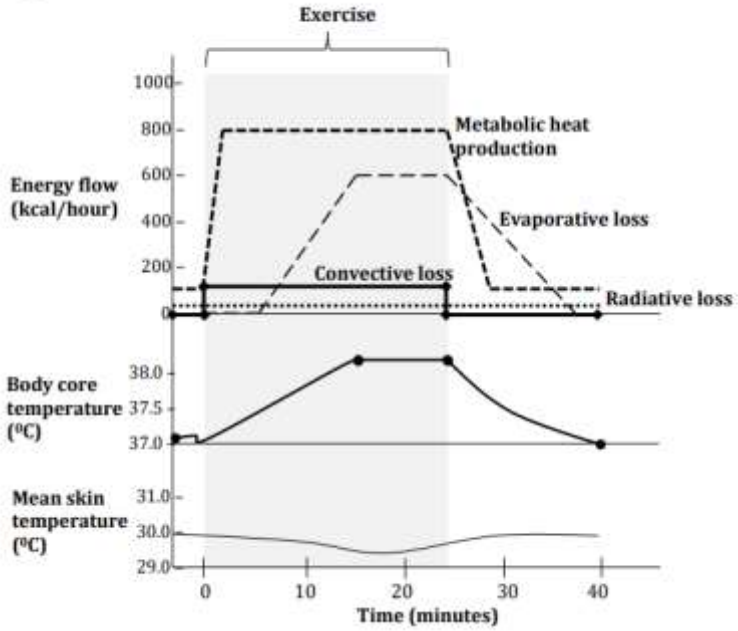
Fig 2.0 A

a) . Explain the shapes of the curves for: i glucose, ii urea, iii sodium ions iv potassium ions.
b) Account for the shape of curve for the flow rate above in Fig. 2.0 A.

(VINE HIGH SCHOOL)

32.0.Figure 3. Shows a whole – body heat balance during exercise of an athlete. Study the graph carefully and answer questions that follow.

Figure 3.



a) Describe how the following are obtained (i) Body core temperature.

(ii) Mean skin temperature.

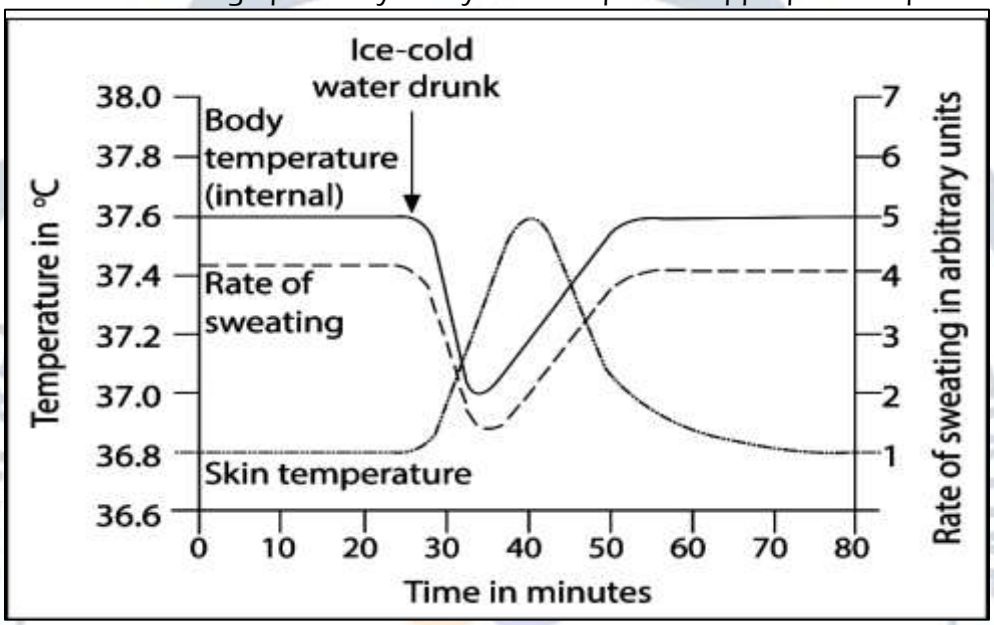
b) (i) Compare convective loss and evaporative loss of heat during the exercise.

(ii) Explain the relationship between mean skin temperature and the body core temperature during the period of exercise.

c) Explain the Trends in the following components during and after the exercise. (i) Metabolic heat production (ii) Evaporative loss. (iii) Radiative loss. (iv) Convective loss.

d) Explain ways through which the body prevents overheating during the exercise.

33.0. In an experiment, a person sat inside a large container which was kept at a constant temperature of 25°c. After 23 minutes, a person drunk 500cm^3 of ice cold water. The person's internal temperature was measured near the brain by attaching a temperature probe to the ear drum. Measurements of the person's internal temperature, skin temperature and the rate of sweating are shown in the graph. Study it very well and provide appropriate responses.



a) Compare the changes in the skin temperature and internal body temperature after ice-cold water was drunk.

b) Describe the relationship between the internal body temperatures and following measurable variables after ice cold water was drunk.
(i) Rate of sweating.
(ii) Skin temperature.

c) Account for the relationships above in b(ii) and (ii)

d) Suggest

(i) Why the ice-cold water was not given before 23-minutes of the experiment. (03 marks)

(ii) Conclusions that can be made from the experiment.

(iii) why the skin temperature does not give an accurate measurement of the core body temperature.

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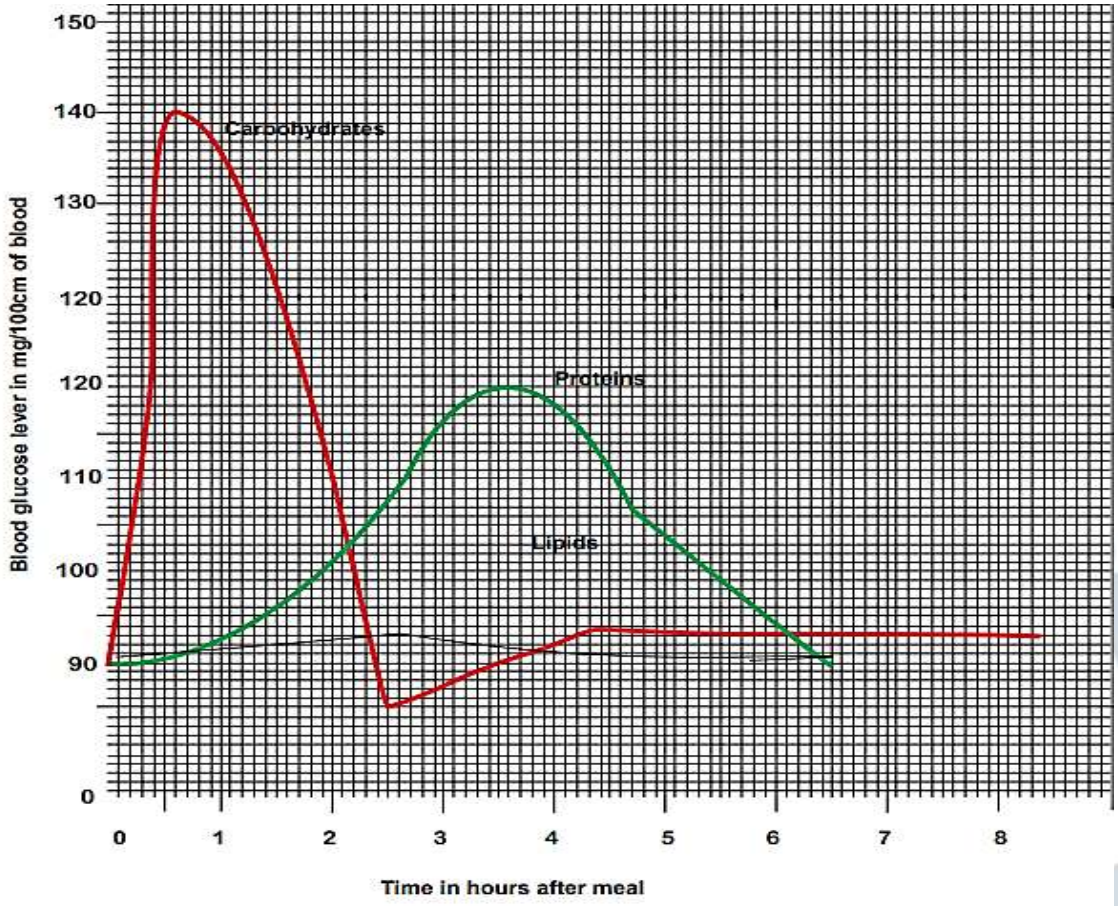
34.0. In an investigation, a health adult human blood glucose level was measured after eating a complex carbohydrate. The experiment was repeated on another day when the same person ate protein and lastly when ate fat. The results obtained were plotted on the graph shown below.



a) Compare the levels of blood glucose in the person after carbohydrate and protein meal.
b) Give an explanation for the observed level of glucose in the person after carbohydrate meal from
   (i) 0.0 hour to 2.5 hours.
   (ii) 2.5 hours to 8.0 hours
c) Explain the blood glucose level in the person after.
   (i) protein meal.
   (ii) Lipid meal.
d) Explain the difference in variation of glucose after carbohydrate meal and that of protein meal.
e) What is the significance of the physiological processes illustrated above?

(BWERANYANGI GIRLS' SSS)

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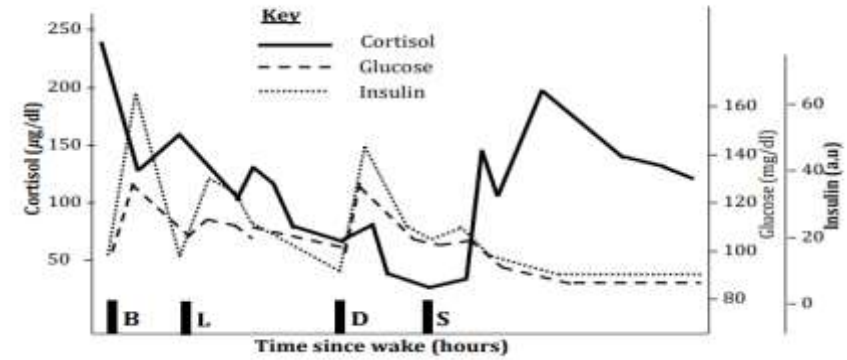
35.0. The graph in Figure 2. shows average diurnal profile of plasma cortisol hormone, glucose and insulin hormone levels in 10 healthy subjects in relation to the four meals namely breakfast (B), lunch (L), dinner (D) and supper (S) consumed during the normal circadian alignment between behaviour cycles (fasting or feeding and sleep or wake cycles) and endogenous circadian cycles in an individual. Use the graph to answer questions that follow.

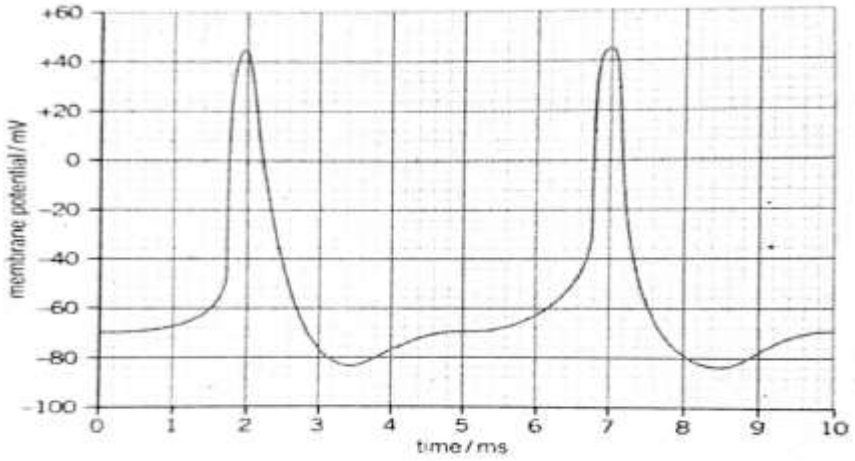
Figure 2.



a) Explain:
   (i) The changes in the concentration of blood glucose level immediately after every meal.
   (ii) The relationship between glucose and insulin hormone levels throughout the circadian alignment.
b) Comment on the trend of cortisol hormone between breakfast and supper.
c) Suggest an explanation for the following after supper:
   (i) Glucose
   (ii) Insulin hormone
   (iii) Cortisol hormone
d) (i) How is blood sugar regulation important to the body.
   (ii) Describe the coordination of the body organs to regulate blood glucose.

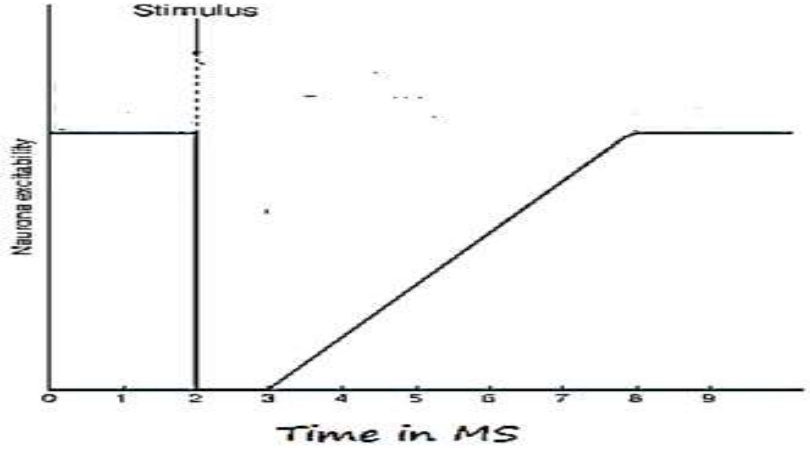
(KITAGATA SS)

36.0.The frequency and the presence of action potential can be recorded using CRO. The graph below shows data collected in two manners, showing two action potentials



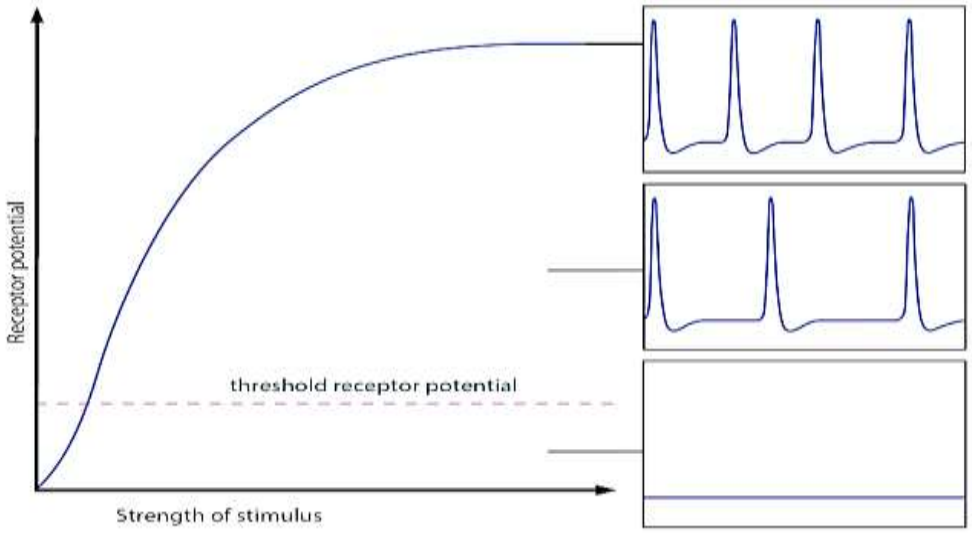
(i) state what occur in the neurone between 1 and 2ms
(ii) state and explain how membrane potential changes between 5.5ms and 7ms
(iii)using data calculate the frequency of action potential

(iv) state the differences between repolarization, depolarization and hyperpolarization
(v)describe what would happen if refractory period didn't exist
(vi)describe how movement of ions reestablishes resting potential
(vii) explain how the motor neurone causes depolarization of the postsynaptic neurone
37.0.The graph below shows neurone excitability before and after a nerve impulse.



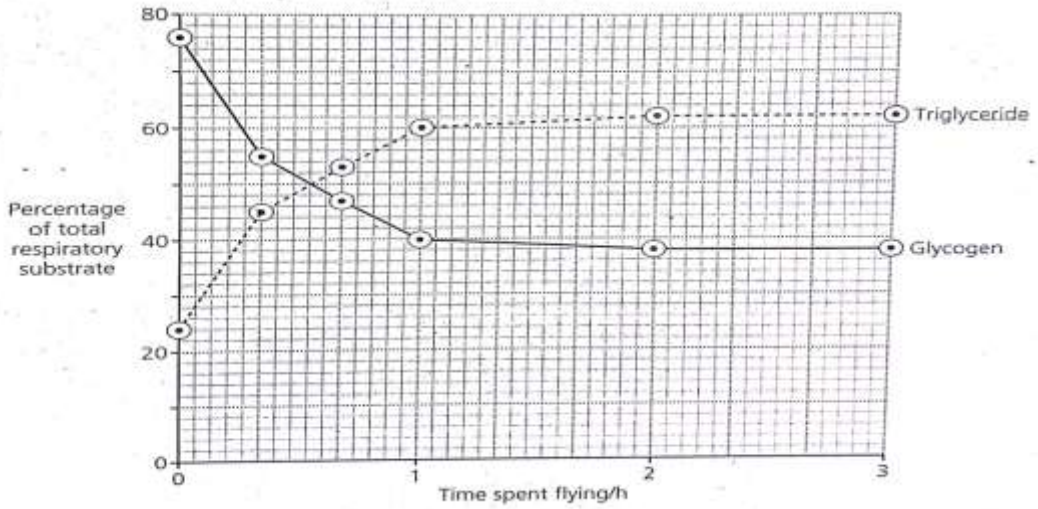
(i) Describe the changes in the neurone excitability
(ii) Account for the changes in the neurone excitability.
(iii) Explain the factors that affect the transmission of the action potentials
(iv) Explain the advantages of Saltatory conduction
(v) Compare action potential with graded potential. (ST. JUDE SS, MASAKA)

38.0.The graph shows changes in receptor potential of a Pacinian corpuscle when pressure was applied at the central core. Study it carefully and answer questions that follow.



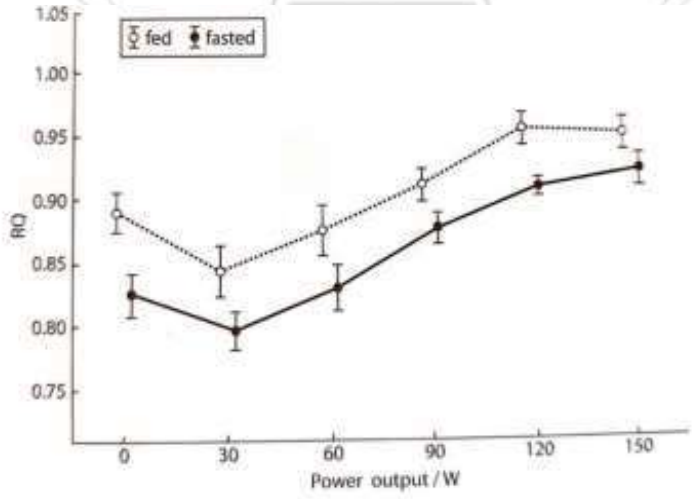
(i) What is the threshold receptor potential?
(ii) Describe the relationship between the strength of stimulus with the magnitude receptor potential
(iii) Explain the above relationship in (ii) above
(iv) Explain the functional significance of the pattern in (ii) above
(v) Explain the relationship between the strength of stimulus applied and the frequency of action potential generated.

39.0.The figure below shows the respiratory substrates used by a locust during a prolonged period of flight. Study it carefully and answer questions that follow.



(i) Compare the percentage of glycogen and triglyceride used.
(ii) Describe the changes in the percentage of
a) Glycogen.
b) Triglyceride.
(iii) Describe the relationship between the percentage of Glycogen and triglyceride used during flight. **(KYEMBAMBI GIRLS)**

40.0. An investigation was carried out into the effect of fasting on the RQ of two students. One of the students was given no food (fasting) for 12 hours while the other ate a normal balanced diet. The students were then made to exercise at increasing intensities in rooms set at the same temperature and humidity. The volumes of oxygen used in their bodies and carbon dioxide produced were measured and the RQ calculated for the different exercise intensities. Intensity was measured as power output. The results are shown in the figure below.

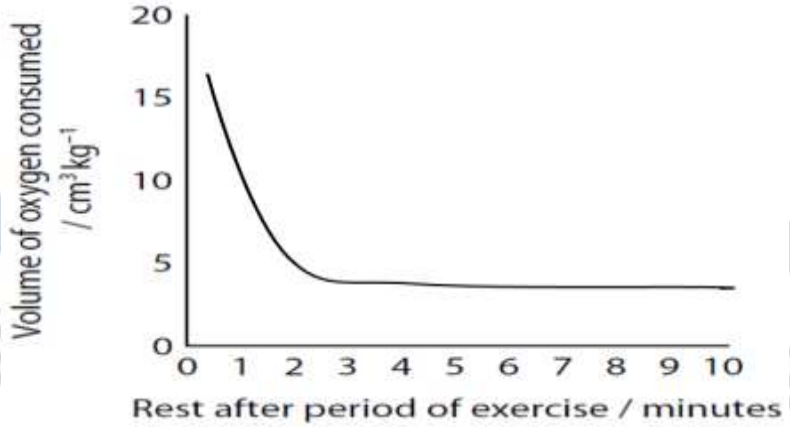


(a) (i) The temperature and humidity of the room were kept the same. Suggest two factors that would need to be controlled.

(ii) Compare the effects of increasing exercise intensity on RQ of the two students. Differences

iii) Explain the results obtained in the figure above

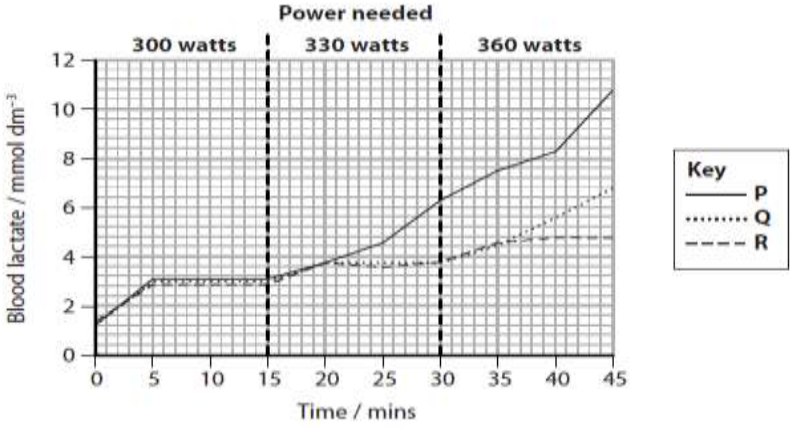
41.0.A spirometer trace was used to measure the total volume of oxygen consumed by an athlete at rest. The oxygen consumed at rest was 4.0 cm^3 $kg^{-1}min^{-1}$. The athlete then did a period of intense exercise. The graph shows the values for the 10 minutes of rest after the period of exercise.



(i) Explain the change in the oxygen consumption during the 10 minutes of rest after exercise.

(ii) Explain how the respiratory centre is involved in the control of ventilation rate in the 10 minutes of rest after exercise.

b) Athletes monitor the effect of different levels of exercise on their blood lactate concentration. This helps them to train effectively. In a study, three athletes, P, Q and R, used an exercise bicycle for 45 minutes. The power needed to maintain a constant speed was increased every 15 minutes. Their blood lactate concentration was measured at 5-minute intervals. The results are shown in the graph.



(a) Explain the increase in blood lactate concentration observed between 0 and 5 minutes.

(b) Give reasons why blood lactate concentration remains constant between 5 and 15 minutes.

(c) The most effective training involves the greatest power requirement over longer periods of time. Therefore, it is important to avoid high concentrations of blood lactate, which causes muscle fatigue, for as long as possible. Analyze the data to deduce how each of these three athletes should plan their training.

42.0. During exercise, the body uses various means as sources of energy. An investigation was made to determine the effectiveness of different energy sources by analyzing the

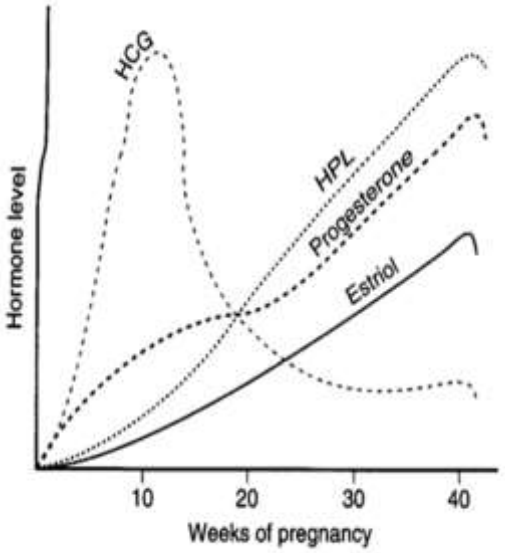
percentage amount of energy used up from cellular respiration, Adenosine Triphosphate (ATP) stores and glycolysis during exercise by an athlete. The results were recorded in the table below. Use the table to answer questions that follow.

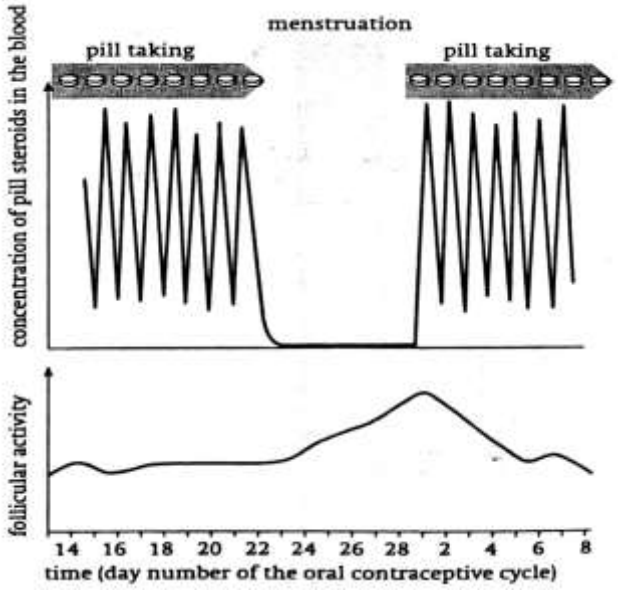
Table 1.

Time during exercise (seconds)	Percentage of energy used		
	Cellular respiration	ATP	Glycolysis
0		0	0
10	10	60	10
20	15	50	20
30	20	40	30
40	25	30	40
50	30	20	30
60	35	10	25
80	50	05	20

a) Present the data in the table on the same axes of the graph.
b) Compare percentage utilization of from glycolysis and ATP stores with time during the exercise.
c) Explain the trends in percentage of energy used up from:
(i) ATP stores
(ii) Glycolysis
(iii) Cellular respiration.
d) (i) How is the formation of ATP regulated in the body of mammals?
(ii) Explain how the structure of ATP suits to its function. **(THE BULLS)**

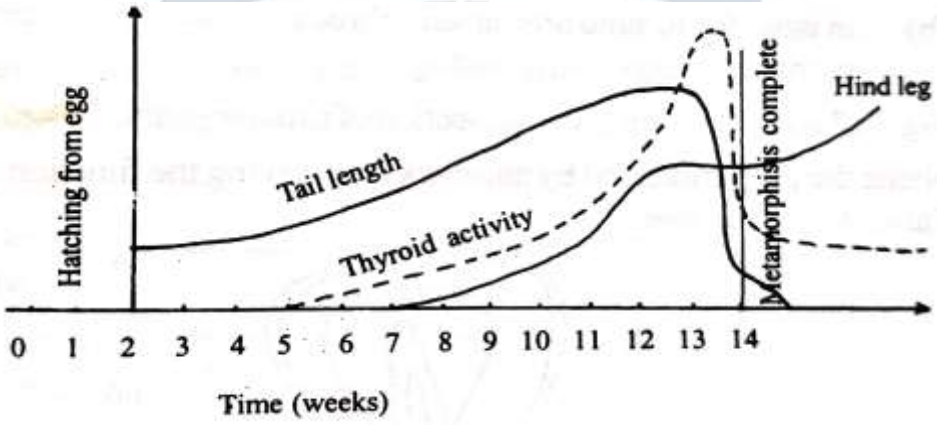
43.a) (i) Describe the histology of mammalian ovaries and testis.
(ii) Outline the Biological basis of the effect of the contraceptive pills.
b) Figure 3.0 shows the interaction of hormones in the plasma of mammalian female organism during pregnancy. Figure 3.1 show part of a woman's 28-day oral contraceptive cycle. The top row shows the days on which she took a combined progesterone and oestrogen pill. The part of the graph below this illustrates the changes in levels of progesterone and oestrogen in her blood. The bottom graph shows the activity of the follicles in her ovaries. Study the graphs below and answer questions that follow.





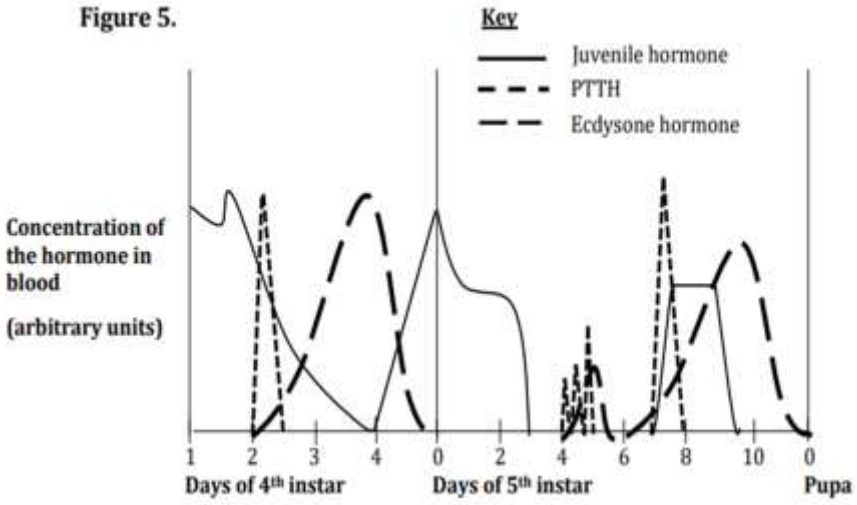
(i)Compare changes in the level of HCG and HPL hormones.
(ii) Account for the changes in the following hormones.
a) HCG b) HP c) Progesterone
d) Estriol b) From Figure 3.1
(i) How many days of the cycle are shown in these graphs?
(ii) Describe the patterns shown by the level of steroids in the woman's blood, and relate these to her pill-taking schedule.
(iii) Describe the patterns shown by the level of follicular activity.
Explain how the levels of steroids in the blood can cause the pattern you describe. **(LIONS)**

44. The graph below shows changes taking place in a tadpole. Study the graph carefully and provide most credible answers.



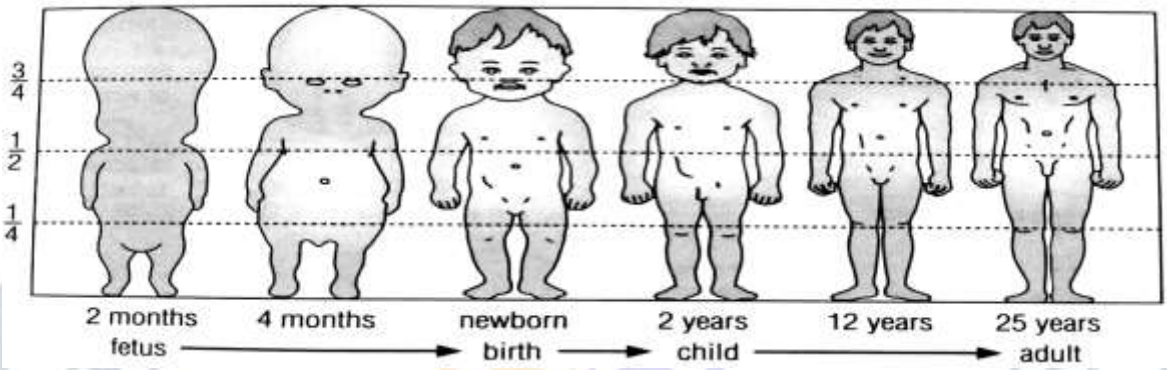
a) From the information above, describe the changes in the following
(i) Tail
(ii) Hind leg.
(iii) Activity of thyroid gland.
b) Account for the changes in the following
(i) Tail
(ii) Hind leg.
(iii) Activity of thyroid gland **(ORA ET LABORA)**

45.0. The graph in Figure 5. Illustrates the control of moulting and metamorphosis in tobacco hornworm moth by different hormones namely prothoracic trophic hormone (PTTH), ecdysone and Juvenile hormone (JH). Use it to answer questions that follow.



a) State the parts of the insect that secretes each hormone shown in the figure 5. above.
b) (i) Describe the variation in concentration of juvenile hormone throughout the metamorphic instars.
(ii) Explain what would happen if corpus allatum was removed from brain of a moth larval stage.
c) Explain the variation of each of the following hormones: (i) PTTH
(ii) JH
(iii) Ecdysone
d) Explain the ecological significance for existence of alternative larval and papal stages within the lifecycle of insects.

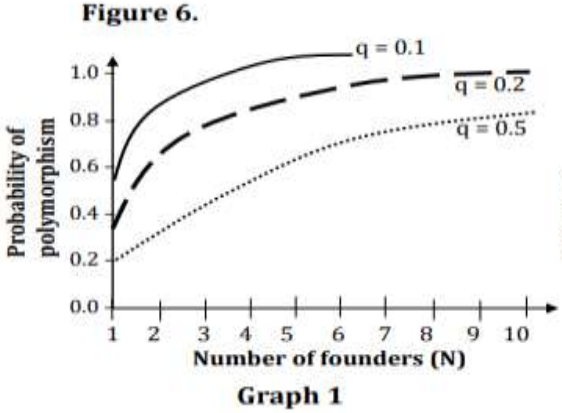
46.0.The figure below shows the relative growth rates of growth from the age of 2 months to 25 years with each stage given a constant height.



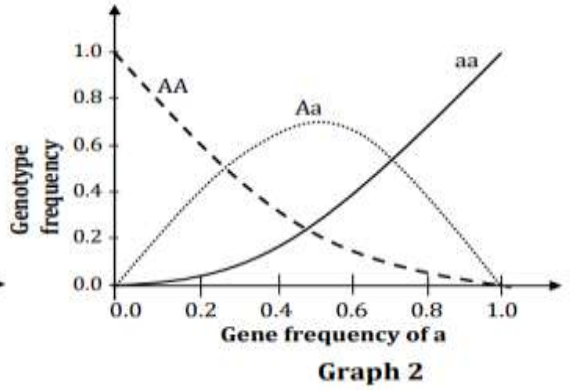
(i) Using the figure above, with reasons identify the pattern of growth
(ii) Explain why the 2-months fetus has a larger head than new born!
With reasons comment on the genitals as shown in the diagram above
(iii) Explain why the height at different stages was kept constant.

47.0.Figure 6. has two graphs. The chances that a founder population will be homozygous depend on the number of founders and the gene frequencies. The probability of polymorphism is shown in graph 1 for three different gene frequencies (q) at a two-allele locus. Graph 2 shows the Hardy-Weinberg proportions of genotypes AA, Aa and aa in relation to the frequency of gene a. use the graphs to answer questions that follow.

Figure 6.



Graph 1



Graph 2

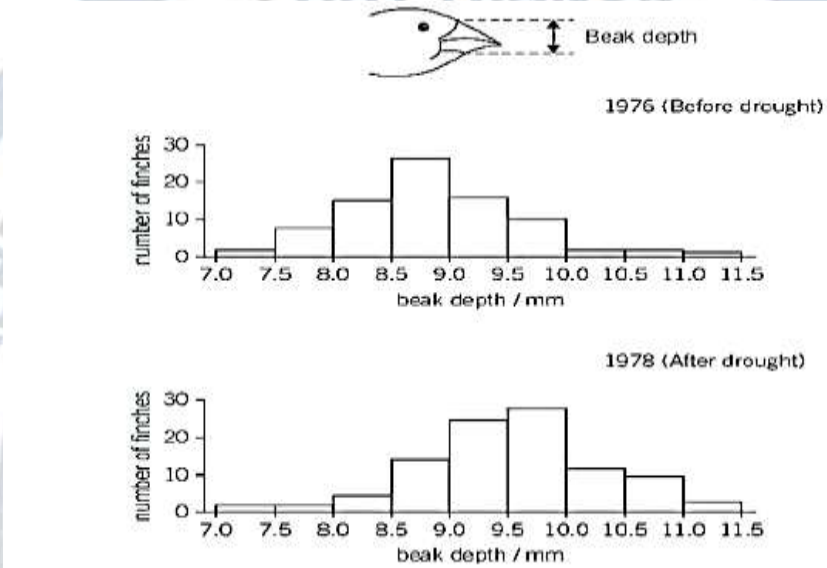
a) Explain graph 2.b) (i) Explain the meaning of the terms: polymorphism and founder principle giving relevant examples in each case.
b) (i) Derive Hardy – Weinberg equation and state its validity.
c) (ii) Cystic fibrosis occurs in the population with a frequency of 1 in 2200. Calculate the frequency of the carrier genotype.

d) (i) From graph 1, explain the relationship between probability of polymorphism and number of founders for different gene frequencies.

(iii) Which conclusions can be drawn from the graphs above?

d) Besides the founder principle, explain other circumstances through which allele frequencies of a population can be decreased. **(BETTER YOUR BEST)**

48.0. The ground finch, Geospiza Fortis, is a species of bird which lives on as a small isolated sland. These finches feed on seeds of different sizes from different species of plants. The finches show variation in the size of their beaks .Birds with larger beaks eats large and small seeds. Birds with smaller beaks only eat small seeds. In 1977there was severe drought on the island. This killed many species of plants that the finches fed on. One species of food plant did survive and this produced large seeds. The graphs show the distribution of beak size of the finch population before and after the drought. Beak size was measured by the depth of the beak as shown in the diagram.



(i) What type of variation is shown in the graphs above?

(ii) How this type of variation is genetically controlled.

(iii) The evidence that the beak size is determined by comparing the beak sizes of the parents and offspring. Explain how this comparison provided evidence for the role of genetic factors.

(iv) Explain the changes in beak shape from 1977 to 1978.

b) The inheritance of banding in garden Snail, *Cepaea nemoralis* is controlled by two unlinked genes. Gene A/a and Gene B/b.
Gene A/a, A-Unbanded and a-Banded.
Gene B/b, B- Single banded and b-Five banded.
The presence of dominant allele, A blocks the functioning of alleles, B and b.

(i) Provide F1 individuals by considering a cross between pure breeding of the Unbanded and five banded parents.

(ii) Work out the F2 ratio by selfing the F1 individuals.

(iii)

49. Explain the following observations:

(a). When seedlings are illuminated on one side only, they grow towards the light source.

(b). When apical buds of tea seedlings are pruned, lateral buds develop into side branches.

(c). Many plants sprout when previously abandoned farm land is cleared and tilled.

49. (a) what is meant by adverse global climatic change?

(b) How do adverse global climatic changes arise?

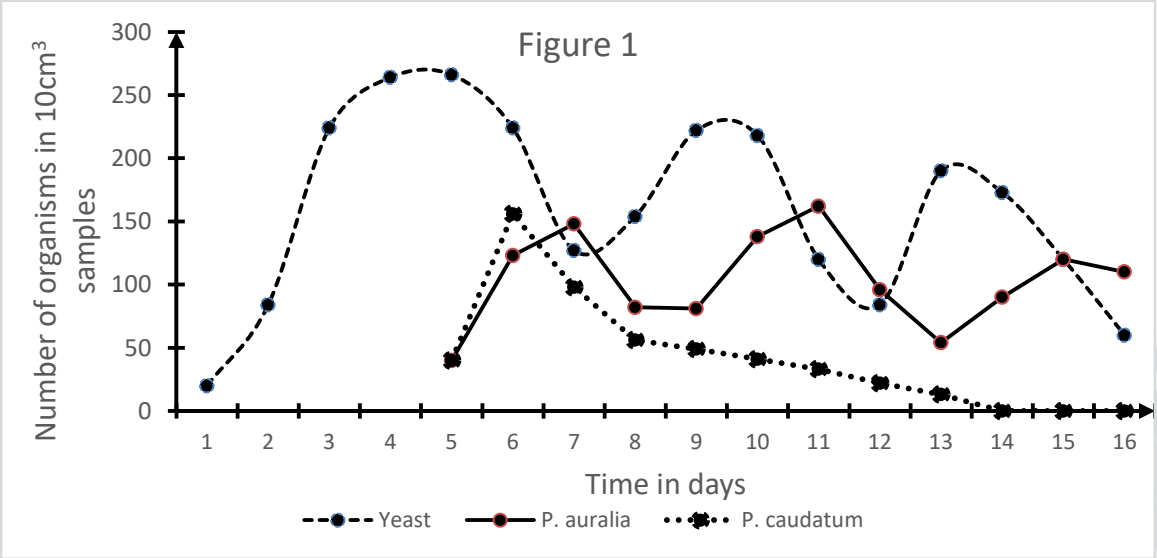
(c) Suggest the possible remedies to adverse global climatic changes.

50 (a). Distinguish between genetic load and genetic drift.

(b) Describe the factors that can disrupt genetic equilibrium.

(c) Describe the role of isolating mechanisms in speciation.

51.A suspension of *Saccharomyces* (yeast) cells was added to a dilute sucrose solution at 25^0C. The mixture was gently agitated for 16 days and 10 cm^3 samples were withdrawn each day and the number of organisms counted. On the fifth day a small quantity of the culture containing two closely related *Paramecium* species (P. *auralia* and P. *caudatum*) was added. The results of the experiment are shown in figure 1 below.



a. Describe the number of P. *auralia* in 10 cm^3 samples during the first 9 days of the experiment.
b. Compare the number of P. *auralia* and Yeast in 10 cm^3 of samples during the last four days of the experiment.
c. Explain the:
   i. Immediate effect of adding *Paramecium* species on number of yeast cells in 10cm^3 samples during the experiment as shown in Figure 1.

(iii) Changes in number of P. *auralia* in 10 cm^3 samples during the first three days of their addition into the suspension.

   ii. Changes in number of P. *caudatum* in 10 cm^3 samples during the last five days of the experiment

d. Suggest what is being demonstrated by the interaction between P. *auralia* and P. *caudatum.*
e. Explain the evolutional effect of the phenomenon demonstrated between P. *auralia* and yeast, in animal species.
f. As demonstrated by the results of the experiment over the 16 day period, the overall numbers of P. *auralia* and Yeast are regulated by a process.
   i. Identify the process.

(ii) Name three biological conditions that are regulated by the process identified in f (i) above. (SHEEMA GIRLS)

52 (a). Distinguish passive and active transport.
(b). Describe the process of direct active transport of a single molecule through the plasma membrane.
(c). Explain why most molecules do not freely diffuse across the cell surface membrane.
53(a). Describe effects of regular exercise on support structures in humans.
(b) Describe how support is achieved in:

i. Mammals
ii. Herbaceous plants.

54(a). What is meant by the term facultative anaerobes?
(b). Outline events leading to accumulation of lactic acid in mammalian muscles
(c) Explain the benefits of formation of lactic acid in animals
55(a). What is meant by tubular secretion?
(b). How does the mammalian kidney prevent blood pH from becoming highly acidic?

(c) In what ways is the structure of the Kidneys of different organisms in different habitats differ.
56(a). Explain the effect of interruption of the night period with a flash of light on flowering in:

i. A short day plant
ii. A long day plant

(b). Explain why a plant fails to flower when its leaves are removed
(c). Explain how movement of *indoleacetic* acid (I.A.A) ensures survival of the plant.

PRACTICAL QUESTIONS. (P530/3).

1. You are provided with specimen **K** which is freshly killed.(Cockroach)

a) Examine the body of the specimen and state the significance of:
   i. Its shape (02 marks)
   ii. Length of the antennae (02 marks)
   iii. Structure of hind legs. (06 marks)

b) Place specimen K with its dorsal side uppermost. Cutoff the right and left inner wings from as close their bases as possible. Proceed and cut off the right outer wing. Deflect the left outer wing to your left. Examine all the visible structures anterior to the fifth abdominal segment on the dorsal side. Draw and label. (14 marks)

c) Without changing the position of the specimen proceed, using forceps lift the 10^{th} abdominal tergum, carefully observe the structures associated with it. Basing on your observation:
   i. Draw and label exposed structures, the 10^{th} tergum and the structures associated with the 10^{th} tergum. (06 marks)
   ii. State the sex of the specimen. (01 mark)

d) Now cutoff the left fore wing, pin the specimen with its dorsal side upper side and dissect to display structures for food digestion and reproduction. Draw and label your dissection. (15 marks)

(BWERA-NTARE)

2. You are provided with specimen Z (Cockroach).
   a. Place the specimen ventral side uppermost and describe the most posterior structure on the body of the specimen. (03 marks)
   b. Examine the abdomen of the specimen and describe how it adapts the specimen for survival. (05 marks)
   Pin the specimen with dorsal side upper most. Dissect along the left lateral line of the abdomen to display visceral structures involved in coordination and reproduction. Draw and label your dissection. (12 marks)

c.

You are provided with specimen **X** (Toad)

Examine the ventral and dorsal surface of the trunk.

(i) Describe the appearance of the ventral and dorsal surfaces. Give the significance of appearance to the animal. (04 marks)

(ii) Outline two structural differences between the two surfaces. (02 mark)

(b) Examine the eardrum. Explain the significance of its structure. (4 marks)

(c) Dissect specimen X to expose blood vessels responsible for:

(i) Taking blood to the left head and upper trunk regions from the heart.

(ii) Carrying blood from the thoracic region, urinary organs and structures responsible for chemical digestion back to the heart. With the heart turned anteriorly, draw and label the blood vessels.

(25 marks) **(MUST SHINE)**

3. You are provided with specimen **B** (Toad)

(a) Examine the structure of the hind feet and explain how it adapts the specimen for survival in its habitat. (04 marks)

(b) Measure and record the thickness and width of the head of the specimen. State the significance of the shape and proportions of the head. (03 marks)

(c) Pin the specimen with its back lying on the dissecting board. Cut along the right jaw to expose structures on the floor of the buccal cavity and explain how the main structure is adapted to its functions. (06 marks)

(d) Dissect specimen B to display:

(i) Blood vessels supplying and those draining the left visceral structures in the thorax.

(ii) Urinal genital structures in the right half of the body of the specimen. Draw and label your dissection. (28 marks)

4. You are provided with specimen **N** (Rat)

a. Examine the external structure involved in the process of hearing and explain how they are adapted to their functions (05 marks)

b. Dissect specimen N to display

(i) Blood vessels carrying blood to and from the left head region.

(ii) Blood vessels carrying blood to the heart from digestive structures. Draw and label. (18 marks)

(c) Now cut out the alimentary canal and associated structures continue with your dissection and display:

(i) Blood vessels draining internal structures posterior to the diaphragm on the right half of the abdomen of the specimen.

(ii) Blood vessels that supply blood to the upper parts of the left hind limbs and groin.

Excluding the heart, draw and label the blood vessels displayed in (i) and (ii) on the same drawing. (26 marks)

(STANDARD COL.. NTUNGAMO)

5. You are provided with specimen **P** (Rat)

(a) Examine the fore limbs of the specimen P and explain how they are adapt the specimen to its environment. (04 marks)

(b) Open up the specimen to display superficial structures posterior to the rib cage. Draw and label the visible structures in left half. (09 marks)

(c) Dissect the specimen further to display blood vessels draining:

(i) Structures on the left side of the thorax and head of the specimen.

(ii) Excretory structures and right hind limb.

With the heart displaced to your right, draw and label your dissection.

(23 marks)

(TOURISTS CITY SCHOOLS)