MATIGO EDUCATION CONSULTANCY LIMITED
MATIGO EXAMINATIONS BOARD
O'LEVEL BIOLOGY SEMINAR BOOKLET
HELD ON 10TH JUNE 2023 AT MBOGO MIXED SS

Students Name: …….

School Name: …….

Signature: ……..

Published by Matigo Examinations Board (MEB),
P.O. Box 9060, Kawempe, KAMPALA.

CONTENTS

INTRODUCTION

Seminars is the exchange of ideas and networking. They play a vital role in all the academic endeavors. Being exposed to the thinking and the work of our facilitators, can be a catalytic thing for all of us as we seek to understand the context and advances of our own areas of work. The Q/A in seminars, and the person-to-person meetings we have (especially under 'normal conditions'), are thus key activities as we work to excel as individual biologists and as a department.
To ensure an inclusive and supportive atmosphere for scientific dialogues, please follow the following guidelines when you ask questions.

- All are encouraged to ask questions during the Q/A session during and after facilitation, please keep asking interesting scientific questions.
- We ask that questions be restricted to the content and context of the seminar and our visitor's professional expertise whereas personal and political questions should be avoided.
- Be open about the area of work encompassed by the seminar, and the conceptual and broader context for the Examiner's presentation.
- Focus on the key terms and scoring points presented on its own grounds so that you can maximize the understanding of the Examiner's work and engage with that work.
- Think about areas you might want to engage in with the work presented during the presentation.

Many thanks for attending our seminar.

BIOLOGY O LEVEL TIPS AND TRICKS

Biology is a content heavy, but interesting subject. With this article, we hope to share with you how to study better for it, and be ready to excel your MOCK and UNEB examinations!

- Content revision is key, as biology questions usually involve recalling and explaining different structures and processes. Therefore make sure your content knowledge is clear.

- Have effective notes. Given the content-heavy nature of the subject, it is difficult to ace the subject without using some form of notes.

- Search up study methods such as active recall, the Cornell note taking method or even the mind map, and figure out what works for you. Know what you are writing, and never blindly copy from the textbook, and keep it short and brief.

- Remember keywords, Get at least the gist of it and choose keywords that are really important to answering the questions, else you might be wasting your time writing it exactly.

- Clarify doubts about, graphs, Experiments, concepts, definitions and processes with your teachers. Whenever you're in doubt, do not let your questions snowball. Immediately consult your teacher about your queries to quickly get a better grasp on the concept and your foundation is clear.

- Use past papers to revise your answering technique and knowledge of content.

- Look at why your teacher marked your answers wrong, note the correct answer and learn from these mistakes.

- Look through the syllabus document. It has the outline of content tested and marking points within the syllabus, practical requirements, definitions of key terms you should include in your answers, as well as command words used in questions.

SEMINAR QUESTIONS

1. An investigation was carried out into the concentration of lactic acid in the blood of ma man before, during and after a vigorous exercise. The results are summarized below.

Time (minutes)	Concentration of lactic acid (mg/100cm^3)
0	14
10	80
15	95
20	70
40	35
60	22
80	18

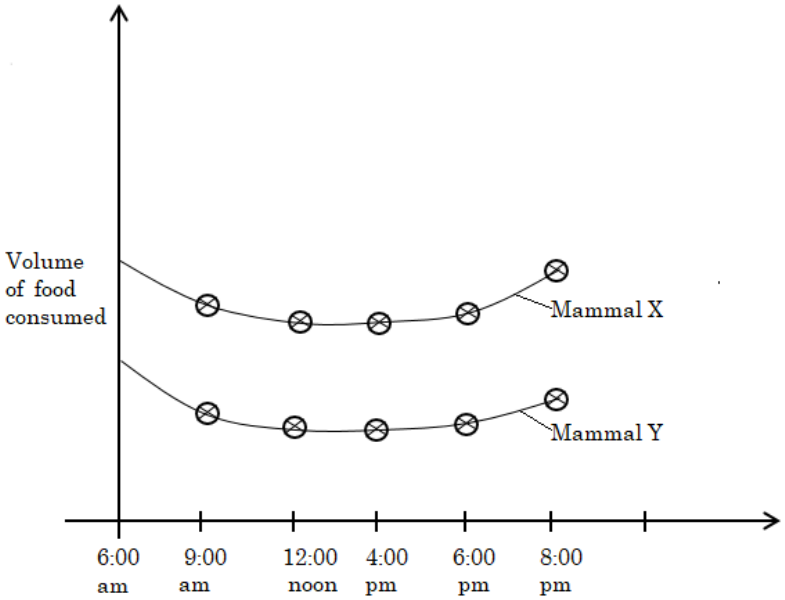
(a) Represent the above information on a suitable graph.
(b) Where in the human body is lactic acid produced during the exercise?
(c) (i) Describe the graph obtained.
(ii) Give reasons for the observed changes in concentration of lactic acid in blood.

2. The table below shows the number of breaths taken per minute of three people living in the same area and climbing 50 steps.

Number of steps	Number of breaths taken per minute		
	Person A	Person B	Person C
10	25	17	22
20	29	21	25
40	37	27	31
50	42	30	34

(a) (i) Plot a graph to show the results.
(ii) Suggest the number of breaths taken per minute at rest by person A.
(b) With a reason, suggest the person who is
(i) Fittest.
Reason
(ii) Least fit
Reason
(c) Explain why the number of breaths taken per minute increase as a person climbs the steps.
(d) Explain the changes in insulin level as a person climbs the steps.

3. The graph below shows results of an investigation of feeding habits of two different sized mammals X and Y of the same species. The study was conducted every 15 hours of the day for four months.



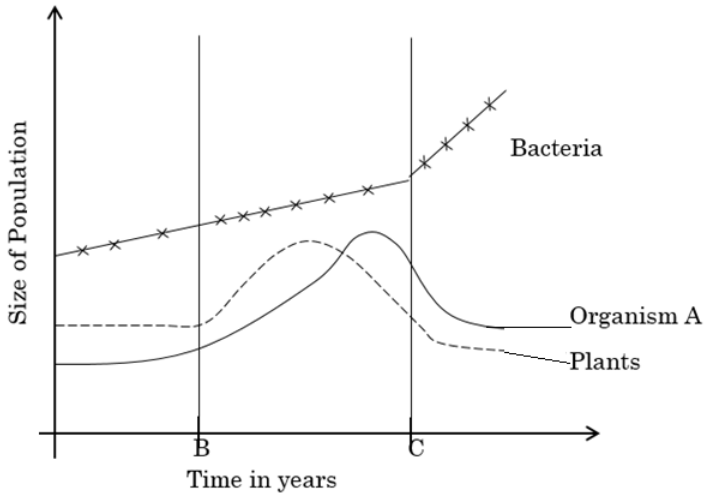
(a) State the time of the day when both animals had consumed
(i) the least amount of food. (ii) highest amount of food.
(b) Suggest reasons for your answer in (a) above.
(i) Least food (ii) Highest food.
(c) Suggest why there was a difference in food consumed by the two animals at all the time.
(d) State the effect of increasing the environmental temperature on the food uptake by mammal Y. Give reasons.
(e) (i) What would be the behavior of mammal X at 8:00pm when food supply is inadequate.

(ii) State two structural adaptations mammal X may use to overcome the problem in (e) above with time.
(f) Suggest two ways in which a lizard responds to changing environmental temperature.
4. The data below shows the number of bubbles produced per minute at $15^{O}C$ and $37^{O}C$ from an aquatic plant when it was exposed to light from a 100 W electric bulb at several distances from the setup of the plant in water. The oxygen bubbles produced are taken as the rate of photosynthesis. Study it carefully and use it to answer questions that follow.

Distance of the bulb from the plant / cm	5	10	20	30	40	50	55	60	65
No. of bubbles produced at $15^{O}C$	400	360	290	220	160	100	70	50	30
No. of bubbles produced at $37^{O}C$	810	750	630	500	390	310	270	200	175

(a) What was the aim of the experiment?
(b) What is the relationship between?
(i) Distance of the bulb from the set up and light intensity received by the plant.
(ii) Distance of the bulb from the set up and number of oxygen bubbles evolved per minute.
(iii) Number of oxygen bubbles evolved by the plant and rate of photosynthesis.
(c) Plot a graph of number of bubbles produced and the distance of bulb from the plant using the same axes.
(d) Describe the shape of the graph at 37^{o}C from your results.
(e)Explain the difference in number of bubbles by the same plant at 15^{O}C and 37^{O}C.
(f)(i) Apart from the factors given state other factors that would affect the rate of photosynthesis in the aquatic plant.
(ii) State **three** importance of photosynthesis.

5. Three different populations in a small lake near an industrial town in Uganda are linked in a food chain. The figure below shows the changes in the size of their population over a period of time. Study the graph carefully and answer the following questions.



(a) (i) Identify the producer
(ii) Name the trophic level of organism A in the food chain?
(b) (i) Suggest what might have entered the lake at time B by referring only to the plant population. Explain your answer.
(iii) Suggest the other effect the substance named above would cause to the water ecosystem of the lake.
(c) Explain the relationship in the variation of the population sizes in the plants and organism A after time B.
(d) Explain how the changes in the size of the population of bacteria after time C is related to the size of the plant population.
(e) On the graph above sketch the curve to show how the oxygen concentration would change over time. Explain.

6. (a) The table below shows the average total energy expenditure requirements for people of different weights.

Total body weight (kg)	**Total energy requirements (kj)**	**Energy requirements per body weight ($Kjkg^{-1}$)**
7	3150	
14	5880	
21	7350	
32	9600	
45	11250	
60	12000	
65	12350	

(i) Complete the third column in the table above.
(ii) Draw a graph of energy requirements per kg of body weight against total body weight.
(ii) Explain the shape of the graph.
(b) Explain why mammals require more energy intake than reptiles of the same size.

7. (a) Define **osmosis**
(b). (i) Explain how osmosis can cause problems for an Amoeba in fresh water?
(ii) What mechanism may protozoans living in fresh water develop so as to deal with the problem mentioned in (b) (i) in above?
(c) Thirsty sailors at the sea cannot drink sea water to quench thirst, if they do, they only become thirstier .Explain why it is so?

8. (a) How is urea formed?
(b) Describe the path followed by urea from the point of formation until it's eliminated from the body.

9. (a) State the difference between **excretion** and **egestion.**
(b) Describe the process of excretion in the kidney.
(c) State **four** adaptations of the kidney to its functions.
10. Discuss the role of hormones in the reproduction of human beings.

11. (a) Describe the term irritability.
(b) How are auxins and adrenaline?
(i) Similar (ii) Different
(c) Describe how
(i) Auxins are important in plants.
(ii) Adrenaline affects a scared human being.

12. How are the following structures in the female reproductive system are adapted to their functions?
(i) Placenta (ii) Fallopian tube (iii) Uterus
(b) State the roles of the following
(i) Prostate gland (ii) Epididymis (iii) Testes
(c) Outline **three** differences between a sperm and an egg.

13. (a) Explain the changes that occur in the following rates when a person climbs a high mountain.
(i) Breathing rate. (ii) Heart beat rate.
(b) Explain how these changes affect the working of the leg muscles during the climb.

14. (a)What is meant by the term **saprophytism**?
(b) Outline the differences between saprophytic feeding and feeding in humans.
(c) Explain the different ways in which saprophytes are economically important in nature.

15. (a)What is **homeostasis**?
(b) Name any **three** factors that must be maintained constant in mammalian

(c) Explain how endotherms respond to heat and cold conditions in their environment.

16.(a) Define the term *biological control method.*
(b) (i) Give examples of biological control methods.
(ii) State the importance of biological control method.
(c) Describe how preys are adapted to escaping from predators.

17. (a) Describe any **four** adaptations of a good respiratory surface to suit its function.
(b) Give **two** reasons why,
(i) Unicellular organisms lack a specialized respiratory system.
(ii) Multicellular organisms like man have a specialized respiratory system.
(c) Describe the mechanism of gaseous exchange in an amoeba.

18. (a) How are the leaves of higher plants adapted to their functions?
(b) Discuss the mechanism of opening and closing of stomata.

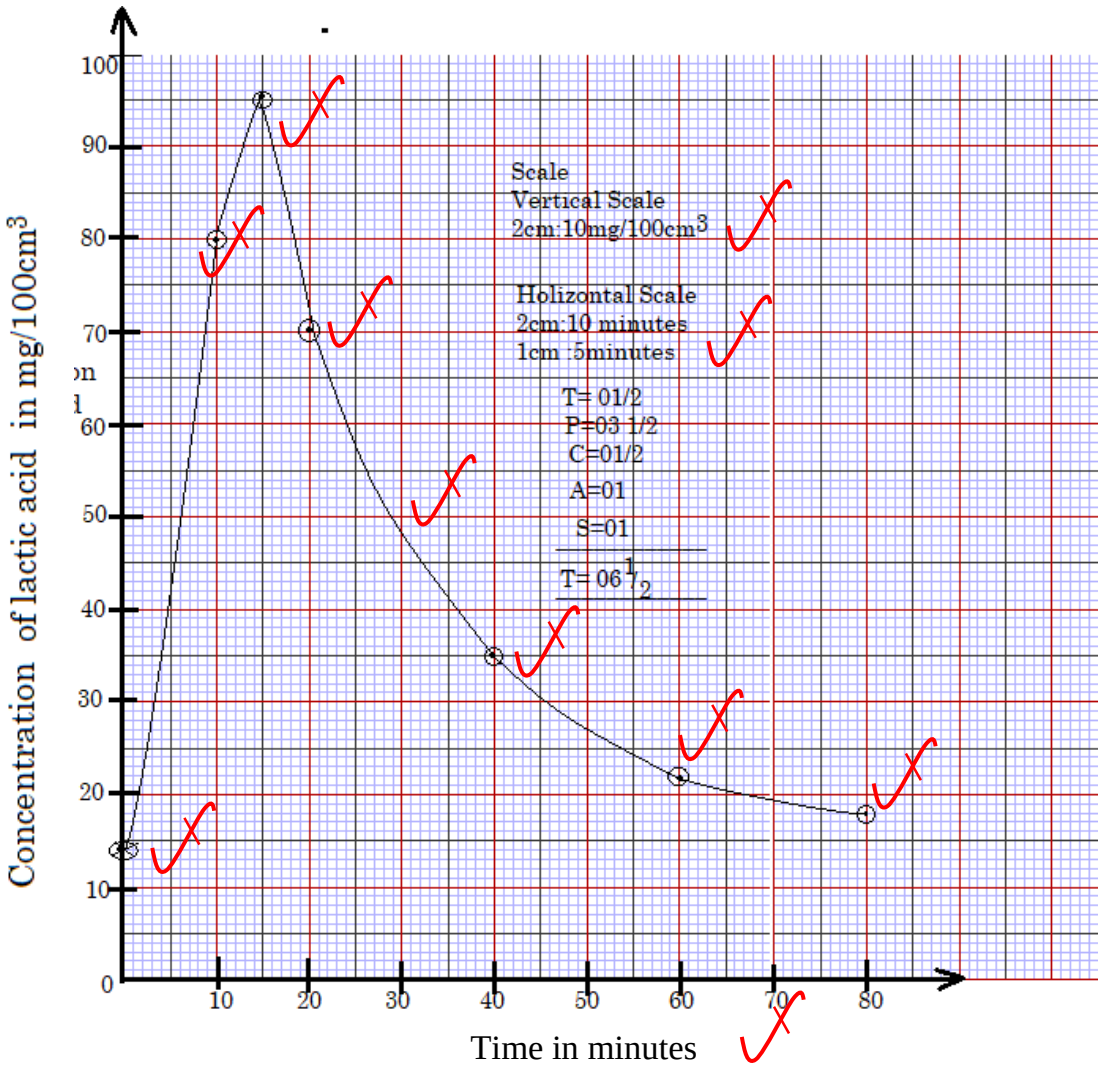
19. (a)Describe the structure and functions of the various parts of the mammalian ear.
(b).Discuss how the various tropisms adapt plants to their habitats.

20. (a) Distinguish between **sex limited traits** and **sex linked traits**.
(b) Haemophilia is a recessive sex linked trait. Using suitable symbols carry out a genetic cross to determine the genotypes and phenotypes of the offsprings when a haemophillic man married a carrier woman for haemophillia.
(i) State the genotypic and phenotypic ratios of the off springs.
(ii) Calculate the probability of producing a haemophillic girl.
(iii) Calculate the percentage of producing a normal boy.

END

SEMINAR ANSWERS

1. (a) A graph showing the variation of lactic acid with time in the blood of a man before, during and after a vigorous exercise.



(b) In the skeletal muscles.

(c) (i) -From 0 to 15 minutes, the concentration of lactic acid increases rapidly, and reaches a maximum /peak of 95 mg/100cm^3.

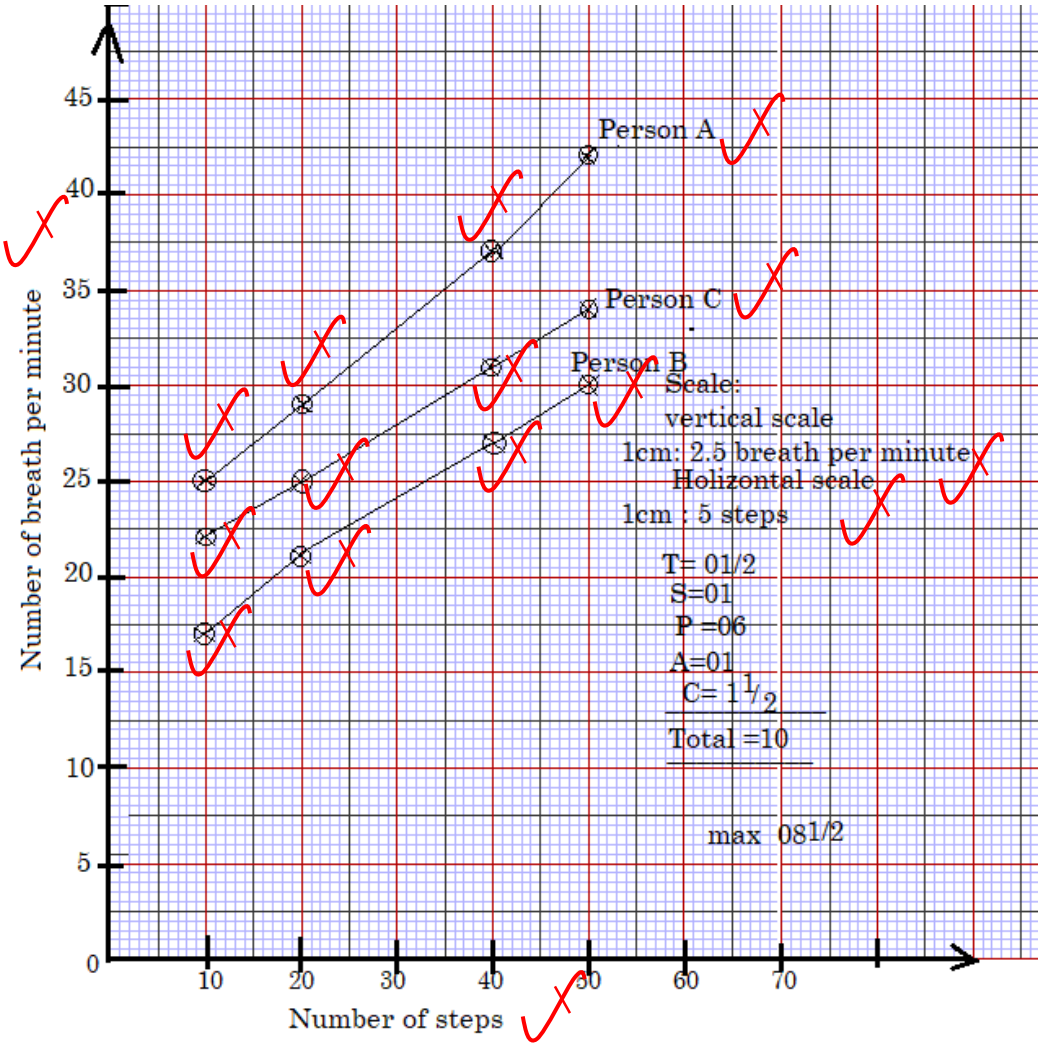
- From 15 to 60 minutes, the concentration of lactic acid decreases rapidly from 95mg/100cm^3 to 22mg/100cm^3.
- From 60 to 80 minutes, the concentration of lactic acid decreases gradually from 22mg/100cm^3 to 18mg/100cm^3.

(ii)- From 0 to 15 minutes, anaerobic respiration occurs rapidly because the rate of breathing is too low to supply enough oxygen, to produce the required energy, lactic acid is produced rapidly.

- From 15 to 60 minutes, vigorous exercises has ended, rapid breathing continues, to pay off the oxygen debt, used to oxidize the lactic acid.
- From 60-80 minutes, most of the lactic acid has been broken down.

2. (a) (i) Plot a graph to show the results.

A graph showing the variation of number of breaths per minute of three people in the same area with number of steps.



(ii) 21 breaths per minute.

(b) (i) Person B.

Reason

The person has less/low number of breath per minute to climb 50 steps.

(ii) Person A

Reason

The person has more /high number of breaths per minute to climb 50 steps.

(c) The number of breaths increases to take in more oxygen used in respiration and release energy used to climb.
(d) Amount of insulin lowers to allow the conversion of glycogen to glucose which is oxidized to release energy used to climb the steps.

3. (i) Between $12:00-4:00\ pm$
(ii) Between $7:30-8:00pm$
(b)(i) Between $12:00-4:00pm$, environmental temperature is high and less food is consumed, as there is less need to generate heat for maintain a constant body temperature.
(ii) Between $7:30-8:00pm$.
The environmental temperature is low and so more food is consumed in order to generate more heat to maintain a constant body temperature.

(c) The mammal X is small and has a large surface area to volume ratio, it loses more heat per unit surface area hence it consumes more food to maintain a constant body temperature, while Y is large with a small surface area to volume ratio and so loses less heat hence it needs less amount of food to maintain a constant body temperature.

(d) Its food uptake will decrease, since its metabolic rate decreases, and less energy is needed/spent to maintain a constant body temperature.

(e) (i) Mammal X becomes less active
(ii) -Having a thick fur.
-Having a thick subcutaneous fat under the skin.

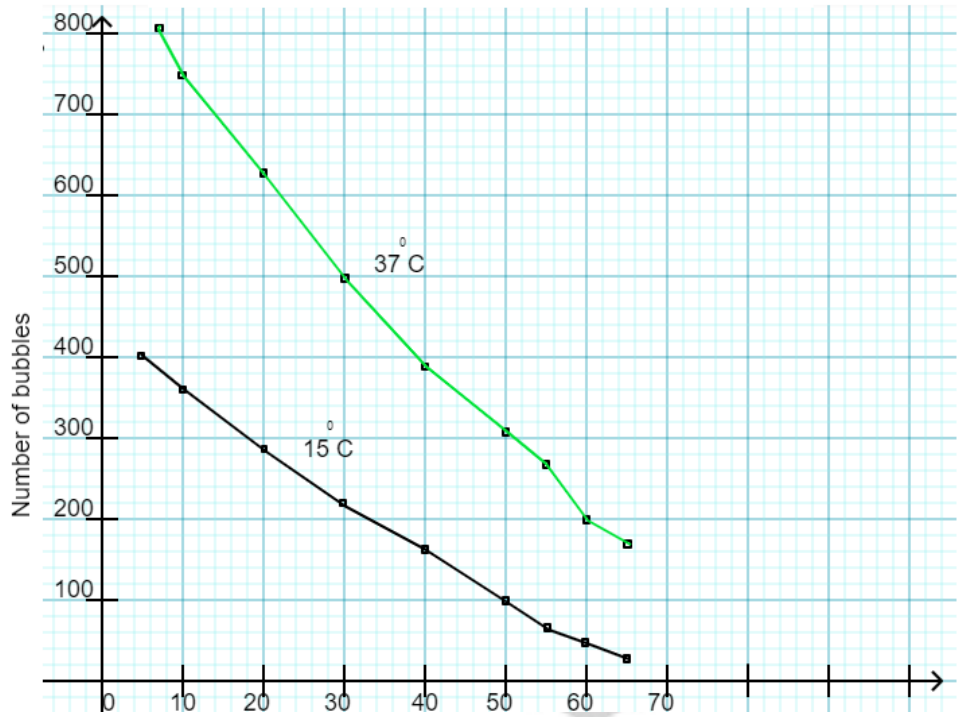
(f) -At low environmental temperature, they bask under the sun or lie on warm rocks/objects to gain heat by conduction.
-At high environmental temperature, they move or hide under shade or enter into burrow where temperature is low.

4. (a)
To investigate the effect of varying light intensity on the rate of photosynthesis at different temperatures.
(b) (i) As the distance of the bulb from the setup increases, the light intensity received by the plant decreases.

(ii) As the distance of the bulb from the set up increases, the number of oxygen bubbles evolved per minute decreases.

(iii) As the rate of photosynthesis increases, the number of oxygen bubbles evolved by the plant per minute increases.

(c) A graph showing the variation of number of bubbles produced with the distance of bulb from the plant



(d) At a distance of 5 cm from the setup, the number of oxygen bubbles produced per minute is high at 800, increase in distance of the bulb from the setup from 5cm to 65cm, the number of oxygen bubbles produced per minute decreases gradually from 800 to 180.

(e)

The number of oxygen bubbles produced per minute at 37ºC is higher than the number of oxygen bubbles produced per minute at 15ºC, because 37ºC is the optimum temperature for the maximum activity of photosynthetic enzymes hence a higher rate of photosynthesis while 15ºC is a low temperature below the optimum temperature thus the rate of photosynthetic enzymes is low due to the them being inactive hence a low rate of photosynthesis.

(f)(i)

- Amount of chlorophyll/chlorophyll concentration.

- Amount of carbon dioxide /Carbon dioxide concentration.
- pH of the medium.

(ii)

- Produced oxygen used by aerobic animals for aerobic respiration.
- Produces food inform of carbohydrates for heterotrophs.
- Reduces the concentration of carbon dioxide in the atmosphere thus preventing global warming.

5. (a)(i) Plants.

(ii) Primary consumer/herbivore

(b) (i) Sewage/fertilizers/manure.

Because of the nutrients such as nitrates and other ions present in the substance, rapid growth of plants occurred, as plant proteins are formed using the nitrates which are needed for growth.

(iii)

- Reduces oxygen content due to decomposition.
- Making water smelling not fit for consumption.
- Causes algal bloom/eutrophication.
- Reduces light penetration/visibility.
- Causes diseases.

(c) After time B, both population of plants and animal A increased, then the population of plants reached a maximum before that of organism A. The population of both then decreased.

Population of plants increased initially because they were fewer organism A grazing on them.

The population of organism A increased due to the availability/plenty of food/plants for them.

The population of plants started decreasing later due to over grazing by organism A.

The population of organism A later decreased due to shortage of plants to feed on.

(d) As plants population decreases,the population of bacteria increase.

Bacteria decomposed dead plants. As the plant population decreases, the organic matter is rapidly used by bacteria resulting in rapid growth of bacterial population.

(e) *Hint*. Curve for oxygen should have the same shape as that for organism A/plant Explanation.

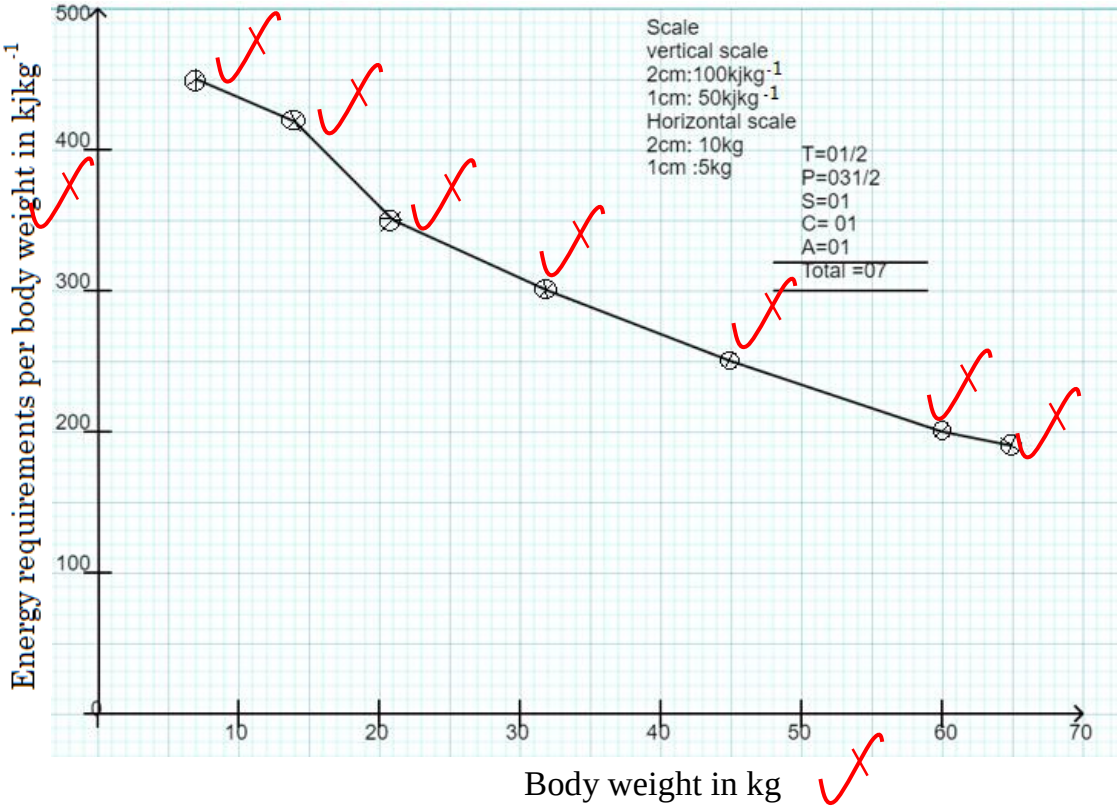
As the plants release oxygen due to photosynthesis, the level of dissolved oxygen increased initially after point B. When the plants die and are decomposed, oxygen is utilized by bacteria which increase their population.

Consumer also utilize oxygen for respiration hence the amount of oxygen decreases.

6. (a)

Total body weight (kg)	***Total energy requirements*** (kj)	***Energy requirements per body weight*** $(Kjkg^{-1})$
7	3150	450
14	5880	420
21	7350	350
32	9600	300
45	11250	250
60	12000	200
65	12350	190

(ii) **A graph of variation of energy requirements per body weight with total body weight.**



(iii)

The curve shows that small people require more energy per unit mass than large people. This is because a small person has a larger surface area to volume ratio and therefore loses heat much faster than a large person. In order to maintain their body temperature constant, small people have to metabolize much faster than large ones. Hence the higher energy requirement per unit mass shown by smaller people.

(b) Mammals are endothermic and are able to generate heat by increasing their metabolic rate. The heat generated is used to maintain a constant body temperature. Reptiles are exothermic and rely on external environment to regulate their body temperature. Thus mammals will require more food intake to sustain their higher metabolic rates.

7. (a) Osmosis is the movement of water molecules from a dilute solution to a concentrated solution across a semi permeable membrane.

(b) The fresh water in which amoeba lives is a less concentrated solution compared to its cell content. Since the amoeba cell membrane is semi permeable, water molecules move in the cell by osmosis. This causes swelling and bursting of the cell.

(ii) Amoeba possesses one or more contractile vacuoles .These collect and eliminate excess water that enters .When they are full, they migrate to the cell membrane, fuse with it and contract to squeeze the water out of the cell.

(c) Sea water is a solution of salts which is a bit more concentrated than the body fluids. When sea water reaches the intestine, it draws water through the membrane of the intestinal wall by osmosis. This withdraw of water from the body is what makes a person more thirsty than before.

8. (a) Excess amino acid are not stored in the body, they are deaminated. Excess amino acids are broken down in the liver into amino group and a carboxyl group. The amino group (enters the ornithine cycle where it) combines with hydrogen to form ammonia. The ammonia immediately combines with carbon dioxide to form urea. The carboxyl group is converted to glucose for respiration or glycogen which is stored.

(b) Urea, formed in the liver, moves through the hepatic vein to the vena cava then to the heart .From the heart, blood is pumped to the lungs through the pulmonary artery, then back to the heart through the pulmonary vein. Blood with urea is pumped through the aorta to the renal artery then to the kidneys.

Ultrafiltration of blood occurs at the Bowman's capsule of the kidney tubules to form the glomerular filtrate. The filtrate moves into the kidney tubules where selective reabsorption occurs. Urea is not reabsorbed hence it passes into the pelvis as urine. Urea passes through the ureter to the urinary bladder and it is passed out of the body through the urethra.

9. (a) Excretion is the elimination of waste products that arise as a result of metabolic reactions in an organism while egestion is the removal of undigested and indigestible materials from the gut through the anus.

(b) Ultra filtration

- Takes place at the Bowman's capsule in the glomerulus.
- The efferent vessel is narrower than the afferent vessel making pressure at the glomerulus high. This high pressure causes ultrafiltration to occur within the glomerulus to form the glomerular filtrate.
- The filtrate consists of materials with small molecules such as urea, glucose, amino acids, vitamins and water that can filter through the walls of the glomerular capillaries and Bowman's capsule.
- substances with large molecules such as plasma proteins and blood cells do not filter through hence are not part of the filtrate.

Selective reabsorption.

- At the proximal convoluted tubule, useful substances such as glucose, amino acids, some water, active hormones and vitamins are selectively reabsorbed into the blood vessels.
- At the loop of Henle, some water and some salts are reabsorbed by osmosis.
- In the distal convoluted tubules, some water and some salts are reabsorbed.
- Selective reabsorption uses energy provided by the mitochondria found in the cells lining the tubules.
- The remaining filtrate, now called urine, containing high amounts of urea passes into the collecting duct (where some water is reabsorbed by osmosis) which leads to the pelvis then ureter to the bladder.

(c)

- Glomerular capillaries have numerous pores, large enough just to let through urea, water, amino acids, glucose ,vitamins hormones but not plasma proteins and blood cells.
- The kidney has numerous nephrons, for efficient excretion.
- Proximal and distal convoluted tubules are folded, to increase the surface area for reabsorption.
- Cells lining the tubules contain numerous mitochondria, to provide energy for active transport and selective reabsorption.
- The inner surfaces of the epithelium cells of the kidney tubules have microvilli, increasing the surface area for reabsorption.
- The inner epithelium of the kidney tubules is thin, for easy passage of substances.
- The kidney tubule is well supplied with blood capillaries, for transport of reabsorbed substances.
- The tubules are coiled, to reduce on the speed of the flow of the filtrate, giving more time for the efficient reabsorption.

10. **Follicle stimulating hormone (FSH)**

- Produced by the anterior pituitary gland.
- Stimulates the development of graafian follicles.
- Stimulates the follicle cells to start secreting oestrogen.

Leutenising hormone (LH)

- Brings about ovulation
- Induces the remains of the Graafian follicle to form corpus luteum which produces progesterone.

Oestrogen

- Produced by the ovary.
- Stimulates the repair and healing of the uterine wall following menstruation.
- Stimulates the production of LH by the anterior pituitary gland.

Progesterone

- Produced by the corpus luteum.
- Slows down the production of LH and FSH
- Causes increased thickening of uterine wall.
- Stimulates the preparation of the uterine wall for implantation.
- Maintains pregnancy/ prevents miscarriage.

Testosterone

- Produced by the testis.
- Stimulates the development of sperms and male secondary sexual characteristics.

Prolactin.

- Produced by the anterior pituitary gland.
- Stimulates the secretion of milk by the mammary glands.

Oxytocin

- Secreted by the posterior pituitary gland.
- Causes the contraction of the muscles of the uterus during child birth.

11. (a) Irritability is the ability of an organism to detect and react to changes in its environment/stimulus.

(b) (i)

- Both are chemical in nature.
- Both are produced in one part of the body (of an organism) and achieve their effect elsewhere.
- Both cause response in the organism where they are produced.

(ii)

Auxins	**Adrenaline**
Produced in plants.	Produced in mammals.
Produced by root and shoot apical meristem.	Produced by adrenal glands.
Control growth responses of plant shoot and root.	Prepares the body of mammals for an emergency.
Move to their target tissues by diffusion.	Is carried by blood to its target tissues.

(iii)

- They control/influence positive phototropism of plant shoots.
- They control/influence positive geotropism of plant roots.
- They promote formation of adventitious roots in stem cuttings.

- They inhibit /stop formation of branches (growth of lateral or axillary -buds) in the presence of the terminal buds.
- They stop/inhibit abscission (leaf fall) of the young leaves.
- They stimulate flowering in plants.
- They promote growth and enlargement of plant leaves.
- They stop/inhibit fruit fall of young fruits.

Effects of adrenaline.

- Stimulates faster rate of heart beat, for quick supply of food (glucose) and oxygen to respiring cells.
- Stimulates faster breathing rate for quick uptake of oxygen into blood and removal of carbon dioxide from the body.
- Causes widening of pupils for more light to enter the eye for better vision.
- Increases the rate of metabolism in the body for generation of more energy required for flight/fight.
- Increases the conversion of glycogen to glucose in the liver for break down during respiration to produce energy.
- Causes dilation of blood vessels supplying muscles for more food and oxygen to reach them for use in respiration.

12. (a)(i) Placenta.

- Thick and fibrous, to protect the foetus from mechanical damage.
- Well supplied with chorionic villi, to increase the surface area for absorption of substances.
- Thin walled, for easy exchange of materials between the mother and the foetus.
- Supplied with many blood vessels, to ensure easy transport of substances between to and from the mother.
- Has a Protective barrier, to ensure that blood cells, blood pressure, bacteria and toxic substances from the mother do not harm the foetus.
- Permeable, to antibodies to allow them diffuse from the mother to the foetus to allow it achieve some immunity.

(ii) **Fallopian tube**.

- Has smooth muscles in its inner walls, which contract rhythmically pushing the egg toward the uterus.
- It is tubular, which provides a passage way for the egg from the oviduct funnel to the uterus.
- Has a narrow lumen, which ensures that the egg moves very slowly to allow for enough time for fertilization to take place.
- It is lined on the inside with ciliated epithelium, whose cilia enable to push the egg towards the uterus as they beat.

(ii) **Uterus**

- It is tubular and wide, providing enough space for the ever increasing size of the developing embryo.
- Has strong muscular walls, that support the increasing weight of the developing embryo and also pushes the embryo out at birth

- It is highly vascularized (dense blood capillaries supply) ,quickly bring food and oxygen and carry away waste products of metabolism.
- It is extensible, to accommodate the ever increasing weight of the developing embryo.

(b) (i) **Prostate gland.**

- It adds alkaline secretion to the fluid which is essential to neutralize the acidic secretions present in the vagina.

(ii) **Epididymis.**

- To store the manufactured sperms.

(iii) **Testes.**

- They produce the male gametes or sex cells called sperms.
- They produce the male sex hormone called testosterone.

(c)

Egg.	**Sperm**
Has no tail	Has a tail.
Contains a York	Does not contain a York.
Has no acrosome	Has an acrosome.
Does not contain mitochondria	Contains a lot of mitochondria.
Large in size.	Small in size.

13. (a) (i) Breathing rate.

The rate of heart beat becomes faster and deeper, due to increased activity, he needs more energy, rate of respiration increases to provide more energy. Respiration requires more oxygen but at high altitudes less oxygen is available. Lactic acid accumulates in his blood due to anaerobic respiration. Due to faster respiration, more carbon dioxide is produced which causes the heavy breathing.

(ii) Heart beat rate.

The rate increases more rapidly resulting in faster circulation of blood, hence faster intake and supply of oxygen and nutrients to tissues which require them, and removal of waste products from sites of production.

(b) Muscles receive increased supply of glucose and oxygen and contract faster. Rate of respiration increases to provide more energy for muscle contraction. Supply of more oxygen allows faster respiration and increased removal of carbon dioxide. It also delays onset of anaerobic respiration in which lactic acid is produced which makes muscles to become fatigue.

14.(a) Type of feeding where organisms secrete enzymes on dead decaying organic matter, digesting it externally, then soluble products are absorbed into their body.

(b)

Humans	**Saprophytes**
There is egestion.	No egestion.
There is ingestion.	No ingestion.
Has digestive system.	Lacks digestive system.
Digestion is both physical and chemical.	Digestion is only chemical /enzymatic.
Digestion occurs within the body.	Digestion occurs outside the body.

(c)

- Prevents excessive accumulation of wastes/garbage since it decomposes organic matter.
- Lead to formation of humus/recycling of nutrients since it decomposes organic matter.
- Spoil food and fabrics due to enzymes they secrete.
- Used in brewing /fermentation due to anaerobic respiration.
- Used in the production of antibiotics due to their poisonous nature.
- Used as food/palatable/edible because they contain nutrients.
- Cause death/diseases because they are poisonous.
- Used in sewage treatment because they decompose organic matter.
- Used in baking due to anaerobic respiration.

15. (a)

It is a mechanism of control and maintenance of a constant internal environment regardless of the external conditions.

(b)

Temperature; Water; Salt or ion content; Carbon dioxide; Glucose, amino acids etc.

(c) How endotherms respond to heat and cold conditions in their environment
Heat/hot conditions:

- Increased sweating, to lose heat through latent heat of vaporization.
- Vasodilation (dilation of arterioles) under the skin, to bring more blood to the skin surface to lose heat to the atmosphere.
- Decreased body metabolism, to reduce heat generation.
- Erector pili muscles relax, making hair follicles to relax hence hair lies flat on skin, no air is trapped, to lose heat.
- Slow/reduced muscular activity due to slow metabolism, to reduce heat production.
- Increased panting to expose tongue and mouth, to release heat.

- Moving to shades to avoid direct heat.
- Aestivation, to escape the extreme heat.
- Flapping of ears to create currents to carry away heat.

Cold conditions

- Stamping of feet, to generate heat.
- Basking in the sun to gain heat directly.
- Less production of sweat, to reduce heat loss through latent heat of vaporization.
- Vasoconstriction of arterioles, hence less blood flow to the skin surface to reduce heat loss.
- Increased rate of metabolism through release of more thyroxine hormone, to generate heat.
- Erector pili muscles contract, pulling hair follicles hence hair is raised, to trap a layer of moist air, to prevent heat loss.
- Shivering/rapid contraction of muscle, to yield heat to warm body.

16. This is the use of a control agent to regulate the population of another organism. The control agent can be the organism's predator, competitor or parasite etc.

(b) (i)

- Introduction of a cat to eat rats.
- Introduction of fish in a pond to feed on the mosquito larvae.
- Introduction of beetles to feed on the water hyacinth.

(ii)

- It is environmental friendly .i.e. it does not pollute or degrade the environment.
- It reduces the pest's population to minimal levels which can be economically - managed.
- It does not kill or harm the untargeted organisms unlike the chemical method.
- It does not lead to extinction of the pest's species since it does not completely wipe out the pest's population.

(c)

- They have developed skeletal muscles for running faster and escaping away from their predators.
- Some camouflage .i.e. their skin colour blends with that of the environment such that they cannot easily be seen by their predators.
- Some do mimicry. i.e. They try to closely resemble or look like another species which is unpalatable or harmful to the predators.
- Some live in groups to increase the powers of defense and protection in case of attack by their predators .e.g. wild beasts and buffaloes
- Some prey have a high sense of smell and keen eye sight for seeing the predator at a distance and run away as early as possible.
- Some make /employ alarm sounds, signals and calls to inform other fellow organisms in the same species about danger. i.e. In case of a predator attack.eg small birds.
- Some prey are capable of stinging their predators. E.g. bees and wasps.

- Electric fish are capable of producing high voltage current to discharge their predators away.
- Some prey have the ability to out run, out swim and out fly their predators.
- Some prey possesses protective shells. E.g. Turtles, tortoises, and snails.
- Some like the lizards break off their tail when attacked giving the animal enough opportunity to escape.
- Some prey discharge away the predators with chemicals that are poisonous, irritating bad smell.
- Some prey scare their predators by puffing up.eg. Blow fish or spreading their wings. E.g. pea cock and turkeys.
- large eyes on both sides of the head give animals such as zebra a wide field of vision, enabling them to keep track of their enemies from far, and take precautions.

17. (a)

- Has a thin membrane to reduce diffusion distance for respiratory gases.
- It is moist to dissolve the respiratory gases before diffusion.
- It has a dense network of blood capillaries to maintain a steep concentration gradient by draining away oxygen and bringing carbon dioxide.
- Has permeable membrane to allow diffusion of the respiratory gases into and out of the respiratory surface.
- Has a highly folded epithelial membrane to increase the surface area for maximum diffusion of gases.
- It is well ventilated to maintain a high concentration gradient that favours diffusion of more gases.

(b) (i)Unicellular organisms are small in size, so they have a larger surface area to volume ratio thus can easily exchange the respiratory gases by simple diffusion via their cell surface membrane.

(ii) Multicellular organisms are large in size, so they have a smaller surface area to volume ratio thus a need for a respiratory system to transport the respiratory gases between the environment and the respiring tissues.

They also have a relatively high metabolic rate whose needs can only be sufficiently catered for by a specialized respiratory system.

(c) There is a higher concentration of oxygen in the surrounding water than in the cell. Oxygen diffuses across the cell membrane from the surrounding water into the cell. The carbon dioxide in the cell is in higher concentration than in the surrounding water thus carbon dioxide diffuses out across the cell membrane into the surrounding.

18.(a) How leaves of higher plants a adapted to their functions.

- Broad and flattened lamina, to increase surface area; for absorption of light.
- Thin blade, to reduce distance for diffusion of gases and penetration of light waves.
- Transparent epidermis and cuticle, to allow light to penetrate to tissues.

- Thin or no cuticle on stomata, to allow for gaseous exchange.
- One-cell thick epidermal layer, to reduce the distance over which sunlight penetrates.
- Palisade cells have numerous chloroplasts containing chlorophyll, to trap maximum amount of light energy.
- Have stomata on the lower epidermis, to allow for gaseous exchange and control of water loss through transpiration.
- Palisade layer have elongated cells located at right angles to the leaf surface, for maximum absorption of light energy.
- Spongy mesophyll layer consists of spherical and loosely-packed cells, to create air spaces, which communicate with the atmosphere through stomata, for purposes of gaseous exchange and control of water loss.
- Veins have conducting tissues: xylem; for movement of water and dissolved mineral salts; phloem; for translocation of manufactured food.

(b) The mechanism of opening and closing of stomata.

The Photosynthetic theory.

During the day, guard cells carry out photosynthesis manufacturing glucose. This increases the osmotic pressure of the sap vacuole, which becomes higher than that of the neighboring epidermal cells, guard cells therefore take in water by osmosis from the neighbouring cells, and become turgid and expanded. The outer thin wall stretches easily, pulling the thicker inner wall outwards, thus the stomata open.

- At night, there is no light hence no photosynthesis takes place. Plant cells respire using up more glucose, the osmotic pressure of the sap vacuole of the guard cells reduces becoming lower than the neighboring epidermal cells. The guard cells lose water by osmosis, to adjacent epidermal cells, they then become flaccid, and pulling together the thick inner walls and stomata closes.

19. (a) The structure and functions of the various parts of the mammalian ear.

- **Pinna:** Is wide/funnel-shaped to collect/gather sound waves, and directs them to the auditory canal into the ear.
- **Eardrum/tympanic membrane:** Is thin and tight, to convert sound waves into vibrations.
- **Ear ossicles:** (maleus, incus and stapes) are of high density, to magnify/amplify sound waves.
- **Oval window** is smaller than eardrum, to magnify the sound waves, and direct them to the inner ear.
- **Cochlea**: is long and coiled, to increase surface area for attachment of receptor cells/sensory hairs. Cochlea has many sensory hairs, which receive sound vibrations and generate impulses.
- **Liquid or fluid/endolymph in cochlea:** transmits sound vibrations.
- **Auditory nerve:** transmits impulses to the brain for interpretation.
- **Eustachian tube:** links the mouth and middle ear to equalize pressure between middle and outer ear to prevent damage to delicate eardrum.

- **Oval window;** Carries sound vibrations from the middle ear to the inner ear.
- **Semicircular canals;** contain receptors for body balance and posture.
- **External auditory canal cells**: produce/secrete wax, to trap dust particles/solid/micro-organisms that can damage eardrum.

(b)How the various tropisms adapt plants to their habitats.

- **Phototropism:** growth curvature in response to direction of light enables plant shoots to grow and get light for maximum photosynthesis.
- **Thigmotropism (haptotropism):** growth curvature in response to contact/hard surface makes plants with weak stems to get support on large plant/trees. This makes them to reach and get light for maximum photosynthesis.

- **Geotropism:** growth curvature in response to gravity enables plant roots to grow deep into the soil for maximum support/anchorage.
- **Hydrotropism**: growth curvature in response to moisture/water, water is the used as a raw material for photosynthesis.
- **Chemotropism:** growth curvature in response to chemical concentration gradient enables pollen tubes to grow down the style into the embryo sac for fertilization to occur in plant flowers.

20. (a)

Sex linked traits are traits controlled by genes on sex chromosomes while sex limited traits are determined by genes located on autosomes (other chromosomes in the body apart from the sex chromosomes) and are expressed only in one particular sex.

(b)

Let H represent the allele for Normal blood clotting

Let h represent the allele for haemophiliac

Parental phenotype: Haemophiliac × Carrier

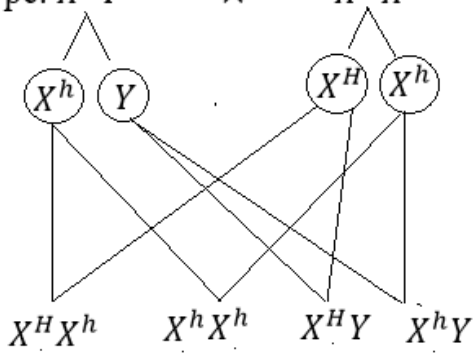
Man women

Parental genotype: X^hY × X^HX^h

Meiosis :

Gametes : X^h, Y, X^H, X^h

Random Fertilization :



Offspring genotype : X^HX^h X^hX^h X^HY X^hY

Offspring phenotype : Normal but carrier female | Haemophiliac female | Normal male | Haemophiliac male

Phenotypic ratio : Normal carrier female : Haemophiliac female : Normal male : Haemophiliac male

Genotypic ratio : $= 1 : 1 : 1 : 1$

$= X^HX^h : X^hX^h : X^HY : X^hY$

$= 1 : 1 : 1 : 1$

(ii) Probability of producing a Haemophiliac girl = $^1/_4$

(iii) Percentage of reducing a Normal boy = $^1/_4 \times 100\%$

$= 25\%$

MULTIPLE CHOICE QUESTIONS

These multiple choice test questions should be used to test factual recall, levels of understanding, and ability to apply learning (analyzing and evaluating). Therefore use them to revise your subject notes.

1. Which of the following changes occurs in the eye when a person moves from bright sun shine into dark room?

A. The pupil becomes large

B. The ciliary muscles relax

C. The eye become blind

D. cannot see

2. The small bones in the ear named hammer, anvil and stirrup are part of the

A. Outer ear

B. Middle ear
C. Inner ear
D. In front part of the ear

3. Which of the following joints allows movement in one plane only?
A. Ball and socket
B. Gliding
C. Hinge
D. Immovable

4. The part of the brain responsible for reasoning and imagination is?
A. Spinal cord
B. Medulla oblongata
C. Cerebrum
D. Cerebellum

5. A strong structure that holds muscles to bone at a joint is called

A. ligament
B. cartilage
C. connective tissue
D. tendon

6. Which of the following represents nervous pathway for impulse that causes knee – jerk reflex?
A. Receptor _ sensory neurone _ relay neurone _ motor neurone _ effectors
B. Receptor_motor neurone _relay neurone _ sensory neurone _ effectors
C. Sensory neurone _ receptor _ relay neurone _ motor neuron _ effectors
D. Receptors _ relay neurone _ motor neurone _sensory neurone _ effectors

7. Which one of the following is involved in osmoregulation in the mammalian body?

A. Thyroxin hormone
B. Testosterone hormone
C. Spinal cord
D. Anti-diuretic hormone (ADH)

8. When a nerve impulse jumps from one nerve fibre to another, it crosses;

A. Receptor
B. Ganglia
C. Myelin sheath
D. Synapse

9. The area of greatest visual accuracy within the eye, containing an enormous number of cone cells is called?

A. Yellow spot

B. Choroid
C. Blind spot
D. Retina

10. Which of the following has both cytoplasm and cell wall
A. liver cells
B. red blood cells
C. root hair cells
D. xylem vessels

11. Which of the following will be a sequence to follow in a scientific procedure after experimentation?

A. Observation and data recording
B. Hypothesis formulation
C. Conclusion
D. Problem identification

12. The term "first aid" is best defined as.

A. Giving medicine to a patient
B. Service rendered by a nurse to a sick person in hospital
C. Service rendered to an accident victim or a sick person before being taken to hospital
D. A first visit to a sick person.

13. Which of the following sets include characteristics which is not exclusive to living organisms

A. Feeding, Irritability and Growth.
B. Reproduction, Death and Definite shape.
C. Excretion, Locomotion and Feeding
D. Growth, Movement and Respiration.

14. Which of the following causes gonorrhea?
A. *Neisseria gonorrhea*
B. *Treponema pallidum*
C. *Vibrio cholerae*
D. *Clostridum tetani*

15. A biologist discovered a new cell in a culture. The new cell had a distinct cell wall but not have a definite nucleus. The cell is most likely to be
A. Protozoa

B. Plant

C. Bacterium

D. Virus

16. Which of the following is common to both plants and animals

A. Cellulose cell wall
B. A digestive system
C. An excretory system
D. Protoplasm

17. The following are reasons why waste disposal is a problem except?

A. In adequate waste bins
B. Excessive packaging of items
C. Enforcing punishment to discharge littering
D. Failure of the cleaners to collect wastes from public places

18. The main purpose of vaccination is

A. To eliminate toxins from the body.
B. To protect the body against side effects of antibiotics
C. To expose the body to synthetic antigens
D. To stimulate antibody production in the body.

19. HIV/AIDS can result from one of the following behavior

A. Hugging and shaking hands
B. Sharing personal items such as towels and swimsuits
C. Being Faithfull to one uninfected sexual partner after marriage.
D. Using sterilized surgical or skin piercing instrument

20. Which of the following refers to a liquid containing either weak or dead micro organisms

A. Steriliser.
B. Preservative.
C. Tranquiliser.
D. Vaccine.

21. Which of the following organisms belong to phylum Ascomycota

A. Bread mould
B. Yeast
C. Mushroom
D. Toad stool

22. By which process does carbon dioxide pass from blood to alveoli of the lungs

A. Osmosis

C. Diffusion
B. Transpiration
D. Respiration

23. In which category as the malpighian layer of mammalian skin is plastic?

A. System
C. Cell
B. Tissue
D. Organ

24. After period of vigorous activity you would except blood leaving a muscle to have

A. More carbon dioxide, more oxygen and more glucose
B. Less carbon dioxide, less oxygen and less glucose
C. More carbon dioxide, less oxygen and less glucose
D. More carbon dioxide, less oxygen and more glucose

25. Predict what will happen if a plant lacks nitrogen
A. Leaves will turn to yellow
B. Leaves will turn to blue
C. Leaves will turn to purple
D. Leaves will turn to brown

26. A part of microscope which allow the observer to move the microscope tube up and down by tiny amounts to change the focus and see specimen clearly

A. Rotating nosepiece
B. Focusing knobs
C. Eye piece lens
D. Objective lens

27. Calculate the date of ovulation in a menstrual cycle of 28 days if menstruation occurs on day 9 to day 13 of a month.

A. 18^{th}

B. 28^{th}

C. 20^{th}

D. 22^{nd}

28. A term which best described a condition of a plant cell that has lost too much water is

A. Haemolysis

B. Crenation

C. Turgidity

D. Plasmolysis

29. The branch of science which deals with the study of living things is known as
A. Biology
B. Ecology
C. Botany
D. Zoology

30. Which of the following structure controls the movements of materials in and out of the cell

A. Nucleus
B. Chloroplast
C. Cell membrane
D. Cell wall

31. Example of diseases caused by virus are

A. Common cold, rabies and cancer
B. Corona, measles, and chicken pox
C. Tuberculosis, typhoid and corona
D. HIV, bilharzias and elephantiasis.

32. Example of diseases caused by virus are

A. Common cold, rabies and cancer
B. Tuberculosis, typhoid and corona
C. Corona, measles, and chicken pox
D. HIV, bilharzias and elephantiasis.

33. The part of the brain responsible for involuntary activities such as water balance and
carbon dioxide level in the blood.

A. Medulla oblongata
B. Hypothalamus
C. Cerebrum
D. Cerebellum
E. Pituitary

34. Which of the following statement is true about blood vessels,

A. All arteries carry oxygenated blood
B. All veins carry deoxygenated blood

C. Pulmonary vein carry oxygenated blood
D. Aorta carries blood away from the right ventricle
E. Vein has narrow lumen than arteries

35. A term used to describe animal which feeds only on plants

A. Carnivores
B. Onivores
C. Decomposers
D. Herbivores

36. The following are the major parts of the alimentary canal except.
A. Oral cavity
B. Transport passage
C. Anal cavity
D. Digestive tract

37. Which body mass index of an Individual can express one who is obese?
A. 35 – 40
B. 20 – 25
C. 25 – 30
D. 30 – 35

38. Bleeding gums is the symptom which can be shown by a person suffering from
A. Rickets
B. Pellagra
C. Beriberi
D. Scurvy

39. If the eye value of a microscope is X5 and the total magnification is X200. Then the objective value is
A. X1000
B. X195
C. X40
D. X20

40. The car uses petrol and give out smoke, in living things this is equivalent to:
A. Movement and respiration
B. Locomotion and nutrition
C. Nutrition and respiration
D. Nutrition and excretion

41. The following are the products of anaerobic respiration process in animals except:
A. Lactic acid
B. Carbon dioxide
C. Alcohol
D. Water

42. The ability of a human body to resist infection by disease causing micro-organisms is known as:
A. Vaccination
B. Inoculation

C. Vaccine
D. Immunity

43. The part of alimentary canal which rolls the chewed food into bolus is called
A. Pharynx
B. Tongue
C. Oesophagus
D. Epiglottis.

44. Viruses are:
A. Eukaryotes
B. Prokaryotes
C. Both eukaryotes and prokaryotes
D. Neither eukaryote nor prokaryotes.

45. Cardiac muscle can be found in which part of the animal body?
A. Skull
B. Heart
C. Small intestine
D. Limbs

46. The kidney in animals is mainly responsible for
A. excretion
B. digestion
C. transportation
D. respiration

47. A term used to identify an individual animal with both male and female sex organs is:
A. unisexual
B. hermaphrodite
C. asexual
D. dioecious

48. The structure found in bacteria are
A. Plasmid, flagella and cilia
B. cytoplasm, cilia and plastids
C. cell wall, plasmid and flagella
D. cell membrane, flagella and hairs

49. Which of the following is a seed bearing plant
A. liverwort
B. fern
C. sisal
D. mosses

50. A part of an onion bulb which is important for vegetative propagation is:
A. scale leaves
B. foliage leaves
C. terminal buds
D. roots

51. Rise of body temperature in the human body is corrected mainly by:
A. dilating the skin arteries and sweating
B. constricting the skin arteries and shivering

C. dilating the skin veins and shivering
D. constricting the skin veins and shivering

52. The stamen of a flower consist of:
A. stigma and ovary
B. anther and stamen
C. filament and ovary
D. anther and filament

53. Which of the following series of activities take place together when focusing distant object?
A. Ciliary muscles relax and the lens becomes thin
B. Ciliary muscles contract and the lens becomes thin
C. Ciliary muscles contract and the lens becomes thick
D. Ciliary muscles relax and the lens becomes thick

54. People with blood group …… are called universal recipients.
A. AB
B. B^+
C. O
D. A

55. Which of the following is not a type of underground storage organ?
A. Bulb
B. Stoma
C. Corm
D. Rhizome

56. In which of the following are the largest amount of nitrogen excreted from the mammalian body?
A. Faeces
B. Sweat
C. Urine
D. Oxygen

57. A group of animals that maintain the body temperature at more or less constant is;
A. Cold blooded animals.
B. Homiotherm .
C. Regulators
D. Poikilotherm

58. A phylum chordata includes all animals that have…….
A. Mammary glands
B. Post anal tail
C. Back bone
D. Scales

59. If a parent cell has twelve chromosomes, how many chromosomes will be in the daughter cells formed after meiosis.
A. Six(6)
B. Twelve (12)

C. Eight (8)
D. Twenty four (24)

60. Night blindness in human body is avoided by eating……
A. Oranges
B. Carrots
C. Red meat
D. green vegetables

61. Which part of a gill of a fish is involved in gaseous exchange?
A. gill slits B. gill bars C. gill filaments D. gill scale

62. The movement of diaphragm is characteristic of gaseous exchange in
A. insect B. fish C. mammal D. amoeba

63. Which of the following will happen when the volume of the thoracic decreases.
A. Air circulates well in the lungs
B. The lungs expand
C. The ribs move upwards
D. The pressure within the lungs increases

64. Floating microscopic plants are called …….
A. Zooplankton
B. Newton
C. Phytoplankton
D. Benthos

65. The unique habitat created by mixing a fresh and salt water is.
A. Brackish
B. river
C. lake
D. ocean

66. If the gall bladder of a man is removed by surgical operation. Which of the following processes will be most seriously affected.
A. Digestion of lipids
B. Formation of urine
C. Digestion of starch
D. Digestion of protein.

67. Which of these is not a function of mammalian blood?
A. Engulfing bacteria
B. Production of hormones
C. Transporting urea
D. Transport of glucose.

68. Conjugation as a method of reproduction occurs in…….
A. Hydra
B. Spirogyra
C. Mucor
D. Rhizopus

69. The cell division responsible for growth is called…….
A. Mitosis
B. Binary fusion

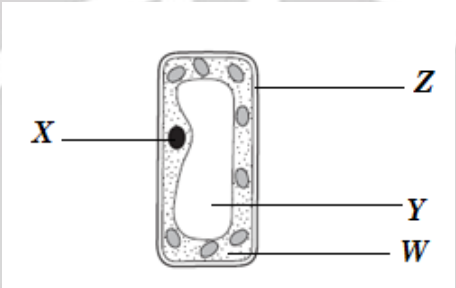
C. Meiosis
D. Conjugation

70. Which of the following is the accessory organ of the digestive system?
A. Kidney
B. Spleen
C. liver
D. lungs

71. Which of these is not an excretory product of plants?
A. Tanin
B. Gum
C. Alkaloid
D. sweat

72. Which two structures are found in all plant epidermal cells?
A. Cell wall and chloroplasts
B. Cell wall and nucleus
C. Chloroplasts and starch grains
D. Nucleus and sap vacuole

73. The diagram below shows a plant cell.

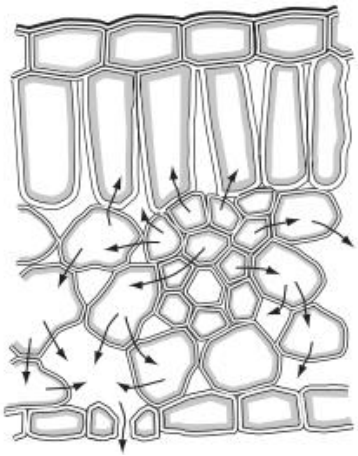


Which structure identifies this as a plant cell rather than an animal cell?

A. W
B. X
C. Y
D. Z

74. The cell of a plant cell is removed using an enzyme, what would happen if this cell is then placed in distilled water.
A. It would take longer for the cell to become turgid.
B. Proteins in the cytoplasm would leave through the cell membrane
C. The cell would become smaller as water passes out
D. The cell would burst as water moves into it

75. The diagram below shows a section through a green leaf.



The arrows represent the movement of;

A. Carbon dioxide during respiration
B. Oxygen during photosynthesis
C. Sugars during translocation
D. Water during transpiration

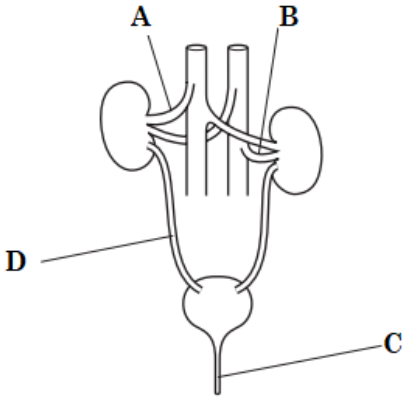
76. What is the enzyme that controls a reaction in which both the enzyme and the substrate can denature at high temperature?

A. Amylase
B. Insulin
C. Lipase
D. Protease

77. Which chemical test shows the presence of an enzyme in a biological washing powder?

A. Benedicts
B. Biuret
C. Ethanol emulsion
D. Iodine solution

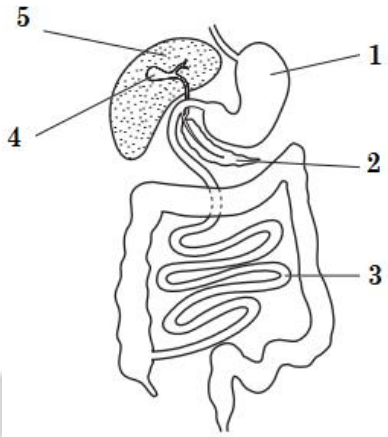
78. The diagram shows the human urinary system which labelled structure is the ureter?



79. Where are most nitrogen compounds excreted from human?

A. Kidney
B. Liver
C. Rectum
D. Skin

80. The diagram shows part of the alimentary canal and associated organs.



Which row correctly describes the function of parts shown in the diagram?

	Part	Function	Part	Function
A	1	Digestion of proteins	3	Absorption of products of digestion
B	2	Emulsifying fats	3	Absorption of amino acids
C	4	Production of bile	5	Making digestive enzymes
D	4	Storing digestive enzymes	2	Making digestive enzymes

81. Which process involves the use of nutrients inside cells?

A. absorption
B. assimilation.
C. digestion
D. ingestion

82. Under which set of conditions will the transpiration rate of a well-watered plant be fastest?

A. a cool, dry, windless day
B. a cool, rainy, windy day
C. a hot, dry, windy day
D. a hot, rainy windy day

83. When a complete ring of bark is removed from the trunk of a tree, it will eventually die because this action cuts off the supply of?

A. Mineral salts to the leaves
B. Nutrients to the roots
C. Oxygen to the leaves
D. Water to the leaves

84. Which word equation shows anaerobic respiration in yeast?

A. Glucose →ethanol
B. Glucose → ethanol + carbon dioxide
C. Glucose → lactic acid
D. Glucose → lactic acid + carbon dioxide

85. Which of the following processes doesn't require energy?

A. Focusing of eye
B. growth of hair
C. secretion of sweat
D. tissue respiration

86. What structure covers the pupil of a human eye?

A. Conjunctiva and cornea
B. Conjunction and sclera
C. Cornea and retina
D. Retina and sclera

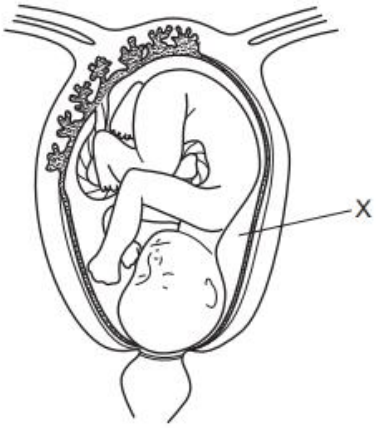
87. Which of the following is always essential for seeds to begin germinating?

A. Carbondioxide
B. Light
C. Mineral salts
D. Oxygen

88. Which substance are present in breast milk but not in bottled milk made from powder.

A. Antibodies
B. Carbohydrates
C. Proteins
D. Vitamins

89. The figure below show a developing fetus in the uterus. Name the liquid found at X



A. Amniotic fluid
B. Blood
C. Urine
D. Water

90. What would be the result of cutting the sperm ducts of the right and left sides in a man.

A. He would become sterile
B. He would be unable to develop sperms
C. He would be unable to pass urine
D. Male sex hormones would no longer circulate in the blood.

91. Which of the following may be heterozygous?

A. A haploid cell
B. An allele of a gene
C. An organism with dominant phenotype
D. An organism with a recessive genotype

92. A human cell contains all of the following. Which is the smallest size,.

A. Gene
B. Nucleus
C. X- chromosome
D. Y- chromosome

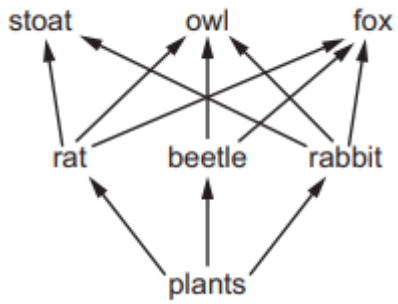
93. What is a result of a natural selection?

A. Dogs that are friendly to humans
B. Grapes that contain seeds
C. Mosquitoes that are resistant to insecticides
D. Onion crops that have a pleasant taste

94. Which sequence describes the flow of energy in an ecosystem?

A. carnivore → herbivore →plant → sun
B. plant →herbivore →carnivore →sun
C. Sun →plant →herbivore →carnivore
D. Sun →plant→herbivore →canivore

95. The diagram shows a food web.



What is likely to happen to the owl population if foxes die out.

A. It will decrease because there will be more competition with stoats for food
B. It will increase because there will be more rats, beetles and rabbits for them to eat
C. It will stay the same because owls do not eat foxes.
D. It will stay the same because stoats will eat less food

96. The diagram below shows a food chain.
Mahogany tree → caterpillar→ song bird →hawk
Identify the type of organism with the largest number in this food chain.

A. Carnivores
B. Consumers
C. Herbivores
D. Produces

97. Which of these is a sign of diabetes mellitus?

A. Lack of haemoglobin
B. Raised blood glucose
C. Reduced urine production
D. Too much insulin

98. Which bones form a joint at the shoulder?
A. humerus and scapular
B. humerus and ulna
C. radius and ulna
D. radius and scapular

99. Which disease is first recognized by painless ulcers which can be anywhere on the body.

A. Anaemia
B. Rickets
C. Scurvy
D. Syphilis

100. During the production of alcohol, why must air be kept out of the fermenter?

A. To allow production of carbon dioxide
B. To inhabit the growth of yeast
C. To prevent complete combustion
D. To allow complete combustion

END OF MCQ

COMMON TERMS AND THEIR MEANING

Key word	Meaning
Nutrition	Taking in nutrients which are organic substances and mineral ions, containing raw materials and energy for growth and tissue repair, absorbing and assimilating them.
Excretion	Removal from organisms of toxic materials, the waste products of metabolism and substances in excess.
Respiration	Chemical reactions that break down nutrient molecules in living cells to release energy.
Sensitivity	The ability to detect or sense changes in the environment and to make responses.
Reproduction	Progresses that make more of the same kind of organism.
Growth	The permanent increase in size and dry mass by an increase in number of cells, cell size, or both.
Movement	An action by an organism or part of an organism that changes position or place.
Elements	Elements are substances that consist of only one kind of atoms and cannot be broken down into simpler substances by chemical means.
Solute	This is a substance that dissolves in a solvent forming a solution
Solvent	This is a substance in which a solute dissolves forming a solution
Solution	A uniform mixture which is formed when a solute is dissolved in a solvent.
Saturated Solution	A very concentrated solution with the maximum amount of solute that dissolve in it already dissolved in it.
Solubility	The maximum amount of solute that can dissolve in 100g of water at a particular temperature.
Chromatography	Chromatography is a process used to separate and identify two or more substances from a mixture.
A cell	Is the smallest unit that can carry on all the processes of life.

Diffusion	The net movement of particles from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of random movement
Osmosis	The diffusion of water molecules from a region of their higher concentration (dilute solution) to a region of their lower concentration (concentrated solution) through a partially permeable membrane.
Active Transport	The movement of ions, in and out of a cell, through a cell membrane, from a region of their lower concentration to a region of their higher concentration,
Enzymes	Are proteins that function as a biological catalyst.
A catalyst	A substance that speeds up a chemical reaction but isn't changed by the reaction.
Nutrition	Taking in nutrients which are organic substances and mineral ions, containing raw materials and energy for growth and tissue repair, absorbing and assimilating them. Nutrition is one of the characteristics of living organisms.
Ingestion	Taking in pieces of food into the mouth
Digestion	The breakdown of large, insoluble food molecules into smaller more soluble ones by chemical and mechanical means.
Absorption	Taking the digested food molecules into the cells
Assimilation	Making use of the digested food molecules for example to release energy or grow etc.
Egestion	The elimination of undigested food materials through the anus
The Pulmonary vein	it transports oxygenated blood from the lungs to the right atrium.
The Aorta	the biggest artery in the body, it transports oxygenated blood from the heart to the rest of the body.
The Vena Cava	the biggest vein in the body, it transports deoxygenated blood from the whole body to the heart.
The pulmonary artery	it transports deoxygenated blood from the heart to the lungs.
Photosynthesis	It is the process by which plants make useful glucose out of the raw materials water and carbon dioxide, using light energy from the sun.
Capillarity	is a factor that helps in the movement of water in the xylem vessels. The water molecules are attracted to

	each other, as one moves upwards it pulls its neighboring molecule with it.
Translocation	This is the transport of organic food such as sucrose and amino acids in the plant through the phloem vessels.
Wilting	Occurs when the transpiration rate is faster than the rate of water absorption.
Rusting	Rusting is the corrosion of iron as a result of reaction with oxygen from air and water.
Respiration	is a chemical reaction that breaks down food molecules in living cells to release energy.
Aerobic Respiration	A chemical, metabolic reaction that burns down glucose with oxygen producing carbon dioxide, water vapour and lots of energy
Aerobic Respiration	the release of relatively large amounts of energy in cells by the breakdown of food substances in the presence of oxygen.
Anaerobic Respiration:	Some organisms are able to respire and release energy when oxygen is lacking. This is anaerobic respiration. These are like yeast, bacteria and other organisms. Humans can also respire anaerobically for a short period of time. The amount of energy produce is much smaller than that produced during aerobic respiration though
Anaerobic respiration	The release of relatively small amount of energy by the breakdown of food substances in the absence of oxygen.
Excretion	Is the removal of toxic materials, the waste products of metabolism and substance in excess of requirements from organisms.
Homeostasis	Ability to maintain a constant internal environment so that every organ and cell is provided the perfect conditions to perform its functions.
Vasoconstriction	This causes the blood vessels to become narrower to reduce heat loss. They also sink deep into the skin to increase the distance heat has to travel to escape thus reducing heat loss.
Reproduction	Is a characteristic of all living organisms. It is the process that makes more of the same kind of organism. Reproduction is essential in all species to ensure that the species does not extinct
Asexual Reproduction	Asexual means not sexual. This means that this kind of reproduction does not involve sex. Asexual

	reproduction is the production of genetically identical offspring from one parent.
Asexual Reproduction in Bacteria	Bacteria are tiny single-celled organisms. They reproduce by a process called binary fission. In binary fission, one bacterium grows and exact copy of it's DNA coil which carries its genetic information.
Sexual Reproduction	Sexual reproduction is the process involving the fusion of haploid nuclei to form a diploid zygote and the production of genetically dissimilar offspring.
Pollination	Is the transfer of pollen grains from the male part of a flower to the female part of a flower.
Self-pollination	The transfer of a pollen grain from the anther to the stigma of the same flower or the stigma of a flower of the same plant.
Cross Pollination	The transfer of a pollen grain from the anther to the stigma of a flower of another plant of the same species.
Seed dispersal	Is the scattering of the seeds all over the place to colonise the area.
Ejaculation	The ejection of semen out of the body
Birth Control	Birth control is controlling the number of children and the time to have them.

S4 JOINT MOCK EXAMINATIONS
TIME TABLE 2023 (UCE)

DAY& DATE	PERIOD	SUBJECT	DURATION
Friday 21st/07/2023.	Afternoon	Briefing Candidates	2 h
Monday 24th/07/2023.	Morning	456/1 Mathematics	2 h 30min
	Afternoon	456/2 Mathematics	2 h 30min
Tuesday 25th/07/2023.	Morning	273/1 Geography	2 h 30min
	Afternoon	273/2 Geography	2 h 30min
Wednesday 26th/07/2023.	Morning	112/1 English Language	2 h
	Afternoon	112/2 English Language	2 h
Thursday 27th/07/2023	Morning	241/1 History: East Africa	2 h
	Afternoon	241/2 History: West Africa 241/3 History: Central Africa 241/4 History: South Africa	2 h 2 h 2 h
Friday 28th/07/2023	Morning	545/1 Chemistry	1 h 30min
	Afternoon	545/2 Chemistry	2 h
Monday 31st/07/2023	Morning	545/3 Chemistry (Practical)	2 h
	Afternoon	208/1 Literature in English	2 h 30min
Tuesday 01st/08/2023	Morning	553/1 Biology	2 h 30min
	Afternoon	527/1 Agriculture	2 h 30min
Wednesday 02nd/08/2023	Morning	535/1 Physics	2 h 15min
	Afternoon	535/2 Physics	2 h 15min
Thursday 03rd/08/2023	Morning	535/3 Physics (practical)	2 h 15min
	Afternoon	840/2 Computer studies	2 h 30min
Friday 04th/08/2023	Morning	223/1 CRE: Christian living today 224/1 CRE: St. Luke's Gospel 225/1 Islamic religious education	2 h 30min 2 h 2 h
	Afternoon	840/1 Computer studies	2 h 30min
Monday 07th/08/2023	Morning	314/3 French: Writing expression/composition 336/1 Lugha Ya Kiswahili 337/1 Arabic: Grammar, Reading, comp& Trans 335/1 Luganda 345/1 Runyankore/Rukiga 355/1 Lusoga 385/1Runyoro/Rutoro 395/1 Lumasaaba 315/1 Leb Lango	1 h 30min 2 h 30min 2 h 2 h 2 h 30min 2 h 30min 2 h 30min 2 h 30min 2 h 30min
	Afternoon	314/2 French: Grammar & Reading 337/2 Arabic: composition & summary 335/2 Luganda 355/2 Lusoga 345/2 Runyankore/Rukiga 385/2Runyoro/Rutoro 395/2 Lumasaaba 315/2 Leb Lango	1h 30min 1h 30min 2h 30min 2 h 30min 2 h 30min 2 h 30min 2 h 30min 2 h 30min

Tuesday 08th/08/2023	**Morning**	**612/2 IPS Art: Still Life/Nature**	**2 h 30min**
	Afternoon	**800/1 Commerce** **810/1 Principle of accounts**	**2 h 30min** **2 h 30min**
Wednesday 09th/08/2023	**Morning**	**553/2 Biology (Practical)**	**2 h**
	Afternoon	**612/3 IPS Art: Living person**	**2 h**
Thursday 10th/08/2023	**Morning**	**527/2 Agriculture (practical)**	**2 h 15min**
	Afternoon	**224/5 CRE: African Religious Heritage** **225/2 Islamic religious education**	**2 h** **2 h**
Friday 11th/08/2023	**Morning**	**845/1 Entrepreneurship Education.**	**2 h 30min**
	Afternoon	**845/2Entrepreneurship** **535/4 Physics (Practical)**	**2 h 30min** **2 h 15min**
Monday 14th/08/2023	**Morning**	**612/1 IPS Art: Studio Technology**	**2 h**
	Afternoon	**545/4 chemistry (Practical)**	**2 h**
Tuesday 15th/08/2023	**Morning**	**612/5 IPS Art: Craft A (Planning)**	**2 h 15min**
	Afternoon	**612/5 IPS Art: Craft A (Test)**	**3 h**
Wednesday 16th/08/2023	**Morning**	**612/4 IPS Art: Imaginative comp.(sketching session)**	**2 h**

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