MKS-2015

BIOLOGY FORM 2 END OF YEAR EXAMINATION- 2015.

**SECTION A(ANSWER ALL QUESTIONS 45MKS)**

1. What characteristics of life are exhibited by the following?

a) An orange tree producing juicy oranges? (1mk)

***Reproduction√1***

b) An athlete breathing heavily after running a marathon? (1mk)

***Gaseous exchange/respiration√1***

2. What are the functions of the following apparatus used in collection of specimen? (2mks)

 i) Pooter - ***sucking small animals from rock surfaces or barks of trees.√1***

 ii) Bait trap-***attracting and trapping small animals eg. Rats.*** √1

3. What is meant by taxonomy? (1mk)

 ***Is the branch of biology/science that deals in classification of living organisms.√1***

4. Give **two** main characteristics of members of the same species. (2mks)

 ***Inter-breed naturally/freely. –produce viable/fertile offspring.√1***

5a) What is meant by Binomial nomenclature? (1mk)

***Is the double naming system where organisms are given a genus and a species name.√1***

 b) The scientific name for a sweet potato is **ipomea Batata.**  Identify two mistakes made when writing the scientific name and offer a solution. (2mks)

***Genus name starts with small letter instead of capital letter. soln.Ipomea √1***

***Species name starts with a capital letter instead of small letter. Soln. batata.√1***

 ***Scientific name underlined jointly instead of separately when hand written.soln. Ipomea batata√1***

***Written in print but not italicized. Soln. Ipomea batata √1 2x1=2mks max.***

6. What are the functions of the following parts of a microscope? (2mks)

 i) Condenser- ***concentrates light on the object on the stage****.√****1***

 ii) Diaphragm ***– regulates the amount of light passing through the condenser to illuminate the specimen. √1***

7. Outline the functions of the following cell organelles. (2mks)

 i) Ribosomes ***– protein synthesis.√1***

 ii) Lysosomes **– *contain lytic enzyme which break down large molecules, destroy worn out organelles or even the entire cells.√1***

8. Using a microscope, a student counted 55 cells across a field of view whose diameter was 6000 um. Calculate the average length of the cells. Show your working. (2mks)

 ***Length of cell = Diameter of field of view√1 = 6000um =109.0909/109.1um√1***

 ***Number of cells. 55***

9. The diagram below shows results of what happens to plant cell when placed in a certain solution.

X

1. What was the nature of the solution in which the cell was placed? (1mk)

***Hypotonic solution √1***

1. Identify the force represented by the arrow X and explain how it develops. (2mks)

***Turgor pressure√1: the cell gained water by osmosis and become turgid. Rej. Absorbed for gained. √1 1`x2=2mks***

10. Name **three** cells in a leaf that contain chloroplasts. (3mks)

***Guard cell√1. Palisade layer√1. Spongy mesophyll layer.√1 1x3=3mks***

11. What are the products of the light stage of photosynthesis. (2mks)

***Hydrogen atoms√1. Oxygen√ 1***

12. Study the diagram of the mammalian tooth **below** and answer the questions that follow.



 (a) Identify the tooth. (1mk)

 ***Pre-molar√1****.*

 (b) Give a reason for your answer in (a) above. (1mk)

***Have two roots.√1***

 (c) State **one** adaptation of the tooth to its function. (1mk)

***Has a wide top surface to increase the surface area for grinding/chewing food.√1***

 ***Have cusps to increase surface area for chewing.√1 1x1=1mk***

13. The diagram below shows chemical reactions I and II which are controlled by enzymes.

 Glucose + Glucose

 Reaction II Reaction I

 Enzyme B Enzyme A

 Maltose + Water

1. Into which class of carbohydrates is maltose (1mk)

***Disaccharides.√1***

1. Name reaction I and enzyme A (2mks)

 Reaction I *–****Condensation.√1***

 Enzyme A –***Maltase.√1***

14. (i) Identify the mode of feeding of the animal whose dental formula is shown below.(1mk)

I O C O PM 3 M 3

 3 O 3 3

***Herbivorous√1: Rej. Herbivore*.**

 (ii) Give reasons for your answer in 14(i) above (2mks)

 ***Presence of a diastema.√1***

 ***Have horny pad/ absence of upper incisors.√1 2x1=2mks***

15. The diagram below represents a transverse section of a plant organ.



 (a)From which plant organ was the section obtained? (1mk)

 ***Dicotyledonous root/root√1***

 (b) Give **one** reason for your answer in (a) above. (1mk)

***Presence of root hairs√1. Star- shaped xylem √1.Endodermis****.√1* ***1x1=1mk***

16. The epidermis of a leaf is adapted to have the specialized cells known as the guard cell such as shown below.

Guard cell

X

Epidermal cell

●

●

●

●

 (a) (i) Name the structure labelled **X** on the diagram. (1 mk)

 ***Stoma√1,Rej. Stomata.***

 (ii) State **three** adaptations of the guard cell to its function of opening and closing of stomata in plants. (6 mks) 3x2=6mks

* ***The walls of the guard cell are differentially thickened with the inner membrane to open the stoma when turgid.√2***
* ***The cell is rich in mitochondria for photosynthesis which creates sugar for high osmotic gradient of the cell which draws in water from adjacent cells.√2***
* ***Bean and sausage shaped to create pore/aperture/stomata for gaseous exchange.√2***

 (b) The mammalian lung is known to have adapted the mammal to terrestrial habitat by having a pleural membrane.

1. State **two** functions of a pleural membrane that gives the mammal advantage over other organisms. (2 mks)

***-Secretes pleural fluids;√1***

***-Holds the lungs in pleural cavity√1***

***-Protection of lungs √1 1x2=2mks***

 (ii) Name **two** diseases of the respiratory system. (1 mk)

 ***Lung cancer√1/2. Asthma√1/2. Acute/chronic Bronchitis.√1/2 Pneumonia√1/2***

 ***Tuberculorises pneumonia√1/2 2x1/2=1mk max.***

**SECTION B (ANSWER ALL QUESTIONS 15MKS)**

17a). What is meant by the following terms. (3mks)

 i) Respiration Quotient (RQ).

 ***It’s a ratio showing the relationship between the amount of carbon(IV) oxide produced against the amount of oxygen consumed during respiration.√ 1mk***

 ii) Oxygen debt.

 ***Amount of oxygen required to get rid of lactic acid that accumulates in the body tissues when the supply of oxygen is less than demand. √ 1mk***

 iii) Basal metabolic rate.

 ***Is the energy required to maintain normal body functions when the body is at rest eg.breathing, heart beat, blood circulation and maintenance of constant body temperature. √ 1mk***

1. What is the role of mitochondrion in respiration? (1mk)

***Has cristae to provide large surface area for attachment of respiratory enzymes.√1x1=1mk***

1. Outline **three** differences between Aerobic and Anaerobic respiration.(3mks) ***3x1=3mks***

***Aerobic respiration Anaerobic respiration***

***1. Over a short period of time, energy is 1.Over a short period of time, energy released***

***Not released faster.√1/2 Faster.√1/2***

***2. Water molecules are produced. √ 1/2 2. Water molecules are not produced.√1/2***

***3. Substrate is completely broken down 3.Substrate is not completely broken down and as***

***To carbon (IV) oxide and water. √1/2 A result lactic acid or alcohol is produced.√1/2***

***4. Oxygen is necessary to ensure a 4. Oxygen is not necessary hence substrate is***

***Complete combustion or oxidation not broken down completely.√1/2***

***Of substrate.√1/2***

***5. End products are water and carbon(IV) 5.End products are alcohol in plants and lactic***

***Oxide which diffuses out of the cells and acid in animals. Both which are toxic to cells when***

***Is excreted before it accumulates in the let to accumulate in the body.√1/2***

***Body to toxic levels.√1/2***

18. In an experiment on respiration, the rate of carbon (IV) oxide production in pea seedlings was recorded under different temperature, as shown below.

Temperature Volume of CO2 produced (cm3)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time  | 0hr | 1st hr. | 2nd hr. | 3rd hr. | 4th hr. | 5th hr. | 6th hr. |
| 300 C | 0.0 | 9.0 | 13.0 | 20.0 | 21.5 | 23.0 | 24.5 |
| 35o C | 0.0 | 8.0 | 16.5 | 25.0 | 25.5 | 26.5 | 27.0 |
| 40oC | 0.0 | 12.0 | 23.5 | 30.0 | 26.0 | 18.5 | 10.0 |

1. Using the same axes, plot graphs to show volume of carbon(IV) oxide production at each temperature against time. Let time be on the horizontal axis. Use the graph paper provided.(5mks)***Attachedgraph√Axis=1mk, scale=1mk,plotting=1mk,curves=1mk,labeling=1mk.***
2. What is the optimum respiration temperature for this experiment? Explain how the answer is arrived at. (1mk)

***400C√1/2, because there is maximum volume of CO2 produced i.e 30 cm3 at the 3rd hr as shown on the graph.√1/2***

1. Suggest reasons for the shape of the graph when temperature was maintained at 40oC.

(2mks)

***Volume of CO2 produced decreases drastically√1, from optimum point as the enzymes involved in this reaction are denatured at this temperature, losing their enzymatic activity resulting in decrease in the volume of CO2 produced√1****.*

**SECTION C (ANSWER ONLY ONE QUESTION 20MKS)**

19. Describe the mechanism of **opening** and **closing** of stomata using.

a) Photosynthetic theory.(10mks)

 ***Opening.*** *1x5=5mks*

 ***In the guard cell there are chloroplasts which carry out photosynthesis in the presence of light during the day√1. During photosynthesis, glucose is produced in the guard cells√1,this increases the osmotic pressure in the guard cells than the neighboring epidermal cells,√1water then moves by osmosis and increases their turgidity√1. The inner walls of the guard cells being thicker than the outer walls allows the outer walls to stretch more than the inner walls causing guard cells to bulge outwards opening the stomata√1.***

 ***Closing.*** *1x5=5mks*

 ***During the night when there is no light no photosynthesis takes place in the guard cells.√1 Glucose in the guard cells is converted into starch lowering the osmotic pressure of the guard cells than the neighboring cells√1. Water is drawn away from the guard cells by osmosis into the neighboring cells making them to be flaccid√1, the thinner outer wall shrinks√1 and the curvature of thicker inner wall reduces then the stomata closes√1.***

b)Starch- sugar inter-conversion theory.(10mks)

***Opening.*** *1x5=5mks*

***During the day in the presence of light√1, photosynthesis occurs in the chloroplasts of the guard cells using carbon(IV) oxide lowering its concentration hence reducing the acidity of the guard cells /pH increases√1. This favors the conversion of starch to glucose which then increases the osmotic pressure of the guard cells higher than their neighboring cells√1. Water from the neighboring cells move into the guard cells by osmosis causing them to be turgid. √1The outer walls which are thinner than inner walls stretch more causing the guard cells to bulge outwards and stomata opens.√1***

***Closing.*** *1x5=5mks*

***In the night there is no light, no photosynthesis takes place in the chloroplasts of the guard cells√1 hence carbon (IV) oxide accumulates in the guard cells causing increase in acidity/pH lowers favoring the conversion of glucose into starch √1making osmotic pressure of the cell to lower than neighboring cells√1. Guard cells then lose water to the neighboring cells by osmosis they become flaccid and stomata closes.√ 1***

20. Describe the **structure**, **composition** and **functions** of components of mammalian blood.(20mks)

***Mammalian blood consists of :***

***Plasma.***

***Red blood cells/Erythrocytes.***

***White blood cells/Leucocytes.***

***Platelets/Thrombocytes.***

1. ***Plasma. √1*** *1x5=5mks*

***Is a pale yellow fluid consisting of 90% water in which a variety of substances are suspended and others dissolved it.eg, glucose, amino acids ,mineral salts, hormones, lipids, plasma proteins and some enzymes. It has the following functions1:***

***-Transports red blood cells which contain oxyhaemoglobin to the tissues facilitating oxygen transport.√1***

***-Forms a medium in which dissolved food substances are transported to the liver and other body tissues.√1***

***-Transports hormones.√1***

***-Regulates pH of the body fluids√1.***

***-Distributes heat around the body hence regulates body temperature.√1***

***-Transports metabolic wastes eg, urea, carbon(IV)oxide and other nitrogenous wastes to the excretory organs where they are eliminated by organs such as kidneys, lungs and the skin.√1***

 ***ii) Red blood cells./Erythrocytes. √1*** *1x5=5mks*

 ***In adults, they are made in the bone marrow of the short bones such as sternum, ribs and the vertebrate while in the embryo they are made in the spleen and liver√1.***

***They lack nucleus, contain haemoglobin, have biconcave shape, are many in number√1 and change their shape to squeeze in the narrow capillaries all to enhance their main function of oxygen transport to the cells and carbon(IV) oxide removal from the cells.√1***

 ***iii)White blood cells/Leucocytes√1.*** *1x5=5mks*

 ***They are nucleated, lack haemoglobin hence colourless and fewer in number in blood than red blood cells√1.***

 ***They consist of lymphocytes which protect the body from infection in the following ways:***

 ***-Antibodies which are antitoxins neutralize the toxins or antigens produced by pathogenic Micro-organisms.√1***

 ***-Lysins destroy micro-organisms by digesting their cell membranes or walls.√1***

 ***-Opsonins are antibodies which adhere to the outer surface of micro-organisms making it easier for phagocytes to ingest them.√1***

 ***-Some antibodies such as agglutinins cause clumping together of micro- organisms***

 ***Stopping them from multiplying and eventually they die.√1***

 ***iv)Platelets/Thrombocytes.√1*** *1x5=5mks*

 ***Are fragments from large cells in the bone marrow. They are discoid in shape and assume a star-shape appearance in extracted blood√1. Have no nucleus and their number is***

***Approximately 2.5 million per mm3 of blood.√1***

 ***Their important role is blood clotting when blood vessels are injured.√1***