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NAME:..... STREAM:.....

SENIOR FOUR

553/1

BIOLOGY

PAPER 1

EXAM 5

INSTRUCTIONS:

- Answer all questions in Section A and Section B, plus two questions in Section C.

SECTION A
Attempt all questions.

1. Figure 1, below shows part of the epidermis of a leaf.



Figure 1

The difference between cell A and B is that;

- A. A can photosynthesize while B cannot.
- B. B has a cell wall while A does not.
- C. B has chloroplasts while A does not.
- D. B has a nucleus while A does not.

A

2. Arthropods are most successful group of organisms on land because;
- A. They have a water proof exoskeleton
 - B. They can move very fast
 - C. They have jointed legs,
 - D. They have segmented bodies.
- A
3. Which one of the following groups of organisms belong to phylum coelenterate?
- A. Tilapia and snake
 - B. Jelly fish and sea anemone
 - C. Earth worm and leech
 - D. Crab and wood louse
- B
4. The interaction between two species as both attempts to use the same environmental resources would be termed as;
- A. Competition
 - B. Parasitism
 - C. Commensalism
 - B. Predation
- A

In parasitism one organism feeds on another living organism

In commensalism is a relationship where one organism benefit from another which does not benefit or lose anything from the relationship

In predation one organism the predator kills instantly and feeds on another organism the prey

5. The following are adaptations of hydrophytes to their habitats except;
- A. Most emergent and floating types have broad leaves.
 - B. They are deeply modified into thread like straws.
 - C. They are shallow rooted with buttress roots.
 - D. They have large air-filled tissues.
- C
6. The following reagents are used to test for food substances.
- i. Iodine solution
 - ii. Copper II sulphate solution
 - iii. Dilute hydrochloric acid
 - iv. Dilute sodium hydroxide solution
- Which of the above can be used to test for proteins?
- A. ii and iii
 - B. i and iv
 - C. ii and iv
 - D. ii only
- B

When testing for proteins to a food sample dilute sodium hydroxide is added followed by a few drops of copper sulphate solution
Presence of proteins is indicated by a purple solution

7. Which of the following enzymes convert starch to maltose and maltose to glucose respectively?
- A. Amylase, lactose
 - B. Amylase, maltose
 - C. Amylase, catalase
 - D. Amylase, maltase.
- D

8. A germinating seed was subjected to a food test. What food substance was found to be in large amounts?
- A. Fats
 - B. Glucose
 - C. Carbohydrates
 - D. Proteins
- B

During germination starch is converted to glucose

9. Which of the following happens when ventricles contract?
- A. Blood is conveyed to the Aorta and pulmonary artery.
 - B. Blood is conveyed to the vena cava and pulmonary vein.
 - C. The bicuspid and tricuspid valves open and blood enters the ventricles.
 - D. Blood in the veins moves much faster.
- A

10. In which two parts of the alimentary canal are proteins chemically digested?
- A. small intestines and mouth
 - B. mouth and duodenum
 - C. stomach and duodenum
 - D. mouth and stomach.
- C

In the stomach proteins are broken down by pepsin and in the duodenum by trypsin

11. Which of the following pairs consists of fat soluble vitamins?
- A. B and A
 - B. B and C
 - C. K and C
 - D. A and D
- B

Fat soluble vitamins are ADEK

12. The presence of starch and not glucose is used to show that photosynthesis take place in the leaves. This is because;
- A. Glucose is always formed during photosynthesis.
 - B. Starch is always formed during photosynthesis.
 - C. Glucose formed is immediately converted to starch.
 - D. Glucose is never formed in leaves.
- C

13. Which of the following dental formulae is associated with a carnivore?

- A. $I^{3/3}$ $C^{1/1}$ $PM^{4/4}$ $M^{2/3}$
- B. $I^{2/1}$ $C^{0/0}$ $PM^{3/2}$ $M^{3/3}$
- C. $I^{0/1}$ $C^{0/1}$ $PM^{3/3}$ $M^{3/3}$
- D. $I^{0/0}$ $C^{2/3}$ $PM^{0/3}$ $M^{2/3}$

A

14. A pregnant mother suffers from weakened bones and teeth, the vitamin and minerals to correct the defect are;

- A. Vitamin C, phosphorous and calcium
- B. Vitamin B, iodine and calcium
- C. Vitamin A, calcium and clay
- D. Vitamin D, phosphorous and calcium.

D

15. Which one of the following best describes the term “single circulation” in fish?

- A. Blood flows into gills and then into the body.
- B. Blood passes through the heart once for every complete circulation
- C. Blood passes through two chambers of the heart
- D. Blood first flows through arteries and then through the veins.

B

16. Figure 2 below, shows a section through a mammalian kidney.

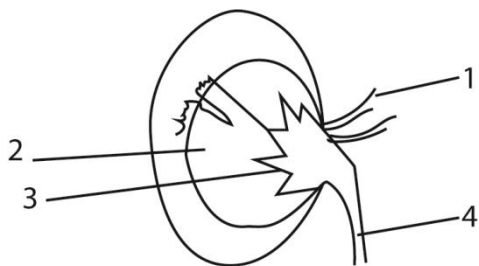


Figure 2

Which of the following shows the correct sequence of naming the parts labeled 1-5 in that order?

- A. Medulla, cortex, ureter, pyramid, renal artery.
- B. Renal artery, cortex, medulla, pyramid, ureter
- C. Renal artery, medulla, pyramid, ureter
- D. Ureter, cortex, medulla, pyramid, renal artery.

C

17. Which of the following is a deficiency disease?

- A. Short sightedness
- B. Colour blindness
- C. Night blindness
- D. Trachoma

C

18. Vertebral canals, broad flat transverse processes are characteristics of;
- A. Cervical vertebra
 - B. Sacral vertebra
 - C. Lumbar vertebra
 - D. Thoracic vertebra.

A

19. The urine of a healthy person contains no glucose because;
- A. The nephron is impermeable to glucose.
 - B. Glucose passes back into blood stream.
 - C. The kidney converts glucose to urea
 - D. Glucose is used for respiration before reaching the collecting ducts.

B

20. The following processes are carried out ONLY by living organisms except;
- A. Denitrification
 - B. Nitrification
 - C. Decay
 - D. Nitrogen fixation

D

Nitrogen fixation can be carried by lightning

21. Which of the following changes occur when one walks out of bright sunshine to a poorly lit room? The:
- A. circular iris muscles contract
 - B. circular iris muscles relax
 - C. lens becomes thicker
 - D. pupil narrows.

B

22. The movement of the part of a plant in response to a non-directional stimulus is referred to as;
- A. tropism
 - B. taxis
 - C. nastic
 - D. phototropism

C

23. A woman who has small breasts, beards and a deep voice is likely to be having an over secretion of;
- A. testosterone
 - B. Oestrogen
 - C. oxytocin
 - D. adrenalin

A

24. The route followed by an impulse passing along a motor neuron is;
- A. Nerve endings, dendrone, axon, dendrites.

- B. Cell body, axon, dendrone, dendrites
- C. Nerve endings, dendrites, dendron, and axon
- D. Dendrites, dendron, axon, nerve endings.

B

25. 160cm^3 of water added to 250cm^3 of dry soil. The volume of the mixture after stirring was 380cm^3 . Calculate the percentage of air in the soil sample?

- A. 7.9%
- B. 12%
- C. 25%
- D. 34%

B

Amount of air = $(250 + 160) - 380 = 30\text{cm}^3$

Percentage of air = $\frac{30}{250} \times 100 = 12\%$

26. Study the following figure 3 and answer the questions that follows;

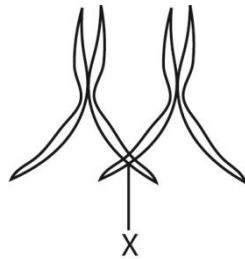


Figure 3

The part marked X on the pair of the chromosomes is called;

- A. Crossing over
- B. Centromere
- C. Chiasma
- D. Chromatid.

C

27. The circulatory system of an embryo is never in direct connection with mothers' blood vessels because;

- A. It is connected to the uterus by the placenta.
- B. Mother blood pressure would burst the capillary of the embryo.
- C. The mother blood contains blood and respiratory gasses.
- D. Many substances in mothers' blood are poisonous.

B

28. The following mechanisms would lead to evolution to occur except;

- A. Mutation
- B. Isolation
- C. Speciation
- D. Inbreeding

D

29. Growth can be measured using any of the following methods except;
- A. Age of the organism
 - B. Length of the organism
 - C. Volume of the organism
 - D. Fresh and dry weight of the organism.

A

30. The following occur during mitosis in animal cells:
- i) chromosomes thicken and become more visible.
 - ii) centromere divide
 - iii) chromosomes line up at the equator of the spindle
 - iv) daughter centromeres are pulled to the opposite poles of the spindles.

Which of the above occur during anaphase?

- A. i and ii
- B. i and iii
- C. ii and iv
- D. iii and iv

D

SECTION B

Attempt all questions.

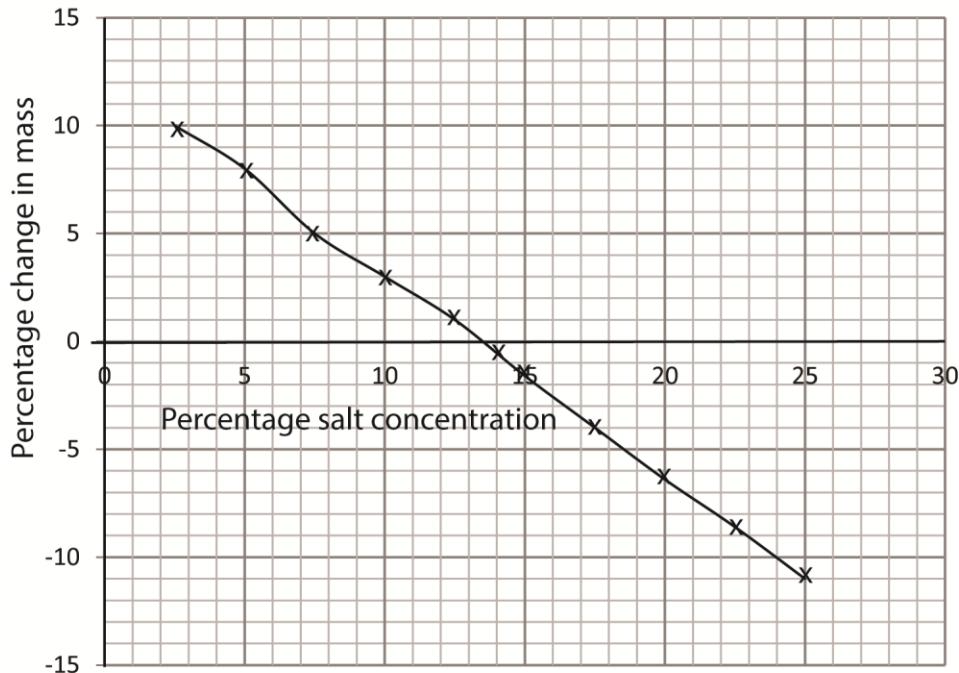
31. Small pieces of potato were placed in solution of different salt concentrations. After four hours, they were removed from the solution, wiped dry and reweighed. The results were as shown in the table;

Percentage salt concentration	Percentage change in mass
2.5	+10
5.0	+8
7.5	+5
10.0	+3
12.5	+1
15.0	+1.6
17.5	-4
20.0	-6.4
22.5	-8.6
25.0	-11

- a. Represent the results on a graph (Percentage change in mass on a vertical axis and percentage salt concentration on horizontal axis)

(9 marks)

Percentage change in mass against percentage salt concentration



- b. How does the weight of the cylinder vary with salt concentration?

(2 marks)

Below 13.5% salt concentration, the weight of cylinder increases as the salt concentration decrease; above 13.5% salt concentration the weight of the cylinders decrease as the concentration increases

- c. From the graph, determine the salt concentration which is the same as the cell sap of the piece of potato

(1 mark)

13.5%

- d. (i) Name the process responsible for the variation in mass of potato cylinders with salt concentration.

(1 mark)

Osmosis

- (ii) Explain briefly how the process brings about the change in mass of the potato cylinder.

(2 marks)

Solutions contain less than 13.5% salt concentration are hypotonic to the cell, and cylinders take in water by osmosis and increase in weight

Solutions contain more than 13.5% salt concentration are hypertonic to the cell, and cylinders lose water by osmosis and decrease in weight

(iii) State any three roles, that take place in living organisms which occur in the same process as that named in d) (i) above. (3 marks)

- Absorption of water by roots of plant
- Absorption of water from the gut
- Reabsorption of water in the kidneys

e. What would happen to the potato cylinder if they were placed in 0% salt concentration. (2 marks)

They gain water by osmosis and gain weight,

32. (a) Define the term “mutation” (1 mark)
This is a change in the amount or structure of DNA of an organism

(b) Name any two causes of mutation (1 mark)

- Ultraviolet light
- Chemicals
- Freezing of cells

(c) The gene for normal production of haemoglobin is dominant to the mutant gene that causes sickle cell anemia. If the female carrier of genes for sickle cell anemia marries a normal man, show the possible genotypes and phenotypes of the off springs. Use suitable genetic symbols.

(8 marks)

H- gene for normal haemoglobin

h- mutant gene for sickle cell

Parents genotype female, Hh x male, HH

Gametes

H h H

Offspring genotype

HH Hh

Offspring phenotype: all normal

33. (a) Distinguish between excretion and secretion (2 marks)
 Excretion is the removal of waste metabolic products from the body.
 Secretion is a process by which substances are produced and discharged from a cell, gland, or organ for a particular function in the organism or for excretion
- (b) Name the secretion produced by the following body organs and their functions (4½ marks)

Organ	Secretion	Function
Duodenum	Mucus	Protects duodenum lining from being digested by enzymes
	Bicarbonate solution	Neutralizes the acid from stomach
Liver	bile	Emulsifies fats
Stomach	Pepsinogen	Pepsinogen is converted to pepsin and digests proteins
	HCl	Kills germ Provides pH for action pepsin

- (c) Name the secretions of the pancreas that is (are) involved;
- i) Digestion (1 mark)
- Pancreatic amylase: breaks down starch to disaccharide maltose.
 - Pancreatic lipase: breaks down tri-glycerides in the emulsified fat into mono-glyceride and fatty acids.
 - Protease: (Protein - splitting enzymes) which include **trypsin, chymotrypsin, carboxy-peptidase** and **elastase**
- ii) Control of blood sugar level (1 mark)
- (d) Name the secretions of the pituitary gland that are involved in;
- i) Water balance (1 mark)
 Antidiuretic hormone
- ii) Regulation of growth (1 mark)
 Growth hormone

SECTION C

Attempt ALL questions in this section.

34. (a) Define the term homeostasis *(1 mark)*
The term **homeostasis** is the maintenance of **static** or **constant conditions in the internal environment** of the body.
- (b) Explain the behavioural and physiological processes that take place in man during the regulation of body temperature. *(10 marks)*

Response to cold conditions

- **The hair is raised** and air trapped in the hairs insulates the body
- **Vasoconstriction** reduces blood flow the skin surface cutting down the heat loss from the blood to the surrounding.
- The metabolic rate increases to produce heat in the body.
- Decrease in sweating to reduce heat loss through evaporation.
- Shivering: at very low temperature skeletal muscles are stimulated to contract and relax automatically leading to production of heat.

Behavioral response to cold

1. Engaging in exercises (making a lot of noise in some organism)
2. Taking hot drink or bath
3. Wearing heavy clothes
4. Burrowing
5. Hibernation

Response of endotherms to hot conditions.

- The hairs are lowered and reduces air insulation
- The arterioles leading to the superficial capillaries dilate. As a result, the blood flow to the surface is increased and more heat energy can be lost to the surrounding.
- Sweating **occurs and evaporation of sweat cools the body**
- The metabolic rate decreases, reducing heat production in the body

Behavioral response to hotness

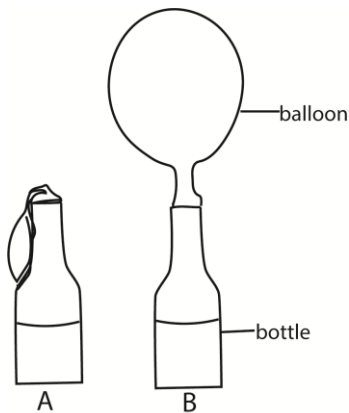
- Moving to cold places
- bathing

(c) Outline any four (4) functions of the human skin other than temperature regulation. *(4 marks)*

- Provides a protective barrier against mechanical, thermal and physical injury and hazardous substances.
- Prevents loss of moisture.
- Reduces harmful effects of UV radiation.
- Acts as a sensory organ (touch, detects temperature)

35. (a) Describe an experiment to show that anaerobic respiration takes place in yeast. *(10 marks)*

Yeast **break down glucose (food) into ethanol, carbon dioxide and releases energy**. It is a type of cellular respiration that takes place in the absence of oxygen to produce energy
 $C_6H_{12}O_6$ (fermentation) $\rightarrow 2CH_3CH_2OH + 2CO_2$



- Put equal amount of glucose solution into bottles A and B
- To bottle B add yeast but no yeast to bottle A
- Close each bottle with a tight balloon and wait for about an hour

Observation

Balloon of bottle B inflates with awhile that of bottle does not

Explanation

Yeast in bottle B ferments glucose to produce carbon dioxide that inflates the balloon. A tight balloon prevents entry of oxygen and thus fermentation occurs anaerobically.

Bottle A without yeast no fermentation occurs and no gas produced

(b) Differentiate between anaerobic and aerobic respiration *(3 marks)*

Differences in aerobic and anaerobic respiration

Green plant → Caterpillar → Preying mantis → Chameleon

- (ii) What would happen to the food chain drawn in (c) (i) if the preying mantis were removed from the environment?
(3 marks)

Caterpillar increase in number due to lack of predators and these eat and reduce the amount of green plants. Chameleon reduce in number due to lack of food

- (d) What is the role of each of the following organisms in the food web drawn in (b) above?
- (i) Predatory bug (1 mark)
Provide food to chameleon
 - (ii) Grasshopper (1 mark)
Provide food to chameleon and predatory bug
 - (iii) Preying mantis (1 mark)
Provide food to chameleon
 - (iv) Green plants (1 mark)
Provide food to caterpillar, and grasshopper

37. (a) What is air pollution (1 mark)
Air pollution is the presence in or introduction into the air of a substance which has harmful or poisonous effects.

- (b) Outline the human activities that cause air pollution (6 marks)

- *Emission from factories*
- *Emission from cars, aeroplane, aerosol cans*
- *Cigarette smoking*
- *Burning of rubbish*
- *Burning fuel such coal, kerosene*

- (c) How does air pollution affect living organisms (8 marks)

- *Illness such as pneumonia or bronchitis, headache*
- *Bad smell*
- *Irritation to nose, throat, eyes and skin*
- *Cause cancer*
- *Damage body organs, liver brain lungs*

END