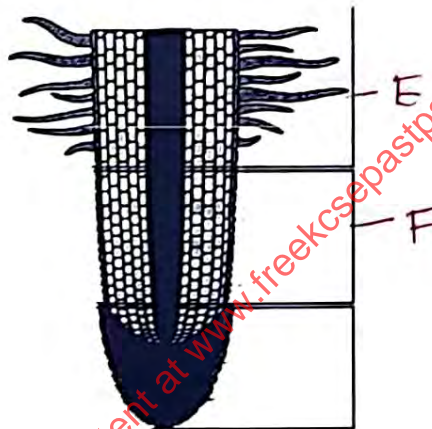


Answer all the questions in the spaces provided.

1. State two reasons why humans are not commonly used as specimens for genetic studies. (2 marks)

- Humans take longer to mature (for observations to be made)
- Cannot be contained (under some set experimental conditions)
- It is unethical

2. On the diagram of the root tip below, label the regions where:



- (a) cells become specialised as E (1 mark)
- (b) cells increase in size as F (1 mark)
3. (a) State two environmental conditions that can lead to the formation of carboxyhaemoglobin in the human body. (2 marks)

Burning carbon in inadequate supply of air e.g. Jiko

Burning of fossil fuels/emission of CO from exhaust fumes;
From mines; generators.

- (b) Explain the effect of carboxyhaemoglobin in the human body. (2 marks)

Carboxyhaemoglobin is a stable compound/doesn't dissociate
break; haemoglobin is not free/is locked up hence not able
to transport oxygen; resulting to suffocation/death.

4. State the significance of each of the following characteristics of the mammalian lungs:

(a) being elastic *To accommodate varied volumes of respiratory gases.* (1 mark)

To allow it to expand/inflate during inhalation & contract/deflate during exhalation.

(b) having pleural fluid. (1 mark)

Shock absorber against mechanical damage

Reduce friction/lubricates the lungs during breathing

5. Below is a diagram of a bacterium.



(a) Identify the Kingdom to which the organism belongs. (1 mark)

Monera; Acc with small letters.

(b) State two features shown on the diagram that are characteristics of this Kingdom. (2 marks)

✓ Unicellular

✓ No definite nucleus / prokaryotic / primitive nucleus / circular DNA

✓ presence of flagella; Rot flagellum

✓ Few organelles / No membrane bound organelles

6. (a) Name the part of the ovule that forms each of the following structures after fertilisation:

(i) zygote (1 mark)

Egg cell;

(ii) testa. (1 mark)

Integument;

(b) Name the hormone responsible for the development of a deep voice in humans. (1 mark)

Testosterone; Do not penalise for small spelling mistake

7. (a) Differentiate between a population and a community as used in ecology. (1 mark)

A population is a group of organisms of the same species coexisting in a particular habitat while a community is a group of plant & animal/diff species living together in a given habitat.

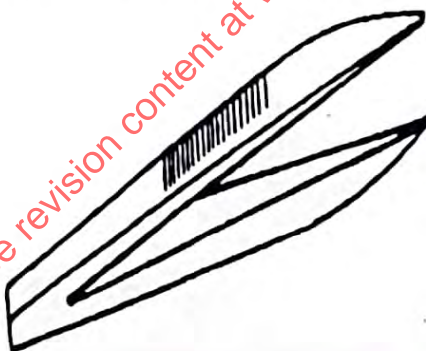
- (b) Explain one negative effect of the use of herbicides on human health. (1 mark)

Herbicides (gradually) accumulate in food chains (plant/animal tissues) which when fed on by humans being slowly accumulate in human tissues causing diseases/poisoning

- (c) State two ways through which energy is lost from one trophic level to the next in a food chain. (2 marks)

Elimination of wastes / Excretion / urination / sweating / defecation
Decomposition of organic matter / partial predation / unconsumed parts through respiration.

8. The following apparatus is used in biological studies.



- (a) Identify the apparatus. (1 mark)

(A pair of) forceps.

- (b) State its function. (1 mark)

Picking up / holding specimen (for biological study).

9. (a) Give two reasons why anaerobic respiration yields less energy than aerobic respiration. (2 marks)
- incomplete/partial breakdown/oxidation of substrate
inadequate/shortage/absence/lack of oxygen

- (b) Explain why fats are not efficient respiratory substrates. (2 marks)

- Fats are insoluble hence not easily transported to body tissues.
- Fats require more oxygen to be oxidised.

10. The table below shows the concentration in parts per million of sodium and iodide ions in sea water and cell sap of a plant.

	Sodium ions concentration	Iodide ions concentration
Sea water	326	39
Cell sap	162	574

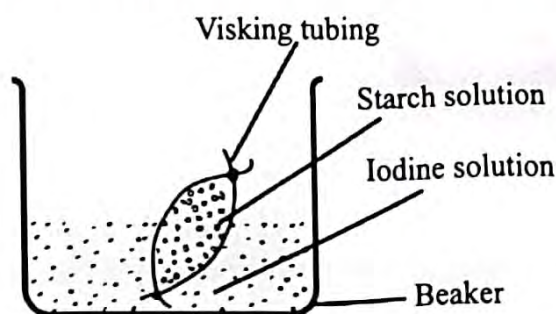
- (a) (i) Which of the two ions intake will be affected if the plant was sprayed with a chemical that inhibits respiration. (1 mark)

Iodide ions

- (ii) explain your answer in 10(a)(i). (2 marks)

The uptake of I⁻ ions is done by active transport, which is respiration/energy dependent, which when inhibited, consequently impairs the active transport process responsible for the uptake of ions.

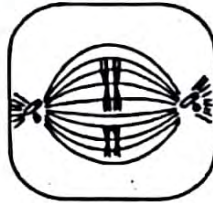
- (b) An experiment was set up as shown in the diagram below.



At the end of the experiment it was observed that the starch turned blue black while the colour of iodine solution in the beaker did not change. Account for this observation. (2 marks)

The visking tubing being semi-permeable; allowed selective passage of the iodine molecules into it; starch molecules are bigger than iodine hence could not diffuse through the pores of the V-tubing into the beaker.

11. The diagram below represents a stage in cell division.



(a) (i) Name the stage of cell division illustrated. (1 mark)

metaphase I

(ii) Give a reason for your answer in 11(a)(i). (1 mark)

Spindles have formed; Each pair of chromosomes/bivalent/homologous chromosome aligned at the equator.

(b) In the space below, illustrate the next stage of cell division after the one illustrated above. (1 mark)



(c) Explain the disadvantage of in-breeding among living organisms. (2 marks)

Homocous variation; resulting in transmission of undesired genes to subsequent generations;
Loss of hybrid vigor;
No hybrid vigor/heterosis
Res; low hybrid vigor.

12. Explain why protozoans do not require an elaborate system of gaseous exchange. (2 marks)

Have small body sizes hence have large SA to V.R.G hence diffusion alone is adequate/sufficient to meet its gaseous exchange needs.

13. The diameter of the field of view of a light microscope was found to be 1.5 mm. Cells observed under the field of view appeared as shown below.



Determine the length of each cell in micrometers. (1 mm = 1000 μ m) (2 marks)

$(1.5 \times 100) \div 6$; ~~is the Ans if it is without~~
= 250 μ m ; ~~The SI unit~~

14. Name the cell organelle responsible for each of the following activities:

(a) protein synthesis (1 mark)

Ribosome ;

(b) transport of lipids (1 mark)

Golgi bodies / apparatus ;
Smooth Endoplasmic Reticulum ;

15. Name two organisms that belong to the Kingdom Protocista. (2 marks)

Amoeba;

Paramecium / Paramecia;

Euglena, Spirogyra, Trifinosa, Plasmodium, Chlamydomonas

16. (a) Explain why only the fine adjustment knob should be used when focusing a specimen using the high power objective lens of the light microscope. (2 marks)

The distance/space for manipulation on the stage is limited;
to avoid crushing the slide/specimen;

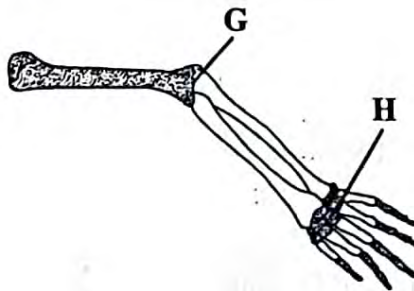
(b) An animal cell was viewed under a light microscope using objective lens of $\times 75$ and eye piece lens of $\times 10$. Determine the total magnification of the image. (2 marks)

$$\begin{aligned} \text{Total magnification} &= \text{Eye piece (lens)} \times \text{Objective (lens)} \\ &= 10 \times 75 \\ &= 750 \end{aligned}$$

17. A goat and a sheep are both herbivores. Explain why the two can comfortably exist in the same ecosystem. (2 marks)

A goat is a browser (mainly feeds on shrubs/tree leaved) while a sheep is a grazer (mainly feeds on grass); there is no competition (for common food) needed for their survival;

18. The diagram below shows the bones of the human arm.



(a) Name the type of joint formed in the region labelled:

(i) G Hinge; (1 mark)

(ii) H Gliding/sliding joint; (1 mark)



- (b) Explain why the bones of the cranium are fused. (1 mark)

To protect the (delicate) brain enclosed therein;

19. 60 white and 60 black mice were released in an area inhabited by jackals. After six weeks, it was established that 24 black and 8 white mice had remained.

- (a) Account for the above observation. (3 marks)

There was a greater decline in the number of white mice than black; the white mice were selected against (by nature); they did not camouflage well with the surroundings; hence could be easily seen by jackals/predators unlike the black mice;

- (b) Name the evolution theory that supports this observation. (1 mark)

Natural selection;

20. A small amount of a substance K was applied on one side of bean coleoptiles. After 36 hours, the coleoptiles curved away from the side where the substance was applied.

- (a) Suggest the likely identity of substance K. (1 mark)

Auxin / Indole - Acetic Acid / IAA;

- (b) Explain how the substance may have caused coleoptiles to curve. (3 marks)

The substance caused faster cell division and cell elongation on the side it was applied; leading to faster growth compared to the opposite side; resulting in a curvature away from the side where it was applied;

21. Explain the role of antidiuretic hormone when the human blood water level is below normal. (3 marks)

The body is dehydrated; more ADH is secreted; the ADH stimulates the kidney tubules increasing their permeability to water; water is reabsorbed into the blood stream until the osmotic balance is attained;



22. Equal amounts of crushed Irish potato were placed in equal volumes of hydrogen peroxide solution at various pH values. A gas, L, was produced, its volume measured and recorded as shown in the table below.

pH	4.2	7.0	9.2
Volume of gas L (cm ³)	2.9	5.9	7.9

- (a) Identify gas L. (1 mark)

Oxygen / O₂

- (b) Account for the difference in the volume of gas L produced at pH values 4.2 and 9.2. (3 marks)

more gas was produced at pH 9.2 than pH 4.2; pH 9.2 was alkaline/basic; was favorable for the optimal working of the enzyme (catalase) in the Irish potato; lower pH 4.2 was acidic medium & did not favor the optimal working of the enzyme;

23. (a) Name the causative agent of Trichomoniasis. (1 mark)

Trichomonas vaginalis

- (b) State the role of hair-like structures in each of the following: (2 marks)

- (i) fallopian tube

propel the ovum/sperm/zygote/blastoct to the oviduct; ovette

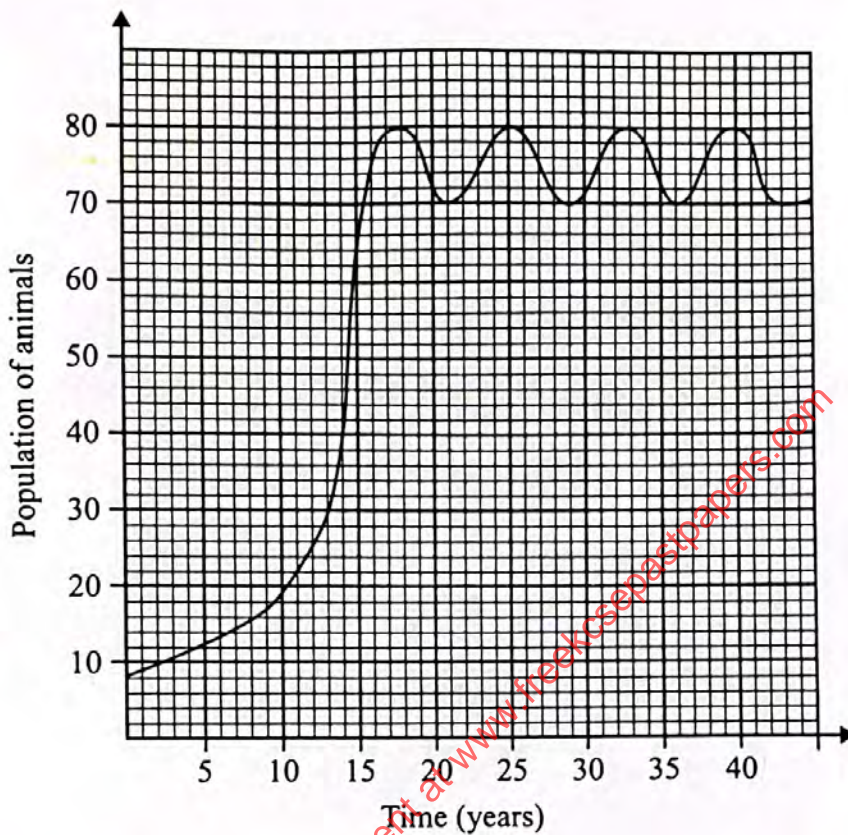
- (ii) nasal lining

trap solid/dust particles in the inhaled air;

- (c) Name the agent of pollination in a maize plant. (1 mark)

wind; Acc wind pollination/pollinated

24. Below is a graphical representation of the population of animals in a certain ecosystem over a period of time.



- (a) Determine the carrying capacity of the ecosystem. (1 mark)

75 ± 1;

- (b) Account for the change in population for the first 15 years. (3 marks)

The pop increased exponentially/rapidly because the organisms had adjusted to the environment; conditions were favorable (for reproduction) / there was adequate food/water/space/no competition (for resources); There were no diseases; more reproduced/fewer deaths; Acc less competition.

25. The photograph below shows a plant obtained from a certain habitat.



(a) Suggest the likely habitat for the plant. (1 mark)

Aquatic; see correct examples, eg. river, lake, swamp, pond, water, marshy (etc), marine, saline, estuarine, wetland, wet

(b) Explain your answer in 25(a). (3 marks)

- Broader leaf surfaces to ↑ S.A for transpiration; the broad surfaces have more stomata on the upper leaf surfaces to enhance loss of excess water;
- presence of shallow roots to minimise absorption of water.
- Broad leaf surface / large air spaces / aerenchyma tissues for buoyancy;
- Flowers raised above water surface to enhance pollination.

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