F4 TOPICAL REVISION

BIOLOGY

A SERIES OF KCSE TOPICAL REVISION QUESTIONS IN BIOLOGY.

An Intensive Analysis of Past KCSE Questions. Candidates are Hereby Advised to Keep attention to this Crucial Quick Revision Kit.

For Marking Scheme/Answers

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MWALIMU AGENCY

1. GENETICS

1. A woman with blood group **A** gave birth to twins both having blood group **AB**.

   Determine the genotype of:

   a) Father
   b) Mother

2. 50 black mice and 50 white mice were released into an area inhabited by a pair of owls.

   After four months, the mice in the area were recaptured and only 38 of the black mice and 9 of the white mice were remaining.

   a) How would this observation be explained ?
   b) Name the theory of evolution that supports the results in **(a)** above.

3. State **three** mechanisms that prevent self pollination in a flower that has both male and female Parts.

4. (a) Distinguish between complete and incomplete dominance
   (b) State **two** sources of variation

5. Part of one strand of a DNA molecule was found to have the following base sequence.

   G – T – C – A – G – T

   (a) What is the sequence on m-RNA strand copied from this DNA portion?
   (b) State **two** roles of DNA molecule.

6. State **three** ways by which plants compensate for lack of ability to move from one place to another.

7. A student mixed a sample of urine from a person with Benedict's solution and heated, the colour changed to orange.
   (a) What was present in the urine sample?
   (b) What did the student conclude on the health status of the person?
   (c) Which organ in the person may not be functioning properly?

8. Differentiate between continuous and discontinuous variations

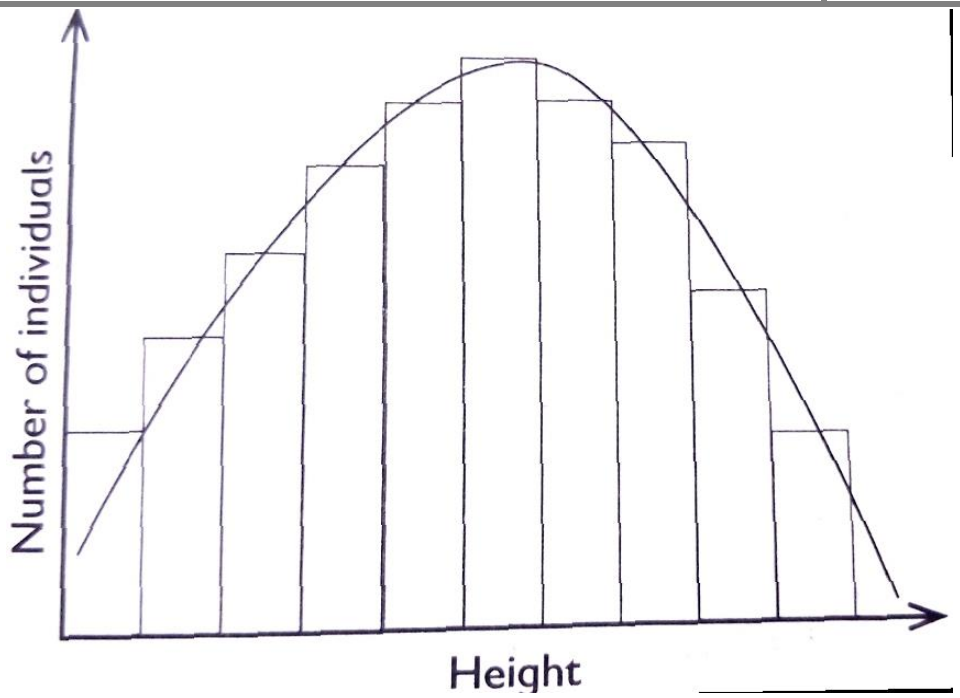
9. Members of the same species of organism tend to differ due to variation. State **three** causes of variation in organisms

10. Identify the type of gene mutations represented by the following pairs of words:-

    (i) Shirt instead of skirt
    (ii) Hopping instead of shopping
    (iii) Eat instead of tea

11. A DNA stand has the following base sequence: GCCTAGATCAC
    What is the sequence of the : (i) Complementary DNA strand?
    (ii) M-RNA strand coped form this DNA strand

12. The figure below represents the distribution of height of pupils in a school



(a) Name the type of variation represented by the curve
(b) Outline **two** possible causes of variation in height of individuals in man

13. a) Wekesa and Wanjiku who are siblings are both normal as their parents but have a Hemophilic brother. Give the Genotype of their parents.

b) i)What are linked genes?
ii) What do you understand by the phase a test cross?

14. There are at least 205 known sex – linked recessive disorder
a) Name **any two** of them.
b) State a reason why sex – linked recessive why traits tend to effect the male child.
c) State why if a mother has the trait all her sons will have it

15. The table below is a representation of a chromatide with genes along its length. It undergoes mutation to appear as shown below:

Before mutation	L	M	N	O	P	Q
After mutation	L	O	N	M	P	Q

a) Name the type of chromosomal mutation represented

b) Name **one** mutagenic agent

16. The figure below is a structural diagram of a portion from a nucleic acid strand

a) Giving a reason, name the nucleic acid to which the portion belongs
b) Write down the sequence of bases of a complementary DNA strand

17. In an experiment, plants with red flowers was crossed with plants with white flowers.

All the plants in the $\mathbf{F_1}$ generation had pink flowers.

a) Give a reason for the appearance of pink flowers in the $\mathbf{F_1}$ generation
b) If plants in $\mathbf{F_1}$ were selfed, state the phenotypic ratio of the $\mathbf{F_2}$ generation
c) Explain; i) Why women should drink extra milk during pregnancy
ii) A pregnant women might want to urinate more often in late pregnancy

18. State the meaning of the following terms giving an example in each case:

(a) Sex-linked genes
(b) Multiple alleles

19. In a certain breeding experiment, a plant species with red flowers was selfed. It produced **119 red** flowered and **41 white** flowered offsprings.

(a) Using letter **R** to represent allele for the red flowers, state the genotype of the red flowered parent plant

(b) Determine the phenotypic ratio of red and white flowered plants. Show your working

20. Give an example of a sex-linked trait in human on:
(i) **Y** – Chromosome
(ii) **X** – Chromosome

21. Explain why growth of long hair on the pinnae of the ears in human occurs in males only

22. Explain why **prophase 1** of meiosis contributes towards genetic variation in living organisms.

23. A pure Red flowered plant was crossed with a pure white flowered plant. All the F_1 generation plants had pink flowers.

(a) Give an explanation for the absence of Red and white flowered plants in the F_1 generation.
(b) If the F_1 generation pea plants were selfed, state the phenotypic ratio of the F_2 generation plants.

24. (a) Name a genetic disorder due to gene mutation that affects the malpighian layer of the skin in man.
(b) Give **two** functions of the fluid produced by sebaceous glands.

25. (a) Define the term "Gene mutation."
(b) Name the genetic disorders that result from gene mutation in human beings.

26. (i) What are mutations
(ii) Name **two** mutagens

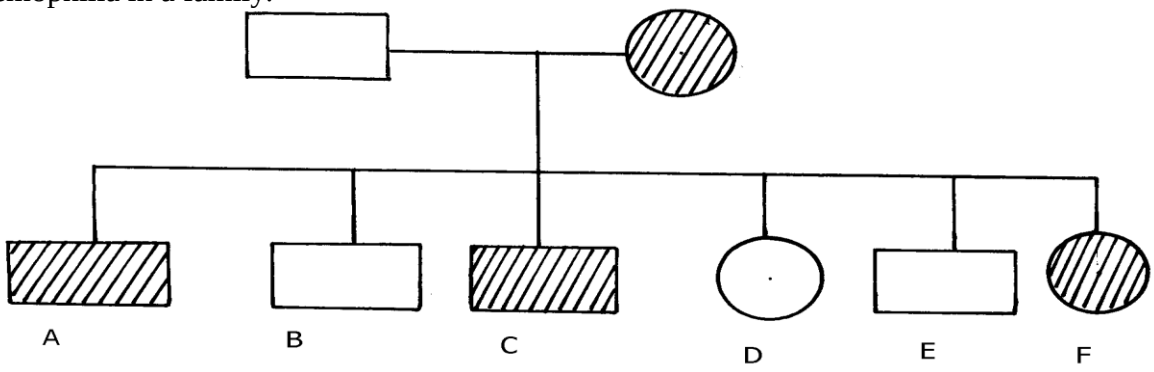
27. A section of a DNA strand contains the following sequence CGGATAC

(a) Write the; (i) Complementary DNA strand
(ii) MRNA strand
(b) Name the site for protein synthesis in a cell

28. In a certain bird species, red flight feathers is controlled by gene **R** while white flight feathers is controlled by gene **r**. The heterozygous condition **Rr** results into pink flight feathers. The two genes are also sex linked and transmitted on x-chromosome.

a) By use of fusion lines, find the genotypes of across between a male with pink flight feathers and a female with white flight feathers
b) Which type of dominance is illustrated here?
c) i)Identify the nucleic acid whose base sequence is shown below:
G-A-C-U-A-G-A-C-G
ii) Give a reason for your answer in **c (i)** above
iii) If the nucleic acid was involved in protein synthesis, how many amino acids would be present in the protein synthesized? Give a reason

29. Study he genetic chart below showing the inheritance of the gene responsible for haemophilia in a family.





a) Write the genotype of individuals A, B, F

b) A member of this family labelled **F** marries a haemophiliac male. What will be the phenotypic ratio of the offspring? Show your workings

c) Other than the condition stated above, state any other **two** common genetic disorders that result from gene mutation.

30. [a]Defferentiate between phenotype and genotype as used in genetics

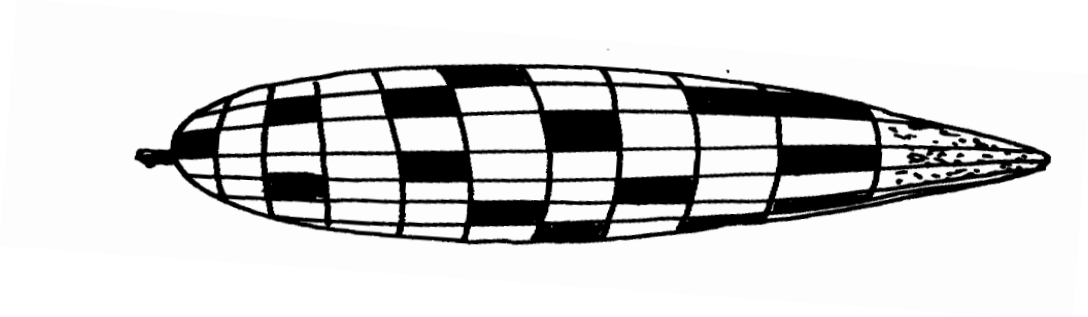
[b]State three structural defferences between DNA and RNA

31. A cross between a red-flowered and a white flowered plant produced only pink –flowered F_1 plants

(a) There was neither a red nor white –flowered F_1 plants. Explain
(b) The F_1 offspring were selfed to get F_2 generation. Using appropriate letter symbols, work out the genotypes of F_2 generation
(c) Give the genotypic and phenotypic ratios of F_2 generation
(d) Distinguish between dominant and recessive genes

32. A true-breeding purple maize variety was cross-pollinated with a true-breeding yellow maize variety.

The offspring produced all purple fruits.
The plants grown from these F_1 grains were interbred among each other.
A typical cob of F_2 generation is shown below:
The yellow fruits are shaded while the purple ones are un-shaded.



(a) (i) In terms of flowers only, state why it is easier to work out genetic crossings using maize

(ii) Count separately the yellow and purple grains and therefore find the rations of purple grains to yellow grains

(b) Using appropriate symbol, work out a genetic cross for F_2 generation

(c) From the above information, give the dominant gene

(d) State **two** practical applications of genetics in identity determination

33. [a]How is sex determined in a man

[b][i]Defferentiate between sickle cell anaemia and sickle cell trait

[ii]Explain why people with sickle cell trait have an adaptive survival over normal indivituals in Malaria pandemic regions

34. The table below shows results of test to determine blood groups of persons **Y** and **Z**.A tick (√) Represents, agglutination while a cross (**x**) represents no agglutination;

Person	Test with antibody (a)	Test with antibody (b)	Test with Rhesus antibody	Blood group
Y- (male)	√	X	√	
X- (female)	X	√	X	

(a) Fill the blank space in table to show the blood group of the persons **Y** and **Z**

(b) In order to investigate the inheritance of Rhesus factor, work out a cross between a male with Rh^+ and female with Rh^- .Let **D** represent the presence of Rhesu factor and **d** to represent the absence of the Rhesus factor

(c) Determine the genotype of the cross in **(b)** above.

(d)Which of the children can donate blood to their mother?

35. Describe the behavioural adaptations of animals to temperature

36. In man blood group inheritance is controlled by multiple alleles in which allele **A** is co dominant to allele **B**. a woman laterozygous for blood group **A** married a man heterozygous for blood group **B**

a) State the genotype of both parents

b) Using a pun net square, show the genotypes of F_1 generation

c) State **one** application of knowledge of blood group inheritance in man

d) The nitrogenous bases in nucleic acids are Adenine (A), cytosine(C), Guanine (G),

Thiamine (T) and uracil (U). Input of a molecule of DNA the sequence of bases is CTT.

Using the letters **A, C, G, T, U** where appropriate, write down the base sequence in;

i) Corresponding part of the complementary strand of DNA molecules

ii) Corresponding part in mRNA

iii) A change in the DNA molecules caused the base sequence in the triplets to change from CTT to CAT. State **one** factor which could have caused the change

37. In an investigation plants with red flowers were crossed with plants with white flowers.

All the plants in the F_1 generation had pink flowers when the F_1 plants were crossed, he counted 480 plants in F_2 generation

(a) Using appropriate letter symbols, work out the cross between the F_1 plants to get the F_2 generation

(b) Give the phenotypic and genotypic ratios for the F_2 generation

Phenotypic ratio

Genotypic ratio

(c) How many plants in the F_2 generation had pink flowers? (show your work)

38. In an experiment, a black mouse was mated with a brown mouse. All the off springs in F_1 generation were black. The off springs grew and were allowed to mate with one another.

The total number of F_2 generation offspring were 96.

(a) Using letter **B** to denote the gene for black colour. Work out the genotype of the F_1 generation. (Use a punnet square)

(b) State the following for the F_2 generation

(i) Genotypic ratio

(ii) Phenotypic ratio

(iii) The total number of brown mice

39. (a) Distinguish between Homologous structures and analogous structures. Give an example in each case.

Homologous structures

Example

Analogous structures

Example

(b) Explain why parasites develop resistance to certain drugs after a long time of exposure.

(c) (i) What is non— disjunction?

(ii) Give **one** example of a genetic disorder associated with non-disjunction .

2. EVOLUTION

1. a) Distinguish between homologous and analogous structures in evolution.
   b) Name **one** vestigial structure in mammals.
2. a) Give **two** examples of adaptive radiation in animals.
   b) State **two** disadvantages of using fossils as evidence of evolution
3. Distinguish between camouflage and mimicry.
4. State the role of light in photosynthesis
5. (a) Name the region of the **gut** where digestion of cellulose takes place.
   (b) State role of **cardiac sphincter** in the stomach.
6. (a) Give **two** limitations of fossil records as evidence of evolution
   (b) State any **two** similarities in structure between **Homo erectus** and **Homo Sapiens**
7. (a) (i) What is meant by vestigial structures?
   (ii) Give an example of a vestigial structure in human
8. Distinguish between the struggle for existence and survival for the fittest as used in the theory of natural selection
9. Give **two** factors that determine water reabsorption in the distal convulated tubule
10. Distinguish divergent and convergent evolution
11. (a) What are the advantages of natural selection
    (b) All insects are believed to have arisen from a common ancestor. However, modern Insects differ widely in a variety of ways such as in the adaptation of their mouthparts for different modes of feeding. What kind of evolution is this?
12. Explain why Lamacks theory of evolution is not accepted by Biologists today.
13. a) i) What is meant by vestigal structures
    ii) Give an example of vestigal structure in human
    b) Explain why certain drugs become ineffective in curing a disease after many years of use
14. (a) What is organic evolution?
    (b) Briefly explain the term "***survival for the fittest***" as used in Darwin's theory of natural selection
15. Explain why insecticides become ineffective against insects if used for several years in succession
16. State **three** limitations of fossils records as an evidence of organic evolution
17. State **three** pieces of evidence that support the theory of organic evolution
18. What is meant by natural selection?
19. (a) Explain why Lamarcks theory of evolution is not accepted today
    (b) State **two** limitations of fossils records as evidence of organic evolution
20. In a breeding experiment, plants with red flowers were crossed. They produced 123 plants with red flowers and 41 with white flowers:

(a) Identify the recessive trait
(b) Give a reason for your answer
(c) If white flowered plants were selfed, what would be the genotype of their offspring? Show your working using appropriate symbols **(R, r)**
(d) What is a test cross?

21. a) What is organic evolution?
b) Describe the various evidences which support the theory of organic evolution.

22. (a) What is meant by the term natural selection
(b) Describe how natural selection brings about the adaptations of a species to its environment
(c) Distinguish between convergent and divergent evolution
(d) Discuss **four** evidences to show that evolution has taken place

23. Explain the various evidence for organic evolution

24. (a) What is organic evolution
(b) Explain why resistance to antibiotics is considered as an example of evolution
(c) List and explain various evidences of organic evolution

25. Pure breed red flowered plants were cross pollinated with pure breed white plants.The resulting F_1 offspring's had pink flowers.

(a) Using letter **R** to represent the gene for red colour and letter W to represent gene for white colour of flowers. Work out the genotype of the $\mathbf{F_1}$ generation
(b) If seeds from the $\mathbf{F_1}$ generation plants were planted and allowed to self pollinate. Work out the phenotypic ratio of the $\mathbf{F_2}$ generation

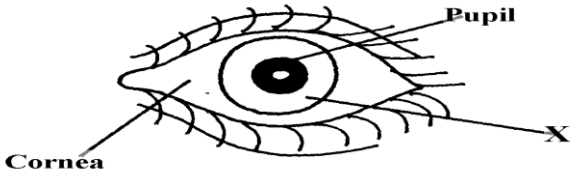
3. IRRITABILITY AND SENSITIVITY IN PLANTS ANIMALS

1. Give **two** functions of the exoskeleton in arthropods.

2. When shoots of young plants are exposed to unidirectional light they bend towards light;

   a) Name the type of response exhibited by the young shoots
   b) Explain the cause of the observation above

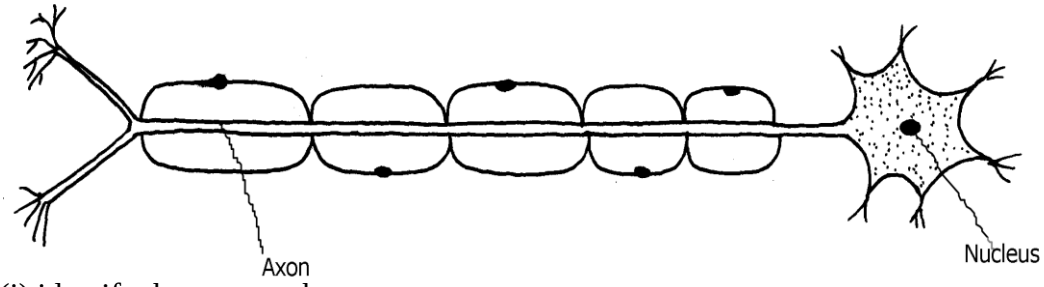
3. Study the drawing below and use it to answer the questions that follow :-



   a) Name the part labeled **X.**
   b) Describe the changes that occur in the structure **X** in dim light.
   c) What is meant by the term **accommodation** with reference to the eye?

4. (a) State **two** differences between taxes and tropisms
   (b) Give **two** survival values of tactic movements to organisms

5. The diagram below represents a type of neurone.

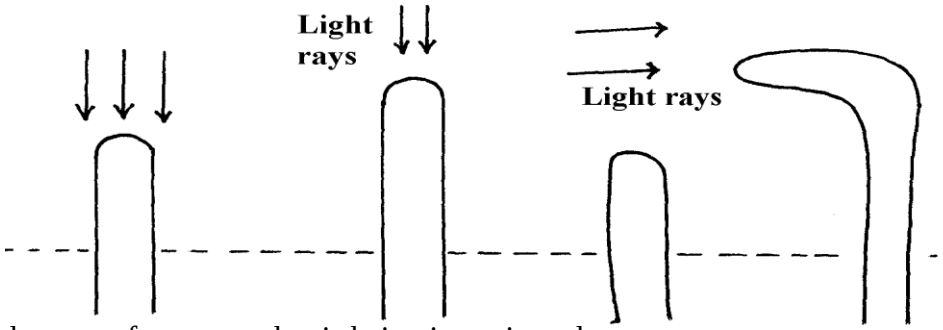


   (a) (i) identify the neuron above.
   (ii) Give a reason for your answer in a (i) above.
   (c) With an arrow, indicate on the diagram the direction of an impulse through the neurone.
   (d) Name the chemical substance that brings about transmission of impulse across a synapse

6. A student was traveling from Nairobi to Mombasa. As the bus descended down hill he felt an unpleasant sensation in the ear.

   (a) How did the sensation come about? *
   (b) How can the unpleasant sensation be relieved?

7. An experiment was carried out to investigate a growth response in maize seedling as shown in the diagram below:

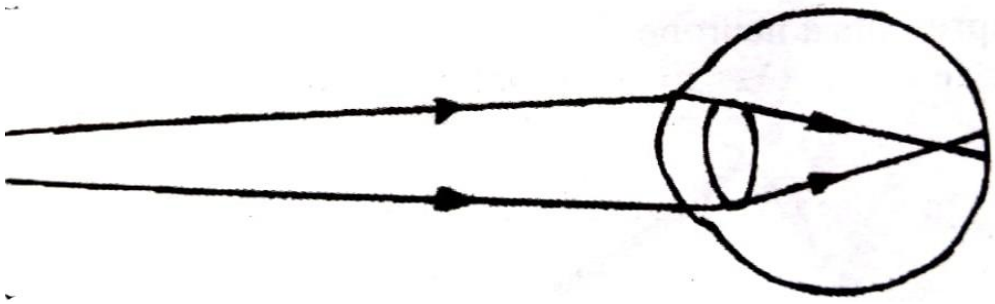


   (a) State the type of response that is being investigated .....

(b) Explain the response exhibited by the shoot

8. State **three** genetic disorders caused by gene mutations

9. The diagram below shows the position of an image formed in a defective eye:-



(a) Name the defect

(b)Explain how the defect named in **(a)** above can be corrected

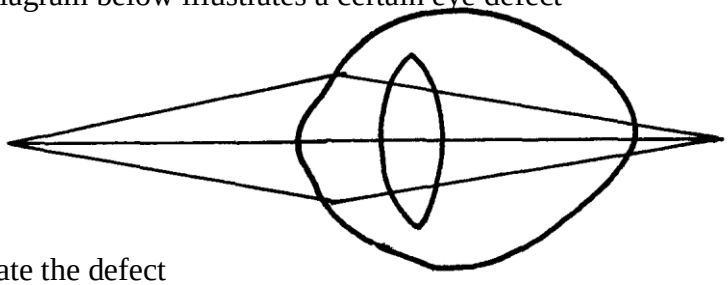
10. (a) State **three** structural differences between arteries and veins in mammals

(b) Name a disease that causes thickening and hardening of arteries

11. (a) Name the part of the eye in which the light sensitive cells are located

(b) List the **two** types of sensory cells found in the part named in (a) above

12. The diagram below illustrates a certain eye defect



(a) State the defect

(b) On the diagram illustrate how the defect can be corrected

(c) State **one** advantage of having two eyes in human beings

13. Briefly explain the role of the following part of skin

a) Cornified layer

b) Malpighian layer

14. State the functions of the following structures of the mammalian ear

a) Eustachian tube

b) Essicles

15. a) Distinguish between conditioned and simple reflexes

b) State how the nerve cell structure is suited to its function of impulse transmission

16. (a) Name the part of the mammalian eye that:

(i) Transmits impulses to the brain

(ii) Regulates the amount of light entering the eye

(b) State the changes that occur in the part of the eye named in **(a) (ii)** above when one moved from bright light to dim light conditions

17. Name the type of response exhibited by the following:

(a) A pollen tube growing towards the embryo sac

(b) Maggots moving from lit side of a box to the dark side

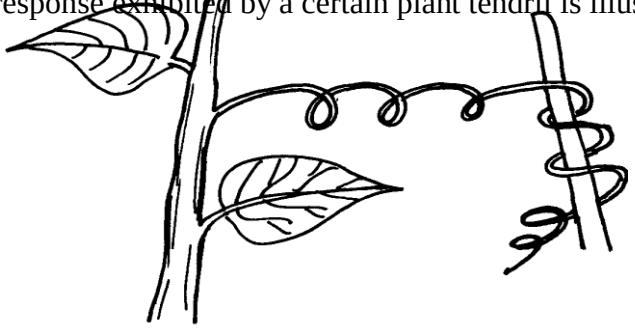
18. A response exhibited by a certain plant tendril is illustrated below:



(i) Name the type of response

(ii) Explain how the response named in **(i)** above occurs

19. A response exhibited by a certain plant tendril is illustrated below:-



Name the type of response

20. Removal of the apical bud from a shrub is a practice that results in the development of many lateral buds which later form branches

(a) Give reasons for the development of lateral branches after the removal of the apical bud

(b) Suggest **one** application of this practice?

21. In an accident a victim suffered brain injury. Consequently he had loss of memory which part of the brain was damaged?

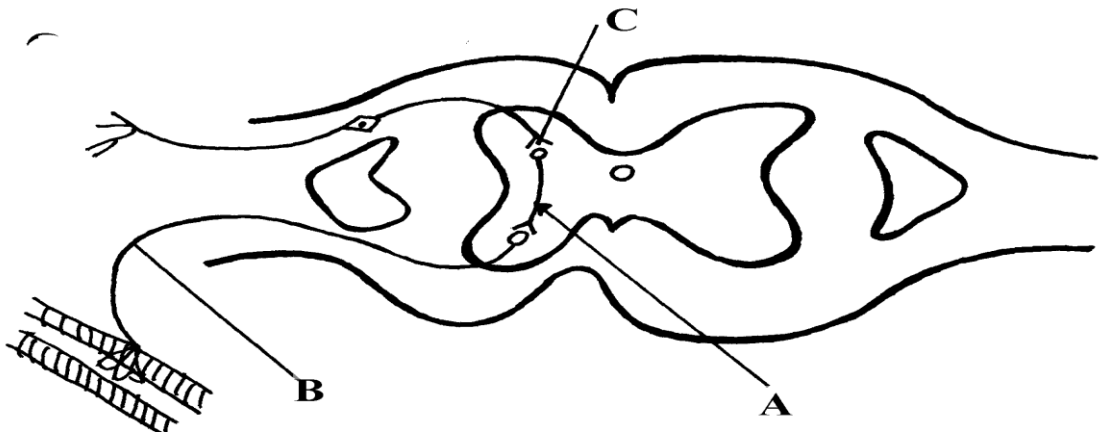
22. A person was able to read a book clearly at arm's length but not at normal reading distance

(a) State the eye defect the person suffered from

(b) Why was he unable to read the book clearly at normal distance?

(c) How can the defect be corrected?

23. The diagram below represents a simple reflex arc;



(a) Name the parts labeled **A** and **B**
(b) Explain how an impulse is transmitted across the gap labeled **C**

24. (a) State **two** functions of a mammalian ear
(b) How is the cochlea suited to its function

25. State **one** function of potassium ions in the human body.

26. State **two** functions of vitamin B_5 (pantothenic acid).

27. (a) What is the biological importance of tactic responses?
(b) A person had an accident and had problems with his vision, hearing and memory. Identify the part of the brain that was affected

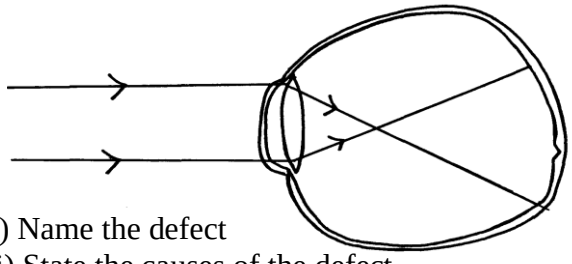
28. Identify the following responses shown by plants:- (a) Shoots grow towards light
(b) Roots grow towards gravity
(c) Tendril intertwine around an object

29. How is the mammalian skin adapted to its functions?

30. Explain how the mammalian skin is adapted to it's functions

31. Explain the structure and functions of the human eye.

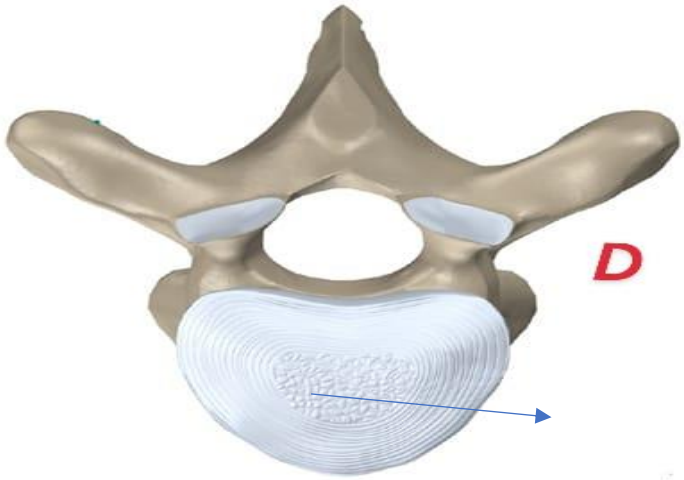
32. The diagram below shows the position of an image in a defective eye.



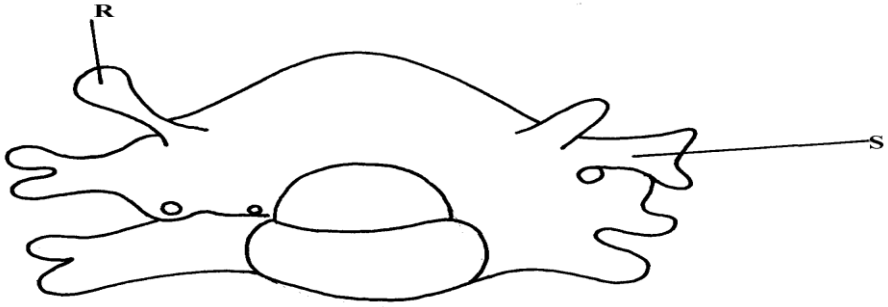
(a) (i) Name the defect
(ii) State the causes of the defect
(b) Explain how the defect in **a(i)** above can be corrected.
(c) State the functions of cones
(d) How are nocturnal animals adapted to seeing?

4.SUPPORT AND MOVEMENT IN PLANTS AND ANIMALS

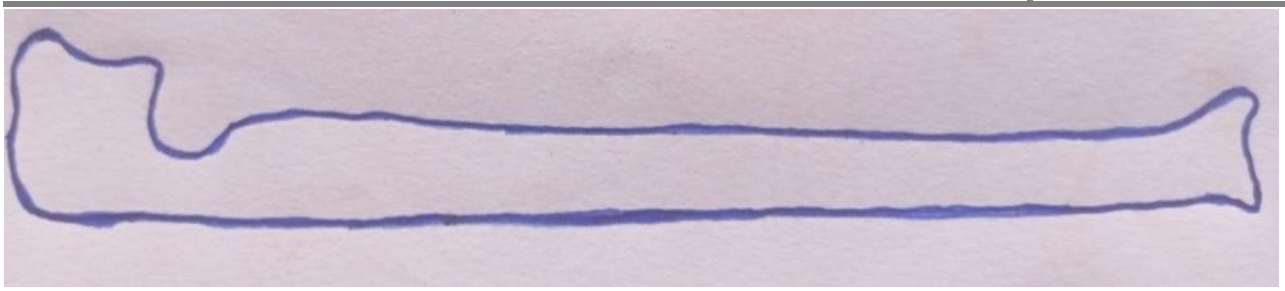
1. Explain how the following tissues are adapted to provide mechanical support in plants:-
   a) Parenchyma
   b) Collenchyma
   c) Selerenchyma
2. The diagram below represents a bone in the mammalian skeleton



   a) Identify the bone with a reason
   b) State the function of the part labeled **D**
3. The diagram below represents a mammalian bone



   (a) Identify the bone shown above
   (b) State the function of the parts labelled **R** and **S**
   (c) State the region of the body in which the bone is found
4. (i) Name **two** bones that form the ball and socket joint in the fore limb of a mammal
   (ii) Name the fluid that is found in the above mentioned joint and its function
5. State **three** types of skeleton found in Kingdom animalia
6. State **three** differences between an animal's muscle cell and plant's palisade cell
7. The diagram below represents a mammalian bone



(a)Name the bone

(b) (i) Which bone articulates with the bone shown in the diagram at the notch

(ii) Name the type of joint formed when the bones in **b(i)** articulate

8. (a) Name the hard outer covering of the members of the phylum Arthropoda

(b) State **two** roles played by the structure named in **(a)** above

9. (a) State the role of lignin in the wall of the xylem vessel

(b) How does vascular bundles contribute to support in plants

10. (a) Distinguish between tendons and ligaments

b) State **one** way through which herbaceous plants achieve support

11. Name the ;

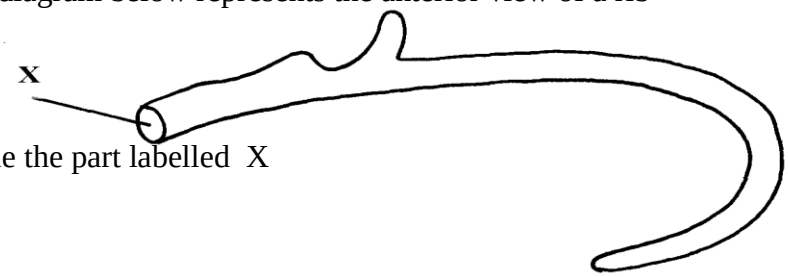
a) i) Material used to strengthen the xylem tissue

ii) Tissue that is removed when the bark of a dicotyledonous plant is ringed

b) State the areas of the plant where translocated materials are taken

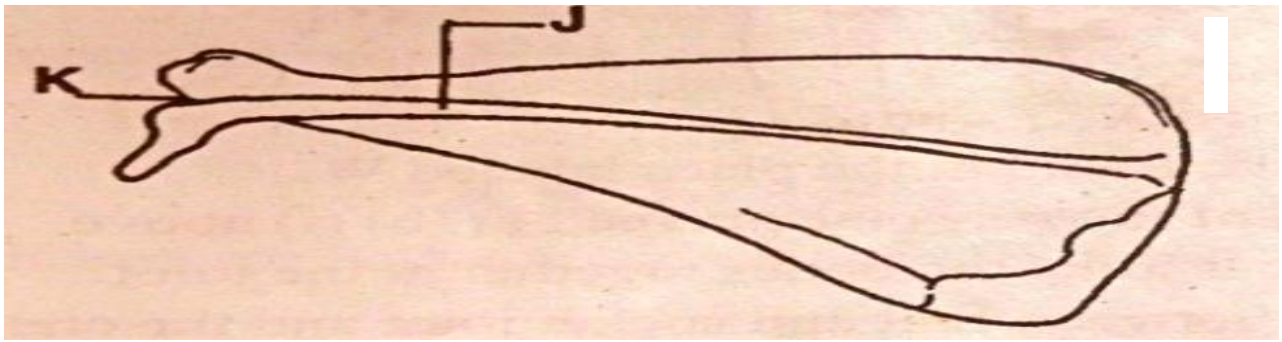
12. Give **three** importance of mammalian skeleton

13. The diagram below represents the anterior view of a rib



Name the part labelled X

14. The diagram below represents a bone obtained from a mammal



a) Name the bone

b) Name the:

i) Bones which articulate with the bone named in **(a)** above at the cavity labelled **K**

ii) Joint formed by the two bones at **K**

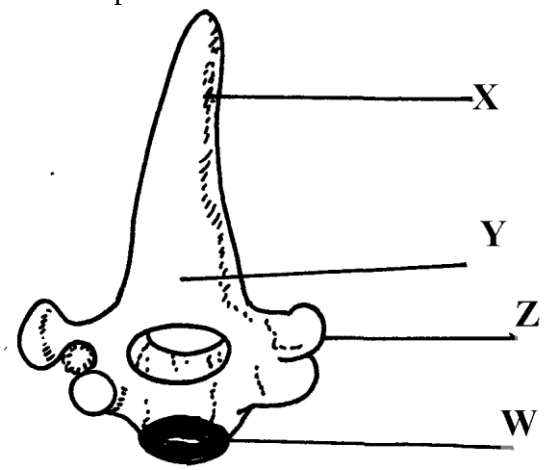
c) State functions of part labelled **J**

15. The diagram below represents a bone obtained from a mammalian skeleton:



(a) Identify the bone
(b) Name the:
(i) Bone it articulates with at point **A**
(ii) Type of joint that forms at point **B** in articulation with other bones

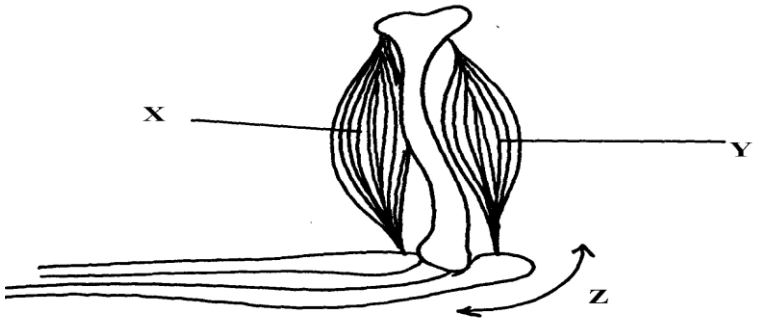
16. The diagram below represents a bone obtained form a mammal



(a) Identify the bone
(b) Name the structures labeled **X** and **W**
(c) Name the bone that articulate with structure labeled **Z**

17. (a) Name the vertebra in a mammalian body that is characterised by presence of **odontoid process**.
(b) State the function of the **odontoid process**

18. a) Name **three** supporting tissues in plants
b) Study the diagram below and answer the questions which follow:

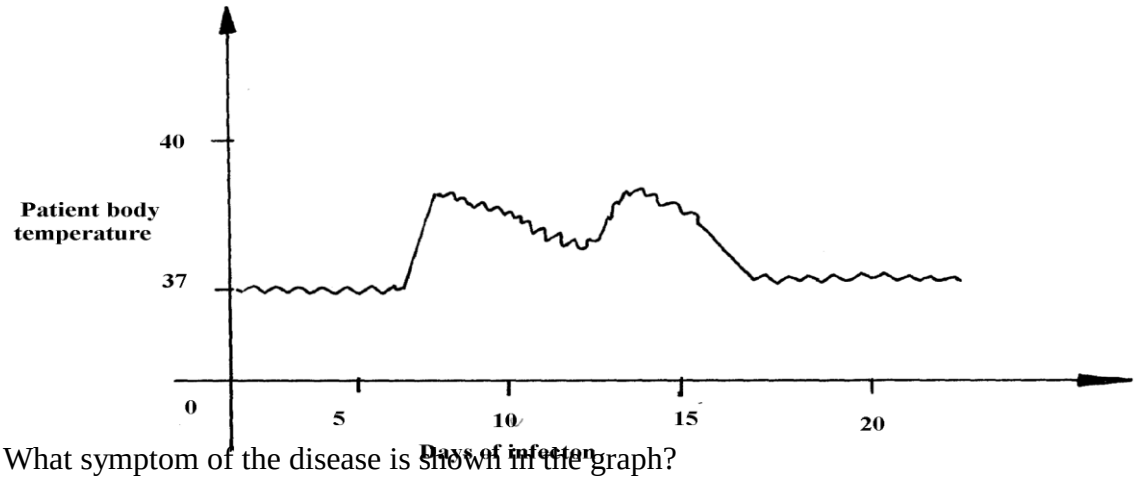


i) Identify the muscle represented by **X** and **Y**
ii) Describe how muscles **x** and **y** cause straightening of the joint **z**
c) Name the joint **z**

19. (a) What is the importance of locomotion in animals?
(b) Explain how a bony fish is adapted for movement in its habitat

4. HUMAN HEALTH

1. a) Name the causative agent of cholera.
   b) Name the intermediate hosts in the life cycle of the following parasites;
      i) *Ascaris lumbricoides.*
      ii) *Schistosoma haematobium.*
   c) How does the parasite *plasmodium vivax* gain entry into its host?
2. The graph below shows body temperature of a patient suffering from malaria



   (a) What symptom of the disease is shown in the graph?
   (b) Name the organism that causes malaria
   (c) Suggest **one** method of controlling spread of malaria
3. Name the causative agent of typhoid
4. Malaria is a common disease in Kenya:-
   (a) What causes the disease?
   (b) State **one** control measure of the disease
5. a) Name the causative agents of the following disease in humans:-
   i) **Typhoid;**
   ii) **Amoebic dysentery;**
   b) Name the disease in human cased by plasmodium falciparum
6. Explain why it is important to go for voluntary counseling and testing (VCT) on HIV/AIDS
7. Name **one** human disease caused by each of the following parasites.
   (a) Plasmodium falciparum……
   (b) Entamoeba histolytica …….

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