FORM 4 WORK

CHAPTER 1

GENETICS

PAST KCSE QUESTIONS ON TOPICS

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

--- S --- P --- S --- P --- S --- P --- S

C G U C

(a) Giving a reason, name the nucleic acid to which the portion belongs.

(2 marks)

Name _____

Reason _____

(b) Write down the sequence of bases of a complimentary strand to that shown above (1 mark)

2. State two structural differences between ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) (2 marks)

3. Name a disorder of human blood that is caused by mutation (1 mark)

4. State the function of deoxyribonucleic acid (DNA) molecule (1 mark)

5. Give a reason why it is only mutation in genes of gametes that influence evolution (2 marks)

6. In an experiment, red flower were crossed with plants with white flower. All the plants in the F1 generation had pink flowers.

(a) Give a reason for the appearance of pink flower in the F1

generation (1 mark)

(b) If the plants from F1 generation were selfed, state the phenotype ratio of the F2 generation (2 marks)

7. State two characteristics that researchers select in breading programmes. (2 marks)

8. Give an example of sex- linked trait in humans on; (2 marks)

Y chromosome _____

X chromosome _____

9. In an experiment, a variety of garden peas having a smooth seed oat was crossed with a variety with a wrinkled seed coat. All the seeds obtained in the F1 had a smooth seed coat. The F1 generation was selfed. The total number of F2 generation was 7324.

(a) Using appropriate letter symbols, work out the genotype of the F1 generation. (4 marks)

(b) From the information above, work out the following for the F2 generation

(i) Genotype ratio (2 marks)

(ii) Phenotype ratio (1 mark)

(iii) Wrinkled number (1 mark)

10. In a certain plant species, some individual plant may have white, red or pink flower. In an experiment a plant with white parent plant were pure lines. All the plants from F1 generation were pink. Using letter R to represent the gene for red colour and letter W for white colour;

(a) Work out the genotype of F1 generation (3 marks)

(b) If the plants from F1 generation were selfed, what would be the phenotypic ratio of the F2 generation? (3 marks)

(c) What is the genetic explanation for the absence of plants with red and white in the flower F1 generation? (2 marks)

11. In a breeding experiment, plants with red flower were crossed. They produced 123 plants with red flowers and 41 with white flowers.

(a) Identify the recessive character. Give a reason

(b) What were the genotypes of the parent plants that give rise to the plants with red and white flowers?

(c) If the white flowers were selfed, what would be the genotypes of their offspring?

12. (a) Name two disorders in humans caused by gene mutation (2 marks)

(b) Describe the following chromosomal mutations

(i) Inversion (2 marks)

(ii) Translocation

(c) In mice the allele for black fur is dominant to the allele for brown fur. What percentage offspring would have brown fur from a cross between heterozygous black mice and brown mice? Show your working. Use letter B to represent the allele for black colour. (4 marks)

13. (a) What is meant by the term allele? (1 mark)

(b) Explain how the following occur during gene mutation

(i) Deletion (1 mark)

(ii) Inversion (1 mark)

(c) What is a test- cross? (1 mark)

14. In maize the gene for purple colour is dominant to the gene for white colour. A pure breeding maize plant with purple grains was crossed with a heterozygous plant.

(a) (i) Using letter G to represent the gene for purple colour, work out the genotypic ratio of the offspring (5 marks)

(ii) State the phenotype of the offspring (1 mark)

(b) What is genetic engineering? (1 mark)

15. Define the following terms as used in genetics.

(i) Alleles

(ii) Genotype

(iii) Phenotype

16. A farmer mated his dark red cow with a white bull. The cow gave birth to a light red calf

(a) State why the calf is light red and not dark red or white

(b) If a light red bull is mated with a dark red cow, work out using appropriate letter symbols the probability of getting a light offspring

17. (a) What is meant by linked genes?

(b) (i) In fruit flies (Drosophila) the gene for red eyes ® is dominant over

the one for white – eye (r). If a true breeding white – eyed male, all the offspring will be red eyed. However, if a true – breeding white-eyed female is mated with a true- breeding red- eyed male, all the female offspring will be red – eyed. Explain this apparent contradiction.

(ii) Work out the ratio of the expected phenotypes if a red- eyed female offspring from the cross- described in (i) above is mated with red-eyed males.

18. (a) Explain the term variation with reference to the study of genetics.

(b) Using relevant examples distinguish between discontinuous variation and continuous variation

(c) What is the importance of genetic variation?

(d) Describe one example where genetic variations has helped a species to survive

19. The diagram below shows the base sequence of part of a nucleic acid stand. Observe it and answer the questions that follow

G T T A G C T G A

(a) What do the letters G, T , C and A represent?

(b) Giving your reasons state whether it is part of DNA or an RNA strand.

(c) Show the complementary DNA strand

(d) Show the complimentary RNA strand

20. In human couples the sex of a baby is determined by the man. Explain this statement.

CHAPTER 2

EVOLUTION

PAST KCSE QUESTIONS ON TOPICS

1. State the difference between Lamarckian and Darwinian theories of evolution
2. Two populations of the same species of birds were separated over a long period of time by an ocean. Both populations initially fed on insects only. Later it was observed that one population fed entirely on fruits and seeds. Although insect were available. Name this type of evolutionary change.
3. Explain why Lamarck's theory of evolution is not accepted by biologists today
4. State three pieces of evidence that support the theory of evolution. (3 marks)
5. state two advantages of natural selection to organisms (2 marks)
6. Give a reason why each of the following is important in the study of evolution

   (i) Fossils records

   (ii) Comparative anatomy
7. Describe how natural selection brings about adaptation of a species to its environment (6 marks)
8. Explain how the process of evolution may result to the formation of new species
9. What is meant by

   (a) organic evolution (1 mark)

   (b) continental drift (1 mark)
10. Explain continental drift as an evidence of evolution (3 marks)
11. (a) What is a test- cross? (2 marks)

(b) Give a reason why organisms become resistant to drugs (1 mark)

12. Distinguish between the following terms

    (a) Homologous structures

    (b) Analogous structures (4 marks)

13. (a) What is meant by natural selection?

    (b) Explain the role played by mutation in evolution (5 marks)

14. Define the following terms

    (a) Hybrid

    (b) Hybrid vigour

15. The peppered moth exists in two varieties, which are genetically controlled. The dark variety is found predominantly in industrial cities and the white variety is found predominantly in rural areas. Explain how this pattern of distribution supports the theory of evolution by natural selection (6 marks)

16. Explain what is meant by the following concepts

    (a) Special creation (2 marks)

    (b) Organic evolution (2 marks)

CHAPTER 3

RECEPTION, RESPONSE AND CO-ORDINATION

PAST KCSE QUESTIONS ON THE TOPIC

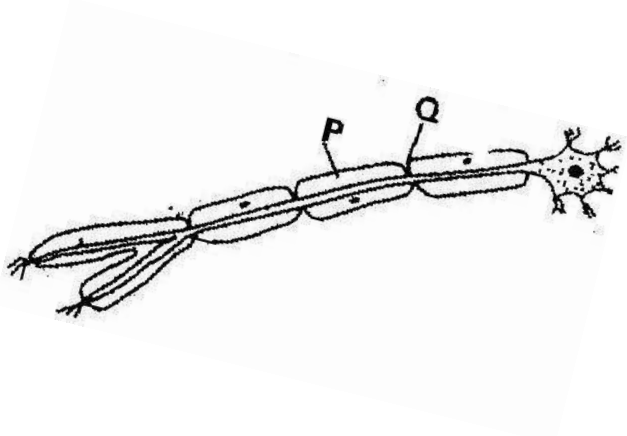
1. State one structural and one functional differences between motor and sensory neurons

   Structural differences

   Functional differences (2 marks)

2. The table below shows two mammalian hormones. For each hormone, state the site of production and its function in the body.

Hormone	Site of production	Function
Oestrogen		
Aldosterone		

3. 

   (i) With an arrow, indicate on the diagram the direction of the impulse through the neurone (1 mark)

   (ii) State the functions of parts labeled P and Q (2 marks)

4. (a) How are structures of the human eye adapted to their functions (14 marks)

   (b) State three defects of the eye and how each can be corrected (6 marks)

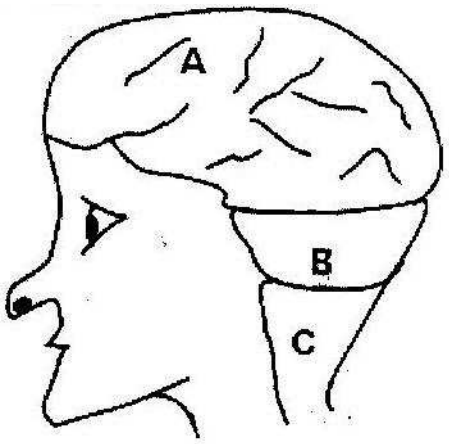
5. State the changes that occur in a nerve axon to produce an action potential

   (3 marks)

6. In an accident a victim suffered brain injury. Consequently he had loss of memory.

   Which part of the brain was damaged? (1 mark)

7. The diagram below shows surface view of a human brain



   (a) Name the parts labeled B and C (2 marks)

   (b) State three functions of the part labeled A (3 marks)

   (c) State what would happen if the part labeled B was damaged. (1 mark)

8. What is the function of the following cells in the retina of the human eye?

   (2 marks)

   (a) Cones

   (b) Rods

9. (a) State the functions of the following parts of the mammalian ear

   (i) Tympanic membrane (3 marks)

(ii) Eustachian tube (1 mark)

(iii) Ear ossicles (2 marks)

(b) Describe how semi- circular canals perform their functions (2 marks)

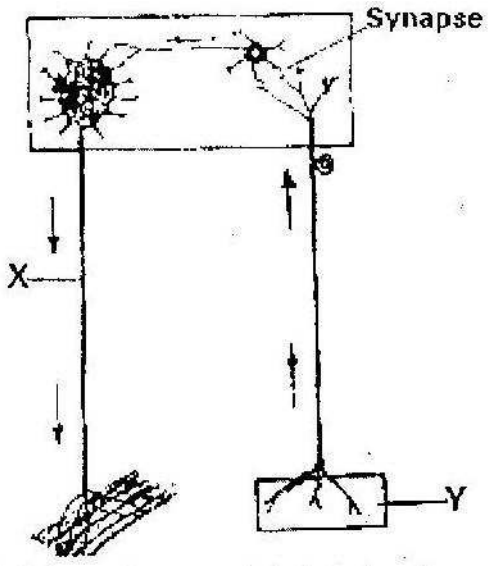
10. State the importance of tactic response among some members of Kingdom Protista?

(1 mark)

(a) What name is given to response to contact with surface exhibited by tendrils and climbing stems in plants? (1 mark)

(b) State three biological importances of tropisms to plants (3 marks)

11. The diagram below represents a reflex arc in human



(a) Name the parts labeled X and Y (2 marks)

X _____

Y _____

(b) Name the substance that is responsible for the transmission of an impulse across the synapse (1 mark)

12. (a) State the function of the ciliary muscles in the human eye. (1 mark)

(b) State two functional differences between the rods and cones in the human eye

(2 marks)

13. State the function of each of the following parts of human ear (4 marks)

(a) Ear ossicles

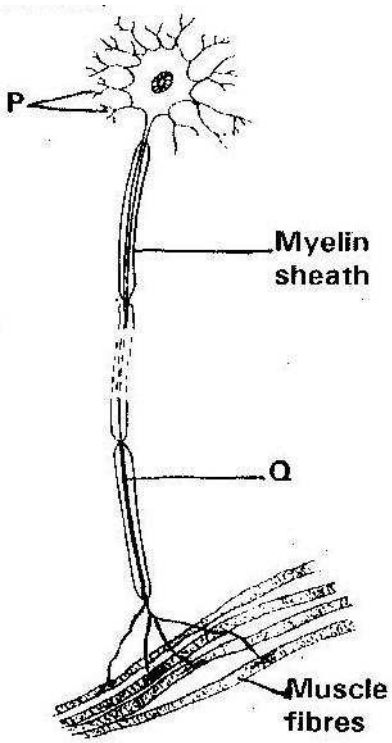
(b) Cochlea

(c) Semi- circular canals

(d) Eustachian tube

14. (a) Where in the human body are relay neurons found? (1 mark)

(b) The diagram below represents a neurone



(i) Name the neurone (1 mark)

(ii) Name the parts labeled P and Q (2 marks)

15. (a) Name the hormone that is responsible for apical dominance (1 mark)

(b) What is thigmotropism? (1 mark)

16. Describe the structure and functions of the various parts of the human ear

(20 marks)

17. Nocturnal animals such as the owl are capable of seeing fairly well at night

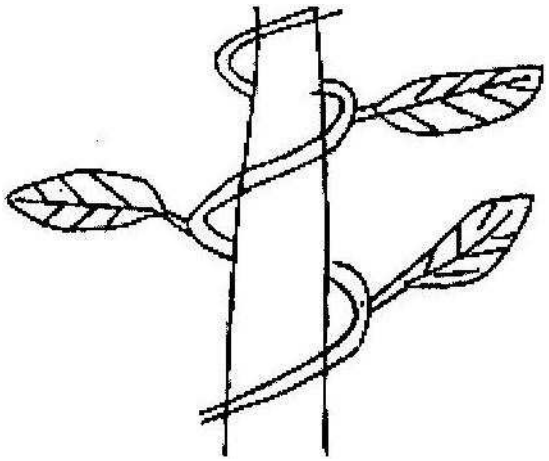
What two retinal adaptations have made this possible? (2 marks)

18. State two functions of the human ear? (2 marks)

19. State four differences between co- ordination of the human eye's internal response to light and that of tropic movement of the flowering plant in response to light.

(4 marks)

20. The figure below shows a stem of a plant growing round a tree trunk



(i) What is the name of the response, which causes the twisted growth?

(1 mark)

(ii) Explain how the twisting process is accomplished (2 marks)

(iii) Identify the state of leaves if the plant is autotrophic (2 marks)

21. Euglena is positively phototactic. Of what biological significance is this characteristics? (1 mark)

22. State the function of acetylcholine (2 marks)

23. Where in the human body is the relay neurone located? (1 mark)

24. State three effects of nicotine to human health (3 marks)

25. state the part of the eye involved in

(i) Colour vision

(ii) Maintaining shape of the eyeball

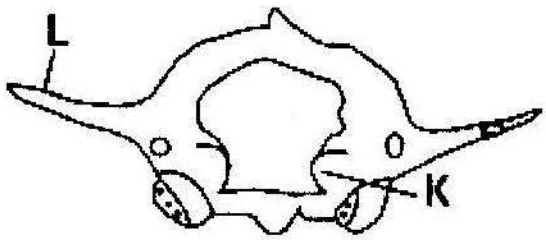
(iii) Change in diameter of the lens

CHAPTER 4

SUPPORT AND MOVEMENT IN PLANTS AND ANIMALS

PAST KCSE QUESTION ON THE TOPIC

1. The diagram below represents in a mammalian bone



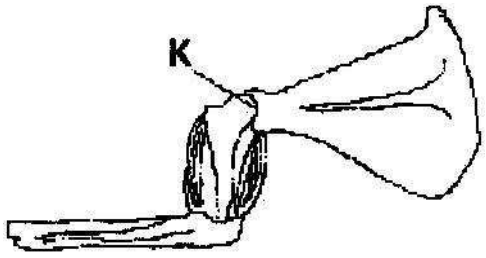
(a) State the function of the part labeled K and L (2 marks)

(b) State the region of the body in which the bone is found (1 mark)

2. State two ways in which skeletal muscle fibres are adapted to the function

(2 marks)

3. The diagram below shows the arrangement of bones and muscles in a human arm.



(i) Name the parts of the bone labeled K (1 mark)

(ii) How do the muscles work to extend the arm? (3 marks)

4. State three structural differences between biceps muscles and muscles of the gut

	Biceps	Gut muscles
(i) (ii) (iii) (iv)		

5.

(a) Name the bone (1 mark)

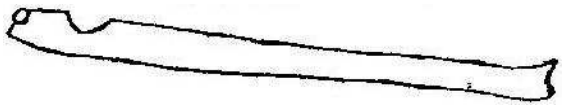
(b) Name the type of joint formed by the bone at its anterior end with the adjacent bone (1 mark)

6. Give a reason why the lumbar vertebrae have long and abroad transverse processes (2 marks)

7. (a) Name the three types of skeletons found in multicellular animals (3 marks)

(b) Describe how the cervical, lumbar and sacral vertebrae are suited to their functions (17 marks)

8. A bone obtained from a mammal is represented by the diagram below



(a) Name the bone (1 mark)

(b) Which bones articulate with the bone shown in the diagram at the notch?

(2 marks)

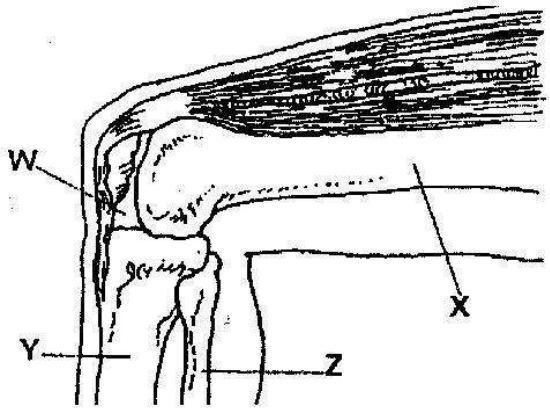
9. (a) Name the cartilage between the bones of the vertebral column

(1 mark)]

(b) State the function of the cartilage in (a) above (1 mark)

10. How are xylem vessels adapted for support? (1 mark)

11. The diagram below represents bones at a joint found in the hind limb of a mammal



(a) Name the bones labeled X, Y, and Z (3 marks)

X _____

Y _____

Z _____

(b) (i) Name the substance found in the place labeled W (1 mark)

(ii) State the function of the substance named in (b) (i) above

(c) Name the structure that joins the bones together at the joint (1 mark)

(d) State the differences between ball and socket joint and the one illustrated in the diagram above (1 mark)

(e) Name the structure at the elbow that performs the same functions as the patella (1 mark)

12. (a) State a characteristic that is common to all cervical vertebrae

(b) Name two tissues in plants that provide mechanical support (2 marks)

13. (a) Name the three types of muscles found in mammals and give an example of where each on of them is found

(b) State the difference between ball and socket and hinge joint (1 mark)

14. State three functions of an insects exoskeleton (3 marks)

15. State the function of the following fins of a fish

(a) Dorsal fin (1 mark)

(b) Pectoral and pelvic fins (1 mark)

(c) Caudal fin (1 mark)

16. State the diagnostic features of the cardiac muscles (3 marks)

The following figure is a part of a pelvic girdle known as the innominate bone

(a) Make a complete drawing of the girdle (1 mark)

(b) Name the bones that articulate with the pelvic girdle. In each case name the part that articulates with (2 marks)

17. Distinguish between tendons and ligaments (2 marks)

18. Explain what antagonistic muscles are and give an example (4 marks)

19. (a) Name three types of strengthening tissues found in plants (3 marks)

(b) Explain how the tissue in (a) above are adapted to their functions (3 marks)

20. (a) Name the three main types of joint (3 marks)

(b) Give an example of where each type of joint name in (a) above is found in the human body (3 marks)

21. What makes young herbaceous plant remain upright? (2 marks)]

22. Name three types of muscles found in the human body, state where each type is located and how each is adapted to its functions. (12 marks)