

GENETICS

KCSE QUICK REVISION

*Compilation of Possible Questions in Biology Likely to be
Examined in KCSE.*

*A Special Analysis of Prediction Questions that may be Tested in KCSE from this
Topic in Form 4.*

BIOLOGY

SERIES 1

For Marking Schemes

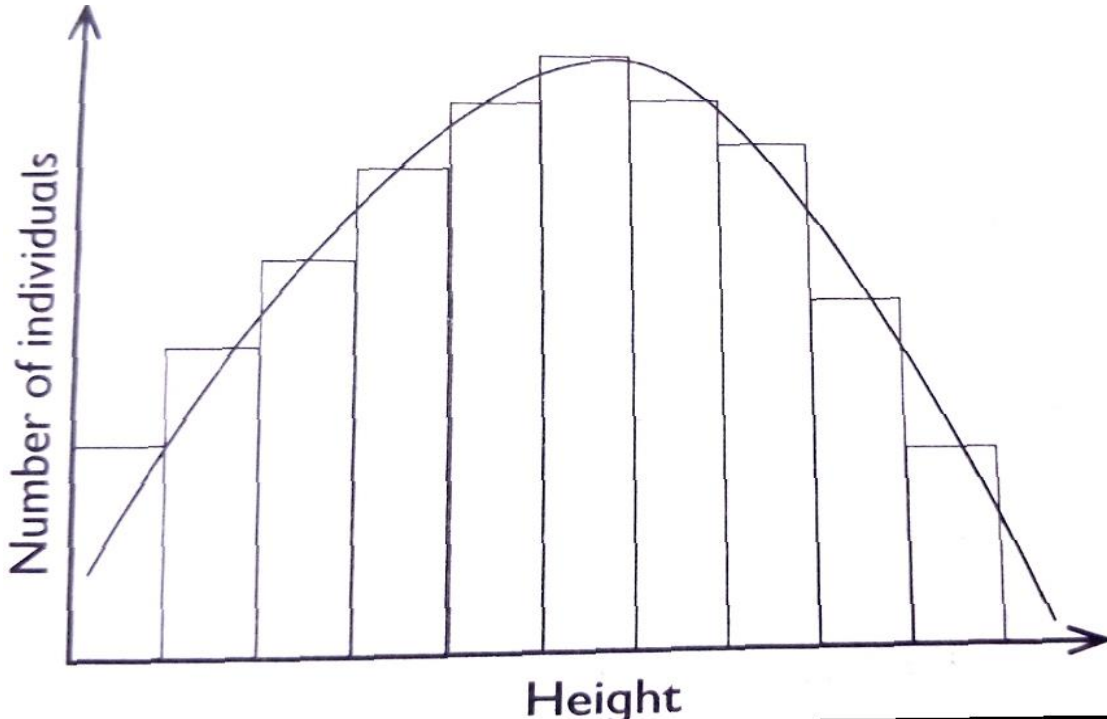
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MWALIMU CONSULTANCY

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 copied from this DNA strand
12. The figure below represents the distribution of height of pupils in a school

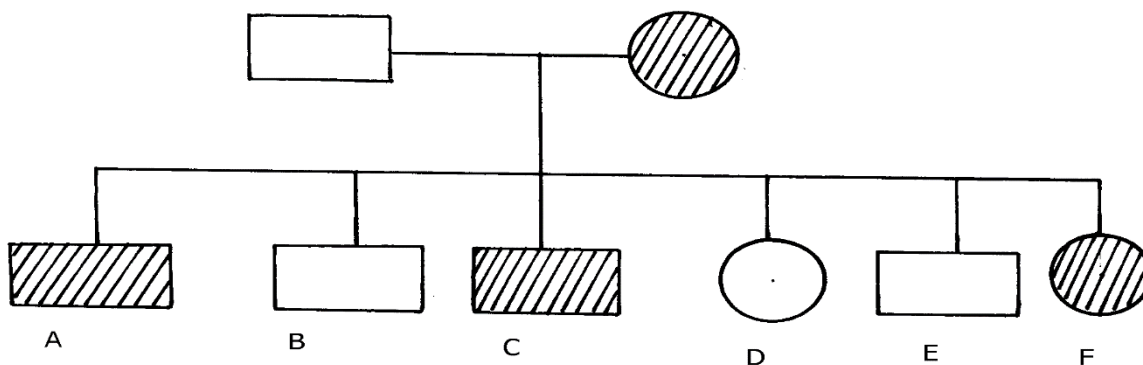


- (a) Name the type of variation represented by the curve
(b) Outline **two** possible causes of variation in height of individuals in man
13. a) Wekesa and Wanjiku who are siblings are both normal as their parents but have a Hemophilic brother. Give the Genotype of their parents.
b) i) What are linked genes?
ii) What do you understand by the phrase 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

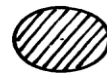
- a) Name the type of chromosomal mutation represented
- b) Name **one** mutagenic agent
- 16.** The figure below is a structural diagram of a portion from a nucleic acid strand
- a) Giving a reason, name the nucleic acid to which the portion belongs
- b) Write down the sequence of bases of a complementary DNA strand
- 17.** In an experiment, plants with red flowers was crossed with plants with white flowers. All the plants in the **F₁** generation had pink flowers.
- a) Give a reason for the appearance of pink flowers in the **F₁** generation
- b) If plants in **F₁** were selfed, state the phenotypic ratio of the **F₂** 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. 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 **F₁** generation plants had pink flowers.
- (a) Give an explanation for the absence of Red and white flowered plants in the **F₁** generation.
- (b) If the **F₁** generation pea plants were selfed, state the phenotypic ratio of the **F₂** 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 CCGATAC
(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 the genetic chart below showing the inheritance of the gene responsible for haemophilia in a family.

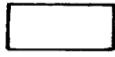




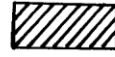
Normal female



Carrier female

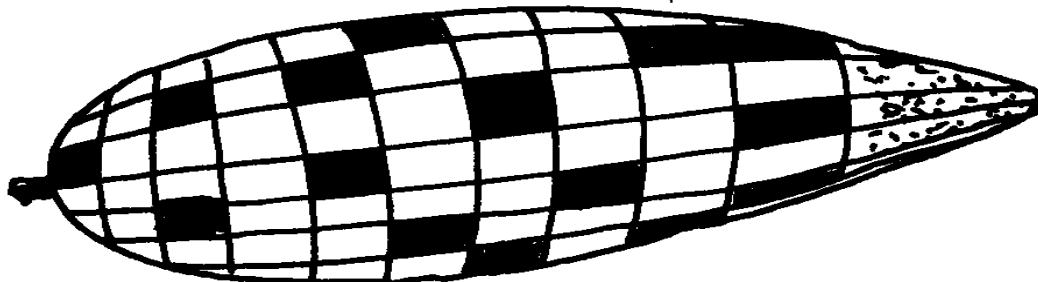


Normal male



haemophiliac male

- 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] Differentiate between phenotype and genotype as used in genetics
[b] State three structural differences 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 were 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 ratios of purple grains to yellow grains
- (b) Using appropriate symbol, work out a genetic cross for F₂ 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]Differentiate between sickle cell anaemia and sickle cell trait

[ii]Explain why people with sickle cell trait have an adaptive survival over normal individuals 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 Rhesus 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 heterozygous 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 F₁ 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 F₁ generation had pink flowers when the F₁ plants were crossed, he counted 480 plants in F₂ generation

Using appropriate letter symbols, work out the cross between the F₁ plants to get the F₂ generation

- (b) Give the phenotypic and genotypic ratios for the F₂ generation

Phenotypic ratio

Genotypic ratio

- (c) How many plants in the F₂ 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 F₁ generation were black. The off springs grew and were allowed to mate with one another.

The total number of F₂ generation offspring were 96.

- (a) Using letter **B** to denote the gene for black colour. Work out the genotype of the F₁ generation. (Use a punnet square)

- (b) State the following for the F₂ 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 .

For Marking Schemes/Answers

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