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PRIMARY EDUCATION & RIGHTEOUSNESS LEARNING

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Ch - 3: Genetics

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Short Questions

Question 1: What is a gene ? How is it related to heredity ?

Question 2: Define mutation and give its significance.

Question 3: What is crossing-over ? What are the factors affecting it ?

Question 4: Why did Mendel selected pea plants for his experiment ?

Question 5: Define Mendel's law of segregation.

Question 6: What is monohybrid cross ? How did Mendel performed this cross ?

Question 7: A certain couple got four daughters in a sequence and no son. Does it mean that the husband does not produce Y-chromosome bearing sperms ? Explain.

What is the chance of this couple having a daughter ?

Question 8: Mutation alters the hereditary material. Give reasons.

Question 9: Why do men suffer from haemophilia and colour blindness ? Under what conditions do women suffer from these disorders ?

Give Reasons

Question 1: Law of independent assortment holds good for the gene pairs that occur in different pairs of chromosomes.

Question 2: Heritable variations are called genetic variations.

Question 3: Discontinuous variations are inheritable.

Question 4: Why X-linked recessive diseases are more common among males than females.

Question 5: In honey bee, female is diploid and male is haploid.

Question 6: Haemophilia shows criss-cross inheritance.

Differentiate

Question 1: Homozygous and Heterozygous.

Question 2: Y-linked inheritance and X-linked inheritance.

Question 3: Haemophilia and Colour blindness.

Question 4: Genotype and Phenotype.

Question 5: Monohybrid and Dihybrid cross.

Diagram Based Questions

Question 1: (i) State Mendel's Law of Dominance.

(ii) A pure tall plant (TT) is crossed with a pure dwarf plant (tt).

Draw Punnet squares to show (1) F₂ generation (2) F₂ generation.

(iii) Give the Phenotype of the F₂ generation.

(iv) Give the Phenotypic and Genotypic ratio of the F₂ and F₂ generation.

(v) Name any one X-linked disease found in humans.

Question 2: Write a short note on **sex determination** in man.

Question 3: A woman with normal vision marries a man with normal vision. They have a colour blind son. Her husband dies and she marries a colour blind man. Show the type of children that might be expected from this marriage and the proportion of each.

Question 4: What is dihybrid cross ? How did Mendel performed this cross.

Question 5: A woman had normal vision, but her father was colour blind. She marries a man, who is colour blind. Find out the probability of the first child being colour blind, whether it is a boy or girl.

Question 6: The karyotype (set of chromosomes) shown below is taken from a dividing cell in a certain individual.

- (i) Is the individual male or female? Explain your answer.
- (ii) How would you expect (a) a female cell and (b) sperm cell to differ in chromosome composition?

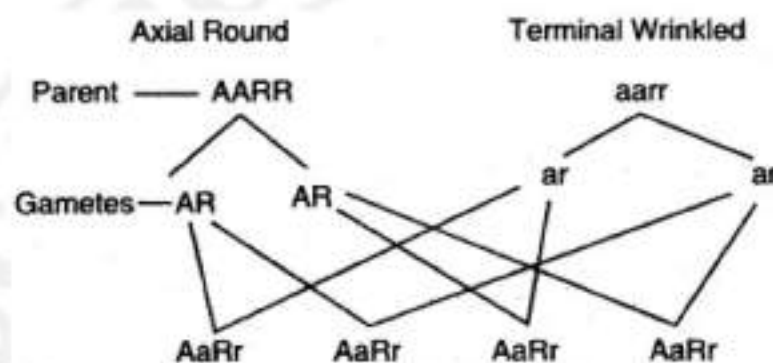
Question 7: (i) State Mendel's law of Independent Assortment.

(ii) A homozygous Tall plant (T) bearing red coloured (R) flowers is crossed with a homozygous Dwarf plant (t) bearing white flowers (r):

- (1) Give the Genotype and Phenotype of the F_2 generation.
- (2) Give the possible combinations of the gametes that can be obtained from the F_2 hybrid.
- (3) Give the dihybrid ratio and the phenotype of the offsprings of the F_2 generation when two plants of the F_1 generation above are crossed.

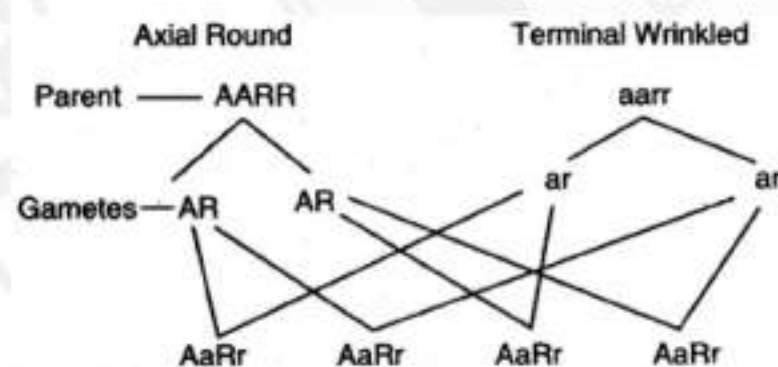
Question 8: A haemophilic man marries a carrier women. Find out the probability of their offsprings being haemophilic.

Question 9: Given below is a schematic diagram showing Mendel's Experiment on sweet pea plants having axial flowers with round seeds (AARR) and Terminal flowers with wrinkled seeds (aarr). Study the same and answer the questions that follow :



- (i) Give the phenotype of F_1 progeny.
- (ii) Give the phenotypes of F_2 progeny produced upon by the self-pollination of F_1 progeny.
- (iii) Give the phenotypic ratio of F_2 progeny.
- (iv) Name and explain the law induced by Mendel on the basis of the above observation.

Question 10: (a) Given below is a schematic diagram showing Mendel's Experiment on sweet pea plants having axial flowers with round seeds (AARR) and terminal flowers with wrinkled seeds (aarr). Study the same and answer the questions, that follow :



- (i) Give the phenotype of F_1 progeny.
- (ii) Give the phenotypes of F_2 progeny produced upon by the self-pollination of F_1 progeny.
- (iii) Give the phenotypic ratio of F_2 progeny.
- (iv) Name and explain the law induced by Mendel on the basis of the above observation.

Explain the Terms

Question:

1. Heredity
2. Variation
3. Dominance
4. Linkage
5. Mutation
6. Crossing-over
7. Heterosome
8. Recessive character
9. Genotype
10. Alleles

Name the Following

Question:

1. The study of heredity and variation.
2. Cells having a single set of chromosomes.
3. The genetic composition of an organism.
4. Pairs of chromosomes, present in human egg cells.
5. Number of chromosomes present in human gametes.
6. The diploid number for cell of man.
7. Chromatids where Recombination of characters occurs.
8. A specific part of chromosome that determine hereditary characteristics.
9. The pattern of arrangement of genes along a chromosomes.
10. Pair of genes responsible for a particular characteristic.
11. The type of gene, which in the presence of a contrasting allele is not expressed.

Give Technical Terms

Question:

1. Transmission of characters through generations.
2. Differences occurring within offsprings of the same progeny.
3. Cell organelle directly involved in genetics.
4. Cell which determines the sex of a baby.
5. A virus with DNA as heredity material.
6. The hereditary unit, which is responsible for inheritance.
7. Transmits characteristics from parents to offsprings.
8. The individual having similar pair of genes.
9. The individuals having dissimilar pair of genes.
10. The ratio of offspring on F2 generation in a dihybrid cross.
11. A single egg was fertilized by a single sperm. But twins derived from that egg were born. What is the name of such type of twins ?
12. A twin consisting of a brother and a sister were born to a lady. What is the name of such a type of twins ?
13. Name a genetic disease in which a person cannot distinguish red and green colour.

Fill in the Blanks

Complete the following sentences with appropriate words :

1. The chromosomal theory of inheritance was proposed by _____ and _____ in 1902.
2. _____ is the hereditary unit.
3. In mammals, the female is homozygous while the male is _____.
4. A chromosome is composed of _____ % DNA and 50% _____.
5. _____ is the Father of Genetics.
6. The number of chromosomes in human is _____.
7. The physical expression of genes is called _____.
8. The small differences among individuals are called _____.
9. The dissimilar pairs of genes present in an individual are known as _____.
10. _____ chromosomes do not take part in sex determination.
11. _____ are the alternative forms of a gene producing different effects.
12. _____ is the ratio of dihybrid cross.
13. A character that is suppressed is _____.
14. Upon _____ the diploid condition is restored.

True & False

Mention, if the following statements are True or False. If false rewrite the wrong statement in its correct form:

1. Most genetic diseases in man are recessive in character.
2. DNA has a double helical structure.
3. Genes are responsible for genetic characters.
4. Linkage is a permanent feature of few genes.
5. Mutation can be brought about artificially.
6. A female is responsible for the sex of the progeny.
7. Mendel experimented upon plants of *Oryza sativa*.
8. Male act as carrier for colourblindness.
9. Females are more affected by sex-linked genetic disorders.
10. Colour blindness is a Y-linked character.
11. Haemophilia exhibits X linked inheritance.
12. A colourblind male cannot distinguish any colour.
13. Cancer is a genetic disorder.

State the Function

Write the functional activity of the following structures:

Name	Function
DNA	Controls biosynthetic processes of cell.
Chromosomes	Carry genetic information from parents to offspring.
Genes	Carries parental characters to offsprings.
Autosomes	Responsible for physical character of progeny.
Heterosomes	Sex-determination.

Choose the Odd One Out

1. Genes, Chromosomes, Alleles, Ovule.
2. Seed shape, Seed color, Flower position, Inflorescence.
3. Law of dominance, Law of segregation, Law of independent assortment, Blackman law of limiting factor.
4. Haemophilia, Colour blindness, Night blindness, Albinism.

Multiple Choice Questions

- Genetics is a branch of biology dealing with:
 (a) Heredity in living beings (b) Variation in living beings
(c) Both heredity and variation (d) None of these
- Who among the following is called father of genetics?
 (a) Mendel (b) F. Meisher
(c) Watson and Crick (d) Lamarck
- When an individual has both the genes of a contrasting character, it is said to be:
(a) Homozygous (b) Heterozygous
 (c) Phenotype (d) Genotype
- When two individuals differing in at least one character are crossed, the process is known as:
(a) Hybridization (b) Selection
 (c) Pedigree (d) None of these
- A cross was made between tall and dwarf plants. In F1 generation all plants were tall, when the F1 plants were selfed, the tall and dwarf plants appeared in 3: 1 ratio in F2 generation. This phenomenon is known as:
(a) Dominance (b) Segregation
 (c) Hybridization (d) Crossing over
- What is the effect of sexual reproduction?
(a) Offspring is weak (b) Offspring is like the parents
 (c) Offspring is more vigorous (d) Offspring is diseased
- DNA structure was discovered by:
(a) Lamarck (b) Mendel
(c) Watson and Crick (d) H. G. Khurana
- Chromosomal aberrations are caused by:
(a) Change in the structure of gene.
(b) Change in the number of chromosome.
(c) Change in the arrangement or position of genes.
(d) Change in the number or arrangement of genes in the chromosome.

Match the Column

Column 'II' is a list of items related to ideas in Column 'I'. Match the term in Column 'II' with the suitable idea given in Column 'I'.

Column I	Column II
Genetics	Chromosomes similar in size and shape.
Autosomes	The alternative forms of a gene.
Recessive gene	Study of laws of inheritance of characters
Allele	A gene that can express only when in a similar pair.
Homologous chromosomes	Chromosomes other than the pair of sex chromosomes.