

REVIEW QUESTIONS

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A. MULTIPLE CHOICE TYPE

(Select the most appropriate option)

1. Which one of the following is the phenotypic monohybrid ratio in F_2 generation?

- a) 3 : 1 b) 1 : 2 : 1
c) 2 : 2 d) 1 : 3

Solution:-

- a) 3 : 1

2. If a pure tall plant is crossed with a pure dwarf plant, then offspring will be

- (a) all tall (b) all dwarf
(c) 3 tall 1 dwarf (d) 50% tall 50% dwarf

Solution:-

- (a) all tall

3. The 9:3:3:1 dihybrid ratio is due to

- (a) segregation (b) crossing over
(c) independent assortment (d) homologous pairing

Solution:-

- (c) independent assortment

4. A plant with green pods and smooth seeds with genotype Ggss will give rise to the following gametes:

- (a) Gg and Ss (b) Gs and ss
(c) Gs and gs (d) Gg and gs

Solution:-

- (c) Gs and gs

B. VERY SHORT ANSWER TYPE**1. Match the terms in column I with their explanations in column II****Column I****(Term)**

- a. Genetics
b. Autosomes
c. Recessive gene
d. Allele

Column II**(Explanation)**

- (i) Chromosomes similar in size and shape
(ii) The alternative forms of a gene
(iii) Study of laws of inheritance of characters
(iv) A gene that can express when only in a similar pair

e. Homologous chromosomes

Solution:-

Column I

(Term)

- a. Genetics
- b. Autosomes
- c. Recessive gene
- d. Allele
- e. Homologous chromosomes

(v) Chromosomes other than the pair of sex

Column II

(Explanation)

- (iii) Study of laws of inheritance of characters
- (v) Chromosomes other than the pair of sex
- (iv) A gene that can express when only in a similar pair
- (ii) The alternative forms of a gene
- (i) Chromosomes similar in size and shape

2. Name any two genetic diseases in humans.

Solution:-

Colour blindness and Haemophilia etc. are genetic diseases in humans.

3. Which one of the following genotypes is homozygous dominant and which one homozygous recessive in regard to tongue rolling:

Rr, rr, RR?

Solution:-

Homozygous recessive – rr

Homozygous dominant - RR

C. SHORT ANSWER TYPE

1. Differentiate between:

(a) Genotype and Phenotype

Solution:-

Genotype	Phenotype
The set of genes present in the cells of an organism.	The observable characteristics which are genetically controlled.

(b) Character and Trait

Solution:-

Character	Trait
A character is a heritable feature.	A trait is an alternative form of character.

(c) Monohybrid and dihybrid cross (phenotypic ratio).

Solution:-

Monohybrid	Dihybrid
Mendel crossed pure breeding varieties, first, by taking only one feature at a time. Phenotypic ratio is 3:1	Mendel crossed pure breeding varieties, by taking two features together. Phenotypic ratio is 9: 3: 3: 1

2. Among lion, tiger and domestic cat, all the three have the same number of 38 chromosomes, yet they have different appearances. How do you account for such differences?

Solution:-

All the three have 38 chromosomes. However, the characteristics of species including physical appearance, body functions, behavior, etc., are not simply the outcome of chromosome number, but these are the result of the units called genes which the chromosomes carry. The lion and the cat have the same number of chromosomes (38). Yet one is distinct from the other in body size, appearance, colour, behavior, etc. All such characteristics of an organism are the result of the genes located on the chromosomes.

3. List any three features of garden pea with their dominant and recessive traits.

Solution:-

Character	Dominant Trait	Recessive Trait
Flower Colour	Purple	White
Flower Position	Axillary	Terminal
Plant height	Tall	Dwarf

4. Explain why generally only the male child suffers from colour blindness and not the female?

Solution:-

Colour blindness are more common in males than in females. Such defects are due to recessive genes, which occur on the 'x' chromosomes. Colour blindness is an inherited disease due to which affected individuals cannot differentiate between certain colours, Mostly red and green.

Males have only one X chromosome. If there is recessive gene present on X chromosome, then the male will suffer from colour-blindness.

Females have two X chromosomes. It is definitely not possible that both the X chromosomes carry abnormal gene. Hence, if one gene is abnormal and since it is

recessive, its expression will be masked by the normal gene present on the other X chromosome. So it is rare or unlikely for Females to suffer from colour-blindness.

5. In a certain species of animals, black fur (B) is dominant over brown fur (b). Show the possible ratio of genotypes and phenotypes of the offspring of pure breeding different coloured parents.

Solution:-

From the question it is given that B refers to black fur and b refers to brown fur. Then,

Genotypic ratio = 1BB: 2Bb: 1bb

Phenotypic ratio = 3B: 1b

D. LONG ANSWER TYPE

1. Explain the following terms:

(a) Heterozygous

Solution:-

Heterozygous dominant with dissimilar pair

Rr (hetero: different, zygos: pair)

Certain tongue rollers are heterozygous with Rr genotype.

(b) Homozygous

Solution:-

Homozygous dominant, that has similar pair RR (homo: similar, zygos: pair)

A non-roller will have rr (homozygous) genotype.

(c) Pedigree chart

Solution:-

1. Males are shown by squares and females by circles.
2. Both father and mother are tongue rollers (hollow symbols represent the usual expressed character).
3. Of the three children born, two can roll (hollow symbols) and one cannot (solid symbol).
4. The recessive trait (rr) of non-rolling in one of the children could have come from nowhere else but the parents.

2. State the three Mendel's laws of inheritance.

Solution:-

Mendel's generalizations of the results of breeding experiments are summarized under three laws:

1. Law of Dominance: Out of a pair of contrasting characters present together, only one is able to express itself while the other remains suppressed. The one that expresses is the recessive. The recessive character can express only when the pair consists of both recessives (homozygous recessive)
2. Law of Segregation (also called the law of purity of gametes): The two members of a pair of factors separate during the formation of gametes. They do not blend but segregate or separate into different gametes. The gametes combine together by random fusion at the time of zygote formation.
3. Law of Independent Assortment: When there are two pairs of characters, the distribution of the alleles of one character into the gametes is independent of the distribution of the alleles of the other character.

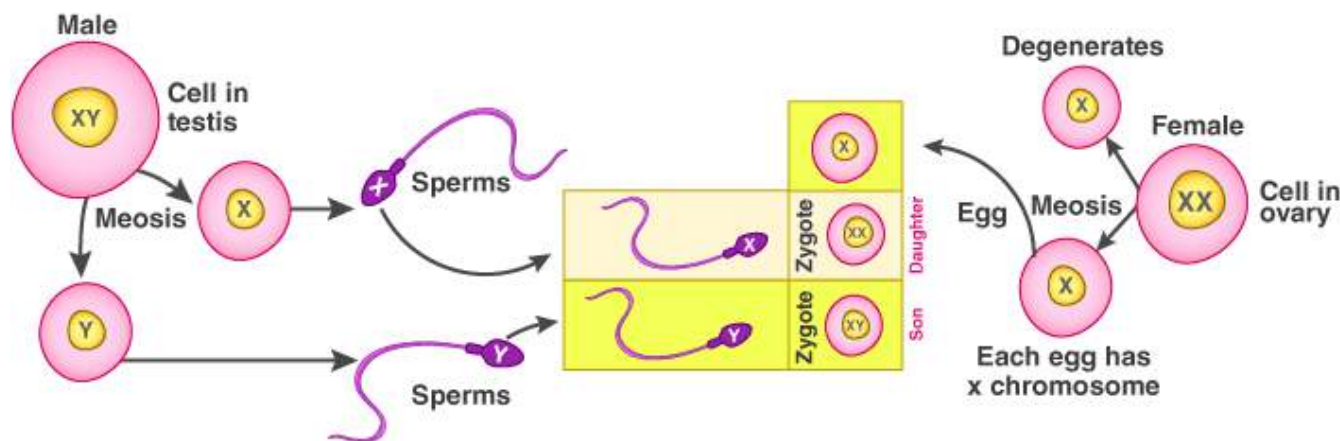
3. Does the sex of the child depend on the father or is it just a matter of chance?

Discuss.

Solution:-

The sex of the child depends upon the kind of sperm that fertilises the egg. The egg contains only one X chromosome, but half of the sperms released into the genital tract of the female during coitus are X-bearing and the remaining half are Y-bearing. It is simply a matter of chance as to which type of sperm fuses with the ovum:

1. If the egg (X) is fused by X- bearing sperm, the resulting combination is xx, i.e. female constitution and the child produced is a female (Daughter).
2. If the egg (X) is fused by Y-bearing sperm, the resulting combination is XY, i.e. male constitution and the child produced is a male (son).



All eggs are alike (each with one X-chromosome), but sperms are either with X-or with Y-

chromosome (50% of each kind). The type of sperm that fertilizes the egg determines whether the child will be male or female.

E. STRUCTURED/APPLICATION AND SKILL TYPE

1. In a certain species of animals, black fur (B) is dominant over brown fur (b). Predict the genotype and phenotype of the offspring, when both parents are 'Bb' or have heterozygous black fur.

Solution:-



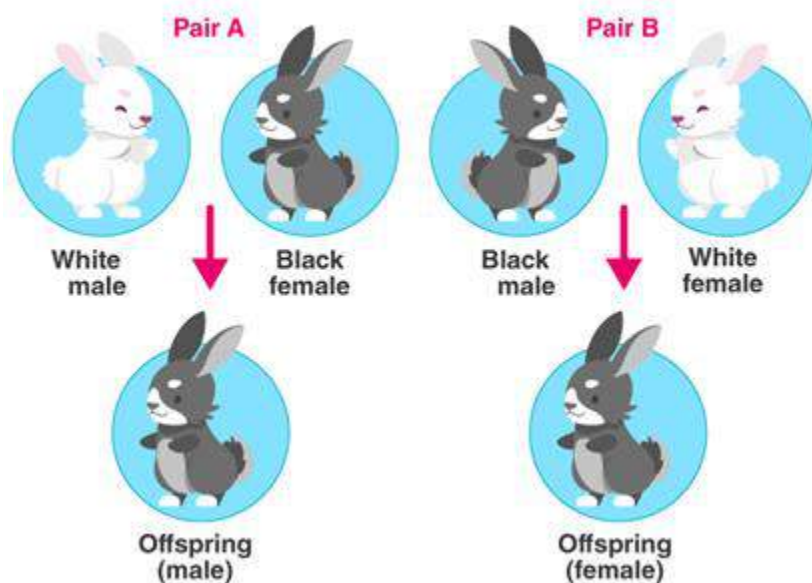
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From the question it is given that B refers to black fur and b refers to brown fur. Then,

Genotypic ratio = 1BB: 2Bb: 1bb

Phenotypic ratio = 3B: 1b

2. Two pairs (A and B) of rabbits were crossed as given below:



(a) Can you tell which coat colour (black or white) is dominant?

Solution:-

Black colour is dominant.

(b) Is the coat colour sex-linked?

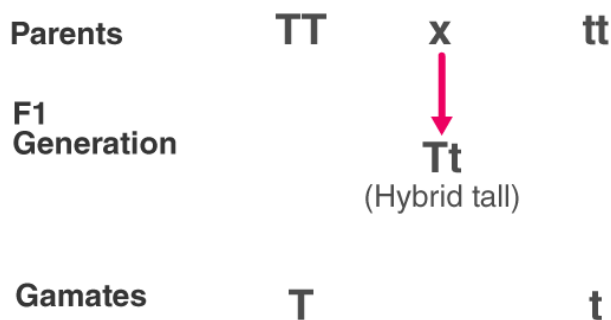
Solution:-

No.

3. Make a Punnett square for finding out the proportion of different genotypes in the progeny of a genetic cross between

(a) A pure tall (TT) pea plant with a pure dwarf (tt) pea plant.

Solution:-



F₂ generation -

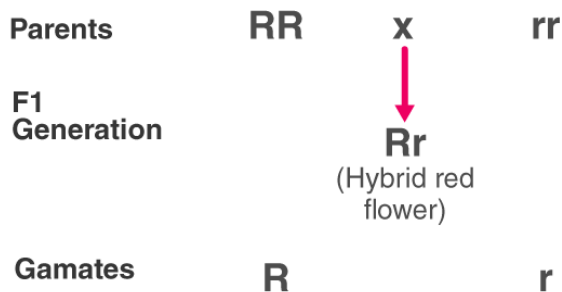
Gametes	T	t
T	TT	Tt
t	Tt	tt

Genotype - 1(Homozygous tall): 2 (Heterozygous tall):1 (Homozygous dwarf)

Phenotype - 3 (Tall): 1(Dwarf)

(b) Red flower variety of pea (RR) with white flower variety of pea (rr).

Solution:-



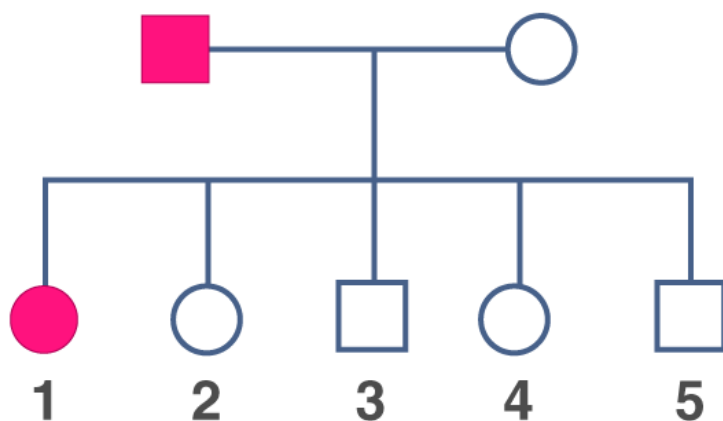
F₂ generation -

Gametes	R	r
R	RR	Rr
r	Rr	rr

Genotype - 1(Homozygous red): 2 (Heterozygous red): 1 (Homozygous white)

Phenotype - 3 (Red): 1(White)

4. A family consists of two parents and their five children and the pedigree chart shown below shows the inheritance of the trait colour blindness in them.



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(a) Who is colour blind in the parents - the Father or the Mother?

Solution:-

By observing the pedigree chart we can say that the father is colour blind.

(b) How many daughters and how many sons have been born in the family?

Solution:-

Two sons and three daughters.

(c) What does the child 1 indicate about this trait?

Solution:-

The child 1 (daughter) is colour blind.

(d) On which chromosome is the gene of this trait located?

Solution:-

On X chromosome the gene of this trait located.

(e) Name one other trait in humans which follows a similar pattern of inheritance.

Solution:-

The other trait in humans which follows a similar pattern of inheritance is Haemophilia.

