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CHAPTER -9 HEREDITY AND EVOLUTION

1. The process where characteristics are transmitted from parent to offspring's is called:

- (a) Variation
- (b) Heredity
- (c) Gene
- (d) Allele

2. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are

- (i) large chromosome (ii) small chromosome (iii) Y-chromosome (iv) X-chromosome
- (a) (i) and (ii)
 - (b) (iii) only
 - (c) (iii) and (iv)
 - (d) (ii) and (iv)

3. A trait in an organism is influenced by

- (a) paternal DNA only
- (b) maternal DNA only
- (c) both maternal and paternal DNA
- (d) neither by paternal nor by maternal DNA

4. If a normal cell of human body contains 46 pairs of chromosomes then the numbers of chromosomes in a sex cell of a human being is most likely to be:

- (a) 60
- (b) 23
- (c) 22
- (d) 40

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5. A cross between a tall plant (TT) and short plant (tt) resulted in progeny that were all tall plants as:

- (a) Tallness is the dominant trait
- (b) Shortness is the dominant trait
- (c) Tallness is the recessive trait
- (d) Height of plant is not governed by gene t or t

6. In peas, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plants to pure short plants in F₂ generation will be:

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

7. Which of the following determines the sex of a child?

- (a) The length of the mother's pregnancy
- (b) The length of time between ovulation and copulation
- (c) The presence of an X chromosome in an ovum
- (d) The presence of a Y chromosome in a sperm

8. Which is the one characteristic of the parents that can be inherited by their children?

- (a) Deep scar on chin
- (b) Snub nose
- (c) Technique of swimming
- (d) Cut nose

9. What is the ancient name for all human beings?

- (a) Monkey
- (b) Chimpanzee
- (c) Homo sapiens

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(d) Invertebrates

10. Which part of the DNA provides information for a protein?

(a) Chromosome

(b) Mitochondria

(c) RNA

(d) Gene

11. The genetic constitution of an individual organism is known as its

(a) phenotype (b) homozygous (c) genotype (d) allele

12. The characters which can be observed in an organism is known as its

(a) dominant traits (b) phenotype (c) genotype (d) recessive traits

13. Which chromosome is not in a perfect pair in human males?

(a) Chromosome 13 (b) X chromosome (c) Y chromosome (d) Both (b) and (c)

14. In human sex determination, a zygote which has inherited an X- chromosome from father will be

(a) a male child (b) a female child (c) twins (d) either male or female.

15. When a tall pea-plant (TT) was crossed with a short pea-plant (tt), the progenies were all tall plants because

(a) tallness is the recessive trait. (b) shortness is the dominant trait.

(c) height of pea-plant is not governed by gene T or t. (d) tallness is the dominant trait.

16. Dihybrid cross is related to the law of

(a) dominance (b) segregation (c) independent assortment (d) none.

17. A tall pea plant was crossed with a dwarf plant and two types of progenies tall and dwarf are produced in the ratio of 1:1. What are the genotypes of the parents?

(a) TT and tt (b) Tt and TT (c) Tt and Tt (d) Tt and tt

18. Which of the following is totally impossible outcome of Mendel's Experiment?

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- (a) 3 tall 1 short plant (b) 24 tall and 8 short plants
(c) 8 tall and 0 short plants (d) 4 tall plants and 1 medium height plant.

19. Mendel went on to study science and mathematics at the:-

- (a) University of Vienna
(b) University of Austria
(c) University of Australia
(d) None

20. In pea plants, the pods may be inflated (I, dominant) or constricted (i, recessive). What proportion of the offspring would be expected to be inflated, if (Ii) is crossed with (ii)?

- (a) 25% (b) 50% (c) 75% (d) 100%

VSA (1 Marks Questions)

1. "Each organism has its own identity" Explain....
2. What is F2 generation?
3. What is the genetic constitution of human sperm?
4. What is genetics?
5. What is the probability that a human progeny will be a boy?

SA (2 Marks Questions)

1. List two differences in tabular form between dominant trait and recessive traits.
2. What are genes? Where are these located?
3. An elephant learns a trick at the circus. Will his offspring's also know the trick by birth? Support your answer with reasons.
4. Why we humans are not exact copy of one of the parents? 5. Traits acquired during lifetime of an individual are not inherited
6. What indication do we get by reappearance of dwarf plant in F2 generation?
7. Give an example where sex is determined by the environmental factors.
8. Why did Mendel choose garden pea for his experiments? Write two reasons.

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SA (3 Marks Questions)

1. How do Mendel's experiment show that traits are inherited independently?
2. How the genes, chromosomes and DNA are inter related to each other?
3. A body builder builds his muscles. Will his child will born with strong muscles? If not, why strength of muscles didn't pass on next generation?
4. How is the equal genetic contribution of male and female parents ensured in the progeny?
5. (a) Why did Mendel carry out an experiment to study inheritance of two traits in garden pea?
(b) What were his findings with respect to inheritance of traits in F_1 and F_2 generation?
(c) State the ratio obtained in the F_2 generation in the above mentioned experiment.

Case based study questions

1. Reproduction results in variation from one generation to the next. The variation produced in the organisms during the successive generation gets accumulated over a long period of time in an organism. After several generation these variations comes up in the organisms and the organisms starts showing up different characteristics and hence leads to the appearance of new species. The main advantage of variation in a species is that it increases the chance of its survival in a changing environment. The organisms which shows positive variation, survives. Those who do not show variations get extinct.

- a) What are variations?
- b) Why the variations are accumulated over generations?
- c) What are the positive variations?

2. The following picture shows the inheritance of gene forms (alleles) for blood group in humans.

father	mother		
	A	B	O
A	AA	AB	AO
B	BA	BB	BO
O	OA	OB	OO

alleles	blood type
A+A	= A
A+O	= A
A+B	= AB
B+B	= B
B+O	= B
O+O	= O

- a) If blood group of father is A and of mother is B, what are the possible blood groups of their offspring?
- b) What will the blood group of child if both parents have "O" blood group?
- c) Which allele is recessive in the above case?

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Answers 1 Marks VSA-MCQ Questions

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	b	b	c	B	a	c	d	b	c	d
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	c	b	d	b	d	c	d	d	d	b

Answers 1 Marks VSA Questions

1.(i)The DNA of each organism is different from others.

(ii)The DNA of each organism is specific within the same species with specific number to chromosomes /genes.

2.The generation produced by the offsprings of F1 generation i.e. first generation as parent is called F2 generation.

3. The genetic constitution of sperm is 22+ X chromosome or 22 + Y chromosome.

4. *Genetics* is a branch of biology concerned with the study of *genes*, *genetic* variation, and *heredity* in organisms.

5. 50% probability

ANSWERS. 2 Marks Questions

1. Differences in tabular form between dominant trait and recessive traits.

Dominant trait	Recessive trait
(i) It is the trait controlled by dominant allele.	It is the trait controlled by recessive allele.
(ii) It is the trait which is expressed in F ₁ generation.	It is the trait which remains suppressed in F ₁ generation and appears in F ₂ generation.

2. The basic functional unit of heredity are called genes. They are also the structural unit of heredity. They are located on chromosomes and their locations are called loci (singular-locus). Genes could be the sequence of DNA in some organisms and those of RNA in some others.

3. Learning a trick at the circus is not an inherited trait. It is an acquired trait which cannot be transferred into the progeny. So, his offspring's will not know the trick by birth.

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4. Some of the people resemble one of their parents because of genes. Every person has two copies of each gene inherited from each parent. The dominant gene form is expressed in their body.
5. These are acquired traits that do not make any change to the DNA of an organism.
6. After obtaining progeny in F₂ generation in a di hybrid cross, Mendel concluded that when two pairs of traits are combined in a hybrid, one pair of character segregates independently of the other pair of character.
7. In some snails and turtles sex is determined by the environmental factors like temperature of water.
8. Mendel chose garden pea for his experiments because
 - (1) Pea plant is a small and easy to grow
 - (2) Short life cycle

Answers 3 Marks Questions

1. If a body builder builds his muscles, this trait is acquired trait and restricted to muscles only these changes don't affect the DNA of germ cells hence don't pass on to next generation.
2. Genes are segments of DNA, which is wound compactly into chromosomes. DNA is genetic material of an organism, genes are the functional part of this material and chromosomes are the vehicles of heredity as they carry genes.
3. If a body builder builds his muscles, this trait is acquired trait and restricted to muscles only these changes don't affect the DNA of germ cells hence don't pass on to next generation.
4. Equal genetic contribution of male and female parents in the progeny is ensured by the equal inheritance of chromosome from each parent. Human possesses 23 pairs of chromosomes, of which 22 pairs are autosomes and 1 pair is the sex chromosomes. The two sex chromosomes in human are X and Y. Females have 2 X chromosomes and males have a X and Y chromosome. During the process of fertilization, a haploid sperm fuses with a haploid ovum to produce a diploid zygote. Zygote receives equal amount of genetic material from each parent and thus, retains the diploid nature on fertilization.
5. (a) Mendel carried out crosses with two traits to see the interaction and basis of inheritance between them. In a dihybrid cross given by Mendel, it was observed that when two pairs of characters were considered each trait expressed independent of the other.

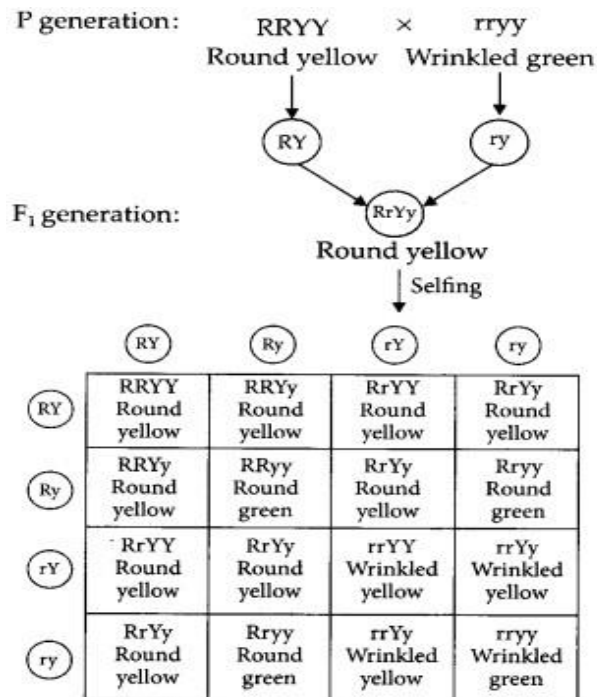
(b) For example, a cross between round yellow and wrinkled green parents.

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(C) In F₁ generation, all plants are with round yellow seeds. But in F₂ generation, we find all types of plants : Round yellow, Round green, Wrinkled yellow, Wrinkled green. F₂ generation ratio : Round-yellow = 9 : Round- green = 3 : Colour of stem in F₁ progeny Wrinkled yellow = 3 : Wrinkled-green = 1 (9:3:3:1)

Answers of Case based questions

1.a) The difference in the characteristics of individual in a population is called variation.

b) Due to their inheritance

c) Variations that provides survival advantage to an organism

2.a) A, B, AB, O

b) O

c) O