2 MARKS EACH

1. A cross was carried out between two pea plants showing the contrasting traits of the height of the plants. The result of the cross showed 50 % parental characters.
   (a) Work out the cross with the help of a Punnett square.
   (b) Name the type of cross carried out.
2. In a cross between two tall pea plants, some of the offsprings produced were dwarf. Show with the help of Punnett square how this is possible.
3. The Tallness of pea plant is a dominant trait, while dwarfness is the alternate recessive trait. When a pure-line tall is crossed with the pure-line dwarf, what fraction of tall plant in F2 shall be heterozygous? Give reasons.
4. How does a test-cross help in identifying the genotype of the organism? Explain.
5. The Inheritance pattern of ABO blood groups in humans shows dominance, co- dominance, and multiple allelism. Explain each concept with the help of blood group genotypes.
6. Write the scientific name of the fruit fly. Why did Morgan prefer to work with fruit-flies for his experiments? State any three reasons
7. In a dihybrid cross white-eyed, yellow bodied female Drosophila crossed with red-eyed, brown bodied male Drosophila produced in F2 generation 1.3 percent recombinants and 98.7 percent progeny with parental type combinations. This observation of Morgan deviated from the Mendelian F2 phenotypic dihybrid ratio. Explain, giving reasons, Morgan's observations.
8. Write the types of sex-determination mechanisms the following crosses show. Give an example of each type.
   (a) Female XX with male XO (b) Female ZW with male ZZ.
9. Name a blood-related autosomal Mendelian disorder. Why is it called Mendelian disorder? How is the disorder transmitted from parents to offsprings?
10. (a) Name the genetic disorder in a human female having 44 + XO karyotype. Mention the diagnostic features of the disorder.
    (b) Explain the cause of such chromosomal disorder.
11. How multiple allelism is different from pleiotropy explain with the help of example.

3 MARKS EACH

1. (a) Write the conclusions Mendel derived on dominance of traits on the basis of monohybrid Crosses that he carried out in pea plants.
   (b) Explain why a recessive allele is unable to express itself in a heterozygous state?
2. Explain polygenic inheritance with the help of a suitable example. How is polygenic inheritance different from pleiotropy?
3. In pea plants, the colour of the flower is either violet or white whereas human skin colour shows many gradations. Explain with reasons how is it possible?
4. Work out a monohybrid cross up to F2 generation between two pea plants and two Antirrhinum plants both having contrasting traits with respect to colour of flower. Comment on the pattern of inheritance in the crosses carried out in above cases.

5. Pea seeds with 'BB' alleles have round seeds and large starch grains, while seeds with 'bb' alleles have wrinkled seeds with small starch grains. Work out the cross between these two parents. Explain the phenotypic ratio of the progeny with respect to seed shape and the starch grain size of the progeny produced.

6. Given below is a table showing the genotypes and the phenotypes of blood groups in the human population:

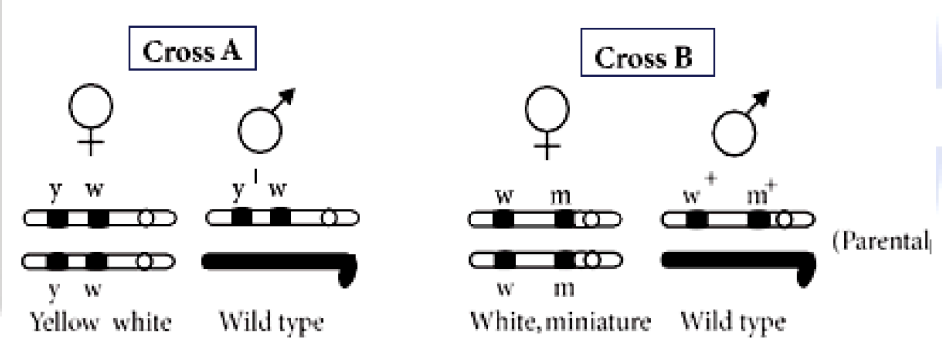
S.No.	Genotype	Phenotype
1	(W)	A
2	I^BI^O	(Y)
3	I^AI^B	(Z)
4	(X)	O

(a) Identify the genotypes (W) and (X) and the phenotypes (Y) and (Z).

(b) How is co-dominance different from incomplete dominance and dominance?

(c) Name the pattern of inheritance exhibited by the phenotypes (Y) and (Z) in the table.

7. Study the two crosses given below and answer the question.



Identify in which of the given crosses, the strength of linkage between the genes is higher. Give reasons in support of your answer.

8. During the studies on genes in Drosophila that were sex-linked, T.H. Morgan found F2 population phenotypic ratios deviated from expected 9: 3: 3: 1 ratio. Explain the conclusion he derived from it.

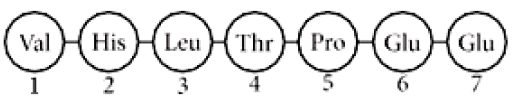
9. (a) Explain the mechanism of sex- determination in humans.

(b) How does it differ from sex determination in birds and honey bees?

(c) Differentiate between male heterogamety and female heterogamety with the help of one example of each.

3 MARKS EACH

1. A relevant portion of β - chain of haemoglobin of a normal human is given below:

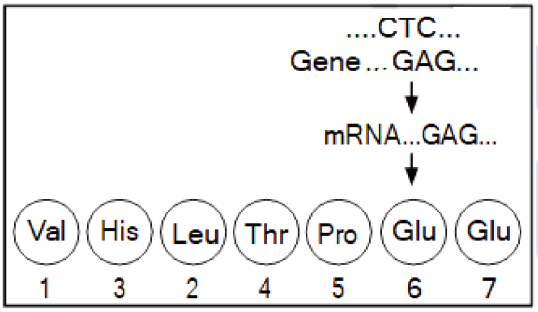


The codon for sixth amino acid is GAG. The sixth codon GAG mutates to GAA as a result of mutation 'A' and into GUG as a result of mutation 'B'. Haemoglobin structure did not change as a result of mutation 'A' whereas haemoglobin structure changed because of mutation 'B' leading to sickle shaped RBCs. Explain giving reasons how could mutation 'B' change the haemoglobin structure and not mutation 'A'?

2. Identify 'a', 'b', 'c','d', 'e' and 'f ' in the table given below.

No.	Syndrome	Cause	Characteristics of affected individuals	Sex male/female/both
1	Down's	Trisomy of 21	'a' (i) (ii)	'b'
2	'c'	XXY	Overall masculine development	'd'
3	Turner's	45 with XO	'e' (i) (ii)	'f'

3. Given below is the representation of an amino acid composition of the relevant translated portion of β-chain of haemoglobin, related to the shape of human red blood cells.



HbA peptide

(a) Is this representation indicating a normal human or a sufferer from certain related genetic disease? Give reason in support of your answer.

(b) What difference would be noticed in the phenotype of the normal and the sufferer related to this gene?

(c) Who are likely to suffer more from the defect related to the gene represented the males, the females or both males and females equally? Why?

5 MARKS EACH

1. (a) List the three different allelic forms of gene 'I' in humans. Explain the different phenotypic expressions, controlled by these three forms.

(b) A woman with blood group 'A' marries a man with blood group 'O'. Discuss the possibilities of the inheritance of the blood groups in the following starting with "yes" or "no" for each:

(c) They produce children with blood group "A" only.

(d) They produce children some with "O" blood group and some with "A" blood group.

2. (a) Dihybrid cross between two garden pea plants, one homozygous tall with round seeds, and the other dwarf with wrinkled seeds was carried out.

(b) Write the genotype and phenotype of the F1 progeny obtained from this cross.

(c) Give the different types of gametes of the F1 progeny.

(d) Write the phenotypes and its ratios of the F2 generation obtained in this cross along with the explanation provided by Mendel.

(e) How were the observations of F2 progeny of dihybrid crosses in Drosophila by Morgan different from that of Mendel carried in pea plants? Explain giving reasons.

3. Let 'Y' be the genotypic symbol for dominant yellow seed colour, symbol 'y' for recessive green seed colour, symbol 'R' for the dominant round shape of seed and symbol 'r' for recessive wrinkled seed shape in garden pea. Using these symbols explain Mendel's law of independent assortment.

4. (a) Why are colour blindness and thalassemia categorised as Mendelian disorders? Write the symptoms of these diseases seen in people suffering from them.

(b) About 8% of the human male population suffers from colour blindness whereas only about 0.4% of the human female population suffers from this disease. Write an explanation to show how it is possible.

5. A child suffering from thalassemia is born to a normal couple. But the mother is being blamed by the family for delivering a sick baby.

(a) What is thalassemia?

(b) How would you counsel the family not to blame the mother for delivering a child suffering from this disease? Explain.

(c) List the values your counselling can propagate in the families.