

QB365 Question Paper Software
12th Standard - Biology
Principles of Inheritance and Variation Case Study
Questions

Exam Time: 00:30 Hrs

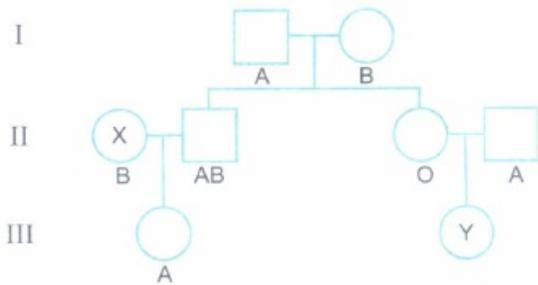
Date: 2025-10-14

Total Marks: 8

Questions:

Case Study Questions

1. Study the pedigree chart showing the pattern of inheritance of blood group character in a family.



- (a) Give the genotypes of the parents in generation I.
- (b) State the possible genotypes of the individuals.
 - (i) X in generation II.
 - (ii) Y in generation III.
- (c) How does the inheritance of this blood group explain codominance?

2. **Read the following and answer any four questions from (i) to (v) given below:**

Prashant wanted to find the genotype of a pea plant bearing purple coloured flowers in his garden. To do this, he crossed purple flowered plant with white flowered plant. As a result, all plants were purple flowered only. Upon selfing these plants, 75 purple flower plants and 25 white flower plants were obtained. Now, he can determine the genotype of a purple flowered plant by crossing it with a white flowered plant.

(i) Which of the following cannot be derived from the crosses done by Prashant?

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|----------------------------------------|--------------------------------------|---------------------------------------------------|
| (a) Mendel's law of segregation | (b) Mendel's law of dominance | (c) Mendel's law of independent assortment |
|----------------------------------------|--------------------------------------|---------------------------------------------------|

(ii) To determine the genotype of a purple flowered plant, Prashant crossed this plant with a white flowered plant. This cross represents a

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|-----------------------|---------------------------|-----------------------------|----------------------------|
| (a) test cross | (b) dihybrid cross | (c) reciprocal cross | (d) trihybrid cross |
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(iii) In a white flowered plant, the allele is expressed in

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|----------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|
| (a) heterozygous condition only | (b) homozygous condition only | (c) F₃ generation | (d) both homozygous condition |
|----------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|

(iv) The character, i.e., purple colour of the flowers that appeared in the first filial generation is

- | | | | |
|--------------------------------|-------------------------------|--------------------------------|-----------------------------|
| (a) recessive character | (b) dominant character | (c) holandric character | (d) lethal character |
|--------------------------------|-------------------------------|--------------------------------|-----------------------------|

(v) **Assertion :** A geneticist crossed two plants and he obtained 50% purple flowered plants and 50% white flowered plants.

Reasons : Purple coloured flower plant might be heterozygous.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false

Answers Key:

Case Study Questions

1. (a) Father - $I^A i$, Mother $I^B i$

(b) (i) $-I^B i$

(ii) $I^A i$ or ii

(C) (i) The alleles I^A and I^B of the blood group character are equally dominant and both of them express themselves when present together, resulting in blood group AB.

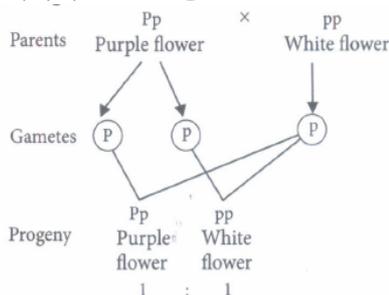
2. **(i) (c) :** Mendel's law of independent assortment states 'when two pairs of traits are combined in a hybrid, segregation of one pair of characters is independent of the other pair of characters: This law can be derived by dihybrid cross but Prashant has performed monohybrid cross only, i.e., one pair of traits.

(ii) (a) : In a test cross, an organism (pea plant) showing a dominant phenotype whose genotype is to be determined is crossed with the recessive parent instead of self-crossing. The progenies of such a cross can easily be analysed to predict the genotype of the test organism. Normal test cross ratio for a monohybrid cross is 1 : 1 and for a dihybrid cross is 1 : 1 : 1 : 1.

(iii) (b) : The factor of an allelic or allelomorphic pair which is unable to express its effect in the presence of its contrasting factor in a heterozygote is called recessive factor or allele, e.g., the allele 't' in hybrid tall pea plant Tt. The effect of recessive factor becomes known only when it is present in the pure or homozygous state, e.g., tt in dwarf pea plant.

(iv) (b) : In first filial generation or heterozygous individuals, out of the two factors or alleles representing the alternate traits of a character, one is dominant and expresses itself in the hybrid or F_1 generation. The other factor or allele is recessive and does not show its effect in the heterozygous individual.

(v) (a) : The given cross can be illustrated as follows:



or 50% purple flowered plant, 50% white flowered plant.