Class 10 Science · Chapter 8: Heredity

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. A pea plant carries one T factor and one t factor for height. The plant will be [1]

(a) tall (b) short

(c) of medium height (d) tall in some seasons and short in others

Answer: (a) A single copy of T is enough to make the plant tall; both copies must be t for it to be short. Tt is therefore tall, with no halfway height.

2. The pair of sex chromosomes present in the body cells of a man is [1]

(a) XX (b) XY

(c) YY (d) only one X

Answer: (b) Men have a mismatched pair: one normal-sized X and one short Y. Women have a perfect pair, XX.

3. Which of the following is a pair of contrasting visible characters that Mendel studied in garden peas? [1]

(a) smooth or hairy leaves (b) round or wrinkled seeds

(c) long or short roots (d) thick or thin stems

Answer: (b) Mendel worked with contrasting visible characters of garden peas such as round or wrinkled seeds, tall or short plants and white or violet flowers. The other pairs are not among them.

4. A breeder crosses pure-breeding pea plants that bear round seeds with pure-breeding plants that bear wrinkled seeds. The F1 seeds will be [1]

(a) all round (b) all wrinkled

(c) half round and half wrinkled (d) all slightly wrinkled

Answer: (a) Round seed is the dominant trait, and the F1 of pure contrasting parents shows only one parental trait with no halfway form, so every F1 seed is round.

5. In a few reptiles, whether a hatchling is male or female is decided by [1]

(a) the sex chromosome given by the father (b) the temperature at which the fertilised egg is kept

(c) the food eaten by the mother (d) the number of eggs laid together

Answer: (b) In some reptiles the temperature at which the fertilised eggs are kept determines whether the young developing in them will be male or female; this is an environmental cue, not a chromosome.

6. Rohan says that because his mother has only X chromosomes, both X chromosomes of his sister must have come from their mother. Is he right? Explain. [2]

No. The mother is XX and gives one X to each child. The sister is XX, so her second X came from the father; an X from the father makes a girl, a Y makes a boy.

- says no: one X from the mother only (1)
- the other X came from the father, which made her a girl (1)

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7. A culture of bacteria grown from one cell is heated to a high temperature for an hour, and only a few cells survive. Give the reason only these few survived, and say what most cells in the culture will be like a few generations later. [2]

The cells were not all identical: a few carried a variation that let them withstand heat, and variants do not have equal chances of surviving in an environment. The survivors pass the variation on, so after a few generations most cells in the culture can withstand heat.

- the survivors carried a heat-tolerant variation; variants differ in chance of survival (1)
- offspring inherit it, so the culture becomes mostly heat-tolerant (1)

8. Give two examples from animals which show that the sex of an individual is not always decided by its genes, and state what decides it in each. [2]

In a few reptiles the temperature at which the fertilised eggs are kept decides whether the young are male or female. In snails an individual can change sex, so sex is not genetically determined.

- reptiles: incubation temperature of the eggs (1)
- snails: individuals change sex (1)

9. Kavita crossed pure-breeding pea plants with yellow seeds and pure-breeding plants with green seeds. Every F1 seed was yellow. She self-pollinated the F1 and got 452 yellow and 148 green seeds. (a) Which trait is dominant? Give the reason. (b) Work out the approximate ratio of yellow to green seeds. (c) What does the appearance of green seeds in the F2 show? [3]

(a) Yellow is dominant: the F1 of pure contrasting parents shows only yellow, with no blending. (b) 452 : 148 = 3.05 : 1, about 3 : 1. (c) The green trait was inherited by the F1 plants but not expressed; both traits were present in the F1, and only yellow showed.

- yellow dominant, as the only trait in the F1 (1)
- ratio about 3 : 1 worked from 452/148 (1)
- green factor was present but hidden in the F1 (1)

10. A pure tall pea plant with round seeds (TT RR) is crossed with a pure short plant with wrinkled seeds (tt rr). (a) Give the genotype and appearance of the F1. (b) Name the kinds of germ-cell an F1 plant makes. (c) Name the two new combinations that appear in the F2. [3]

(a) Tt Rr; all tall with round seeds, as both are dominant. (b) TR, Tr, tR and tr. (c) Tall with wrinkled seeds, and short with round seeds.

- F1 Tt Rr, tall with round seeds (1)
- four germ-cells TR, Tr, tR, tr (1)
- tall-wrinkled and short-round (1)

11. A survey of 200 families in a housing society, each with one child, found 98 boys and 102 girls. (a) Explain why the numbers are close to half and half. (b) Which parent's chromosome decided the sex of each child? (c) A neighbour says the mothers of the girls are responsible. Comment. [3]

(a) Every father makes germ-cells carrying X and germ-cells carrying Y in equal numbers, so about half the children (100 of 200) are expected to be boys. (b) The father's: an X from him gives a girl, a Y a boy. (c) The neighbour is wrong: every mother gives only an X, so she cannot decide the sex of the child.

- X and Y sperms equal, so half boys, half girls (1)
- the father's chromosome decides (1)
- mother always gives X, so she cannot decide (1)

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