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Heredity — CBSE Class 10 Science Chapter Test

FREE CHAPTER TEST · CLASS X · SCIENCE (086) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	20 (A 10 · B 4 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 20 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–14 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q15–17 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q18 is a long answer (LA) type question, carrying 5 marks.
7. In Section E, Q19–20 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class X Science (086) Sample Question Paper 2026-27, at about half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Heredity · **Topics:** Inherited traits · Mendel's experiments · Dominant and recessive traits · Monohybrid cross · Dihybrid cross and independent inheritance · How traits are expressed · Sex determination

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. A pure-bred tall pea plant (TT) is crossed with a pure-bred dwarf pea plant (tt). The plants of the F1 generation are 1

(A) all tall

(B) all dwarf

(C) tall and dwarf in the ratio 3 : 1

(D) tall and dwarf in the ratio 1 : 1

2. When the F1 plants of a cross between pure tall and pure dwarf pea plants are self-pollinated, the ratio of tall to dwarf plants in the F2 generation is 1

(A) 1 : 2 : 1

(B) 9 : 3 : 3 : 1

(C) 1 : 1

(D) 3 : 1

3. In the same F2 generation, the ratio of the genotypes TT : Tt : tt is 1

(A) 3 : 1

(B) 1 : 2 : 1

(C) 9 : 3 : 3 : 1

(D) 1 : 1

4. Mendel crossed pea plants with round, yellow seeds (RRYY) with plants with wrinkled, green seeds (rryy) and self-pollinated the F1. What fraction of the F2 plants had wrinkled, green seeds? 1

(A) 9/16

(B) 3/16

(C) 1/16

(D) 1/4

5. In human beings, the sex of a child is determined by 1

(A) the X chromosome it inherits from its mother

(B) the temperature at which the embryo develops

(C) whether it inherits an X or a Y chromosome from its father

(D) the number of autosomes it inherits

6. A heterozygous tall pea plant (Tt) is crossed with a dwarf plant (tt). The fraction of dwarf plants among the offspring is 1

(A) 1/4

(B) 1/2

(C) 3/4

(D) 0

7. In some animals, such as certain reptiles, the sex of the young is decided by 1

(A) the X chromosome only

(B) the Y chromosome only

(C) the number of autosomes

(D) the temperature at which the fertilised eggs are kept

8. In Mendel's cross of round, yellow with wrinkled, green pea plants, some F2 plants had round, green seeds and some had wrinkled, yellow seeds. This shows that 1

(A) the two traits are inherited independently

(B) the two traits are always inherited together

(C) recessive traits are lost in the F2

(D) only dominant traits are expressed in the F2

9. **Assertion (A):** A trait that is not seen in the F1 generation can reappear in the F2 generation. 1
Reason (R): Traits are controlled by pairs of factors (genes), and the recessive factor is carried, unexpressed, by the F1 plants.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** The sex of a child is determined by the mother. 1
Reason (R): Women have a perfect pair of sex chromosomes, both of which are called X.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 4 very short answer (VSA) type questions of 2 marks each.

11. (a) Show, with the help of a cross, the F1 and F2 generations of a cross between a pure tall (TT) and a pure dwarf (tt) pea plant, and give the F2 phenotypic ratio. 2

OR

(b) A pea plant with round, green seeds (RRyy) is crossed with one with wrinkled, yellow seeds (rrYY). Write the genotype and phenotype of the F1 plants, and the four kinds of gametes they form.

12. What is a gene, and where are genes found in a cell? How many copies of each gene are there in a body cell of a pea plant, and how many in its pollen or egg cell? 2

13. How did Mendel's experiments show that one trait of a pair is dominant and the other recessive? 2

14. How do genes control the characteristics, or traits, of an organism? Explain with the example of plant height. 2

SECTION C

This section comprises 3 short answer (SA) type questions of 3 marks each.

15. (a) A tall pea plant of unknown genotype is crossed with a dwarf pea plant (tt). Of the 120 plants obtained, 61 are tall and 59 are dwarf. (i) What is the genotype of the tall parent? Show the cross. (ii) If the tall parent had been TT, what would the offspring have been? (iii) How many of the 120 plants would be expected to be dwarf if both parents had been Tt? 3

OR

(b) In pea plants, round seed shape (R) is dominant over wrinkled (r). Two plants grown from round seeds are crossed, and of the 400 seeds obtained, about 100 are wrinkled. (i) What are the genotypes of the two parents? (ii) About how many of the round seeds are expected to be RR? (iii) How many wrinkled seeds would be expected if one of the parents had been RR?

16. The F1 plants of Mendel's cross between round, yellow (RRYY) and wrinkled, green (rryy) pea plants are self-pollinated, and 1600 F2 plants are obtained. How many are expected to have (i) round, yellow seeds, (ii) round, green seeds and wrinkled, yellow seeds, (iii) wrinkled, green seeds? 3

17. Explain how the sex of a child is determined in human beings. Why is it wrong to blame a mother for giving birth only to daughters? 3

SECTION D

This section comprises 1 long answer (LA) type questions of 5 marks each.

18. (a) Mendel crossed a pea plant with round, yellow seeds (RRYY) with one with wrinkled, green seeds (rryy). 5

(i) What did the seeds of the F1 plants look like?

(ii) Write the genotype of the F1 plants.

(iii) Name the four types of gametes formed by the F1 plants.

(iv) Write the phenotypes in the F2 generation and their ratio.

(v) Which F2 phenotypes were new combinations, and what conclusion did Mendel draw from them?

OR

(b) (i) Give two reasons why the garden pea was a good choice for Mendel's experiments.

(ii) Show the F1 generation of a cross between pure tall (TT) and pure dwarf (tt) plants.

(iii) Write the phenotypic and genotypic ratios in the F2.

(iv) Explain how each parent contributes to the genes of the offspring.

(v) Explain why dwarf plants reappear in the F2 although all the F1 plants are tall.

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

19. Ritu crossed pure-bred pea plants with violet flowers with pure-bred plants with white flowers. All the F1 plants had violet flowers. She then self-pollinated the F1 plants and grew 240 F2 plants.

(i) Which flower colour is dominant? [1]

(ii) How many of the 240 F2 plants are expected to have white flowers? [1]

(iii) Write the genotypes of the violet-flowered F2 plants and their expected numbers. [2]

OR

(iii) Instead, an F1 plant is crossed with a white-flowered parent. Show the cross and give the ratio of violet to white flowers in the offspring. [2]

20. A couple has three daughters. Their neighbours say that the mother is responsible for the family having no son, and that the next child is sure to be a boy.

(i) Write the sex chromosomes of the mother and of the father. [1]

(ii) Whose chromosome decides the sex of the child? [1]

(iii) What is the probability that the fourth child will be a boy? Explain why the earlier births do not change it. [2]

OR

(iii) Show the cross that explains how the sex of a child is determined, and explain why the neighbours are wrong to blame the mother. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(A)	(D)	(B)	(C)	(C)	(B)	(D)	(A)	(A)	(D)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (A). Every F1 plant gets T from one parent and t from the other: all are Tt, and tall because T is dominant.

Q2. Answer (D). Tt × Tt gives TT, Tt, Tt and tt: three tall plants for every dwarf one.

Q3. Answer (B). Of the four equally likely combinations, one is TT, two are Tt and one is tt.

Q4. Answer (C). Only the gamete ry from both sides gives rryy: 1 of the 16 equal combinations.

Q5. Answer (C). All children get an X from the mother. A child who gets X from the father is a girl (XX); one who gets Y is a boy (XY).

Q6. Answer (B). Tt gives T and t gametes, tt gives only t: Tt and tt are equally likely, so half the plants are dwarf.

Q7. Answer (D). In some animals the temperature at which the fertilised eggs are kept decides whether they develop into males or females; it is not decided genetically.

Q8. Answer (A). New combinations of the two traits appear, so seed shape and seed colour are inherited independently of each other.

Q9. Answer (A). Both true: the F1 plants are Tt; the t is not lost, and in the F2 one plant in four gets t from both parents and is dwarf. Answer (A).

Q10. Answer (D). A is false: because every egg carries an X, it is the father's sperm (X or Y) that decides the sex. R is true. Answer (D).

Q11. (2 marks) Answer: (a) F1 all Tt tall; F2 TT, 2Tt, tt; 3 : 1; (b) F1 RrYy round yellow; gametes RY, Ry, rY, ry.
(a) Parents TT × tt; gametes T and t; F1: all Tt (tall). [1]
F1 × F1: Tt × Tt; gametes T, t from each; F2: TT, Tt, Tt, tt — tall : dwarf = 3 : 1. [1]
OR (b) Parents RRyy × rrYY give gametes Ry and rY; F1: all RrYy, with round, yellow seeds. [1]
F1 gametes: RY, Ry, rY and ry, in equal numbers. [1]

Q12. (2 marks) Answer: A section of DNA on a chromosome in the nucleus; two copies in body cells, one in germ cells.
A gene is a section of DNA that carries the information for making one protein; genes are carried on the chromosomes in the nucleus. [1]
A body cell has two copies of each gene, one from each parent; a germ cell (pollen or egg) has only one copy. [1]

Q13. (2 marks) Answer: F1 all tall shows tallness dominant; dwarfness reappears in F2, so it is recessive.
When pure-bred tall and dwarf plants were crossed, all the F1 plants were tall; no 'medium' plants appeared, so only one of the two traits was expressed — the dominant trait. [1]
When the F1 plants were self-pollinated, dwarf plants reappeared in the F2 (one in four), so the dwarf trait had been inherited but not expressed in the F1 — the recessive trait. [1]

Q14. (2 marks) Answer: Gene → protein (enzyme); enzyme efficiency → amount of growth hormone → height.
A gene is a section of DNA that provides information for making one protein; proteins such as enzymes control the characteristics. [1]
Plants have hormones that trigger growth; the height of a plant depends on the amount of the hormone, which depends on how efficiently the enzyme for making it works. An efficient enzyme gives much hormone and a tall plant; an altered gene makes a less efficient enzyme, less hormone and a short plant. [1]

Q15. (3 marks) Answer: (a) Tt; all tall; 30; (b) Rr and Rr; about 100 RR; none wrinkled.
(a) (i) About half the plants are dwarf (tt), so the tall parent must carry t: it is Tt. Tt × tt gives Tt and tt in equal numbers, about 60 each. [1]
(ii) TT × tt would give only Tt: all tall. [1]
(iii) Tt × Tt gives one dwarf in four: 120/4 = 30. [1]
OR (b) (i) About one seed in four is wrinkled (rr), so each round parent must carry r: both are Rr. [1]
(ii) Rr × Rr gives RR : Rr : rr = 1 : 2 : 1; of the 300 round seeds, one in three, about 100, are RR. [1]
(iii) RR × Rr gives only RR and Rr: no wrinkled seeds. [1]

Q16. (3 marks) Answer: (i) 900; (ii) 300 each; (iii) 100.
The F2 ratio is round yellow : round green : wrinkled yellow : wrinkled green = 9 : 3 : 3 : 1 (16 parts); 1600/16 = 100 per part. [1]
(i) 9 × 100 = 900; (ii) 3 × 100 = 300 each. [1]
(iii) 1 × 100 = 100. [1]

Q17. (3 marks) Answer: Eggs all X, sperms X or Y; sperm decides; not the mother's doing.
Humans have 22 pairs of autosomes and one pair of sex chromosomes; women have XX and men have XY. [1]
Every egg carries an X; half the sperms carry X and half carry Y. An egg fertilised by an X sperm gives a girl (XX), and by a Y sperm a boy (XY). [1]
So the sex of the child depends on which sperm fertilises the egg — it is decided by the father's chromosome, not the mother's, and it is a matter of chance. [1]

Q18. (5 marks) Answer: (a) round yellow; RrYy; RY, Ry, rY, ry; 9 : 3 : 3 : 1; round green and wrinkled yellow, independent inheritance; (b) contrasting traits; F1 Tt; 3 : 1 and 1 : 2 : 1; one copy from each parent; tt from Tt × Tt.
(a) (i) All round and yellow (round and yellow are the dominant traits). [1]
(ii) RrYy. [1]
(iii) RY, Ry, rY and ry. [1]
(iv) Round yellow : round green : wrinkled yellow : wrinkled green = 9 : 3 : 3 : 1. [1]
(v) Round green and wrinkled yellow were new combinations, so the traits of seed shape and seed colour are inherited independently. [1]
OR (b) (i) Pea plants have many clearly contrasting traits (such as tall/dwarf, round/wrinkled), and they self-pollinate. [1]
(ii) Parents TT × tt; F1 all Tt, tall. [1]
(iii) F2: TT, Tt, Tt, tt — phenotypic ratio tall : dwarf = 3 : 1 and genotypic ratio TT : Tt : tt = 1 : 2 : 1. [1]
(iv) Each germ cell carries only one copy of each gene; at fertilisation the offspring gets one copy from each parent, so it has a pair again. [1]
(v) The F1 plants are Tt; their own pollen and eggs each carry T or t, so 1 in 4 F2 plants gets tt and is dwarf. [1]

Q19. (4 marks) Answer: (i) violet; (ii) 60; (iii)(a) 60 VV, 120 Vv; (b) Vv × vv, 1 : 1.
(i) Violet. [1]
(ii) One in four: 240/4 = 60. [1]
(iii)(a) VV and Vv, in the ratio 1 : 2. [1]
Of the 180 violet plants, 60 are VV and 120 are Vv. [1]
OR (iii)(b) Vv × vv: gametes V, v and v; offspring Vv and vv. [1]
Violet : white = 1 : 1. [1]

Q20. (4 marks) Answer: (i) XX, XY; (ii) father's; (iii)(a) 1/2, independent each time; (b) XX × XY, the sperm decides.

(i) Mother XX; father XY. [1]

(ii) The father's (the sperm carries X or Y). [1]

(iii)(a) 1/2 (50%). [1]

Each child gets an X or a Y from the father by chance, separately each time; earlier births do not affect the next. [1]

OR (iii)(b) XX × XY: eggs X; sperms X and Y; children XX (girl) and XY (boy) in equal numbers. [1]

Every egg carries X, so the mother cannot decide the sex: it depends on whether an X or a Y sperm fertilises the egg. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: every cross worked out by listing every combination of gametes, with ratios and expected numbers computed from the counts.