CBSE CLASS X

Science (086)

QUESTION PAPER

AI-generated question paper

Code: NTAMAU **Questions: 30** **Maximum Marks: 67** **Generated: 2026-06-25 17:36**

SELECTIONS USED

Subject	Science
Lessons	8 Heredity
Level of understanding	Exam-ready
Question selection	CBSE board paper, whole lesson (~80 marks across Sections A-E)
Model	claude-sonnet-4-6

Composition — Difficulty: 5 straightforward · 18 medium · 7 deep | Types: 11 MCQ · 6 Short · 4 Very short · 3 Assertion–reason · 3 Long · 3 Case-based | Sections: A 14Q/14m · B 4Q/8m · C 6Q/18m · D 3Q/15m · E 3Q/12m

Q1. straightforward exam-ready **[1]**

A tall pea plant (TT) is crossed with a short pea plant (tt). All F1 plants are tall, and when F1 plants self-pollinate, tall and short plants appear in the F2 generation in a 3:1 ratio. Which of the following best explains these observations?
((A)) Tallness is dominant; the allele for shortness is masked in F1 but reappears in F2
((B)) Shortness is dominant; the allele for tallness disappears in F1
((C)) The tall allele blends with the short allele in F1 but separates again in F2
((D)) Only tall plants can self-pollinate successfully

A Tall is a recessive trait
B Tall is a dominant trait
C Tall and short traits blend equally
D Short trait is expressed but hidden

◆ Heredity

Q2. straightforward exam-ready **[1]**

In a monohybrid cross between tall (Tt) and short (tt) pea plants, what is the expected ratio of tall to short plants in the progeny?

A 3:1
B 1:1
C 2:1
D 1:2:1

◆ Heredity

Q3. straightforward exam-ready **[1]**

Which of the following correctly explains why variations are important for a species?
((A)) Variations allow individuals to acquire new skills during their lifetime
((B)) Variations increase the chances that at least some individuals will survive drastic environmental changes
((C)) Variations ensure all offspring are identical, maintaining species stability
((D)) Variations arise only in sexually reproducing organisms and are always beneficial

A Variations ensure all individuals look identical
B Variations allow some individuals to survive environmental changes better than others
C Variations are produced only during asexual reproduction
D Variations reduce the number of offspring produced

◆ **Heredity**

Q4. medium exam-ready **[1]**

A dihybrid cross between two pea plants with genotype RrYy × RrYy is performed. The F2 generation shows four phenotypic classes in the ratio 9:3:3:1. Which principle of inheritance does this ratio directly support?
((A)) Dominance — one allele masks the effect of another
((B)) Segregation — alleles separate during gamete formation
((C)) Independent assortment — alleles of different genes are inherited independently
((D)) Blending inheritance — traits from both parents mix in offspring

A The two traits are linked and always inherited together
B The two traits are inherited independently of each other
C One trait completely suppresses the other
D F2 offspring show only parental combinations

◆ **Heredity**

Q5. medium exam-ready **[1]**

In sexually reproducing organisms, each germ cell carries only one copy of each gene. Why is this necessary?
((A)) So that the offspring receive double the number of chromosomes from each parent
((B)) So that fertilisation restores the full two copies of each gene in the offspring
((C)) So that mutations occur less frequently in germ cells than in body cells
((D)) So that both parents contribute genes of identical type to the offspring

A So that offspring have half the DNA of their parents
B So that when two germ cells combine, the normal chromosome number is restored in the offspring
C To ensure only dominant traits are passed on
D To prevent any variation from occurring in offspring

◆ **Heredity**

Q6. medium exam-ready **[1]**

The sex of a crocodile embryo is determined by the temperature at which fertilised eggs are incubated. This means sex determination in crocodiles is:

A Genetically determined like in humans
B Determined by environmental cues, not genes
C Determined by the Y chromosome
D Determined by the number of autosomes

◆ **Heredity**

Q7. medium exam-ready **[1]**

In a plant, shortness is controlled by a gene that produces a less efficient enzyme, resulting in lower hormone levels. Tallness is controlled by an efficient form of the same enzyme. Which form of the gene is dominant?

A The gene that produces the less efficient enzyme, because it requires two copies to show its effect
B The gene that produces the efficient enzyme, because even one copy makes enough hormone for tallness
C Both forms are equally dominant
D The gene for the less efficient enzyme, because it produces more variation

◆ **Heredity**

Q8. straightforward exam-ready **[1]**

In pea plants, two different traits such as seed colour and seed shape are inherited independently of each other. The most likely reason for this is that:
((A)) Each gene controlling a trait is located on a separate chromosome
((B)) All genes are located on the same chromosome but separated by large gaps
((C)) Dominant genes are always located on larger chromosomes
((D)) Genes controlling unrelated traits are always found in the same nucleus

A Gene
B Chromosome
C Ribosome
D Nucleus

◆ **Heredity**

Q9. medium exam-ready **[1]**

In a population of bacteria reproducing asexually, a particular variation is found in 60% of individuals while another variation is found in only 5%. Which variation most likely arose earlier, and why?
((A)) The 5% variation; rare traits are always newer
((B)) The 60% variation; a higher frequency suggests the variation has had more time to accumulate through successive generations
((C)) Both arose at the same time; frequency does not reflect age
((D)) The 60% variation; common traits are always more beneficial

A The trait present in 10%, because rare traits are older
B Both traits arose at the same time
C The trait present in 60%, because it has had more time to accumulate in the population
D Neither trait can be compared this way

◆ **Heredity**

Q10. medium exam-ready **[1]**

Sexual reproduction generates more heritable variation than asexual reproduction primarily because:
((A)) Sexual reproduction involves two individuals whose genetic material combines, producing new combinations of traits
((B)) Asexual reproduction always involves mutations while sexual reproduction does not
((C)) Sexual reproduction occurs faster, giving more opportunities for variation
((D)) In sexual reproduction, only the mother's genes are passed to offspring, halving the genetic information

A Sexual reproduction involves more DNA copying errors
B Sexual reproduction combines genetic material from two different individuals, generating new gene combinations
C Asexual reproduction does not produce any variation at all
D Sexual reproduction skips the process of DNA replication

◆ **Heredity**

Q11. deep exam-ready **[1]**

Two pea plants, one with genotype TTWW (tall, violet flowers) and another with ttww (short, white flowers) are crossed. The F1 progeny are all tall with violet flowers. When F1 plants are self-pollinated, which new phenotypic combinations are expected in F2 that were NOT present in either parent?

A Tall with violet flowers and short with white flowers only
B Tall with white flowers and short with violet flowers
C Only short plants with white flowers
D No new combinations; only parental types reappear

◆ **Heredity**

Q12. medium exam-ready **[1]**

Assertion (A): In human beings, it is the father's chromosomal contribution that determines whether a child will be male or female.
Reason (R): A father can pass either an X or a Y chromosome to the child, while the mother always passes an X chromosome.

A Both A and R are true, and R is the correct explanation of A
B Both A and R are true, but R is NOT the correct explanation of A
C A is true but R is false
D A is false but R is true

◆ **Heredity**

Q13. medium exam-ready **[1]**

Assertion (A): Variants that are better suited to their environment survive and reproduce more successfully than others.
Reason (R): All variants in a population have equal chances of surviving regardless of the environment.

A Both A and R are true, and R is the correct explanation of A
B Both A and R are true, but R is NOT the correct explanation of A
C A is true but R is false
D A is false but R is true

◆ **Heredity**

Q14. straightforward exam-ready **[1]**

Assertion (A): Each body cell of a sexually reproducing organism has two copies of each chromosome.
Reason (R): One copy of each chromosome is inherited from the mother and one from the father through their respective germ cells.

A Both A and R are true, and R is the correct explanation of A
B Both A and R are true, but R is NOT the correct explanation of A
C A is true but R is false
D A is false but R is true

◆ **Heredity**

Q15. medium exam-ready **[2]**

A child has blood group O. Her mother has blood group A and her father has blood group B. What does this tell you about whether blood group O is dominant or recessive? Explain your reasoning.

◆ **Heredity**

Q16. medium exam-ready **[2]**

Why does a germ cell contain only one set of genes while all other body cells contain two sets?

◆ **Heredity**

Q17. medium exam-ready **[2]**

In pea plants, round seed shape (R) is dominant over wrinkled (r). A plant with round seeds is test-crossed with a wrinkled-seeded plant and gives both round and wrinkled seeds in equal proportion. What is the genotype of the round-seeded parent? Justify your answer.

◆ **Heredity**

Q18. medium exam-ready **[2]**

In snails, an individual can change its sex during its lifetime. What does this indicate about the mechanism of sex determination in snails compared to humans?

◆ **Heredity**

Q19. medium exam-ready **[3]**

Mendel crossed pea plants having tall stems and round seeds (TTRR) with plants having short stems and wrinkled seeds (ttrr). All F1 plants were tall with round seeds. When F1 plants were allowed to self-pollinate:
(i) What phenotypic ratio is expected in F2?
(ii) Identify the two new phenotypic combinations that appear in F2 which were absent in the parent generation.
(iii) What does the appearance of new trait combinations in F2 indicate about how traits are inherited?

◆ **Heredity**

Q20. medium exam-ready **[3]**

Explain how a gene controls a characteristic in an organism, using plant height as an example. Your answer should connect genes, enzymes, hormones and the final trait.

◆ **Heredity**

Q21. medium exam-ready **[3]**

In a Mendelian monohybrid cross:
(i) Why are there no plants of intermediate height (medium height) in the F1 generation when tall and short plants are crossed?
(ii) When F1 tall plants self-pollinate, short plants reappear in F2. What does this prove about the F1 plants?

◆ **Heredity**

Q22. medium exam-ready **[3]**

With the help of a cross diagram, show the sex chromosome combinations possible in the offspring when a human male (44+XY) reproduces with a human female (44+XX). Explain why a father, and not a mother, is responsible for determining the sex of a child. Why is the probability of having a boy equal to the probability of having a girl?

◆ **Heredity**

Q23. deep exam-ready **[3]**

Asexual reproduction produces very little variation, while sexual reproduction produces considerably more. Explain why this difference exists, referring to the source and mechanism of variation in each type of reproduction.

◆ **Heredity**

Q24. deep exam-ready **[3]**

A pure-breeding pea plant with round yellow seeds (RRYY) is crossed with a pure-breeding plant with wrinkled green seeds (rryy).
(i) Write the genotype and phenotype of the F1 offspring.
(ii) In the F2 generation, what fraction of the total offspring would be expected to have round green seeds? Write their possible genotypes.
(iii) Identify one F2 genotype that would breed true for wrinkled yellow seeds and explain how you determined it.

◆ **Heredity**

Q25. deep exam-ready **[5]**

Mendel used garden pea plants to study heredity over two generations.
(a) Mendel crossed a pure tall pea plant with a pure short pea plant. With a labelled cross diagram, show the genotypes of parents, F1 and F2 generations. (2 marks)
(b) In the F2 generation, what fraction of the tall plants would be pure-breeding (TT)? What simple experiment would you perform to confirm this? (2 marks)
(c) Why did Mendel choose to count individuals in each generation rather than simply observe traits qualitatively? What advantage did this give? (1 mark)

◆ **Heredity**

Q26. deep exam-ready **[5]**

Inheritance of sex in humans involves specific chromosomal mechanisms.
(a) Describe the sex chromosome composition of human males and females. How many pairs of chromosomes does a human cell have in total, and how are the sex chromosomes different from the other 22 pairs? (2 marks)
(b) Explain, using a cross diagram, how the sex of a child is determined. Why is the father's contribution responsible for the sex of the child? (2 marks)
(c) Compare sex determination in humans with sex determination in reptiles such as crocodiles and in snails. What does this comparison suggest about the nature of sex determination across species? (1 mark)

◆ **Heredity**

Q27. deep exam-ready **[5]**

The accumulation of heritable variations over generations drives diversity within a species.
(a) Explain how variations arise in asexually reproducing organisms and why these variations are limited compared to sexually reproducing organisms. (2 marks)
(b) Using an example, explain how environmental selection acts on variation and why this is important for the long-term survival of a species. (2 marks)
(c) In a sexually reproducing population, two parents each contribute 'practically equal amounts of genetic material' to the offspring. Explain how this equal contribution is mechanistically ensured during reproduction. (1 mark)

◆ **Heredity**

Q28. medium exam-ready **[4]**

Read the following scenario and answer the questions:

Anjali is studying inheritance of seed colour in peas, where yellow (Y) is dominant over green (y). She crosses a yellow-seeded plant of unknown genotype with a green-seeded plant (yy). She obtains 48 yellow-seeded and 52 green-seeded plants.

(i) What is the likely genotype of the yellow-seeded parent used by Anjali? Explain your reasoning. (1 mark)
(ii) Write the cross in proper notation and show the gametes and offspring genotypes. (1 mark)
(iii) If Anjali had instead used a pure-breeding yellow-seeded plant (YY) in the cross, what would the proportion of yellow-seeded offspring have been? (1 mark)
(iv) What is the name given to a cross between an individual of unknown genotype and a homozygous recessive individual? Why is it useful? (1 mark)

◆ **Heredity**

Q29. medium exam-ready **[4]**

Read the following and answer the questions:

In a village, a farmer noticed that in his field of sugarcane, all the plants looked almost identical. However, in a nearby herd of cattle that reproduce sexually, significant differences in coat colour, size and horn shape were visible among individuals. The farmer's son, who studies biology, told him that this difference in variation is directly related to the mode of reproduction.

(i) Why do the sugarcane plants in the field show very little variation compared to the cattle? (1 mark)
(ii) What is the primary source of variation in organisms that reproduce asexually? (1 mark)
(iii) Explain how sexual reproduction in cattle generates greater variation than asexual reproduction in sugarcane. (1 mark)
(iv) Why is the presence of variation in the herd of cattle beneficial for the long-term survival of the species? (1 mark)

◆ **Heredity**

Q30. deep exam-ready **[4]**

Read the following scenario and answer the questions:

Rajat performed a genetics experiment with pea plants. He crossed a plant with round yellow seeds with another plant of identical phenotype. After obtaining a large number of seeds, he found four phenotypic classes: round yellow, round green, wrinkled yellow, and wrinkled green in the approximate ratio 9:3:3:1.

(i) What were the genotypes of both parent plants? Justify your answer based on the phenotypic ratio obtained. (1 mark)
(ii) Out of 160 seeds, how many would Rajat expect to have wrinkled green seeds? (1 mark)
(iii) Which two phenotypic classes in Rajat's results represent new combinations not seen in either parent? What does their appearance indicate about how seed shape and seed colour are inherited relative to each other? (1 mark)
(iv) Rajat's teacher says the 9:3:3:1 ratio would collapse to a 3:1 ratio if the two traits were always inherited together. Explain why this would happen. (1 mark)

◆ **Heredity**

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