

DNA, CELLS, AND VARIATION — UNIT TEST

Revised ELL Version — less writing, more multiple choice and classification

Name: _____ Date: _____
Class: _____ Score: _____ / 100

Most questions do not require full sentences. Show work for Punnett squares.

Part A — Multiple Choice

Choose the best answer. (35 marks)

1. Variation means:

- A. differences between living things
- B. only harmful mutations
- C. all organisms are identical
- D. only environmental changes

2. Why is DNA like an instruction book?

- A. It gives cells information.
- B. It is made of paper.
- C. It works only outside cells.
- D. It directly becomes a trait.

3. A nucleotide contains:

- A. sugar, phosphate, and a base
- B. protein, gene, and chromosome
- C. RNA, allele, and trait
- D. cell, tissue, and organ

4. Which base pairing is correct?

- A. A–T and C–G
- B. A–C and T–G
- C. A–G and C–T
- D. A–A and G–G

5. In DNA, the sides of the twisted ladder are made of:

- A. sugar and phosphate
- B. base pairs only
- C. proteins
- D. chromosomes

6. The steps of the DNA ladder are:

- A. base pairs
- B. genes
- C. cells
- D. chromatin

7. Why must DNA be packed?

- A. DNA is long and cells are small.
- B. DNA must leave the cell.
- C. DNA has no bases.
- D. Cells are larger than organisms.

8. Loose DNA is called:

- A. chromatin
- B. phenotype
- C. protein

D. allele

9. Tightly packed DNA is called a:

- A. chromosome
- B. nucleotide
- C. trait
- D. species

10. Chromosomes help during cell division by:

- A. organizing DNA for new cells
- B. removing all genes
- C. stopping replication
- D. changing every allele

11. A gene is:

- A. a section of DNA
- B. a complete organism
- C. a type of ecosystem
- D. a visible trait only

12. An allele is:

- A. a version of a gene
- B. a whole chromosome pair
- C. a protein
- D. a cell

13. Homologous chromosomes:

- A. have the same genes in the same places
- B. have no alleles
- C. come from one parent only
- D. are exact copies in every way

14. Before DNA replication, the two strands:

- A. separate
- B. disappear
- C. become proteins
- D. leave the cell

15. DNA replication produces:

- A. two DNA molecules
- B. one protein
- C. four chromosomes only
- D. one RNA molecule only

16. Which sequence is correct?

- A. DNA → RNA → protein
- B. protein → DNA → ecosystem
- C. trait → RNA → DNA
- D. DNA → species → protein

17. Genetic diversity means:

- A. differences in genes within a species
- B. different species in one area
- C. different ecosystems on Earth
- D. all members are identical

18. Species diversity means:

- A. many different species in one area
- B. different alleles in one gene
- C. different climates only
- D. one species with one trait

19. Ecosystem diversity means:

- A. many kinds of ecosystems
- B. different genes within one species
- C. one wetland with many birds

D. one allele changing

20. Heredity means:

- A. traits pass from parents to offspring
- B. traits never change
- C. DNA becomes food
- D. all traits are environmental

21. A dominant allele:

- A. shows its trait when present
- B. must be common
- C. must be stronger
- D. never appears with a recessive allele

22. A recessive trait shows when:

- A. two recessive alleles are present
- B. one dominant allele is present
- C. the environment changes
- D. there is no DNA

23. Which genotype is heterozygous?

- A. Bb
- B. BB
- C. bb
- D. B

24. Which genotype is homozygous recessive?

- A. bb
- B. Bb
- C. BB
- D. bB

25. Phenotype means:

- A. the visible trait
- B. the allele combination
- C. a DNA base
- D. a chromosome pair

26. A Punnett square shows:

- A. possible offspring genotypes
- B. an exact future child
- C. the order of DNA bases
- D. ecosystem types

27. In codominance:

- A. both alleles show
- B. one allele hides the other
- C. the traits blend
- D. no allele is expressed

28. In incomplete dominance:

- A. the heterozygous trait is in between
- B. both traits show separately
- C. one trait completely hides the other
- D. alleles disappear

29. Type AB blood is an example of:

- A. codominance
- B. incomplete dominance
- C. simple recessive inheritance
- D. mutation only

30. Why can recessive X-linked traits appear more often in males?

- A. Males usually have one X chromosome.
- B. Males have no chromosomes.
- C. Females have one X chromosome.

D. The Y chromosome has all X-linked genes.

31. A mutation is:

- A. a permanent change in DNA
- B. always harmful
- C. always helpful
- D. a change in weather

32. Natural selection favours traits that:

- A. help survival and reproduction
- B. are always dominant
- C. are always new
- D. make organisms larger

33. Antibiotic-resistant bacteria survive because:

- A. they have a helpful mutation
- B. antibiotics feed them
- C. all bacteria are resistant
- D. they stop reproducing

34. Speciation can happen when populations:

- A. become separated and change over time
- B. remain identical forever
- C. stop reproducing completely
- D. lose all variation

35. Biotechnology means:

- A. using living things or DNA technology to make useful products
- B. studying only fossils
- C. removing all mutations
- D. measuring ecosystems only

Part B — Matching

Match each term with the correct meaning. Write the letter. (15 marks)

Terms

- 36. chromatin _____
- 37. chromosome _____
- 38. gene _____
- 39. allele _____
- 40. genotype _____
- 41. phenotype _____
- 42. mutation _____
- 43. adaptation _____
- 44. speciation _____
- 45. biodiversity _____
- 46. recombinant DNA _____
- 47. transgenic organism _____
- 48. gene cloning _____
- 49. gene therapy _____
- 50. mutagen _____

Meanings

- A. a version of a gene
- B. a visible trait
- C. a section of DNA
- D. a change in DNA
- E. loose DNA
- F. tightly packed DNA
- G. the variety of life
- H. a trait that helps survival and reproduction
- I. formation of a new species
- J. allele combination
- K. DNA made from different sources
- L. an organism with DNA from another organism
- M. copying a gene many times
- N. adding a healthy gene to treat a disorder
- O. something that increases the chance of mutation

Part C — Fill in the Blanks

Use the word bank. Each word is used once. (10 marks)

Word Bank: A • T • C • G • mother • father • protein • environment • resistant • vitamin A

51. A pairs with _____.
52. C pairs with _____.
53. One chromosome in a pair comes from the biological _____.
54. The other chromosome comes from the biological _____.
55. RNA helps the cell make a _____.
56. Traits can be affected by DNA and the _____.
57. Antibiotic-_____ bacteria survive antibiotic treatment.
58. Golden rice can help provide _____.
59. DNA uses the four bases A, T, _____, and G.
60. DNA uses the four bases A, _____, C, and G.

Part D — Classification and Punnett Squares

Write short answers or show the grid. (25 marks)

61. Classify each as genetic diversity, species diversity, or ecosystem diversity: (a) different tail patterns in whales; (b) many species in a wetland; (c) forests, deserts, and wetlands.

62. Classify each genotype: BB, Bb, bb. Write homozygous or heterozygous.

63. B = purple and b = white. Complete Bb × bb. Give genotype and phenotype percentages.

64. Incomplete dominance: RR = red, RW = pink, WW = white. Complete RW × WW. Give phenotype percentages.

65. Blood type: What phenotype is AB? What phenotype is ii?

Part E — Short Response

Answer each in 1–2 sentences. (15 marks)

66. Explain why DNA must copy before a cell divides.

67. Explain the difference between a gene and an allele.

68. Explain how antibiotic use can make resistant bacteria more common.

69. Give one benefit and one concern about a transgenic crop.

DNA, CELLS, AND VARIATION — ANSWER KEY

Teacher Copy

Part A — Multiple Choice

1. A	2. A	3. A	4. A	5. A	6. A	7. A
8. A	9. A	10. A	11. A	12. A	13. A	14. A
15. A	16. A	17. A	18. A	19. A	20. A	21. A
22. A	23. A	24. A	25. A	26. A	27. A	28. A
29. A	30. A	31. A	32. A	33. A	34. A	35. A

Part B — Matching

- 36. E
- 37. F
- 38. C
- 39. A
- 40. J
- 41. B
- 42. D
- 43. H
- 44. I
- 45. G
- 46. K
- 47. L
- 48. M
- 49. N
- 50. O

Part C — Fill in the Blanks

- 51. T
- 52. G
- 53. mother
- 54. father

- 55. protein
- 56. environment
- 57. resistant
- 58. vitamin A
- 59. C
- 60. T

Part D — Classification and Punnett Squares

- 61. (a) genetic diversity; (b) species diversity; (c) ecosystem diversity.
- 62. BB: homozygous; Bb: heterozygous; bb: homozygous.
- 63. $Bb \times bb \rightarrow 50\% Bb, 50\% bb; 50\% \text{ purple}, 50\% \text{ white}.$
- 64. $RW \times WW \rightarrow 50\% RW, 50\% WW; 50\% \text{ pink}, 50\% \text{ white}.$
- 65. AB genotype gives type AB blood. ii gives type O blood.

Part E — Sample Answers

- 66. Each new cell needs DNA instructions, so DNA must copy before division.
- 67. A gene is a section of DNA. An allele is one version of that gene.
- 68. Non-resistant bacteria die, while resistant bacteria survive and reproduce. The resistance allele becomes more common.
- 69. Benefit: less insect damage or more food. Concern: possible effects on ecosystems, health, fairness, or control.

Mark Distribution

Part A: 35 marks

Part B: 15 marks

Part C: 10 marks

Part D: 25 marks

Part E: 15 marks

Total: 100 marks

Written-response portion: 15%

Question-to-Chapter Map

Question(s)	Source chapter(s)
1–16	DNA structure, chromosomes, genes, replication, and DNA → RNA → protein
17–25	Biodiversity, heredity, Mendel, dominance, genotype, and phenotype
26–30	Punnett squares, codominance, incomplete dominance, and sex-linked traits
31–34	Mutation, natural selection, antibiotic resistance, and speciation
35	Biotechnology
36–50	Core vocabulary across the full unit
51–60	Base pairing, chromosome pairs, proteins, environment, resistance, and Golden Rice
61–65	Diversity levels, genotype classification, Punnett squares, and blood type
66–69	DNA replication, gene vs allele, antibiotic resistance, and biotechnology risks/benefits