

Biotechnology: Principles and Processes — CBSE Pattern Test 1

Class 12 Biology · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 1 — CBSE Pattern (90 minutes, 40 marks)

Class 12 Biology · Biotechnology: Principles and Processes · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. Restriction enzymes cut DNA at
 - (A) specific sites
 - (B) random sites
 - (C) only ends
 - (D) only one site
2. The enzyme that joins DNA fragments is
 - (A) DNA ligase
 - (B) restriction enzyme
 - (C) polymerase
 - (D) primase
3. ori stands for
 - (A) origin of replication
 - (B) open reading frame
 - (C) operon
 - (D) oncogene
4. The most common bioreactor is the
 - (A) stirred-tank bioreactor
 - (B) spinner flask
 - (C) airlift reactor
 - (D) packed bed
5. Competent cells are prepared using
 - (A) calcium chloride
 - (B) sodium chloride
 - (C) ethanol
 - (D) acetic acid
6. Restriction enzymes are also called
 - (A) molecular scissors
 - (B) molecular glue
 - (C) vectors
 - (D) hosts
7. Transformation is the uptake of
 - (A) foreign DNA

- (B) protein
 - (C) lipid
 - (D) carbohydrate
8. Insertional inactivation is the loss of a
- (A) marker gene function
 - (B) vector
 - (C) host
 - (D) enzyme
9. What is a palindromic sequence?
10. What is downstream processing?

Section B — Short Answer I (4 × 2 = 8 marks)

11. Name the two core techniques of modern biotechnology.
12. What is a cloning vector?
13. What is ori?
14. Why is a stirrer used in a bioreactor?

Section C — Short Answer II (4 × 3 = 12 marks)

15. Describe the tools of recombinant DNA technology.
16. How is a competent host cell prepared?
17. Describe the selection of recombinant cells.
18. Name the features that make a good vector.

Section D — Long Answers (2 × 5 = 10 marks)

19. (a) Describe the process of recombinant DNA technology. (b) Explain transformation.
20. (a) Describe the components of a stirred-tank bioreactor. (b) Explain downstream processing.

Answer Key (Marking Scheme)

- Q1 — (A) specific sites. Q2 — (A) DNA ligase. Q3 — (A) origin of replication. Q4 — (A) stirred-tank bioreactor. Q5 — (A) calcium chloride. Q6 — (A) molecular scissors. Q7 — (A) foreign DNA. Q8 — (A) marker gene function.
- Q9 — A palindromic sequence reads the same on both strands in the 5'→3' direction.
- Q10 — Downstream processing is the separation and purification of the product.
- Q11 — Genetic engineering and maintaining a sterile environment.
- Q12 — A cloning vector is a carrier that can replicate in a host (e.g. pBR322).
- Q13 — ori is the origin of replication controlling the copy number.
- Q14 — To ensure even mixing and aeration.
- Q15 — Restriction enzymes, ligase, polymerase, vectors and host organisms.
- Q16 — By treatment with divalent cations (CaCl₂) or by electroporation.
- Q17 — Using selectable markers and insertional inactivation.
- Q18 — ori, selectable marker, cloning sites and small size.

Q19 — (a) Isolation → cutting → ligation → transformation → selection → downstream processing. (b) Transformation is the uptake of foreign DNA by a host cell.

Q20 — (a) Vessel with agitator, aerator and temperature/pH control. (b) Separation and purification of the product.