

BIOLOGY • CLASS 12

10

CHAPTER

Biotechnology and its Applications

NCERT SOLUTIONS



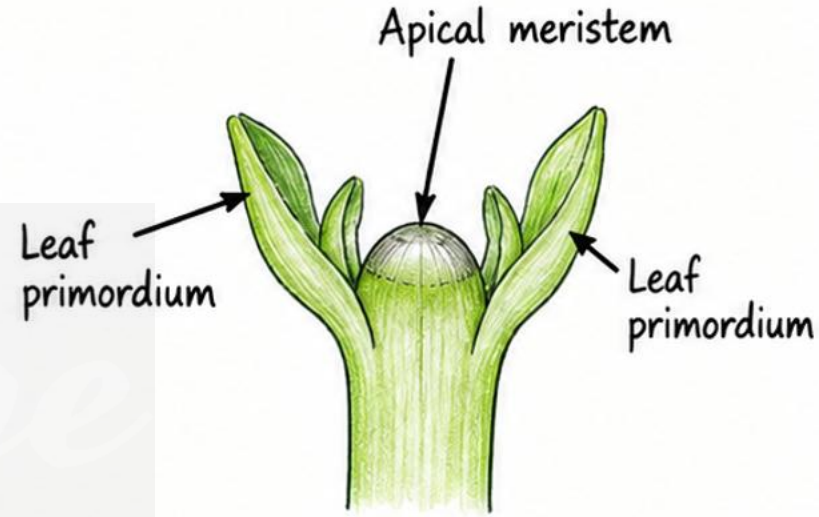
EXERCISE SOLUTIONS: QUESTIONS 1-2

1. Which part of a plant is best suited for making virus-free plants, and why?

Answer:

The apical or axillary meristem is best suited. These actively dividing regions are often free of viruses even when other parts of the plant are infected.

Culturing a suitable meristem can regenerate healthy plants. The regenerated plants should be tested to confirm that they are virus-free.



2. What is the major advantage of micropropagation?

Answer:

It produces many plants in a short time from a small amount of starting tissue.

The plants usually retain the desirable characters of the parent and are called somaclones.

This allows rapid multiplication of selected plants throughout the year.

EXERCISE SOLUTION: QUESTION 3

3. What are the components of the medium used to propagate an explant in vitro?

Answer: An explant is a small piece of plant tissue used to start a culture. Its medium supplies nutrients and supports growth.

Component	Main role
Water	Solvent for nutrients
Mineral salts	Supply essential macro- and micronutrients
Sugar, usually sucrose	Provides carbon and energy
Vitamins	Support metabolism
Amino acids or other organic supplements	May support growth, depending on the tissue
Plant growth regulators: auxins and cytokinins	Regulate cell division, root and shoot formation
Agar, if a solid medium is needed	Provides physical support

The appropriate medium depends on the plant and tissue. Aseptic conditions help prevent contamination.

EXERCISE SOLUTIONS: QUESTIONS 4–5

4. Why do Bt toxin crystals not kill the bacteria that produce them?

- (a) The bacteria are resistant.
- (b) The toxin is immature.
- (c) The toxin is inactive.
- (d) The toxin is enclosed in a special sac.

Answer: (c) The toxin is inactive.

The crystalline protein occurs as an inactive protoxin in the bacterium. It becomes active in the gut of a susceptible insect.

5. What are transgenic bacteria? Give one example.

Answer:

Transgenic bacteria contain foreign genetic material introduced through genetic engineering, which gives them a new trait.

Example: bacteria (Escherichia coli) carrying human insulin-coding DNA can produce human insulin polypeptides. Recombinant human insulin is used to treat diabetes.

EXERCISE SOLUTION: QUESTION 6

6. Compare the advantages and disadvantages of producing genetically modified crops.

Answer:

Possible advantages

- Resistance to selected pests can reduce crop damage and some insecticide use.
- Tolerance to particular stresses may improve crop performance.
- Improved nutritional quality, storage life or reduced post-harvest losses.
- Higher or more reliable yields where the introduced trait is useful.

Possible disadvantages or concerns

- Gene flow to related plants may have ecological effects.
- Target pests or weeds can evolve resistance under selection.
- Potential effects on non-target organisms need assessment.
- Food safety, including possible allergenicity, must be tested.
- Seed costs, patents and access can affect farmers.

Benefits and risks depend on the crop, trait and farming system. Assessment should be case by case.

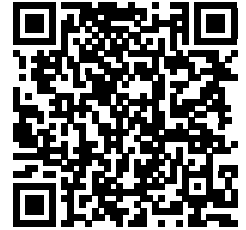


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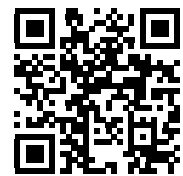


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