

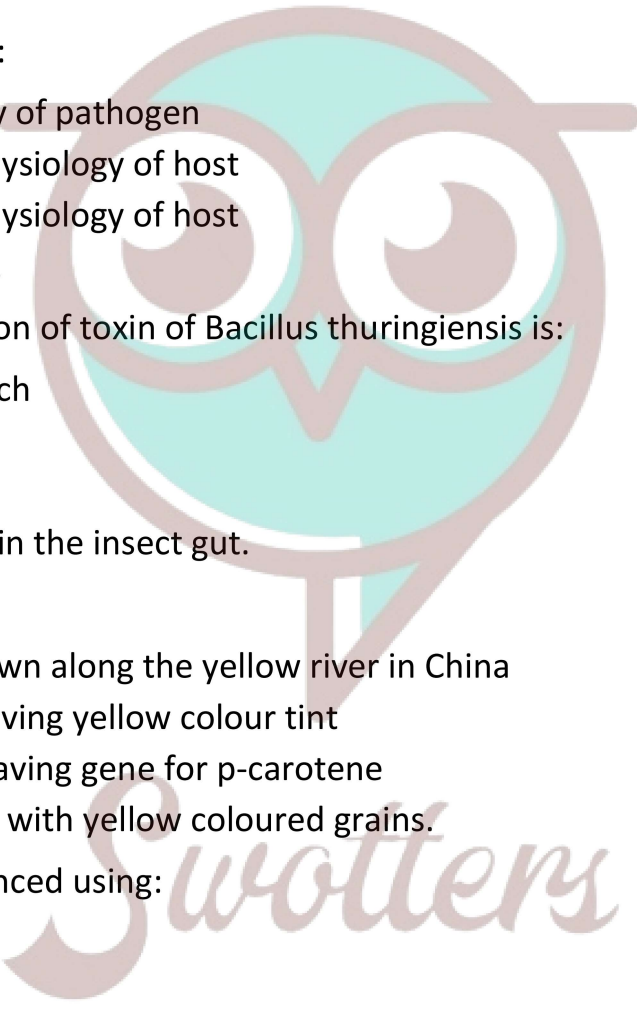
BIOLOGY



Important Questions

➤ Multiple Choice Questions:

1. Bt cotton is not:
 - (a) A GM plant
 - (b) Insect resistant
 - (c) a bacterial gene expression system
 - (d) Resistant to all pesticides.
2. C-peptide of human insulin is:
 - (a) A part of mature insulin molecule
 - (b) Responsible for formation of disulphide bridges
 - (c) Removed during maturation of pro-insulin to insulin
 - (d) Responsible for its biological activity.
3. GEAC stands for:
 - (a) Genome Engineering Action Committee
 - (b) Ground Environment Action Committee
 - (c) Genetic Engineering Approval Committee
 - (d) Genetic and Environment Approval committee.
4. α -1 antitrypsin as:
 - (a) An antacid
 - (b) An enzyme
 - (c) Used to treat arthritis
 - (d) Used to treat emphysema.
5. A probe which is a molecule used to locate specific sequences in a mixture of DNA or RNA molecules could be:
 - (a) A single-stranded RNA
 - (b) A single-stranded DNA
 - (c) Either RNA or DNA
 - (d) Can be ss DNA but not ss RNA.
6. Choose the correct option regarding Retrovirus.
 - (a) An RNA virus that can synthesise DNA during infection
 - (b) A DNA virus that can synthesise RNA during infection
 - (c) An ssDNA virus
 - (d) AdsRNA virus.
7. The site of production of ADA in the body is:

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- (a) Bone marrow
(b) Lymphocytes
(c) Blood plasma
(d) Monocytes.
8. A protoxin is:
- (a) A primitive toxin
(b) A denatured toxin
(c) Toxin produced by protozoa
(d) Inactive toxin.
9. Pathophysiology is the:
- (a) Study of physiology of pathogen
(b) Study of normal physiology of host
(c) Study of altered physiology of host
(d) None of the above.
10. The trigger for activation of toxin of *Bacillus thuringiensis* is:
- (a) Acidic pH of stomach
(b) High temperature
(c) Alkaline pH of gut
(d) Mechanical action in the insect gut.
11. Golden rice is:
- (a) A variety of rice grown along the yellow river in China
(b) Long stored rice having yellow colour tint
(c) A transgenic rice having gene for p-carotene
(d) Wild variety of rice with yellow coloured grains.
12. In RNAi, genes are silenced using:
- (a) ssDNA
(b) dsDNA
(c) dsRNA
(d) ssRNA.
13. The first clinical gene therapy was done for the treatment of:
- (a) AIDS
(b) Cancer
(c) Cystic fibrosis
(d) SCID.
14. ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of

ADA?

- (a) Adenosine deoxy aminase
- (b) Adenosine deaminase
- (c) Aspartate deaminase
- (d) Arginine deaminase.

15. Silencing of a gene could be achieved through the use of:

- (a) Short interfering RNA (RNAi)
- (b) Antisense RNA
- (c) By Both
- (d) None of the above.

➤ **Very Short Question:**

1. Name the technique based on the principle of antigen-antibody interaction used in detection of a virus (HIV).
2. Development of a transgenic food crop may help in solving the problem of night blindness in the developing countries, name this crop plant.
3. Which nematode infects the roots of tobacco plant and causes a great reduction in yield?
4. The first transgenic cow, produced human protein – enriched milk. Name the cow and the protein found in milk.
5. The insulin produced using recombinant DNA technology is more advantageous than the insulin extracted from pancreas of slaughtered cattle and pigs. How?
6. Name two pest resistant plants produced by using recombinant DNA technology.
7. Name the genetically engineered human Insulin?
8. Write the Scientific name of nematode that attacks the root of tobacco plant?
9. Define a patent?
10. Expand GEAC.

➤ **Short Questions:**

1. What are the two methods for correcting ADA deficiency in a child?
2. Some crop plants are modified genetically by manipulating their genes. How are they made beneficial?
3. GEAC is one of the organisation set up by Indian Government. Write its full form. Give its two objectives.
4. "Industrialised nations are exploiting the bioresources of under industrialised nations . Justify the statement with a suitable example.

5. What is Golden rice? What is its advantage?
6. What are the three critical research areas in the field of Biotechnology?
7. What are the advantages of molecular diagnostics over conventional methods?
8. What do you mean by "Biopiracy" Give an example?

➤ Long Questions:

1. Mention any six fields of application of biotechnology for human welfare.
2. "Specific Bt Toxin gene is incorporated into the cotton plant so as to control the infestation of Bollworm". Mention the organism from which the gene was isolated and explain its mode of action.
3. How is the ELISA test carried out?

➤ Assertion and Reason Questions:

1. Two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
 - a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - c) Assertion is true but reason is false.
 - d) Both assertion and reason are false.

Assertion: Flavr-Savr tomato was the first transgenic commercial crop that entered the market.

Reason: Roundup variety of soybean was prepared through breeding.

2. Two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
 - a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - c) Assertion is true but reason is false.
 - d) Both assertion and reason are false.

Assertion: GM foods are facing widespread resistance by the people.

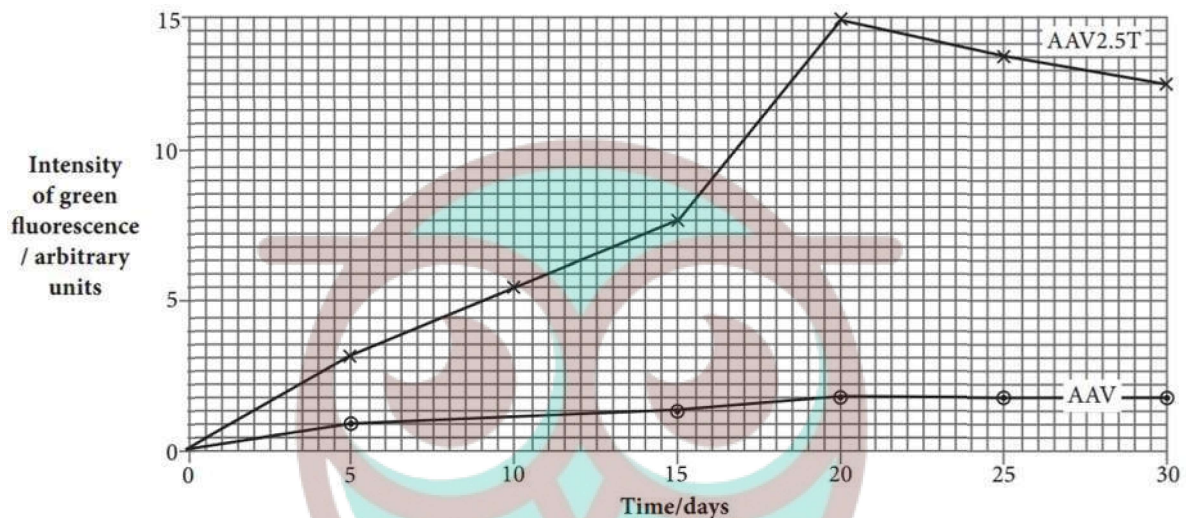
Reason: GM foods have mutated genes which cause infections and allergies.

➤ Case Study Questions:

1. Read the following and answer any four questions from (i) to (v) given below:

One approach of gene therapy to treat cystic fibrosis uses viruses to deliver normal alleles of the CFTR gene into epithelial cells of the airways. A team of researchers in the USA developed

a new strain of non-pathogenic adeno-associated virus (AAV), AAV2.5T. Genes for the CFTR protein and the enzyme luciferase were inserted into the DNA of the viruses. Luciferase catalyses the production of a green fluorescent protein when luciferin is added. The normal AAV strain and the AAV2.5T strain were added to cultures of epithelial cells from the airways. After adding luciferin, the number of cells that had taken up the viral genes was estimated using the intensity of the green fluorescence which developed. The result are shown in the given graph.



- (i) What could be the probable reason for inserting a gene for luciferase by researchers into the viral DNA?
- Infected cells are able to produce luciferase.
 - It is easy to identify the infected cells that have taken up viral DNA under fluorescent lamp.
 - The non-infected cells were easily identified under fluorescent lamp as they will glow.
 - Both (a) and (b).
- (ii) Select the incorrect statement with respect to the graph given.
- Both AAV and AAV2.5T can infect epithelial cells.
 - Intensity of green fluorescence increases more in AAV 2.5 T as compared to normal AAV.
 - AAV infect cells more readily than AAV 2.5 T.
 - None of these.
- (iii) The name of first transgenic cow is:
- cDNA does not contain non-coding regions such as introns.
 - cDNA can be transcribed and translated directly.
 - There is no need of post-transcriptional modification such as splicing, etc.
 - All of these.
- (iv) There is a decrease in intensity of green fluorescence in cells infected with AAV 2.5T during the last 10 day. This is because:

- a) Green fluorescent protein was broken down.
- b) Luciferin was used up.
- c) Infected cells die.
- d) All of these.

(v) Which of the following best describe gene therapy?

- a) Mutating the sequence of a particular gene.
- b) Replacing a healthy gene with a defective gene.
- c) Replacing a defective gene with a functional gene.
- d) Transferring a healthy gene from one species with healthy gene of other species.

2. Read the following and answer any four questions from (i) to (v) given below:

European patent office, Munich granted patent for fungicidal use of neem oil, to firm of W.R. Grace & Co. It was challenged by Vandana Shiva and Ajay Phadke who had researched neem in India and it was shown that Grace & Co. had not unveiled any novelty factor in neem's properties. Ethics include rules of conduct by which a community regulates the behaviour and decides as to which activity is lawful and which is not.

(i) _____ allow private, monopoly right over animals and plants.

- a) Bioethics.
- b) Biopatents.
- c) Bioweapons.
- d) Either (a) or (b).

(ii) Which of the following is not a criteria of granting patent?

- a) Novelty.
- b) Utility.
- c) Non-obviousness.
- d) Prior art.

(iii) On which plants patents have been granted?

- a) Piper nigrum.
- b) Brassica campestris.
- c) Punica granataum.
- d) All of these.

(iv) Rules of conduct that may be used to regulate our activities in relation to biological world are included in _____.

- a) Bioethics.
- b) Biopiracy.
- c) Biopatents.
- d) Biowar.

(v) **Assertion:** Genes and cells should not be patented.

Reason: Genes and cells are not an inventions.

- Both assertion and reason are true and reason is the correct explanation of assertion.
- Both assertion and reason are true but reason is not the correct explanation of assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.

✓ **Answer Key-**

➤ **Multiple Choice Answers:**

- (c) a bacterial gene expression system
- (c) Removed during maturation of pro-insulin to insulin
- (c) Genetic Engineering Approval Committee
- (d) Used to treat emphysema.
- (c) Either RNA or DNA
- (a) An RNA virus that can synthesise DNA during infection
- (a) Bone marrow
- (d) Inactive toxin.
- (c) Study of altered physiology of host
- (c) Alkaline pH of gut
- (c) A transgenic rice having gene for p-carotene
- (c) dsRNA
- (d) SCID.
- (b) Adenosine deaminase
- (c) By Both

➤ **Very Short Answers:**

- ELISA (Enzyme linked immuno – sorbent Assay)
- Golden Rice
- Meloidegyneincognitia.
- Rosie, alpha-lactalbumin
- Insulin obtained from animal source causes allergy.
- Bt Cotton, Bt Corn, BtBrinjal.
- Humulin
- Meloidogyneincognitia.

9. Patent is the government protection to the inventor of biological material, Securing to him for a specific time the exclusive right of manufacturing, exploiting, using & selling an invention.
10. Genetic Engineering Approval Committee.

➤ Short Answer:

1. Bone marrow transplantation having functional ADA enzyme and Enzyme replacement therapy.
2. More tolerant to abiotic stresses; pest resistant; reduction in post harvest losses; increased nutritional value of food.
3. GEAC – Genetic Engineering approval committee. Objectives of GEAC as below:
 - (i) To make decisions regarding validity of GM research.
 - (ii) Safety of introducing GMO for public use.
4. Industrialised nations are collecting and patenting the genetic resources of under industrialised country like India. An American Company got patent rights on Basmati rice. Valuable biomolecules obtained from bioresources are patented and used for commercial purposes.
5. Golden rice is a transgenic variety of rice which contains a gene which codes for Vitamin A precursor. This variety have green yellow coloured grains and is rich in Vitamin A & thus nutritionally very advantageous.
6.
 - i. providing best catalyst in the form of improved organism usually in the form of microbe or pure enzyme.
 - ii. Creating optimal conditions through engineering for a catalyst to function.
 - iii. downstream processing to purify the protein / organic compound.
7. In conventional methods, presence of pathogen is normally suspected only when pathogen has produced a disease symptom. By this time the concentration of pathogen is already very high in Body which could be harmful but with molecular diagnostics, Small amount of pathogen could be detected by amplification by PCR.
8. Biopiracy refers to the use of bio-resources lay multinational companies & other organizations without proper authorizations from the countries & people concerned eg. Basmati rice grown in India is distinct for its unique flavor & aroma but an American company got patent rights on Basmati through US patent.

➤ Long Answer:

1. Applications of Biotechnology:
 - i. Therapeutics

- ii. Genetically modified crops
- iii. Molecular diagnostics
- iv. Processed food items
- v. Bioremediation
- vi. Biological waste treatment
- vii. Energy production.

2.

- Specific Bt toxin genes isolated from *Bacillus Thuringiensis* are incorporated into cotton. Cry I AC and Cry II AC control the bollworm.
- Bt gene forms protein crystals that contain a toxin insecticidal protein.
- It is in an inactive state.
- The inactive toxin is converted into active form due to the alkaline pH of the gut which solubilizes the crystal.
- Activated Bt-toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis. It finally leads to the death of the insect.

3. ELISA (Enzyme-Linked Immunosorbent Assay Test):

- i. It is a technique of detecting a very small amount of protein (antibody or antigen) with the help of enzyme peroxidase or alkaline phosphatase and stain-producing substrates like 5-aminosalicylic acid or orthophenylene diamine.
- ii. The serum is sorbed to the surface of the ELISA plate.
- iii. An antibody is specific to the antigen for diagnosis placed over an immobilized antigen.
- iv. The spot is washed to remove the free antibody.
- v. Antibody bound to the enzyme is poured over the spot so as to react with complex antibody.
- vi. The area is washed again to remove the free antibody-enzyme complex.
- vii. Chromagen is added. It will produce a stain showing the antigen was present.
- viii. ELISA is a quick method of diagnosis of pregnancy (by detection hCG in urine), AIDS, hepatitis, STDs, thyroid disorder, and Rubella virus.

➤ Assertion and Reason Answers:

1. (c) Assertion is true but reason is false.

Explanation:

The Flavr-Savr tomato, was the first genetically modified fruit/vegetable to reach the market in USA. Roundup ready soybean is a genetically modified herbicide tolerant cultivar.

2. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Explanation:

The GM crops are fast becoming a part of agriculture throughout the world because of their contribution to the increased crop productivity and to global food, feed and fiber security, besides their use in health-care and industry.

However, GM foods are facing widespread resistance by the people from all over the world. It is because transgenes in commercial crops can endanger native species. For example, the gene for Bt toxin expressed in pollen might endanger pollinators like honeybees. These crops cause problems in human health by supplying allergens and transfer of antibiotic resistance markers. The GM crops may change the fundamental vegetable nature of plants as the genes from animals (e.g., fish or mouse) are being introduced into crop plants. GM foods also have a bad effect on environment and biodiversity.

➤ **Case Study Answers:**

1.

- (i) (d) Both (a) and (b).

Explanation:

Luciferase catalyses the production of a green fluorescent protein when luciferin is added.

- (ii) (c) AA V infect cells more readily than AAV 2.5 T.

Explanation:

AAV 2.5T infects cells more readily than AAV.

- (iii) (d) All of these.

Explanation:

cDNA is a DNA copy produced from the m RNA by reverse transcriptase.

- (iv) (d) All of these.

- (v) (c) Replacing a defective gene with a functional gene.

Explanation:

Gene therapy refers to the insertion of genes into an individual cells and tissues to treat a disease. Essentially defective/mutant genes are replaced with healthy, functional ones.

2.

(i) (b) Biopatents.

Explanation:

A patent is the right granted by a government to an inventor to prevent others from commercial use of his invention. Biopatent system allows private, monopoly rights over cells, genes, animals and plants.

(ii) (d) Utility.

Explanation:

Patents are supposed to satisfy three criteria of novelty, non-obviousness and utility.

(iii) (d) All of these.

Explanation:

Patents have been taken out on plants such as black pepper, basmati rice, Indian mustard, Pomegranate, Turmeric and neem.

(iv) (a) Bioethics.

(v) (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Explanation:

Genes, cells, micro-organisms, plants and animals are not inventions and hence must not be patented.



Swotters