



# BIOLOGY

## BOOKS - SRIJAN BIOLOGY (ENGLISH)

### BIOTECHNOLOGY AND ITS APPLICATIONS

#### Illustrative Questions

1. A multinational company (XYZ) marked a medicine extracted from medicinal herbs

grown in the sprawling fields in a foreign country. This herb is found only in our country and no compensation was paid or permission taken from relevant authority.

(a) What is the term used to refer to such an act committed by the multinational company?

(b) Justify the meaning of the term. (c) What has our government done to prevent such deeds?



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2. What is the role of RNA-mediated interference?



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3. What are transgenic bacteria? Illustrate using any one example.



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4. Can you suggest a method to extract oil (hydrocarbon) from seeds based on your understanding of rDNA technology and chemistry of oil?



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5. Does our blood have proteases and nucleases?



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6. In view of the current food crisis, it is said, that we need another green revolution. Highlight the major limitations of the earlier green revolution.



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7. Expand GMO. How is it different from a hybrid?



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8. Differentiate between diagnostics and therapeutics. Give one example for each category.



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9. Give the full form of ELISA. Which disease can be detected using it? Discuss the principle underlying the test.



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**10.** Can a disease be detected before its symptoms appear? Explain the principle involved.



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**11.** Many proteins are secreted in their inactive form. This is also true of many toxic proteins produced by microorganisms. Explain how the mechanism is useful for the organism producing the toxin?





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**12.** Give any two reasons why the patent on Basmati should not have gone to an American Company.



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**13.** How was Insulin obtained before the advent of DNA technology? What were the problems encountered?



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**14.** With respect to understanding diseases, discuss the importance of transgenic animal models



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**15.** PCR is a useful tool for early diagnosis of an infectious disease. Elaborate.



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**16.** What is GEAC and what are its objectives?



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**17.** Gene expression can be controlled with the help of RNA. Explain the method with an example.



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**18.** Ignoring our traditional knowledge can prove costly in the area of biological patenting. Justify.



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**19.** Highlight any four areas where genetic modification of plants has been useful.



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**20.** What is recombinant DNA vaccine? Give two examples.



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**21.** Why is it that the line of treatment for a genetic disease is different from infectious diseases?



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**22.** Who was the first patient who was given gene therapy? Why was the given treatment recurrent in nature?



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**23.** Taking examples under each category, discuss upstream and downstream processing,



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**24.** ELISA technique is based on the principles of antigen-antibody interaction. Can this technique be used in the molecular diagnosis of a genetic disorder, such as phenylketonuria?



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**25.** Gene therapy is an attempt to correct a genetic defect by providing a normal gene into the individual. By this the normal function

can be restored. An alternate method would be to provide the gene product (protein/enzyme) known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reason for your answer.



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**26.** You have identified a useful gene in bacteria. Make a flow chart of the steps that

you would follow to transfer this gene to a plant.



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**27.** Why is insulin not administered orally to diabetic patients?



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**28.** Why does flavr savr tomato possess long shelf life?





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**29.** Why is use of insulin from nonhuman sources harmful?



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**30.** Why is genetically produced insulin better than those produced by conventional methods?



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## Practice Questions Very Short Answer Type Questions

1. Name the technique which is used for detecting presence of pathogens in an organism.



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2. Name two diseases against which genetically engineered vaccines are available.



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3. Write one significant application of monoclonal antibodies.



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4. Name the nematode that attacks roots of tobacco plant.



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5. Name the toxic protein secreted by *Bacillus thuringiensis*.



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6. Name the company which started selling human insulin in 1983.



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7. Name the first genetically modified non human primate.



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8. How many polypeptides is insulin made of?  
By which bond do these chains bind together?



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9. Which of the following bacteria is used as a vector for plant genetic engineering ?



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10. Name first transgenic cow.



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11. Name a weed which has a sequenced genome.



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**12.** For which disease first clinical gene therapy was given?



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**13.** Name antiviral proteins.



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**14.** In case of Bt cotton, how does the toxic insecticide protein produced by the bacterium kill the insects?



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**15.** Name two genetically modified hormones.



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**16.** Name genes that control cotton bollworms.





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17. Name first transgenic animal. For which gene was it genetically modified?



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18. Correct the given statement with respect to brazzein. 'Brazzein is a high calorie carbohydrate.'



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## Practice Questions Short Answer Type I Questions

1. Name the first transgenic crop in India.



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2. Name the insulin obtained from a genetically modified microorganism. Also name that microorganism.



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3. What is the main advantage of GM crops?



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4. Name two medically important proteins manufactured by genetic engineering.



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5. What is the cause of adenosine deaminase deficiency in humans?



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6. You have developed a GM organism. Which government organisation would you approach to obtain clearance for its mass production? Why is such a body necessary? Give two reasons



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7. Why is gene encoding for 'Cry' protein inserted into a crop plant?



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**Practice Questions Short Answer Type li**  
**Questions**

1. Define molecular farming.



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## 2. Discuss the Biopatent



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## 3. Discuss the Bioethics



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## 4. Discuss the Biopiracy



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5. With an example, explain how biotechnology has been applied in curing diabetes mellitus



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6. With an example, explain how biotechnology has been applied in raising pest resistant plants



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7. With an example, explain how biotechnology has been applied in producing more nutritionally balanced milk.



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8. Name some microorganisms used for production of different antibiotics.



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9. How are the transgenic animals advantageous to us?



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10. Name some commercially grown transgenic crops with their traits which have been manipulated in them



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**11.** Write a short note on role of biotechnology in agriculture.



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**12.** What are advantages and probable risks of genetic engineering?



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**13.** Give the scientific name of soil bacterium which produces crystal (Cry) proteins.



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**14.** How are Cry proteins useful in agriculture?



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**15.** How do the differently written terms Cry and cry denote?



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**16.** What is genetically modified food? What are the disadvantages of this food?



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## **Practice Questions Long Answer Type Questions**

**1.** Do you think it is ethical to manipulate organisms for human benefits? Justify your

answer.



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2. How is golden rice produced by genetic engineering. Mention its significance.



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3. What are transgenic plants? Describe briefly how hirudin protein is being produced through a transgenic plant.



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4. What is meant by genetically modified crops? How does a genetically modified food primarily differ from the produce of conventionally developed varieties?



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5. What is a transgenic crop? State the advantages of the technique involved in the

production of transgenic crop over breeding activities



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6. Explain the role of biotechnology in therapeutics.



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7. What is gene therapy? Illustrate using the example of adenosine deaminase (ADA)

deficiency.



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**8.** Briefly explain the principle, procedure and the role of ELISA.



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**9.** What is meant by ADA deficiency? How is gene therapy a solution to this problem? Why is it not a permanent cure?





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## Previous Year S Board Paper Questions Short Answer Type Questions

1. Why are biofertilisers preferred over chemical fertilisers?



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2. Define biopatent.





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3. What is the function of GEAC?



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## Previous Year S Board Paper Questions Short Answer Type II Questions

1. What are stem cells? Write two applications of stem cells in medical treatment.



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2. Write a short note on stem cells.



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3. Explain gene therapy, with reference to treatment of SCID.



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1. Give a brief account of genetic engineering.



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2. Explain how insulin can be produced using recombinant DNA technology.



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3. Give the significance of transgenic animals.





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## Review Questions

1. Name first transgenic cow.



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2. Give a brief answer

What are iPS cells?



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3. The most common bacterium used in genetic engineering is

A. Escherichia

B. Clostridium

C. Salmonella

D. Bacillus

**Answer:**



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4. Genetic material of virus is

A. RNA only

B. DNA only

C. Either DNA or RNA

D. Both DNA and RNA

**Answer:**



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5. Who discovered recombinant DNA (DNA) technology?

A. Har Gobind Khorana

B. James D. Watson

C. S. Cohen and H. Boyer

D. Sutton and Avery

**Answer:**



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6. Which one of the following is not obtained from genetic engineering?

A. Haemoglobin

B. Flavr savr tomato

C. Golden rice

D. None of these

**Answer:**



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7. Mention one significant function of the following:

Restriction endonuclease



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8. Mention one significant function of the following:

Monoclonal antibodies



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9. State the best known contribution of:

Kohler and Milstein



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10. State the best known contribution of

P.Maheswari



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11. Expand the PCR





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## **12. Expand the ELISA**



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## **13. Expand the GMO**



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## **14. Expand the CBD**





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**15.** What are the advantages and probable risks of genetic engineering?



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**16.** Write any three uses of gene cloning?



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17. What is gene therapy? Illustrate using the example of adenosine deaminase (ADA) deficiency.



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## Competition Corner Objective Type Questions Multiple Choice Questions

1. *Bacillus thuringiensis* (Bt) strains have been used for designing novel

A. Biofertilisers

B. Biometallurgical techniques

C. Biomineralisation processes

D. Bioinsecticidal plants

**Answer: D**



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2. A tumour inducing plasmid widely used in the production of transgenic plants is that of

A. *Escherichia coli*

B. *Bacillus thuringiensis*

C. *Staphylococcus aureus*

D. *Agrobacterium tumefaciens*

**Answer: D**



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**3. 'Bt' cotton is resistant to**

A. Insects



B. Herbicides

C. Salt

D. Draught

**Answer: A**



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**4. 'Bt' toxin is**

A. Intracellular lipid

B. Intracellular crystalline protein

C. Extracellular crystalline protein

D. Lipid

**Answer: C**



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**5. Transgenic golden rice is enriched with high**

A. Lysine

B. Methionine

C. Glutenin

D. Vitamin A

**Answer: D**



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**6. Reagent used in ELISA test is**

A. Endonuclease

B. Polymerase

C. Ligase

D. Peroxidase

**Answer: D**



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7. The scientists associated with human genome project

A. Watson and Crick

B. Beadle and Tatum

C. Paul Berg and Wollman

D. Francis Collins and Craig Venter

**Answer: D**



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**8. Anticoagulant hirudin is found in**

A. Snake

B. Lizard

C. Leech

D. Scorpion

**Answer: C**



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9. Most widely used bioweapon is

- A. *Bacillus subtilis*
- B. *Pseudomonas putida*
- C. *Bacillus anthracis*
- D. None of the above

**Answer: C**



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10. Herbicide resistant gene in plants is

A. Ct

B. Mt

C. Bt

D. Gst

**Answer: D**



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**11.** Which of the following has been covered under the broad patent category

A. Triticum

B. Oryza

C. Pisum sativum

D. Brassica

**Answer: B**



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12. Bt toxin is obtained from

- A. Prokaryotes
- B. Eukaryotes
- C. Both (a) and (b)
- D. None of these

**Answer: A**



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**13.** Blindness is prevented by use of this crop in poor countries

A. Golden rice

B. Wheat

C. Gram

D. Pea

**Answer: A**



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**14.** In September 2001, which of the following was used as a bioweapon agent in America

A. Botulinum

B. Anthrax (*Bacillus anthracis*)

C. Polio virus

D. AIDS virus

**Answer: B**



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15. A genetically engineered microorganism used successfully in bioremediation of oil spills is a species of

A. Xanthomonas

B. Bacillus

C. Pseudomonas

D. Trichoderma

**Answer: C**



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**16.** Human insulin is being commercially produced from a transgenic species of

- A. (a) Rhizobium
- B. (b) Saccharomyces
- C. (c) Escherichia
- D. (d) Mycobacterium

**Answer: C**



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17. Main objective of production/use of herbicide resistant GM crops is to

A. eliminate weeds from the field without the use of manual labour

B. Eliminate weeds from the field without the use of herbicides

C. Encourage eco-friendly herbicides

D. Reduce herbicide accumulation in food articles for health safety

**Answer: D**



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**18.** A transgenic food crop, which may help in solving the problem of night blindness in developing countries is

A. (a) Flavr savr tomatoes

B. (b) starlink maize

C. (c) Bt soyabean

D. (d) Golden rice

**Answer: D**



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19. 'Golden rice' is a rice variety rich in

A.  $\beta$ -carotene

B. Lysine

C. Vitamin-C

D. Iron

**Answer: A**



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**20.** In Bt cotton , a transgenic plant , Bt refers to

A. Botanical

B. Beta

C. Biotechnology

D. *Bacillus thuringiensis*

**Answer: D**



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21. Golden rice is a transgenic crop of the future with which of the following improved trait?

A. High lysine (essential amino acid) content

B. Insect resistance

C. High protein content

D. High vitamin A content

**Answer: D**



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## 22. Transgenic plants are

A. Produced by a somatic embryo in artificial medium

B. Generated by introducing foreign DNA in a cell and regenerating a plant from that cell

C. Produced after protoplast fusion in artificial medium

D. Grown in artificial medium after hybridisation in the field

**Answer: B**



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**23.** Golden rice was created by transforming rice with two beta-carotene biosynthesis genes, namely,

A. psy and cryl genes

B. LCY-e

C. CHY-1

D. CHY-2

**Answer: A**



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**24.** In transgenics, expression of transgene in target tissue is determined by

A. Enhancer

B. Transgene

C. Promoter

D. Reporter

**Answer: D**



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**25.** The genetically-modified (GM) brinjal in India has been developed for

A. Insect-resistant

B. Enhancing shelf life

C. Enhancing mineral content

D. Drought-resistance

**Answer: A**



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**26.** Some of the characteristics of Bt cotton are

A. Long fibre and resistance to aphids

B. Medium yield, long fibre and resistance to beetle pests

C. High yield and production of toxic protein crystals which kill dipteran pests

D. High yield and resistance to bollworms

**Answer: D**



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27. An improved variety of transgenic basmati rice

- A. Does not require chemical fertilisers and growth hormones
- B. Gives high yield and is rich in vitamin A
- C. Is completely resistant to all insect pests and diseases of paddy
- D. Gives high yield but has no characteristic aroma

**Answer: B**



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**28.** cryIIAb and cryIAb produce toxins that control

A. Cotton bollworms and corn borer respectively

B. Corn borer and cotton bollworms respectively

C. Tobacco budworms and nematodes  
respectively

D. Nematodes and tobacco budworms  
respectively

**Answer: A**



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**29.** Which of the following is a transgenic plant?

A. Hirudin

B. Flavr savr

C. Triticale

D. All of these

**Answer: B**



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**30.** Plants are more rapidly manipulated by genetic engineering than animals due to

- A. Single somatic cell can regenerate a whole plant body
- B. A group of somatic cells can regenerate a whole plant body
- C. May be (a) or (b)
- D. None of the above

**Answer: A**



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**31.** First genetically modified plant commercially released in India is

- A. Golden rice
- B. Slow ripening tomato
- C. Bt brinjal
- D. Bt cotton

**Answer: D**



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**32.** Maximum number of existing transgenic animals is of

A. Fish

B. Mice

C. Cow

D. Pig

**Answer: B**



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**33.** The process of RNA interference has been used in the development of plants resistant to

A. Nematodes

B. Fungi

C. Viruses

D. Insects

**Answer: A**



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**34.** Which body of the Government of India regulates GM research and safety of introducing GM organisms for public services?

A. Bio-safety committee

B. Indian Council of Agricultural Research

C. Genetic Engineering Approval  
Committee

D. Research Committee on Genetic  
Manipulation

**Answer: C**



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**35.** In Bt cotton, the Bt toxin present in plant tissue as pro-toxin is converted into active toxin due to

- A. Alkaline pH of the insect gut
- B. Acidic pH of the insect gut
- C. Action of gut microorganisms
- D. Presence of conversion factors in insect gut

**Answer: A**



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**36.** The crops engineered for glyphosate are resistant/tolerant to

A. Fungi

B. Bacteria

C. Insects

D. Herbicides

**Answer: D**



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**37.** In context of amniocentesis, which of the following statement is incorrect?

A. It can be used for detection of Down syndrome.

B. It can be used for detection of cleft palate.

C. It is usually done when a woman is between 14 - 16 week pregnant.

D. It is used for prenatal sex determination.

**Answer: B**



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**Competition Corner Objective Type Questions  
Assertion And Reason Type Questions**

1. Assertion: Humulin is more effective than the insulin produced by conventional methods.

Reason: Humulin is absorbed rapidly in the blood than the conventionally produced insulin.

A. If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

B. If both Assertion and Reason are true and the Reason is not the correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: A**



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**2. Assertion:** Interferons are effective against viruses.

**Reason:** Proteins which can be synthesised only by genetic engineering are effective against viruses.



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**3. Assertion:** 'Bt' toxin gene has been cloned from bacteria and expressed in plants to provide resistance from insect without the



need of insecticides.

Reason: 'Bt' toxin is produced from bacterium *Bacillus thuringiensis*.



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**4. Assertion:** ELISA is widely used for the detection of infectious diseases like AIDS.

Reason: ELISA is very sensitive and selective test and needs very small amount of reagents.



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5. Assertion: Terrorist are trying to adopt bioweapons these days.

Reason: Bioweapons are liked by terrorist organisation as these are costly.



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6. Assertion: Vaccination is also called preventive inoculation.

Reason: A vaccine prevents the formation of antibodies inside the body.



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7. Assertion: Interferons are a type of antibodies produced by cells infected by bacteria.

Reason: Interferons stimulate inflammation at the site of injury.



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8. Assertion: In recombinant DNA technology, human genes are often transferred into

bacteria (prokaryote) or yeast (eukaryote).

Reason: Both bacteria and yeast multiply very fast to form huge populations which express the desired gene.



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**9. Assertion:** *Agrobacterium tumefaciens* is popular in genetic engineering because this bacterium is associated with roots of all cereals and pulse crops.

Reason: A gene is incorporated in the bacterial

chromosomal genome gets automatically transferred to the crop with which the bacterium is associated.



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