




BIOLOGY PRACTICE EXERCISE

NEET











EXAM ON
5th MAY
2019

Maximise your chance of success in AIPMT and other PMTs by reading this column. This section is specially designed to optimise your preparation by practising more and more. It is a unitwise series having chapterwise question bank, allowing you to prepare systematically and become more competent.

-  Recall question or single concept question – indicated by a single finger.
-  Application question or question which requires 2 or 3 concepts to solve - indicated by 2 fingers.
-  Application question or question which requires 3 or more concepts - indicated by 3 fingers.

CHAPTER-11 : BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

Multiple Choice Questions

-  1. Which of the following is a palindromic sequence?
(a) 5' - CGTATG - 3' (b) 5' - CGAATG - 3'
 3' - GCATAC - 5' 3' - CGAATG - 5'
(c) 5' - GAATTC - 3' (d) 5' - GACTAC - 3'
 3' - CTTAAG - 5' 3' - TACGAC - 5'
-  2. Which one is a true statement regarding DNA polymerase used in PCR?
(a) It is used to ligate introduced DNA in recipient cells.
(b) It serves as a selectable marker.
(c) It is isolated from a virus.
(d) It remains active at high temperature.
-  3. Plasmids are
(a) extra chromosomal DNA which can self replicate
(b) DNA carrying genetic sequence, without expressing it
(c) integrated within host DNA without replication ability
(d) none of these.
-  4. Which one of the following is used as vector for cloning genes in higher organisms?
(a) Baculovirus (b) *Salmonella typhimurium*
(c) *Rhizopus nigricans* (d) Retrovirus
-  5. Restriction enzyme(s) used in recombinant DNA technology that make staggered cuts in DNA leaving sticky ends is/are
(a) *EcoRI* (b) *HindIII*
(c) *BamHI* (d) all of these.
-  6. DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by
(a) electrophoresis
(b) restriction mapping
(c) centrifugation
(d) polymerase chain reaction.
-  7. Blunt ends of passenger and vehicle DNAs are joined by
(a) DNA polymerase I (b) RNA polymerase
(c) DNA ligase (d) DNA polymerase III.
-  8. Which of the following is not a characteristic of pBR322 vector?
(a) It is the first artificial cloning vector constructed in 1977 by Boliver and Rodriguez.
(b) It is the most widely used, versatile and easily manipulated vector.
(c) It has two antibiotic resistance genes, *tet^R* and *amp^R*.
(d) It does not have restriction site for *SalI*.
-  9. During insertional inactivation, the presence of a chromogenic substrate gives blue coloured colonies if the plasmid in the bacteria does not have an insert. The blue colour is produced by the enzyme
(a) α - glucosidase (b) restriction endonuclease
(c) β -galactosidase (d) *Taq* polymerase.
-  10. How many fragments will be generated on the digestion of a closed circular DNA molecule with a restriction enzyme having six recognition sites on the DNA?
(a) 5 (b) 7
(c) 6 (d) 9

True or False

11. Endonucleases cleave base pairs of DNA at their terminal ends.
12. Most commonly used bacteriophage as cloning vectors are lambda phage and M13 phage.
13. Reverse transcriptase enzyme is used to synthesise the DNA or complementary DNA by using mRNA as a template.
14. Type III restriction endonucleases are used in recombinant DNA technology.
15. Gene transfer permits to isolate and introduce only one or a set of desirable genes without introducing undesirable genes into the target organism.
16. The palindromes in DNA are base pair sequences that are same when read in both directions (forward and backward).
17. Treating a bacterial cell with calcium make its cell wall impermeable to DNA and blocks entry of DNA into the cell.
18. Transfer of DNA into prokaryotic cell is called transfection.
19. pBR322 vector was the first artificial cloning vector constructed by Boliver and Rodriguez.
20. DNA ligases help in sealing gaps in DNA fragments.

Match The Columns

21. Match Column-I with Column-II.

Column-I	Column-II
A. DNA staining	(i) Chilled ethanol
B. Mobile genetic element	(ii) Agarose
C. Gene taxi	(iii) Ethidium bromide
D. Sea weeds	(iv) Transposon
E. Precipitation of DNA	(v) Plasmid

22. Match Column-I with Column-II. (There can be more than one match for items in Column-I).

Column-I	Column-II
A. Vectorless gene transfer	(i) Endonuclease
B. Cleaving enzymes	(ii) amp^R
C. Synthesising enzymes	(iii) tet^R
D. pBR322	(iv) Electroporation
E. DNA Insert	(v) Complementary DNA
	(vi) Micro-injection
	(vii) Exonuclease
	(viii) Reverse transcriptase
	(ix) DNA polymerase
	(x) Synthetic DNA

Passage Based Questions

- 23.(A) Complete the given passage with appropriate words or phrases.

In nomenclature of restriction enzymes, Type II restriction enzymes are named for the (i) from which they have been isolated. The first letter used for the enzyme is the first letter of the (ii) name. Then comes the first two letters of its (iii). The fourth letter of the name of enzyme is first letter of the (iv). The end of the name indicates the (v) in which the enzyme was (vi).

- (B) Read the given passage and correct the errors, wherever present.

The cutting of DNA by ligases results in the fragments of DNA and these fragments are separated by gel electroporation. Since DNA fragments are positively charged molecules so they move towards cathode through a medium/matrix. The most commonly used matrix is agarose which is monosaccharide extracted from *E. coli*. The DNA fragments separate according to shape through the pores of agarose gel.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

- (a) if both A and R are true and R is the correct explanation of A
- (b) if both A and R are true but R is not the correct explanation of A
- (c) if A is true but R is false
- (d) if both A and R are false.

24. **Assertion** : Restriction endonuclease recognises palindromic sequence in DNA and cuts them.

Reason : Palindromic sequence has two unique recognition sites *Pst* I and *Pvu* I recognised by restriction endonuclease.

25. **Assertion** : Bacteriophage vectors are more advantageous than plasmid vectors.

Reason : Bacteriophage vectors can be easily detected at the time of cloning experiments.

26. **Assertion** : Type I restriction endonucleases are not used in recombinant DNA technology.

Reason : They recognise specific sites within the DNA but do not cut these sites.

27. **Assertion** : YAC vectors have been exploited extensively in mapping the large genomes.

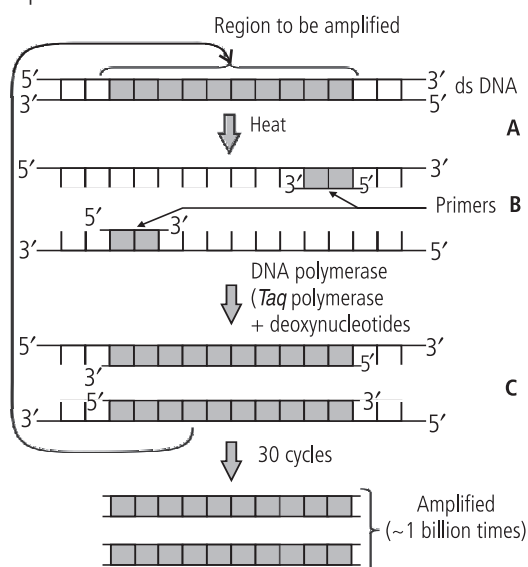
Reason : YAC vectors have a composite structure made of bacteriophage and plasmid.

28. **Assertion** : Plasmid DNA acts as genetic factor.

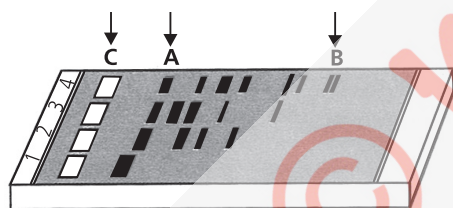
Reason : It carries vital genes necessary for cell.

Figure Based Questions

29. Refer to the given figure and answer the following questions.



- (a) Identify the steps A, B and C in the given figure.
 (b) Name the enzyme required in the process labelled C and write its function.
 (c) Briefly describe the process given in the figure.
30. Refer to the given figure and answer the following questions.



- (a) Identify A, B and C in the given figure.
 (b) How are labelled parts A and B visualised?
 (c) Why labelled part B moved farther away in comparison to labelled part A?

CHAPTER-12 : BIOTECHNOLOGY AND ITS APPLICATIONS

Multiple Choice Questions

1. A dicotyledonous plant forms crown gall when
- Agrobacterium tumefaciens* comes in contact with the plant
 - Agrobacterium rhizogenes* comes in contact with the plant
 - a specific part of Ti plasmid of *A. tumefaciens* gets integrated with the plant chromosome
 - a specific part of Ri plasmid gets integrated with the plant chromosome.

2. Which one of the following statements is wrong in relation to transgenic *Bt* cotton plant?

- Crop yield loss due to attack by *Bacillus thuringiensis* bacterium is reduced.
- Crop yield loss due to attack by lepidopteran insect pests is reduced.
- The use of chemical insecticides in the cotton field is minimised.
- Better quality of cotton is produced.

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

- Flavr Savr tomatoes
- Golden rice
- Starlink maize
- Bt* soyabean.

4. Which one of the following vectors is used to replace the defective gene in gene therapy?

- Adenovirus
- Cosmid
- Ri plasmid
- Ti plasmid

5. In hybridoma technology

- T-cells are fused with myeloma cells
- B-cells are fused with T-cells
- B-cells are fused with myeloma cells
- none of these.

6. *cryIIAb* and *cryIAb* produce toxins against

- cotton bollworms and corn borer respectively
- corn borer and cotton bollworms respectively
- nematodes and tobacco budworms respectively
- corn borer and tobacco budworms respectively.

7. RNA interference which is employed in making tobacco plant resistant to *Meloidogyne incognita* is essentially involved in

- preventing the process of replication of DNA
- preventing the process of translation of mRNA
- preventing the process of splicing of hnRNA
- preventing the process of transcription.

8. Which of the following statements is correct regarding Genetic Engineering Approval Committee (GEAC)?

- Genetic modification of organisms can have unpredictable results when such organisms are introduced into the ecosystem. Therefore, the Indian government has set up organisation such as GEAC.
- It makes decision regarding the validity of GM research.
- It ensures the safety of introducing GM-organisms for public services.
- All of these.

9. Read the given statements and select the correct option.
Statement 1 : 'Flavr Savr' tomato has increased shelf life and better nutrient quality.

Statement 2 : Amount of cell wall degrading enzyme polygalacturonase (responsible for fruit softening) is reduced in Flavr Savr tomato.

- (a) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.
 (b) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.
 (c) Statement 1 is correct and statement 2 is incorrect.
 (d) Both statements 1 and 2 are incorrect.

10. Second generation vaccines are prepared by recombinant DNA technology. Which out of the following are the examples of such vaccines?

- (a) Hepatitis B virus vaccine (b) Herpes virus vaccine
 (c) Salk's polio vaccine (d) Both (a) and (b)

True or False

11. Transgenic mice are used to test the safety of the polio vaccine.
 12. The proteins encoded by the genes *cryIAc* and *cryIAb* control the corn borer.
 13. Enzyme Linked Immunosorbent Assay (ELISA) helps in early diagnosis of disease.
 14. Biopiracy is the use of bio-resources by multinational companies with proper authorisation.
 15. Genetically modified salmon was the first transgenic animal for food production.
 16. RNAi takes place in all prokaryotic organisms as a method of cellular defense.
 17. Cortisone and its derivatives are effective in the treatment of rheumatoid arthritis.
 18. Riboflavin is produced commercially by direct fermentation utilising the fungus *Ashbya griseus* at pH 4.0–5.5 and at temperature 20–25°C.
 19. Genetically engineered strains of *Bacillus amyloquelaciens* and *Lactobacillus casei* have been prepared for production of amino acids on large scale.
 20. Interferon- γ are produced by T-lymphocytes induced by antigenic stimulation.

Match The Columns

21. Match Column-I with Column-II.

Column-I	Column-II
A. SCID	(i) α -1-antitrypsin
B. <i>Brassica napus</i>	(ii) Dr. Gerald Schatten
C. Emphysema	(iii) Dr. Saran Narang
D. ANDI	(iv) Adenosine deaminase
E. Cloning of insulin gene	(v) Hirudin

22. Match Column-I with Column-II. (There can be more than one match for items in Column-I).

Column-I	Column-II
A. Vitamin B ₂	(i) Somatotropin releasing hormone
B. Cortisone	(ii) Prednisone
C. Human growth hormone	(iii) <i>Choanephora cucurbitarum</i>
D. β -carotene	(iv) <i>Ashbya gossypii</i>
E. ELISA	(v) <i>Phycomyces blakesleeanus</i>
	(vi) Prednisolone
	(vii) Riboflavin
	(viii) Peroxidase
	(ix) Hypopituitarism
	(x) Alkaline phosphatase

Passage Based Questions

- 23.(A) Complete the given passage with appropriate words or phrases.

Transgenic animals that produce useful biological products can be created by the introduction of the portion of (i) which codes for a particular product such as α -1-antitrypsin used to treat (ii). In 1997, the first transgenic cow, (iii), produced (iv) enriched milk. The milk contained the (v) and was (vi) a more balanced product.

- (B) Read the given passage and correct the errors, wherever present.

Interferons are the antiviral glycoproteins (called lymphokines) functioning as cytokines produced by the infected cells in response to bacterial infection. Interferon- α is produced when erythrocytes and lymphocytes are exposed to bacteria. Interferon- β are produced by fibroblasts, epithelial cells, macrophytes and leucocytes in response to bacterial infection. Interferon- γ are produced by B-lymphocytes induced by antigenic inhibition.

Assertion & Reason

In each of the following questions, a statement of Assertion (A) is given and a corresponding statement of Reason (R) is given just below it. Of the statements, mark the correct answer as :

- (a) if both A and R are true and R is the correct explanation of A
 (b) if both A and R are true but R is not the correct explanation of A
 (c) if A is true but R is false
 (d) if both A and R are false.

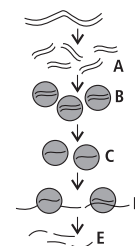
24. **Assertion** : Mouse is the most preferred mammals for studies on gene transfers.

Reason : Mouse possesses features like short oestrous cycle and gestation period, relatively short generation time, production of several offspring per pregnancy, etc.

25. **Assertion :** *Agrobacterium tumefaciens* is called natural genetic engineer.
Reason : *Agrobacterium tumefaciens* infects all broad-leaved agricultural crops but does not infect cereal crops.
26. **Assertion :** ELISA is based on the principle of antigen-antibody interaction.
Reason : ELISA detects protein molecules only when present in high concentration.
27. **Assertion :** β -glucanase enhances nutritional value in plants.
Reason : β -glucanase prevents over ripening of fruits by preventing degradation of cell wall.
28. **Assertion :** Northern blotting is analytical technique used for the identification of RNA by labelled DNA or RNA probe.
Reason : A single stranded RNA joined with a probe is allowed to hybridise to its complementary DNA in a clone of cells.

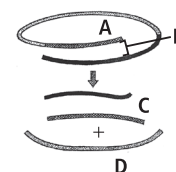
Figure Based Questions

29. Refer to the given figure and answer the following questions.



- (a) Identify A, B, C, D and E in the given figure.
 (b) Write the function of labelled part A.
 (c) Briefly describe the process involved in the given figure.

30. Refer to the given figure and answer the following questions.



- (a) Identify A, B, C and D in the given figure.
 (b) Describe the structure of labelled part A.
 (c) Briefly describe the process involved in given figure.

SOLUTIONS

CHAPTER-11 : BIOTECHNOLOGY : PRINCIPLES AND PROCESSES

1. (c) 2. (d) 3. (a) 4. (d) 5. (d)
 6. (a) 7. (c) 8. (d) 9. (c) 10. (c)
11. **False :** Endonucleases cleave DNA at specific position within the DNA.
12. **True** 13. **True**
14. **False :** Only type II restriction endonucleases are used in recombinant DNA technology.
15. **True** 16. **True**
17. **False.** Bacterial cells are made capable of taking up DNA by treating them with specific concentration of divalent cations *i.e.* calcium.
18. **False :** Transfer of DNA into eukaryotic cell is called transfection.
19. **True** 20. **True**
21. A-(iii), B-(iv), C-(v), D-(ii), E-(i)
 22. A-(iv, vi), B-(i, vii), C-(viii, ix), D-(ii, iii), E-(v, x)
23. (A) (i) bacterium (ii) bacterium's genus
 (iii) species (iv) strain
 (v) order (vi) isolated
- (B) The cutting of DNA by ligases restriction endonucleases results in the fragments of DNA and these fragments are separated by gel electrophoresis. Since DNA fragments are positively negatively charged molecules so they move towards cathode anode through a medium/matrix. The most commonly used matrix is agarose which is monosaccharide polysaccharide extracted from *E. coli* sea weeds. The DNA fragments separate according to shape size through the pores of agarose gel.
24. (c) 25. (a) 26. (a) 27. (c) 28. (d)
29. (a) A - Denaturation
 B - Annealing
 C - Extension
 (b) Process labelled C represents extension, it requires enzyme *Taq* DNA polymerase (obtained from thermophilic bacterium *Thermus aquaticus*). It synthesises the DNA region between primers, using dNTPs (deoxynucleoside triphosphate) and Mg^{2+} .
 (c) The given figure represents steps involved in Polymerase Chain Reaction (PCR). Basic requirements of PCR include a DNA template, two nucleotide primers and enzyme DNA polymerase. A single PCR cycle involves following three basic steps :
 (i) Denaturation : Target DNA is heated to a high temperature (usually $94^{\circ} - 96^{\circ}C$) resulting in separation of two strands.
 (ii) Annealing : The two oligo-nucleotide primers anneal (hybridise) to their complementary single stranded DNA at a temperature of about $40^{\circ} - 60^{\circ}C$.
 (iii) Extension : This is the final step where *Taq* DNA polymerase synthesise DNA region between the primers, using dNTPs and Mg^{2+} . Optimum temperature for extension is $72^{\circ}C$. The cycle is repeated again and again so as to obtain multiple copies of the desired DNA fragment.
30. (a) A – Largest DNA bands
 B – Smallest DNA band
 C – Wells

- (b) The given figure represents a typical agarose gel electrophoresis. Labeled part A and B represent largest DNA bands and smallest DNA bands respectively. When gel containing DNA fragments are stained with ethidium bromide and exposed to UV radiations then bright orange coloured bands of DNA are visible.
- (c) Labeled part A and B represent DNA bands. The fragments of DNA or DNA bands separate according to their size through the sieving effect provided by the agarose gel. So, the labelled part B (smaller fragments), moves farther away than the labelled part A (larger fragments).

CHAPTER-12 : BIOTECHNOLOGY AND ITS APPLICATIONS

1. (c) 2. (a) 3. (b) 4. (a) 5. (c)
6. (a) 7. (b) 8. (d) 9. (a) 10. (d)

11. True

12. False : The proteins encoded by the genes *cryIAC* and *cryIIAb* control the cotton bollworms.

13. True

14. False : Biopiracy is the use of bio resources by multinational companies without proper authorisation.

15. True

16. False. RNAi takes place in all eukaryotic organisms as a method of cellular defense.

17. True

18. False. Riboflavin is produced commercially by direct fermentation utilising the fungus *Ashbya gossypii* at pH 6.0–7.5 and at temperature 28–30°C.

19. True

20. True

21. A-(iv), B-(v), C-(i), D-(ii), E-(iii)

22. A-(iv, vii), B-(ii, vi), C-(i, ix), D-(iii, v), E-(viii, x)

23.(A) (i) DNA (ii) emphysema
(iii) Rosie (iv) human protein
(v) human α -lactalbumin (vi) nutritionally

(B) Interferons are the antiviral glycoproteins (called lymphokines cytokines) functioning as cytokines lymphokines produced by the infected cells in response to bacterial viral infections. Interferons- α is produced when erythrocytes leucocytes and lymphocytes are exposed to bacterial virus. Interferon- β are produced by fibroblasts, epithelial cells, macrophytes and leucocytes in response to viral infection. Interferon- γ are produced by B T-lymphocytes induced by antigenic inhibition stimulation.

24. (a) 25. (b) 26. (c) 27. (d) 28. (b)

29. (a) A - Small interfering RNAs (siRNAs)
B - RNA-induced silencing complex (RISC)
C - Activated RISC

D - Association of RISC with target mRNA
E - Target mRNA cleavage

(b) Labeled part A represents small interfering RNAs. They form RNA-induced silencing complex (RISC) with ribonuclease. siRNA strand acts as a guide where RISCs cut the transcripts in an area where the siRNA binds to mRNA. This destroys mRNA.

(c) The given figure represents steps in RNA interference (RNAi). It involves following steps : (i) RNase enzyme cuts the dsRNA molecules into small interfering RNAs (siRNAs). (ii) Each siRNA complexes with ribonucleases to form an RNA-induced silencing complex (RISC). (iii) siRNA unwinds and RISC is activated. (iv) The activated RISC targets complementary mRNA molecules. The siRNA strands act as guides where the RISCs cut the transcripts. This destroys the mRNA. (v) When mRNA of the parasite is destroyed no protein is synthesised. It results in death of the parasite in the transgenic host. Thus, the transgenic plant gets protection from the parasite.

30. (a) A - Proinsulin
B - Disulphide bond
C - Mature insulin
D - Free C-polypeptide chain

(b) Labeled part A is proinsulin. It has three chains A, B and C. Chains A, B and C have 21, 30 and 33 amino acids respectively.

(c) The given figure represents maturation of proinsulin into insulin. Proinsulin possesses three chains A, B and C. Chain C with 33 amino acids is an extra stretch, which is removed prior to insulin formation.



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