CHAPTER 4

Biotechnology: Principles and Processes

Principles of Biotechnology

1. The cutting of DNA at specific locations became possible with the discovery of: *(2015 Re)*

a. Probes
b. Selectable markers
c. Ligases
d. Restriction enzymes

Tools of Recombinant DNA Technology

2. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme? *(2022)*

a. 5' G T A T T C 3' ; 3' C A T A A G 5'
b. 5' G A T A C T 3' ; 3' C T A T G A 5'
c. 5' G A A T T C 3' ; 3' C T T A A G 5'
d. 5' C T C A G T 3' ; 3' G A G T C A 5'

3. Which of the following is not a desirable feature of a cloning vector? *(2022)*

a. Presence of two or more recognition sites
b. Presence of origin of replication
c. Presence of a marker gene
d. Presence of single restriction enzyme site

4. Given below are two statements: *(2022)*

Statement I: Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.

Statement II: Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site

In the light of the above statements, choose the most appropriate answer from the options given below.

a. Statement I is incorrect but Statement II is correct
b. Both Statement I and Statement II are correct
c. Both statement I and statement II are incorrect
d. Statement I is correct but Statement II is incorrect

5. DNA strands on a gel stained with ethidium bromide when viewed under UV radiation, appear as: *(2021)*

a. Bright orange bands
b. Dark red bands
c. Bright blue bands
d. Yellow bands

6. Plasmid pBR322 has PstI restriction enzyme site within gene amp^R that confers ampicillin resistance, If this enzyme is used for inserting a gene for β- galactoside production and the recombinant plasmid is inserted in an *E.coli* strain *(2021)*

a. The transformed cells will have the ability to resist ampicillin as well as produce β-galactoside.
b. It will lead to lysis of host cell.
c. It will be able to produce a novel protein with dual ability.
d. It will not be able to confer ampicillin resistance to host cell.

7. A specific recognition sequence identified by endonucleases to make cuts at specific positions within the DNA is: *(2021)*

a. Okazaki sequences
b. Palindromic Nucleotide sequences
c. Poly (A) tail sequences
d. Degenerate primer sequence

8. First discovered restriction endonuclease that always cuts DNA molecule at a particular point by recognising a specific sequence of six base pairs is: *(2020-Covid)*

a. Adensosine deaminase
b. Thermostable DNA polymerase
c. Hind II
d. EcoRI

9. Match the organism with its use in biotechnology. *(2020)*

1.	*Bacillus thuringiensis*	(i)	Cloning vector
2.	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
3.	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
4.	*Salmonella typhimurium*	(iv)	Cry proteins

Select the correct option from the following

	(1)	(2)	(3)	(4)
a.	(iv)	(iii)	(i)	(ii)
b.	(iii)	(ii)	(iv)	(i)
c.	(iii)	(iv)	(i)	(ii)
d.	(ii)	(iv)	(iii)	(i)

10. The sequence that controls the copy number of the linked DNA in the vector, is termed: *(2020)*

a. Ori site
b. Palindromic sequence
c. Recognition site
d. Selectable marker

11. The specific palindromic sequence which is recognized by EcoRI is: *(2020)*

a. 5' - GGAACC - 3' 3' - CCTTGG - 5'
b. 5' - CTTAAG - 3' 3' - GAATTC - 5'
c. 5' - GGATCC - 3' 3' - CCTAGG - 5'
d. 5' - GAATTC - 3' 3' - CTTAAG - 5'

12. Identify the wrong statement with regard to restriction enzymes. *(2020)*

a. They cut the strand of DNA at palindromic sites.
b. They are useful in genetic engineering.
c. Sticky ends can be joined by using DNA ligases.
d. Each restriction enzyme functions by inspecting the length of a DNA sequence.

13. Choose the correct pair from the following: *(2020)*

a.	Polymerases	-	Break the DNA into fragments
b.	Nucleases	-	Separate the two strands of DNA
c.	Exonucleases	-	Make cuts at specific positions within DNA
d.	Ligases	-	Join the two DNA molecules

14. Following statements describe the characteristics of the enzyme restriction endonuclease. Identify the incorrect statement. *(2019)*

a. The enzyme cuts DNA molecule at identified position within the DNA.
b. The enzyme binds DNA at specific sites and cuts only one of the two strands.
c. The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.
d. The enzyme recognizes a specific palindromic nucleotide sequence in the DNA.

15. A gene whose expression helps to identify transformed cell is known as *(2017-Delhi)*

a. Selectable marker
b. Vector
c. Plasmid
d. Structural gene

16. Restriction endonucleases are: *(2017)*

a. Used in genetic engineering for ligating two DNA molecules
b. Used for in vitro DNA synthesis
c. Synthesised by bacteria as part of their defense mechanism
d. Present in mammalian cell for degradation of DNA when the cell dies

17. Which of the following restriction enzymes produces blunt ends? **[OS]***(2016 - II)*

a. Xho I
b. Hind III
c. Sal I
d. Eco RV

18. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using: *(2016 - II)*

a. Polymerase-III
b. Ligase
c. Eco RI
d. Taq polymerase

19. Which of the following is a restriction endonuclease? *(2016 - I)*

a. Hind II
b. Protease
c. DNase I
d. RNase

20. Which of the following is not a feature of the plasmids? *(2016 - I)*

a. Independent replication
b. Circular structure
c. Transferable
d. Single-stranded

21. The DNA molecule to which the gene of interest is integrated for cloning is called: *(2015 Re)*

a. Vector
b. Template
c. Carrier
d. Transformer

22. The introduction of t-DNA into plants involves: *(2015 Re)*

a. Altering the pH of the soil, then heat shocking the plants
b. Exposing the plants to cold for a brief period
c. Allowing the plant roots to stand in water
d. Infection of the plant by *Agrobacterium tumifaciens*

23. Which vector can clone only a small fragment of DNA? *(2014)*

a. Cosmid
b. Bacterial artificial chromosome
c. Yeast artificial chromosome
d. Plasmid

24. DNA fragments generated by the restriction endonuclease in a chemical reaction can be separated by: *(2013)*

a. Restriction mapping
b. Centrifugation
c. Polymerase chain reaction
d. Electrophoresis

25. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of: *(2013)*

a. Inactivation of glycosidase enzyme in recombinant bacteria
b. Non-recombinant bacteria containing betagalactosidase
c. Insertional inactivation of alpha-galactosidase in non-recombinant bacteria
d. Insertional inactivation of beta-galactosidase in recombinant bacteria

Processes of Recombinant DNA Technology

26. Which one of the following statement is not true regarding gel electrophoresis technique? *(2022)*

a. Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.
b. The process of extraction of separated DNA strands from gel is called elution.
c. The separated DNA fragments are stained by using ethidium bromide.
d. The presence of chromogenic substrate gives blue coloured DNA bands on the gel

27. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R). *(2022)*

Assertion (A): Polymerase chain reaction is used in DNA amplification

Reason (R): The ampicillin resistant gene is used as a selectable marker to check transformation

In the light of the above statements, choose the correct answer from the options given below.

a. (A) is not correct but (R) is correct
b. Both (A) and (R) are correct and (R) is the correct explanation of (A)
c. Both (A) and (R) are correct but (R) is not the correct explanation of (A)
d. (A) is correct but (R) is not correct

28. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out: *(2021)*

a. DNA
b. Histones
c. Polysaccharides
d. RNA

29. During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first? *(2021)*

a. Extension
b. Denaturation
c. Ligation
d. Annealing

30. In gel electrophoresis, separated DNA fragments can be visualized with the help of: *(2020)*

a. Ethidium bromide in UV radiation
b. Acetorarmine in UV radiation
c. Ethidium bromide in infrared radiation
d. Acetocarmine in bright blue light

31. In a mixture, DNA fragments are separated by *(2020-Covid)*

a. Restriction digestion
b. Electrophoresis
c. Polymerase chain reaction
d. Bioprocess engineering

32. In recombinant DNA technology antibiotics are used: *(2020-Covid)*

a. To detect alien DNA
b. To impart disease-resistance to the host plant
c. As selectable markers
d. To keep medium bacteria-free

33. Match the following techniques or instruments with their usage: *(2020-Covid)*

1.	Bioreactor	(i)	Separation of DNA fragments
2.	Electrophoresis	(ii)	Production of large quantities of products
3.	PCR	(iii)	Detection of pathogen, based on antigen-antibody reaction
4.	ELISA	(iv)	Amplification of nucleic acids

Select the correct option from following:

	(1)	(2)	(3)	(4)
a.	(ii)	(i)	(iv)	(iii)
b.	(iv)	(iii)	(ii)	(i)
c.	(ii)	(i)	(iii)	(iv)
d.	(iii)	(ii)	(iv)	(i)

34. Spooling is: *(2020-Covid)*

a. Cutting of separated DNA bands from the agarose gel
b. Transfer of separated DNA fragments to synthetic membranes
c. Collection of isolated DNA
d. Amplification of DNA

35. Select the correct statement from the following: *(2020-Covid)*

a. The polymerase enzyme joins the gene of interest and the vector DNA
b. Restriction enzyme digestions are performed by incubating purified DNA molecules with the restriction enzymes of optimum conditions
c. PCR is used for isolation and separation of gene of interest
d. Gel electrophoresis is used for amplification of a DNA segment

36. Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes? *(2019)*

a. BOD incubator
b. Sludge digester
c. Industrial oven
d. Bioreactor

37. DNA precipitation out of a mixture of biomolecules can be achieved by treatment with *(2019)*

a. Isopropanol
b. Chilled ethanol
c. Methanol at room temperature
d. Chilled chloroform

38. The correct order of steps in Polymerase Chain Reaction (PCR) is: *(2018)*

a. Extension, Denaturation, Annealing
b. Annealing, Extension, Denaturation
c. Denaturation, Extension, Annealing
d. Denaturation, Annealing, Extension

39. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis? *(2017-Delhi)*

a. The larger the fragment size, the farther it moves
b. The smaller the fragment size, the farther it moves
c. Positively charged fragments move to farther end
d. Negatively charged fragments do not move

40. The process of separation and purification of expressed protein before marketing is called *(2017-Delhi)*

a. Upstream processing
b. Downstream processing
c. Bioprocessing
d. Post production processing

41. The DNA fragments separated on an agarose gel can be visualised after staining with: *(2017-Delhi)*

a. Bromophenol blue
b. Acetocarmine
c. Aniline blue
d. Ethidium bromide

42. Which of the following is not a component of downstream processing? *(2016 - II)*

a. Preservation
b. Expression
c. Separation
d. Purification

43. Stirred-tank bioreactors have been designed for: *(2016 - II)*

a. Availability of oxygen throughout the process
b. Ensuring anaerobic conditions in the culture vessel
c. Purification of product
d. Addition of preservatives to the product

44. The Taq polymerase enzyme is obtained from: *(2016 - I)*

a. *Thermus aquaticus*
b. *Thiobacillus ferroxidans*
c. *Bacillus subtilis*
d. *Pseudomonas putida*

45. *In vitro* clonal propagation in plants is characterised by: *(2014)*

a. Microscopy
b. PCR and RAPD
c. Northern blotting
d. Electrophoresis and HPLC

46. Which of the following is not correctly matched for the organism and its cell wall degrading enzyme? *(2013)*

a. Fungi - Chitinase
b. Bacteria - Lysozyme
c. Plant cells - Cellulase
d. Algae - Methylase

Answer Key

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
d	c	a	b	a	d	b	c	a	a	d	c	d	b	a	c	d
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
b	a	d	a	d	d	d	b	d	c	a	b	a	b	c	a	c
35	36	37	38	39	40	41	42	43	44	45	46					
b	d	b	d	b	b	d	b	a	a	b	d					