

Solution

BIOTECHNOLOGY PRINCIPLES AND PROCESSES WS 1

Class 12 - Biology

1.
(b) Extension of primer end on the template DNA
Explanation: Taq DNA polymerase enzyme extends the primers using the nucleotides provided in the reaction and the genomic DNA as a template.
2.
(c) Gene transfer without a vector
Explanation: Gene transfer without a vector
3.
(b) Restriction enzymes
Explanation: Restriction enzymes
4.
(a) Are synthesised by bacteria as part of their defense mechanism.
Explanation: Are synthesised by bacteria as part of their defense mechanism.
5.
(a) Agrobacterium tumefaciens
Explanation: Agrobacterium tumefaciens
6.
(b) Frederick Sanger
Explanation: Frederick Sanger
7.
(d) Agrobacterium tumefaciens
Explanation: Agrobacterium tumefaciens
8.
(b) Hind II
Explanation: The first restriction endonuclease discovered was Hind II. Hind II always cut DNA molecules at a particular point by recognizing a specific sequence of six base pairs. This specific base sequence is known as the recognition sequence of Hind II.
9.
(b) Agarase
Explanation: Elution is the process of extracting one material from another by washing with a solvent. Elution can be done by using enzyme agarase that can catalyze the hydrolysis of agar.
10.
(c) Proteins are small as compared to DNA
Explanation: Protein molecules are smaller than DNA polynucleotide. Protein and DNA can be separated by polyacrylamide gel having minute pores through which protein can pass but not the DNA.
11.
(a) 5×10^9
Explanation: 5×10^9
12.
(a) Precipitate DNA
Explanation: Ethanol is added because DNA is soluble in water. The alcohol causes DNA to precipitate, or settle out of the solution, leaving behind all the cellular components that aren't soluble in alcohol. The DNA can be spooled (wound) on a stirring rod and pulled from the solution at this point.
13.
(c) Restriction endonuclease
Explanation: Restriction endonuclease
14.
(b) Bt-cotton

Explanation: Bt-cotton

15. (b) E.coli
Explanation: E.coli acts as a host to multiply the recombinant DNA. While forming a recombinant DNA we need a restriction enzyme that will cut out the required DNA fragments which are later joined with the help of DNA ligase.
16. (a) Agrobacterium
Explanation: Agrobacterium
17. (d) Ti genes are removed
Explanation: *Agrobacterium tumefaciens* is called a natural genetic engineer in which Ti plasmid is modified by removing Ti genes used as a cloning vector.
18. (b) Transposon
Explanation: Transposon
19. (d) Extension and amplification
Explanation: Extension and amplification
20. (b) Introduction of foreign genes
Explanation: Introduction of foreign genes
21. (c) Inhibition of cell wall formation.
Explanation: Inhibition of cell wall formation.
22. (d) DNA polymerases
Explanation: DNA polymerases
23. (b) Sticky ends
Explanation: Sticky ends are formed in DNA segments if DNA is digested by EcoRI. Restriction enzymes cut the strand of DNA a little away from the center of palindrome sites but between the same two bases on the opposite strands to form sticky ends.
24. (a) Streptomycin
Explanation: Streptomycin
25. (a) Yeast artificial chromosome
Explanation: Yeast artificial chromosome
26. (a) DNA fingerprinting
Explanation: DNA fingerprinting
27. (d) Will lose tetracycline resistance
Explanation: If the gene of interest (goi) is inserted at the Bam HI site in the PBR322, the plasmid will lose tetracycline resistance which is necessary for the successful hybridization of vector gene and foreign gene.
28. (a) B-lymphocytes and myeloma cells.
Explanation: B- lymphocytes and myeloma cells.
29. (d) DNA amplification
Explanation: DNA amplification
30. (b) Protease
Explanation: Proteases are involved in digesting long protein chains into shorter fragments by splitting the peptide bonds that

link amino acid residues.

Protein can be digested by using enzyme protease to obtain DNA. In the chromosome, DNA is wrapped on histone protein.

31. **(c)** To produce multiple copies of the fragment DNA
Explanation: DNA is amplified by PCR as it can be used to produce multiples copies of fragment DNA. These copies are used to produce recombinant DNA having desired traits.
32. **(d)** β -galactosidase acts on it.
Explanation: X-gal is an analog of lactose, and therefore may be hydrolyzed by the β -galactosidase enzyme which cleaves the β -glycosidic bond in D-lactose.
X-gal, when cleaved by β -galactosidase, yields galactose and 5-bromo-4-chloro-3-hydroxyindole. The latter then spontaneously dimerizes and is oxidized into 5,5'-dibromo-4,4'-dichloro-indigo, an intensely blue product which is insoluble. X-gal itself is colorless, so the presence of blue-colored products may, therefore, be used as a test for the presence of active β -galactosidase.
This easy identification of an active enzyme allows the gene for β -galactosidase (the lacZ gene) to be used as a reporter gene in various applications.
33. **(d)** Sticky ends in both
Explanation: Restriction enzymes, such as EcoRI, are used in a wide variety of molecular genetics techniques including cloning, DNA screening, and deleting sections of DNA in vitro. Restriction enzymes, like EcoRI, that generate sticky ends of DNA are often used to cut DNA prior to ligation, as the sticky ends make the ligation reaction more efficient.
34. **(d)** Anode
Explanation: The smallest segment of DNA in the agrose gel will be towards anode or positively charged ends. The DNA fragments are negatively charged and moves towards negatively charged anode.
35. **(b)** Variation
Explanation: Variation
36. **(c)** Shotgun cloning
Explanation: Shotgun cloning
37. **(c)** Cut DNA at specific locations.
Explanation: Cut DNA at specific locations.
38. **(b)** Tungsten
Explanation: DNA is coated with tungsten before used in the biolistic gun for inserting the DNA directly into target cells for obtaining a particular protein.
39. **(b)** Kary Mullis
Explanation: PCR (Polymerase Chain Reaction) technique was developed by Kary Mullis in 1985, and for this, he received Nobel Prize for chemistry in 1993.
40. **(d)** (ii) & (iv)
Explanation: (ii) & (iv)
41. **(b)** Bioreactors
Explanation: Bioreactor is a large vessel in which large scale raw materials are biologically converted into specific products. Bioreactor is used to produce large scale production.

42. **(b) Elution**
Explanation: The extraction of specific bands of DNA from agarose gels in which they are separated through electrophoresis is known as elution. There are many methods for eluting DNA from a piece of agarose.
43. **(d) Rye**
Explanation: Rye
44. **(b) Gene bank**
Explanation: Gene bank
45. **(c) Protein**
Explanation: Protein
46. **(d) Salmonella typhimurium**
Explanation: Salmonella typhimurium
47. **(c) Sticky ends**
Explanation: Longer overhangs are called cohesive ends or sticky ends. They are most often created by restriction endonucleases when they cut DNA.
48. **(b) mRNA**
Explanation: mRNA
49. **(a) Alec Jeffreys**
Explanation: Alec Jeffreys
50. **(b) Plasmid**
Explanation: Plasmid
51. **(c) DNA probes**
Explanation: DNA probes
52. **(a) Recombinant DNA technique**
Explanation: Recombinant DNA technique
53. **(b) Single stranded**
Explanation: Single stranded
54. **(c) Any of these**
Explanation: The cells can also be multiplied in a continuous culture system wherein the used medium is drained out from one side while the fresh medium is added from the other to maintain the cells in their physiologically most active log/exponential phase. This type of culturing method produces larger biomass leading to higher yields of the desired protein. Small volume cultures cannot yield appreciable quantities of products. To produce in large quantities, the development of bioreactors, where large volumes (100-1000 litres) of culture can be processed, was required. Thus, bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal, or human cells.
55. **(c) Formation of the phosphodiester bond between two DNA fragments.**
Explanation: DNA ligase is a specific type of enzyme, a ligase that facilitates the joining of DNA strands together by catalyzing the formation of a phosphodiester bond.

56. **(c)** Tissue culture
Explanation: Tissue culture
57. **(c)** PCR
Explanation: DNA amplification is done by using the technique of polymerase chain reaction in which millions of copies of DNA segments are produced.
58. **(d)** B-cells are fused with myeloma cells.
Explanation: B-cells are fused with myeloma cells.
59. **(a)** Same molecular weight
Explanation: Gel electrophoresis is a technique used to separate DNA fragments (or other macromolecules, such as RNA and proteins) based on their size and charge. Electrophoresis involves running a current through a gel containing the molecules of interest. Based on their size and charge, the molecules will travel through the gel in different directions or at different speeds, allowing them to be separated from one another.
The DNA fragments in an agarose gel at the same position signify that the two fragments have the same molecular weight and travel the same distance.
60. **(a)** Air bubbles enhance the oxygen transfer area.
Explanation: Bioreactors are used to obtain biological products on large scale continually for commercial purposes. The sparged stirred tank bioreactor is advantageous over the simply stirred tank bioreactor as there is an increased surface area for oxygen transfer. The bubbles increase the oxygen transfer area.
61. **(c)** Uptake of DNA through transient pores in the bacterial cell wall.
Explanation: In order to force bacteria to take up the plasmid, the bacterial cells must first be made 'competent' to take up DNA. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 42⁰C (heat shock) and then putting them back on ice. This enables the bacteria to take up the recombinant DNA.
62. **(b)** Strain RY13
Explanation: The commonly used notation for restriction endonucleases is of the form "vwxyz", where "vwx" names the life form (bacteria) where this restriction endonuclease may be found, "y" names the strain (and is optional), and "z" (in Roman numerals) indicates different restriction endonucleases in the same life form (bacteria).
Thus for example, "EcoRI" means that the restriction endonuclease is found in Escherichia coli ("Eco"); strain RY13 ("R"), restriction endonuclease number "I".
63. **(b)** Cleave DNA molecules into smaller pieces
Explanation: Cleave DNA molecules into smaller pieces
64. **(c)** Downstream processing
Explanation: Downstream processing is the separation and purification of the recombinant protein products. Downstream processing and quality control testing vary for different products.
65. **(c)** 1972
Explanation: 1972
66. **(b)** Ethanol Precipitation
Explanation: The piece of DNA obtained by gel electrophoresis contains agarose gel also. Ethanol precipitation is a commonly used technique for concentrating and de-salting nucleic acids (DNA or RNA) preparations in aqueous solution. The basic procedure is that salt and ethanol are added to the aqueous solution, which forces the precipitation of nucleic acids out of solution.

67.

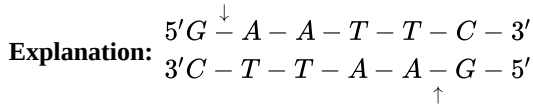
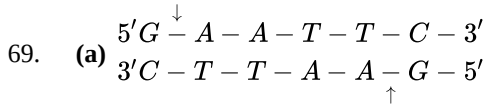
(b) Prophage

Explanation: Prophage

68.

(d) Protease

Explanation: Protease



70. **(a)** Cocking

Explanation: Cocking

71.

(b) Molecular weights of the fragments are different.

Explanation: Gel electrophoresis is a technique used to separate DNA fragments (or other macromolecules, such as RNA and proteins) based on their size and charge. Electrophoresis involves running a current through a gel containing the molecules of interest. Based on their size and charge, the molecules will travel through the gel in different directions or at different speeds, allowing them to be separated from one another.

During gel electrophoresis, different fragments move at different distances due to differences in their molecular weight of the fragments. Smaller fragments move more towards the anode.

72.

(b) Plasmids

Explanation: Plasmids

73.

(b) Polymorphism in sequence

Explanation: Polymorphism in sequence

74. **(a)** Agrobacterium

Explanation: Agrobacterium

75.

(b) comparing the size of the DNA fragment.

Explanation: A molecular-weight size marker also referred to as a protein ladder, DNA ladder, or RNA ladder is a set of standards that are used to identify the approximate size of a molecule run on a gel during electrophoresis, using the principle that molecular weight is inversely proportional to migration rate through a gel matrix. Therefore, when used in gel electrophoresis, markers effectively provide a logarithmic scale by which to estimate the size of the other fragments (providing the fragment sizes of the marker are known).