

# Biotechnology: Principles & Processes

## MULTIPLE CHOICE QUESTIONS

1. EFB refers to
  - (a) English Federation of Biology
  - (b) European Federation of Biology
  - (c) English Federation of Biotechnology
  - (d) European Federation of Biotechnology Biosphere

| Topic | Principles of Biotechnology |
|-------|-----------------------------|
| 1     |                             |

2. Plasmid is-
  - (a) autonomously replicating, extra chromosomal
  - (b) non-autonomously replicating extra chromosomal
  - (c) autonomously replicating chromosomal
  - (d) non-autonomously replicating extrachromosomal
3. Plasmid is
  - (a) linear RNA
  - (b) circular RNA
  - (c) linear DNA
  - (d) circular DNA
4. First recombinant DNA involved native plasmid of
  - (a) *Escherichia coli*
  - (b) *Salmonella typhimurium*
  - (c) *Streptococcus pneumonia*
  - (d) *Clostridium butylicum*
5. First recombinant DNA was made by
  - (a) Herbert Cohen & Stanley Boyer, 1972
  - (b) Stanley Cohen & Herbert Boyer, 1992
  - (c) Stanley Cohen & Herbert Boyer, 1972
  - (d) Herbert Cohen & Stanley Boyer, 1992

6. The recombinant DNA was made
  - (a) before discovery of DNA cutting restriction enzymes
  - (b) after discovery of DNA cutting restriction enzymes
  - (c) after discovery of DNA cutting ligases
  - (d) before discovery of DNA cutting ligases
7. The plasmid DNA linked with cut piece of DNA acts as
  - (a) host
  - (b) vector
  - (c) medium to transfer the DNA piece
  - (d) more than one options
8. Linking of antibiotic resistance gene with plasmid is done using enzyme
  - (a) Ligase
  - (b) Lyase
  - (c) Hydrolase
  - (d) Nuclease
9. The plasmid joined with required DNA of interest is transferred into.....
  - (a) *Escherichia coli*
  - (b) *Salmonella typhimurium*
  - (c) *Streptococcus pneumonia*
  - (d) *Clostridium butylicum*
10. Two core techniques that enabled birth of modern biotechnology are
  - (a) Physical & biological engineering
  - (b) Bioprocesses & genetic engineering
  - (c) Molecular & cellular genetics
  - (d) None of these
11. Biotechnology uses techniques to alter chemistry of
  - (a) Protein & Lipid
  - (b) Protein & RNA
  - (c) Lipid & DNA
  - (d) RNA & DNA

12. In chemical engineering processes, it is important to maintain
- microbe-free environment
  - microbe-laced environment
  - sterile environment
  - more than one options
13. Unique combinations of genetic setup is naturally provided by
- Sexual reproduction
  - Asexual reproduction
  - Biotechnology
  - More than one options
14. Genetic information is preserved by
- sexual reproduction
  - asexual reproduction
  - Both of these
  - none of these
15. When a piece of DNA is transferred to an alien organism-
- it will multiply itself
  - it will not be able to multiply itself
  - it will be present in progeny cells of organism.
  - Both (a) & (c)
16. Chromosome replication is initiated at
- gateway of replication, a specific RNA sequence
  - origin of replication a specific DNA sequence
  - path of replication a specific RNA sequence
  - None of these
17. For alien DNA to replicate it needs to be a part of
- chromosome without origin of replication site
  - mitochondrial DNA with origin of replication site
  - chromosome with origin of replication site
  - cytoplasmic DNA with origin of replication site

- Restriction enzyme, polymerase, hydrolase, vectors
- Recognition enzyme, polymerase, ligase, vector
- Restriction endonuclease, polymerase, ligase, vector
- Restriction enzyme, polymerase, dehydrogenase vector

| Topic<br>3 | Restriction Enzyme |
|------------|--------------------|
|------------|--------------------|

19. In 1963, two restriction endonucleases were isolated in *E. coli* that restricted growth of bacteriophage by
- cutting DNA
  - adding methyl group to DNA
  - removing methyl group to DNA
  - more than one option
20. The first restriction endonuclease was
- Hind-III*
  - Hind-II*
  - Hind-I*
  - Hind-IV*
21. EcoRI comes from
- genus *Eichhonia*
  - species *coli*
  - genus *Echinus*
  - species *crispus*
22. Recognition sequence is
- Specific sugar sequence in DNA which is recognized by restriction endonuclease
  - Specific protein sequence which is recognized by restriction endonuclease
  - Specific lipase sequence which is recognized by restriction endonuclease
  - Specific base sequence in DNA which is recognized by restriction endonuclease
23. The convention for naming restriction endonucleases is
- First two letters come from genus & third from species of prokaryotic cell from which they were isolated.

| Topic<br>2 | Tools of Recombinant DNA Technology |
|------------|-------------------------------------|
|------------|-------------------------------------|

18. The key tools for recombinant DNA technology

- (b) First two letters come from species & third from genus of prokaryotic cell from which they were isolated.
- (c) First letter come from genus & second two from species of prokaryotic cell from which they were isolated.
- (d) First letter come from species & second two from genus of prokaryotic cell from which they were isolated

24. Roman number indicate

- (a) order in which enzyme were isolated
- (b) strain of bacteria
- (c) lab number in which enzyme was isolated
- (d) none of these

25. Restriction enzymes belong to

- (a) Exonucleases      (b) Endonucleases
- (c) Both (a) and (b)    (d) None

26. Exonuclease cuts DNA from

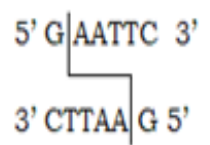
- (a) specific position within DNA
- (b) ends of DNA
- (c) Both (a) & (b)
- (d) None of these

27. Restriction enzyme recognize

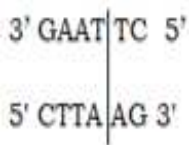
- (a) Paleondromic sequence of phosphates in DNA
- (b) Palindromic sequence of nucleoside in DNA
- (c) Paleondromic sequence of nucleotide in DNA
- (d) Palindromic sequence of nucleotide in DNA

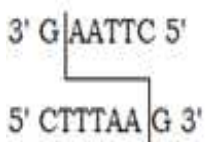
28. ECoRI cuts DNA at

- (a)



(b)


- (c)



(d) All of these

29. Which of the following is a palindrome?

- (a) 5' – GAATAC – 3'

3' – CTTATG – 5'

(b) 5' – GATATAC – 3'

3' – CTATATG – 5'

(c) 5' – GAATTC – 3'

3' – CTTAAG – 5'

(d) All of these

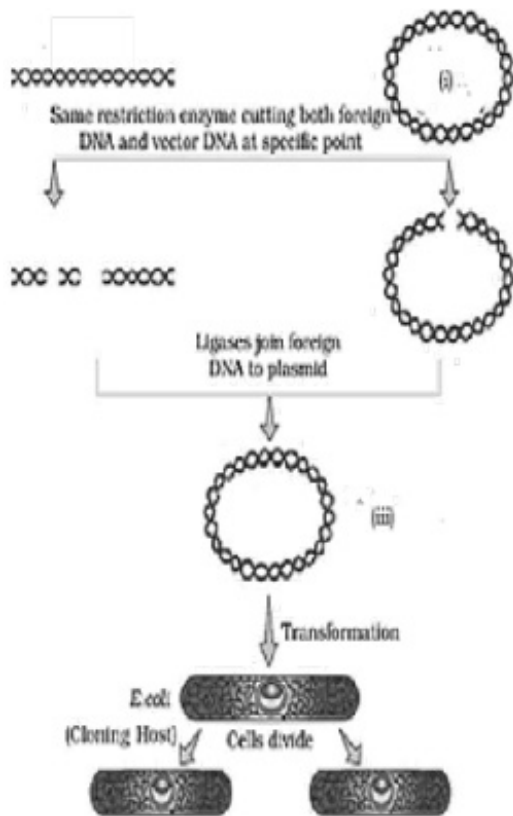
30. Restriction enzyme cuts DNA

- (a) between same two bases on opposite strands, in centre of DNA sequence recognized
- (b) between same two bases on opposite strands, a little away from centre of DNA sequence recognized
- (c) between different two bases on opposite strands, in centre of DNA sequence recognized
- (d) between different two bases on opposite strands, living away from centre of DNA sequence recognized.

31. When cut by the same restriction enzyme the resultant DNA fragments produce

- (a) same kind of sticky ends joined using endonucleases
- (b) different kinds of sticky ends joined using ligase
- (c) same kind of sticky ends which can be joined using ligase
- (d) different kind of sticky ends which can be joined using endonucleases

32.



Identify correct labelling

|     | (i)             | (ii)            | (iii)           |
|-----|-----------------|-----------------|-----------------|
| (a) | vector plasmid  | Recombinant DNA | Foreign DNA     |
| (b) | Foreign DNA     | vector plasmid  | Recombinant DNA |
| (c) | Recombinant DNA | vector plasmid  | Foreign DNA     |
| (d) | vector plasmid  | Foreign DNA     | Recombinant DNA |

33. The process of 'Transformation' takes place when

- (a) bacteria replicates and makes copies of rDNA with it
- (b) bacteria picks up rDNA II
- (c) foreign gene is added to cloning host prokaryote cell
- (d) more than one options

Topic  
4

## Separation & Isolation of DNA Fragments

34. Technique used for separation of DNA fragments is-

- (a) Gel electrophoresis
- (b) DNA fingerprinting
- (c) PCR
- (d) DNA cloning

35. DNA fragments are

- (a) negatively charged
- (b) positively charged
- (c) neutral
- (d) none of these

36. In gel electrophoresis, DNA are forced to move towards

- (a) anode under magnetic field
- (b) cathode under magnetic field
- (c) anode under electric field
- (d) cathode under electric field

37. Matrix used in electrophoresis is

- (a) ethidium bromide
- (b) agarose gel
- (c) natural polymer extracted from sea weeds
- (d) more than one options

38. Ethidium bromide is used to stain because

- (a) DNA fragments are visible without staining
- (b) DNA fragments are not visible under staining
- (c) DNA fragments are not visible without staining
- (d) DNA fragments are visible under staining

39. Stained DNA is exposed to

- (a) visible light
- (b) UV light
- (c) IR light
- (d) Radio wave

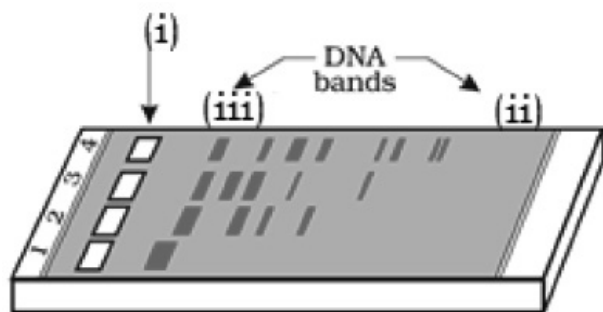
40. Colour of DNA visible under UV light after Ethidium bromide staining is

- (a) blue
- (b) black
- (c) orange
- (d) green

41. The extraction of separated bands of DNA from agarose gel are

- (a) Dilution
- (b) Elution
- (c) Elution
- (d) Delution

42.



Identify labels correctly

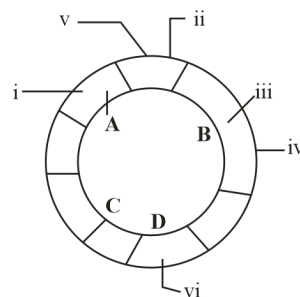
|     | (i)                | (ii)              | (iii)              |
|-----|--------------------|-------------------|--------------------|
| (a) | Largest DNA band   | Smallest DNA band | Wells              |
| (b) | Wells              | Largest DNA bands | Smallest DNA bands |
| (c) | Smallest DNA bands | Largest DNA bands | Wells              |
| (d) | Smallest DNA bands | Wells             | Largest DNA bands  |

**Topic**  
**5**

## Cloning Vectors

43. Plasmids in bacterial cells replicate
- depending on chromosomal DNA
  - independent of chromosomal DNA
  - depending on extra-nuclear DNA
  - more than one options
44. Bacteriophages
- replicate independent of other organisms
  - replicate inside bacterial cell, controlled by chromosomal DNA of bacteria.
  - replicate inside bacterial cell autonomously
  - more than one options

Figure of questions (45 to 52)



45. Bacteriophages serve as \_\_\_\_ in biotechnology.
- host
  - vector
  - molecular marker
  - enzyme
46. Identify Bam HI in given plasmid figure.
- (i)
  - (ii)
  - (iii)
  - (iv)
47. Identify antibiotic resistance gene in figure
- Sal I
  - EcoRI
  - amp<sup>R</sup>
  - pBR322
48. Identify ECoRI in the plasmid
- (iv)
  - (v)
  - (iii)
  - (ii)
49. 'A' & 'B' in figure are
- amp<sup>R</sup> & tet<sup>R</sup>
  - ori & amp<sup>R</sup>
  - tet<sup>R</sup> & amp<sup>R</sup>
  - rop & tet<sup>R</sup>
50. 'rop' codes for i & is shown in figure by ii
- proteins involved in replication; D
  - proteins involved in transcription, C
  - proteins involved in transcription, D
  - proteins involved in replication, C
51. 'Ori' means \_\_\_\_ & is shown in figure by
- origin of translocation; C
  - origin of replication ; D
  - origin of translation ; D
  - origin of replication; C
52. Identify pvu II in given figure of plasmid
- i
  - ii
  - vi
  - iv

- 53.** Which of the following is correct?
- Any piece of DNA linked to ori gene will be replicated
  - Number of replication copies is under control of recognition site
  - Vector should not be chosen based on number of copies supported by it
  - More than one option
- 54.** Transformants include
- cells which have picked vector with foreign DNA ligated to it.
  - cells which have picked up vector without foreign DNA ligated to it
  - cells which have not picked up vector
  - Both (a) & (b)
- 55.** Recombinants are
- cells which have picked vector with foreign DNA ligated to it.
  - cells which have picked up vector without foreign DNA ligated to it
  - cells which have not picked up vector
  - Both (a) & (b)
- 56.** Which is true about recombinant & transformant?
- All transformants are recombinants
  - All recombinants are transformants
  - No relation between these two
  - Both are same thing
- 57.** Normal *E.coli* cell-
- Carries resistance against antibiotics ampicillin, tetracycline and kanamycin
  - Does not carry resistance against antibiotics ampicillin, tetracycline and kanamycin
  - Carries resistance against ampicillin but not tetracycline and kanamycin
  - Carries resistance against tetracycline but not ampicillin and kanamycin
- 58.** In order to link alien DNA, vector needs to have \_\_\_\_ recognition sites for commonly used restriction enzymes.
- very few
  - preferably single
  - many
  - more than one options
- 59.** Assertion- Vector should have many recognition sites for commonly used restriction enzymes.
- Reason- Lot of recognition sites generate several fragments, which make gene cloning easy.
- Assertion and Reason are both correct and Reason is correct explanation for Assertion
  - Assertion and Reason are both correct but Reason is not correct explanation for Assertion
  - Assertion and Reason both are incorrect
  - Assertion is correct but Reason is incorrect
- 60.** If a foreign gene is ligated at Bam HI site of vector PBR322, then the resistance for \_\_\_\_.
- tetracycline is lost
  - ampicillin is lost
  - tetracycline is not lost
  - more than one option
- 61.** The recombinants mentioned in the previous question can be selected out from the non-recombinants by-
- Plating the transformants on tetracycline
  - Plating the transformants on ampicillin
  - Both of these are necessary
  - None of these
- 62.** Recombinants mentioned in 'If a foreign gene is ligated at Bam HI site of vector PBR322' will-
- Grow in ampicillin and tetracycline both
  - Grow in ampicillin but not tetracycline
  - Grow in tetracycline but not ampicillin
  - Grow neither in tetracycline nor in ampicillin
- 63.** Non-recombinants transformants will
- Grow in ampicillin and tetracycline both
  - Grow in ampicillin but not tetracycline
  - Grow in tetracycline but not ampicillin
  - Grow neither in tetracycline nor in ampicillin
- 64.** Non-transformants *E.coli* will-
- Grow in ampicillin and tetracycline both
  - Grow in ampicillin but not tetracycline



- (c) Grow in tetracycline but not ampicillin
- (d) Grow neither in tetracycline nor in ampicillin

65. When rDNA is inserted in coding sequence of  $\beta$ -galactosidase,
- (a) The enzyme gets synthesized
  - (b) Non-recombinant colonies produce blue colour in presence of chromogenic substrate.
  - (c) Colourless colonies are produced
  - (d) Orange colonies are produced
66. Ti-plasmid stands for \_\_\_\_\_ and are present in \_\_\_\_\_.
- (a) Tumor inhibiting, *Agrobacterium speciose*
  - (b) Tumor inducing, *Agrobacterium speciose*
  - (c) Tumor inhibiting, *Agrobacterium tumefaciens*
  - (d) Tumor inducing, *Agrobacterium tumefaciens*
67. The Ti-plasmid being used as cloning vector-
- (a) causes crown gall disease
  - (b) is not pathogenic
  - (c) is pathogenic
  - (d) More than one options

| Topic<br>6 | Competent Host<br>(For transformation with recombinant DNA) |
|------------|---|
|------------|---|

68. DNA is-
- (a) hydrophilic and can pass through cell membrane
  - (b) hydrophobic and can pass through cell membrane
  - (c) hydrophilic and cannot pass through cell membrane
  - (d) hydrophobic and cannot pass through cell membrane
69. Bacterial host cells are made competent to take up rDNA by-
- (a) Treating with  $\text{Na}^+$
  - (b) Treating with  $\text{Al}^{3+}$
  - (c) Treating with  $\text{Ca}^{2+}$
  - (d) More than one options

70. Choose the correct sequence to be followed to enable bacteria to take up rDNA.

- (i) Treating with divalent cation.
  - (ii) Heat shock ( $42^\circ\text{C}$ ).
  - (iii) Incubating on ice.
- (a) i-ii-iii-ii (b) i-iii-ii-iii  
(c) ii-iii-i-ii (d) iii-ii-i-iii

71. Other methods for introducing foreign DNA into host cells are-

- (a) Micro-injection for animal cells
- (b) Gene gun for plant cells
- (c) Disarmed pathogens
- (d) All of these

72. In micro-injection technique, rDNA is injected into-

- (a) Cytoplasm (b) Nucleus
- (c) Cell membrane (d) Lysosomes

73. In biolistics, cells are bombarded with high velocity-

- (a) Micro-particles of iron coated with DNA
- (b) Macro-particles of tungsten coated with DNA
- (c) Micro-particles of gold coated with DNA
- (d) More than one options

| Topic<br>7 | Processes of Recombinant DNA Technology |
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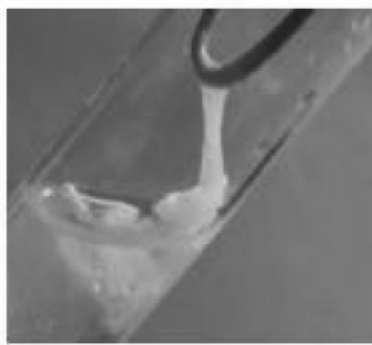
74. Identify correct sequence of process of rDNA technology:

- (i) transferring rDNA into host
  - (ii) isolation of DNA fragment desired
  - (iii) isolation of DNA
  - (iv) culturing host cells in medium at large scale
  - (v) fragmentation of DNA by restriction enzyme
  - (vi) ligation of DNA fragment into a vector
  - (vii) extraction of desired product
- (a) (iii) – (ii) – (v) – (vi) – (i) – (iv) – (vii)  
(b) (iii) – (v) – (i) – (vi) – (ii) – (iv) – (vii)  
(c) (iii) – (v) – (ii) – (vi) – (i) – (iv) – (vii)  
(d) (iii) – (v) – (vi) – (i) – (ii) – (iv) – (vii)

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| <b>Topic<br/>8</b> | <b>Isolation of the Genetic Material<br/>(DNA)</b> |
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75. Nucleic acid is genetic material of:  
 (a) some organisms  
 (b) no organism  
 (c) all organisms without exception  
 (d) most organisms with some exception
76. How many of given enzymes are involved in extraction of genetic material from cell of organisms?  
 (i) Cellulase (ii) Chitinase  
 (iii) Lysozyme (iv) Ribonuclease  
 (v) Protease (vi) Deoxyribonuclease  
 (a) 3 (b) 2  
 (c) 5 (d) 6
77. Match the following:
- |                |              |
|----------------|--------------|
| A              | B            |
| (i) Cellulase  | I. Plant     |
| (ii) Chitinase | II. Bacteria |
| (iii) Lysozyme | III. Fungi   |
- |         |      |       |
|---------|------|-------|
| (i)     | (ii) | (iii) |
| (a) I   | III  | II    |
| (b) II  | III  | I     |
| (c) III | I    | II    |
| (d) I   | II   | III   |
78. Purified DNA is precipitated out by addition of:  
 (a) warm acetic acid (b) chilled acetic acid  
 (c) warm ethanol (d) chilled ethanol

79.



The figure shows DNA separated out, removed by:

- |              |              |
|--------------|--------------|
| (a) spooning | (b) spooling |
| (c) spilling | (d) speeling |

80. The precipitated DNA is seen as:  
 (a) collection of fine threads in suspension  
 (b) collection of fine threads in solution  
 (c) coagulated mass in suspension  
 (d) coagulated mass in solution

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| <b>Topic<br/>9</b> | <b>Cutting of DNA at Specific<br/>Location</b> |
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81. To check the progression of restriction enzyme digestion, \_\_\_\_\_ is used.  
 (a) PCR  
 (b) gel electrophoresis  
 (c) DNA fingerprinting  
 (d) Selectable marker gene
82. Preparation of rDNA involves the enzymes:  
 (a) specific restriction enzyme  
 (b) gene of interest  
 (c) vector DNA  
 (d) all of these

|                     |  |
|---------------------|--|
| <b>Topic<br/>10</b> | <b>Amplification of Gene of Interest using PCR</b> |
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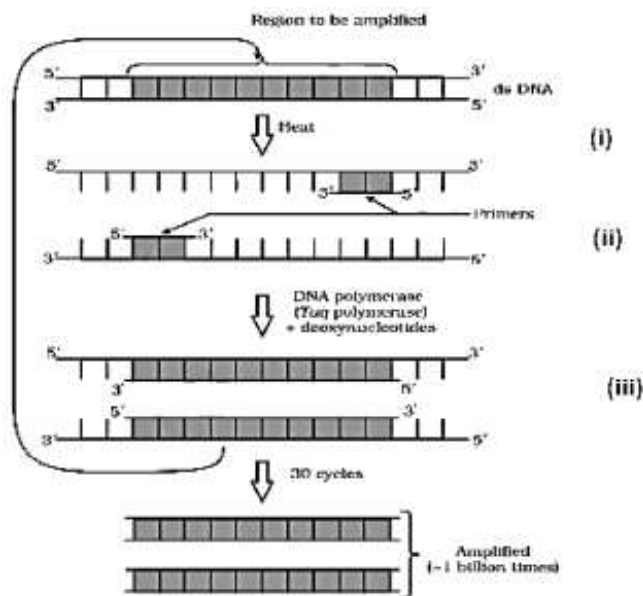
83. PCR stands for:  
 (a) Polynuclease chain reaction  
 (b) Polylypase chain reaction  
 (c) Polyamide chain reaction  
 (d) None of these
84. PCR is an:  
 (a) *in vitro* process (b) *in vivo* process  
 (c) both (d) none
85. How many sets of primers are used in PCR?  
 (a) 1 (b) 2  
 (c) 3 (d) 4
86. Enzyme involved in PCR is:  
 (a) DNA endonuclease (b) RNA polymerase  
 (c) DNA polymerase (d) DNase



87. The enzyme involved in PCR with thermostability is isolated from:

- (a) *Thermus aquaticus* fungi
- (b) *Escherchia coli* bacteria
- (c) *Agrobacterium tumefaciense* bacteria
- (d) None of these

88.



Identify correct labeling of sequence:

- |                  |              |              |
|------------------|--------------|--------------|
| (i)              | (ii)         | (iii)        |
| (a) Annealing    | Denaturation | Extension    |
| (b) Denaturation | Extension    | Annealing    |
| (c) Denaturation | Annealing    | Extension    |
| (d) Extension    | Annealing    | Denaturation |

|                 |   |
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| <b>Topic 11</b> | <b>Insertion of Recombinant DNA into the Host Cell / Organism</b> |
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89. A-Ampicillin resistance gene is called selectable marker in case *E.coli* is made to take up rDNA bearing ampicillin resistance gene.

B-Such *E.coli* grow on ampicillin containing agar plates.

Choose right option with regards to above statements.

- (a) Both are correct
- (b) Only A is correct
- (c) Only B is correct
- (d) None is correct

|                 |                                       |
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| <b>Topic 12</b> | <b>Obtaining Foreign Gene Product</b> |
|-----------------|---------------------------------------|

90. If a protein encoding gene is expressed in a heterologous host, it is called:

- (a) secondary protein
- (b) recombinant protein
- (c) transmitted protein
- (d) tertiary protein

91. In continuous culture system:

- (a) used medium is drained at the end
- (b) used medium is drained twice in the whole process
- (c) used medium is continuously drained out
- (d) none of these

92. Bioreactors are:

- (a) large vessels
- (b) used for large quantity production
- (c) used for biological conversion of raw materials into products
- (d) all of these

|                 |                              |
|-----------------|------------------------------|
| <b>Topic 13</b> | <b>Downstream Processing</b> |
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93. Downstream processing includes :

- (a) separation
- (b) purification
- (c) both the above
- (d) none of these

94. A- Suitable preservatives are added

B- These formulations need clinical trials.

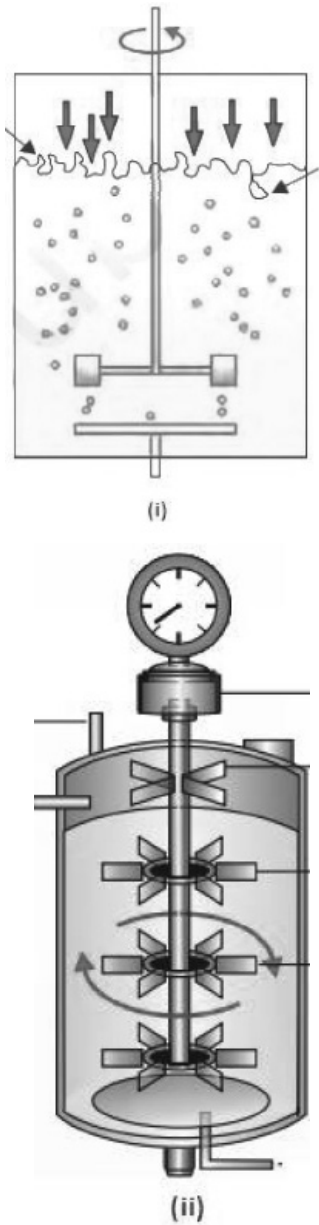
C- Quality control testing is uniform for all the products.

How many of the above statements is incorrect?

- (a) 0
- (b) 1
- (c) 2
- (d) 3

95. Optimal conditions for growth include how many of the following?  
 pH, Salt, Temperature, Vitamin, Oxygen  
 (a) 5 (b) 6  
 (c) 7 (d) 4

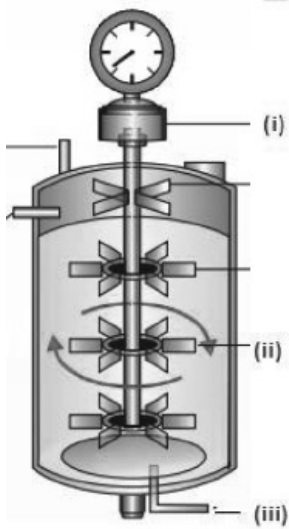
96.



Identify types of stirred-tank bioreactor:

|     | (i)                             | (ii)                            |
|-----|---------------------------------|---------------------------------|
| (a) | Simple stirred-tank bioreactor  | complex stirre dtank bioreactor |
| (b) | Complex stirred-tank bioreactor | simple stirre dtank bioreactor  |
| (c) | Simple                          | Sparged                         |
| (d) | Sparged                         | Simple                          |

97.



Identify the correct labels:

|     | (i)           | (ii)          | (iii)         |
|-----|---------------|---------------|---------------|
| (a) | Motor         | Culture broth | Sterile air   |
| (b) | Culture broth | Motor         | Sterile air   |
| (c) | Motor         | Sterile air   | Culture broth |
| (d) | Sterile air   | Culture broth | Motor         |

98. Sampling ports are mainly required to-
- (a) Keep adding samples into Bioreactors
  - (b) Withdraw small volumes of culture
  - (c) Add Acid/Base for pH control
  - (d) All of these

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|         |         |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d)  | 2. (a)  | 3. (d)  | 4. (b)  | 5. (c)  | 6. (b)  | 7. (b)  | 8. (a)  | 9. (a)  | 10. (b) |
| 11. (d) | 12. (d) | 13. (a) | 14. (b) | 15. (b) | 16. (b) | 17. (c) | 18. (c) | 19. (d) | 20. (b) |
| 21. (b) | 22. (d) | 23. (c) | 24. (d) | 25. (b) | 26. (b) | 27. (d) | 28. (a) | 29. (c) | 30. (b) |
| 31. (c) | 32. (d) | 33. (d) | 34. (a) | 35. (a) | 36. (c) | 37. (d) | 38. (c) | 39. (b) | 40. (c) |
| 41. (c) | 42. (b) | 43. (b) | 44. (c) | 45. (b) | 46. (c) | 47. (c) | 48. (b) | 49. (a) | 50. (a) |
| 51. (d) | 52. (c) | 53. (a) | 54. (a) | 55. (a) | 56. (b) | 57. (b) | 58. (d) | 59. (c) | 60. (a) |
| 61. (a) | 62. (b) | 63. (a) | 64. (d) | 65. (b) | 66. (d) | 67. (b) | 68. (a) | 69. (c) | 70. (b) |
| 71. (d) | 72. (b) | 73. (d) | 74. (c) | 75. (c) | 76. (c) | 77. (a) | 78. (d) | 79. (b) | 80. (a) |
| 81. (b) | 82. (d) | 83. (d) | 84. (a) | 85. (b) | 86. (c) | 87. (d) | 88. (c) | 89. (a) | 90. (b) |
| 91. (c) | 92. (d) | 93. (c) | 94. (b) | 95. (a) | 96. (d) | 97. (a) | 98. (b) | 99. (b) |         |