CBSE Test Paper 02

Ch-11 Biotechnology Principles and Processes

1. Lysozyme kills bacteria by destroying
   a. Cell membrane
   b. Ori
   c. Plasmid
   d. Cell wall
2. The group of letters that form same words when read both forward and backward are called
   a. Endonucleases
   b. Puzzle
   c. Palindrome
   d. Sticky ends
3. The techniques of using live organisms of enzymes from organism to produce products and processes useful to human is called
   a. Hybridization
   b. Mutation
   c. Biotechnology
   d. Regeneration
4. Kanamycin does not inhibit the growth of
   a. E.coli
   b. B. amyloliquifaciens
   c. B.subtilis
   d. T. aquaticus
5. To produce copies in billions of a DNA segment, the number of times PCR should be done is
   a. 5 times
   b. 28-32 times
   c. 10 times
   d. 15 times

6. A recombinant vector with a gene of interest inserted within the gene of α-

galactosidase enzyme, is introduced into a bacterium. Why is this method of selection referred to as "insertional inactivation?

7. Can you recall meiosis and indicate at what stage a recombinant DNA is made?
8. Which was the first type II restriction endonuclease to be discovered?
9. What is Ti plasmid?
10. Explain the role of alkaline phosphatase in recombinant DNA technology. What is the source of this enzyme?
11. Enumerate the steps which are involved in recombinant DNA technology.
12. Can you think and answer how a reporter enzyme can be used to monitor transformation of host cells by foreign DNA in addition to a selectable marker?
13. Describe briefly the following: Downstream processing.
14. Mrs Kavita was eager to know the sex of the foetus which her daughter-in-law was carrying. She was so anxious that she could pay any amount for that. The doctor refused to disclose the result of the test.
    i. What value do you learn from the doctor's act?
    ii. How can one know the sex of the foetus? How is it done?
    iii. Why is disclosing the sex of the foetus banned in our country?
15. What essential features must be present in a cloning vector?

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Answer

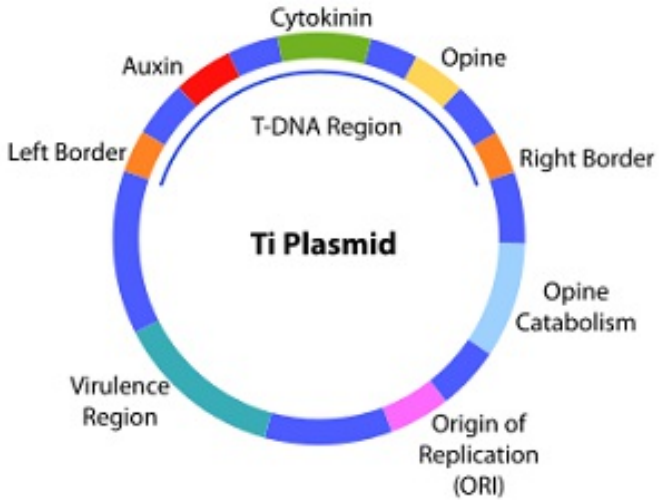
1. a. Cell membrane, d. Cell wall, **Explanation:** Lysozyme is capable of breaking the chemical bonds in the outer cell wall of the bacteria. Bacterial cell walls contain a layer of peptidoglycan, which is the specific site that lysozyme targets.
   The peptidoglycan layer contains alternating molecules called N-acetylglucosamine and N-acetylmuramic acid. These molecules form a strong glycan chain that act as the backbone for the cell wall.
   The link between the N-acetylglucosamine and N-acetylmuramic acid is cleaved by lysozyme. Once this chain is broken by lysozyme, it results in bacterial death.
2. c. Palindrome, **Explanation:** A palindrome is a word, phrase, number, or other sequence of characters which reads the same backward as forward. For example MALYALAM which read same from both side.
3. c. Biotechnology, **Explanation:** Biotechnology is the use of living systems and organisms to develop or make products, or "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use".
4. a. E.coli, **Explanation:** The genes encoding resistance to antibiotics such as ampicillin, chloramphenicol, tetracycline or kanamycin, etc., are considered useful selectable markers for E. coli. The normal E. coli cells do not carry resistancea gainst any of these antibiotics.
   Kanamycin does not inhibit the growth of Escherichia coli bacteria. This antibiotic is used to treat infection caused by Gram-negative bacteria.
5. b. 28-32 times, **Explanation:** To produce billions of copies of a DNA segment PCR (polymerase chain reaction) is done.
   This is a theoretical consideration, as PCR depends on a number of factors as optimal priming, salt concentration, enzyme activity, available dNTPs and so on. Ideally, the number of DNA molecules is doubled with every cycle. So the general formula to calculate the number is:

$n \times 2^{cycles}$= number of DNA molecules at the end of the PCR

n is the number of molecules set into the reaction

The number of times PCR to get billions copy should be done is about 28-32 times.

6. Due to the insertion of gene of interest within the gene the functioning of the gene is inactivated i.e. the concerning enzyme is not produced.
7. Pachytene stage of prophase I by crossing over.
8. Hind II (From Haemophilus influenzae bacterium)
9. A Ti or tumour inducing plasmid is a plasmid that often, but not always, is a part of the genetic equipment that Agrobacterium tumefaciens and Agrobacterium rhizogenes use to transduce their genetic material to plants.



10. This enzyme is used to prevent unwanted self ligation of vector DNA molecule. Sources from bacteria (BAP) from calf intestine (CAP)
11. **Steps involved in recombinant DNA technology are following:**
    i. Isolation of DNA.
    ii. Fragmentation of DNA by restriction endonucleases.
    iii. Isolation of desired DNA fragment.
    iv. Ligation of DNA fragment into vector.

v. Transferring recombinant DNA into host.

vi. Culturing host cells at large scale.

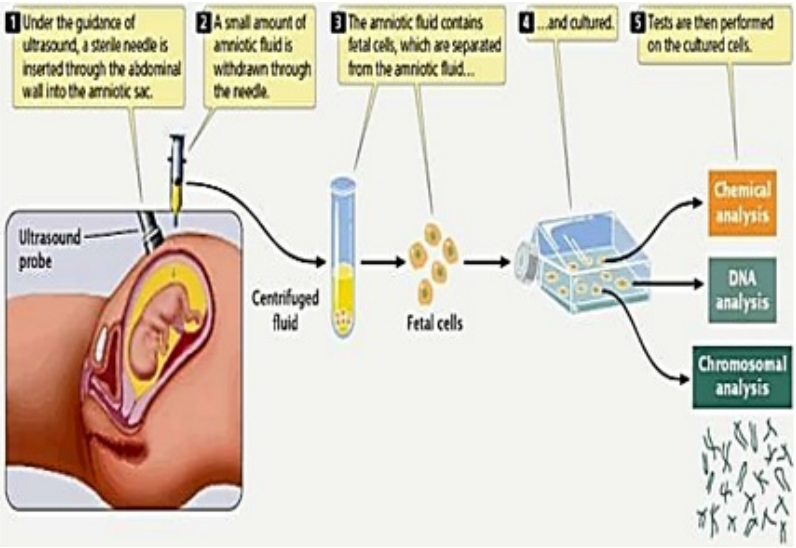
vii. Extraction of the desired product.

12. Reporter enzyme can differentiate recombinants from non-recombinants on the basis of their ability to produce specific colour in the presence of a chromogenic substrate. An rDNA is inserted within the coding sequence of the enzyme, b-galactosidase. This results into inactivation of the enzyme which is referred to as insertional inactivation.

    The presence of a chromogenic substrate gives blue coloured colonies, if the plasmid in the bacteria does not have an insert. Presence of insert results into insertional inactivation of the b-galactosidase and the colonies do not produce any colour. These are identified as recombinant colonies.

13. After completion of the biosynthetic stage, the product has to be subjected through a series of processes before it is ready for marketing as a finished product. The processes include separation and purification, which are collectively referred to as downstream processing. The product has to be formulated with suitable preservatives. Such formulation has to undergo thorough clinical trials as in case of drugs. Strict quality control testing for each product is also required. The downstream processing and quality control testing very from product to product

14. i. The doctor is devoted to his duties and has professional ethics.
    ii. By amniocentesis
    The process – stepwise



iii. In the past, there have been numerous cases where the female foetus has been aborted. This anti-feeling for the girl child is considered a crime. The number of females to males is thereby reduced.

15. Most commercial cloning vectors have key features that have made their use in molecular biology so widespread. Control of Expressions: In the case of expression vectors, the main purpose of these vehicles is the controlled expression of a particular gene inside a convenient host organism (e.g. E. coli). Control of expression can be very important it is usually desirable to insert the target DNA into a site that is under the control of a particular promoter. Some commonly used promoters are T7 promoters, lac promoters and cauliflower mosaic virus's 35s promoter (for plant vectors). Selectable Marker: To allow for convenient and favorable insertions, most cloning vectors have had nearly all their restriction sites engineered out of them and a synthetic multiple cloning site (MCS) inserted that contains many restriction sites. MCSs allow for insertions of DNA into the vector to be targeted and possibly directed in a chosen orientation. A selectable marker, such as an antibiotic resistance is often carried by the vector to allow the selection of positively transformed cells. All plasmids must carry a functional origin of replication (ORI).