QB365

Important Questions - Biotechnology : Principles and Processes

12th Standard CBSE

Biology

Reg.No. : | | | | | | |

Time : 01:00:00 Hrs

Total Marks : 50

Section - A

1) Which is used in molecular genetic engineering? **1**

(a) Tomato (b) Tobacco (c) Carrot (d) Arabidopsis

2) The technique of genetic engineering includes **1**

(a) creation of recombinant DNA (b) use of gene cloning (c) gene transfer (d) All of these.

3) In plant biotechnology, root tumours are induced in plant using the bacterium **1**

(a) Agrobacterium rhizogenes (b) Agrobacterium basilis (c) Rhizobium (d) None of these

4) Polyethylene glycol method is used for **1**

(a) Cut the DNA at specific site (b) Join the cut ends (c) Cut DNA at the ends

(d) Cut RNA at specific sites

5) A bacterial cell was transformed with a recombinant DNA that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be: **1**

(a) Human gene may have intron which bacteria can not process

(b) Amino acid codons for humans and bacteria are different

(c) Human protein is formed but degraded by bacteria (d) All of the above

6) During transcription in eukaryotic cell the RNA splicing and RNA capping takes place inside the **1**

(a) Nucleus (b) Ribosomes (c) Dictyosomes (d) ER

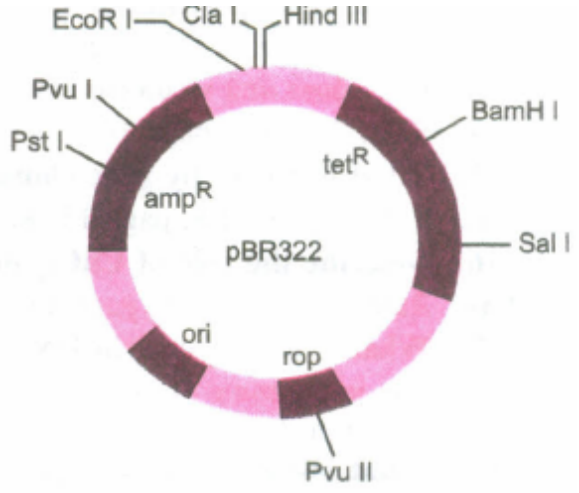
7) Which one of the following technique made it possible to genetically engineer living organisms? **1**

(a) recombinant DNA technique (b) X-ray diffraction (c) heavier isotope labelling (d) hybridization

8) A single strand of nucleic acid tagged with a radioactive molecule is called: **1**

(a) Vector (b) Selectable marker (c) Plasmid (d) Probe

9) The figure below is the diagrammatic representation of the E.Coli vector $_{P}$BR 322. Which one of the given options correctly identifies its certain component (s)? 1



(a) ori-original restriction enzyme (b) rop-reduced osmotic pressure

(c) Hind III, EcoRI-selectable markers (d) amp^R, tet^R-antbiotic resistance genes

10) Biolistics (gene-gun) is suitable for 1

(a) disarming pathogen vectors (b) transformations of plant cells

(c) constructing recombinant DNA by joining with vectors (d) DNA fingerprinting

Section - B

11) (a)Explain how to find whether an E.Coli bacterium has transformed or not when a recombinant DNA bearing ampicillin-resistant gene is transferred into it. 2

(b)What does the ampicillin-resistant gene act as, in the above case?

12) (a)A recombinant vector with a gene of interest inserted within the gene of α -galactosidase enzyme is introduced into a bacterium. Explain the method that would help in selection of recombinant colonies from non-recombinant ones. (b)Why is this method of selection referred to as 'insertional inactivation'? 2

13) What are recombinant proteins? How do bioreactors help in their production? 2

14) what is meant by continuous culture system? 2

15) A mixture of fragmented DNA was electrophoresed in an agarose gel. After staining the gel with ethidium bromide, no DNA bands were observed. What could be the reason? 2

16) What are molecular scissors? Explain their role. 2

17) Describe importance of cloning site in a vector. Illustrate with an example. 2

18) (i) Name two genetically engineered recombinant proteins used for treatement of specific disorders. 2

(ii) Name a substance produced by certain bacteria used in blood transfusion.

(iii) Who is credited with synthesis og gene.

19) How is the amplification of a gene of interest carried out using polymerase Chain Reaction(PCR)? 2

20) (a)Why are restriction endonucleases so called? (b)What is a palindromic nucleotide sequences? How do restriction endo-nucleases act on palindromic sites to create 'sticky ends'? 2

Section - C

21) If a desired gene is identified in an organism for some experiments explain the process of the following: **5**

(i)Cutting this desired gene at a specific location.

(ii)Synthesis of multiple copies of this desired gene.

22) (a)Why are engineered vectors preferred by biotechnologists for transferring the desired genes into another organism? (b)Explain how 'ori', 'selectable markers' and 'cloning sites' facilitate cloning into a vector. **5**

23) What are bioreactors? Sketch the two types of bioreactors. What is the utility? Which is the common type of bioreactors? **5**

24) The biology teacher was explaining about restriction enzymes and came to a point explaining that these enzymes are extracted from bacteria and are called as molecular scissors. Varun, a student got curious and asked some questions for more clarity on the concept to his teacher. **5**

(i) From which part of microorganisms are restriction enzymes derived?

(ii) Why are restriction enzymes called molecular scissors?

(iii|) What if some strands are needed to be cut from within. would that lead to wastage of DNA?

(iv) What value are shown by varun?

****

Section - A

1) (d) Arabidopsis **1**

2) (d) All of these. **1**

3) (a) Agrobacterium rhizogenes **1**

4) (a) Cut the DNA at specific site **1**

5) (a) Human gene may have intron which bacteria can not process **1**

6) (d) ER **1**

7) (a) recombinant DNA technique **1**

8) (d) Probe **1**

9) (d) amp^R, tet^R-antbiotic resistance genes **1**

10) (b) transformations of plant cells **1**

Section - B

11) **2**

(a) The recombinant/transformant can be selected out from the non-recombinants/non-transformants by plating the transformants on ampicillin - containing medium.

- The transformants will grow in it, while the non-transformants will not grow.

(b) It acts as a selectable marker.

12) **2**

(a) - The recombinants can be differentiated from the non-recombinants by their inability to produce colour in the presence of a chromogenic substrate.

- The recombinants do not produce any colour, while the non-recombinants produce a blue colour with the chromogenic substrate in the medium.

(b) Since, the insert inactivates the enzyme, a-galactosidase, this method is called insertional inactivation.

13) **2**

The proteins produced by the expression of recombinant DNA in the transgenic organism are called recombinant proteins. Bioreactors help in the production of recombinant proteins as

(i) Large volumes of culture can be processed in them to produce appreciable quantities of the product.

(ii) They provide optimum conditions of temperature, pH, oxygen, salts, substrate, etc., to achieve the desired product.

14) **2**

- In continuous culture system, the used culture medium is drained out from one-side and fresh medium is added from the other side.
- This system maintains the cells is their physiologically most active state, i.e. in the log or exponential growth phase.
- This method of culturing produces a larger biomass and leads to higher yields of the desired, protein/product.

15) **2**

1) Wrong fitting of electrodes.
2) Non - use of UV = radiations.
3) Inadvert contamination with nuclease
4) Wrong fitting of electrodes.

16) **2**

Restriction endonuclease enzymes are called molecular scissors which can cut double stranded DNA at specific sites.

Role of restriction endonuclease.

1. Restriction endonuclease inspects the length of DNA sequence.
2. It find specific recognition sequence i.e. Palindromic nucleotide sequence in DNA.
3. These enzymes cut the strand of DNA a little away from centre of palindromic sites.
4. Thus restriction endonucleases leave overhanging stretches called sticky ends on each strand.

17) **2**

Cloning site is necessary in order to link the alien DNA to the vector.

The vector should have preferably a single recognition site, for the commonly used restriction enzyme.

1. In E.coli the ligation of alien DNA is carried out at one of two antibiotic resistance genes.
2. A foreign DNA can be ligated at the Bam H I site of tetracycline resistance gene in the vector pBR 322.
3. The recombinant plasmid will lose the tetracycline resistance, but can grow on ampicillin-containing medium.
4. When they are transferred to tetracycline containing medium, the recombinant cannot grow while the non-recombinants will grow on both ampicillin and tetracycline containing medium. Thus cloning sites help in the selection of recombinants.

18) (a) Humulin used for treatement of diabetes millitus. **2**

(b) Tissue Plasminogen Activator (TPA) used for acute myocardial infraction as it dissolves blood clot.

(c) Desetran (a polysaccharide.

(d) Dr. Har Gobind Khorana.

19) **2**

Polymerase Chain Reaction

- Multiple copies of the desired gene or segment of DNA, can be synthesised in vitro using two sets of primers, the oligonucleotides that are complementary to the regions of DNA of the two strands and the enzyme DNA polymerase.
- This enzyme extends the primers using the nucleotides provided in the reaction and the genomic DNA as the template.
- For repeated amplification to be achieved, a thermostable DNA polymerase (Taq polymerase), extracted from the bacterium, Thermus aquaticus is employed; it remains active during the high temperature treatment used for denaturation and separation of the two strands.

20) **2**

(a) Restriction endonucleases are called so, because they restrict the growth of bacteriophage by cutting their DNA at specific sequences.

(b) A palindrome in DNA is the sequence of base pairs that reads the same on the two strands of DNA, when the orientation of reading is kept the same.

- Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome site, but between the same two bases in both the strands.
- This creates single-stranded stretches overhanging at the ends of the palindrome; they are called sticky ends.

Section - C

21) **5**

(i) - Cutting of desired gene at specific location is done by incubating the DNA with specific restriction , endonuclease.

- Restriction enzymes are those which recognise a particular palindromic nucleotide sequence and cuts the DNA at that site.

(ii) Synthesis of multiple copies of the desired gene is carried out by Polymerase Chain Reaction (PCR).

22) 5

(a) Engineered vectors are preferred because they help easy linking of foreign DNA and selection of recombinants from non-recombinants.

(b) Ori

- It is a sequence of bases on DNA from where replication starts; any piece of DNA when linked to this sequence can be made to replicate within the host cells. This sequence also controls the copy number of linked DNA.

Selectable marker

- The selectable marker helps in identifying and eliminating non-transformants or non-recombinants and permits selectively the growth of only recombinants.

Cloning sites

- Cloning sites are necessary to link the alien DNA. Single recognition sites are commonly preferred.
- When an alien DNA is introduced into the coding sequence of an enzyme or an antibiotic resistance, there is insertional inactivation; the enzyme is inactivated or the antibiotic resistance is lost and hence, recombinants can be selected from the non-recombinants.

23) 5

Small volume cultures cannot yield appreciable quantities of products. To produce these products in large quantities the development of 'bioreactors' was required where large volumes (100-1000 litres) of culture can be processed. Thus bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, using microbial, plant, animal or human cells or individual enzymes.

Role. A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins, oxygen). One of the most commonly used bioreactor is of stirring type. A stirred tank reactor is usually cylindrical or with a curved base to facilitate the mixing of the reactor contents. The stirrer facilitates even mixing and oxygen availability throughout the bioreactor. Alternatively air can be bubbled 1lhroughthe reactor. If you look at the figure closely you will see that the bioreactor has an agitator system; an oxygen delivery system, a foam control system, a temperature control system, pH control system, sampling ports so that small volumes of the culture can be withdrawn periodically.

24) 5

(i) Restriction enzymes are derived from a defence unit called restriction modification system which protects the microorganisms from harm.

(ii) They are called as molecular scissors because they cut DNA molecules at specified location indicated by presence of specific recognition sequence.

(iii) No, the strands cut from within are joined by another enzyme called DNA ligase. This joining is either with self or with another different strand.

(iv) Varun is curious, has scientific temperament and ask quick and intelligent questions.