# BIOLOGY

# BOOKS - PRADEEP BIOLOGY (HINGLISH)

# BIOTECHNOLOGY: PRINCIPLE'S AND PROCESSES

## CURIOSITY QUESTIONS

**1.** Is it possible to synthesize DNA in the laboratory?

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**2.** What is the basic aim of rDNA technology?

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## NCERT EXERCISES WITH ANSWERS

**1.** Can you list 10 recombinant proteins which are used in medical practise ? Find out where they are used as therapeutics.

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**2.** Make a chart (with diagrammatic representation) showing a restriction enzyme, the substrate DNA on which it acts, the site at which it cuts DNA and the product it produces.

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**3.** From what you have leartn, can you tell whether enzymes are bigger or DNA is bigger in molecular size ? How did you know?

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**4.** What would be the molar concentration of human DNA in a human cell? Consult your teacher.

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**5.** Do eukaryotic cells have restriction endonucleases ? Justify your answer.

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**6.** Besides better aeration and mixing properties, what other advantages do stirred tank bioreactors have over shake flasks?

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**7.** Collect 5 examples of palindromic DNA sequences by consulting your teacher. Better try to create a palindromic sequence by following base-pair rules.

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**8.** Can you recall meiosis and indicate at what stage a recombinant DNA is made?

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**9.** Can you think and answer how a reporter enzymes can be used to monitor tranformation of host cells by foreign DNA in addition to a selectable marker ?

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**10.** Describe briefly the following:

(a) Origin of replication.

(b). Bioreactors.

(c). Downstream processing.

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**11.** Explain briefly

(a) PCR

(b) Restriction enzymes and DNA

(c) Chitinase

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**12.** Discuss with your teacher and find out how to distinguish between

(a) Plasmid DNA and Chromosomal DNA

(b) RNA and DNA

(c) Exonuclease and Endonuclease.

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## ADDITIONAL QUESTIONS VERY SHORT ANSWER QUESTIONS

**1.** Define biotechnlogy.

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**2.** Expand PCR.

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**3.** What is the popular terminology of recombinant DNA technology?

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**4.** Name the tree types of 'biological tools' used in the synthesis of recombinant DNA.

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**5.** Name the enzymes commonly used to dissolve the bacterial cell wall.

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**6.** What are the molecular scissors?

Watch Video Solution

**7.** What are plasmids?

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**8.** What do you mean by Ori?

Watch Video Solution

**9.** What are bioreactors?

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**10.** Name a 'natural genetic engineer' of plants.

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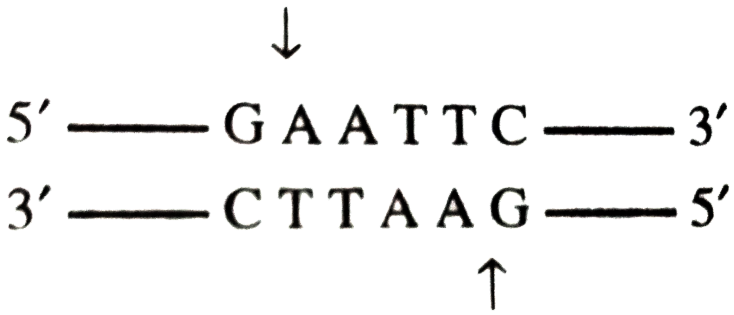
**11.** Name the enzymes responsible for cleavage

in the following sequence:

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**12.** What type of cut ends are formed both the strands of DNA molecule is cleaved at exactly the same nucleotide position?

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**13.** What is microinjection?

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**14.** What is gene gun?

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**15.** What is the meaning of the term vehicle in genetic engineering?

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**16.** Expland GM.

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**17.** What is the function of DNA-ligase?

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**18.** Why is the enzyme cellulase needed for isolating genetic material from plant cells and not from the animal cells?

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**19.** Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of the template strand.

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**20.** Which enzyme is known an 'molecular scissors'?

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**21.** The technique of genetic engineering includes a) creation of recombinant DNA, b) use of gene cloning c) gene transfer , d) All of these.

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**22.** What is downstream processing?

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**23.** What are the uses of PCR?

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**24.** What is a plasmid?

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**25.** Why is the enzyme cellulase needed for isolating genetic material from plant cells and not from the animal cells?

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**26.** Mention the type of host cells suitable for the gene guns to introduce an alien DNA.

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**27.** How is repetitive/satelite DNA separated from bulk genomic DNA for various genetic experiments?

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**28.** Why do DNA fragments move towards the anode during gel electrophoresis ?

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## SHORT ANSWERS QUESTIONS

**1.** What are DNA ligases?

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**2.** What is the function of enzyme alkaline phosphatase?

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**3.** What is genetic engineering?

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**4.** Name the scientists who generated first recombinant DNA molecules.

Watch Video Solution

**5.** What are palindromic nucleotide sequences?


Watch Video Solution

**6.** What is meant by gene cloning?

Watch Video Solution

**7.** What are transgenic plants?

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**8.** Study the linking of DNA fragments shown above. i) Name 'a' DNA and 'b' DNA ii) Name the restrictions enzymes that recognises this palindrome. Iii) Name the enzyme that can link these two DNA fragments.

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**9.** How is DNA isolated in purified form from a bacterial cell?

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**10.** A recombinant DNA is formed when sticky ends of vector DNA and foreign DNA join. Explain how the sticky ends are fomed and get joined.

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**11.** (i) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR.

(ii) Give the characteristic feature and source organism of the DNA polymerase, in PCR.

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**12.** How does one visulaise DNA on an agarose gel?

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**13.** What is meant by gene cloning?

Watch Video Solution

**14.** Describe the role of $CaCl_2$ in the preparation of competent cells?

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**15.** What is palindrome in DNA? Explain with an examples.

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**16.** What are exonucleases and endonucleases?

Watch Video Solution

**17.** Explain the role of enzymes nucleases and ligases.

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**18.** Expand PCR.

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**19.** What do you understand by cloning?

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**20.** Expand the following and mention one application of each

(i) PCR (ii) ELISA

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**21.** (a) Mention the difference in the mode of action of exonuclease and endonuclease.

(b) How does restriction endonuclease function?

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**22.** Name the source of the DNA polymerase used in PCR technique. Mention why it is used.

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**23.** Write any four ways used to introduce a desired DNA segment into a bacterial cell in recombinant technology experiments.

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**24.** Write the role of 'Ori' and 'restriction' site in a cloning vector pBR322.

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**25.** Explain with the help of a suitable example, the naming of a restriction endonuclease.

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**26.** a) While cloning vectors, which of the two will be preferred by biotechnologists

bacteriophases or plasmids, Justify with reason.

b) Name the first transgenic cow developed and state the improvement in the quality of the product produced by it.

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**27.** What essential features must be present in a cloning vehicle?

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**28.** What are the principal of biotechnology?

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**29.** Give a brief historical background of genetic engineering.

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**30.** Write a brief account of the enzymes involved in recombinant DNA technology.

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**31.** Write short notes on a) Micro injection b) Isolation of genetic material.

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**32.** What is the principle of PCR?

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**33.** How is the bacterium Thermus aquaticus employed in recombinant DNA technology ?

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**34.** (a) What are 'molecular scissors' ? Give one. example.

(b) Explain their role in recombinant DNA technology.

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**35.** Why is Agrobacterium tumefaciens a good cloning vector ? Explain.

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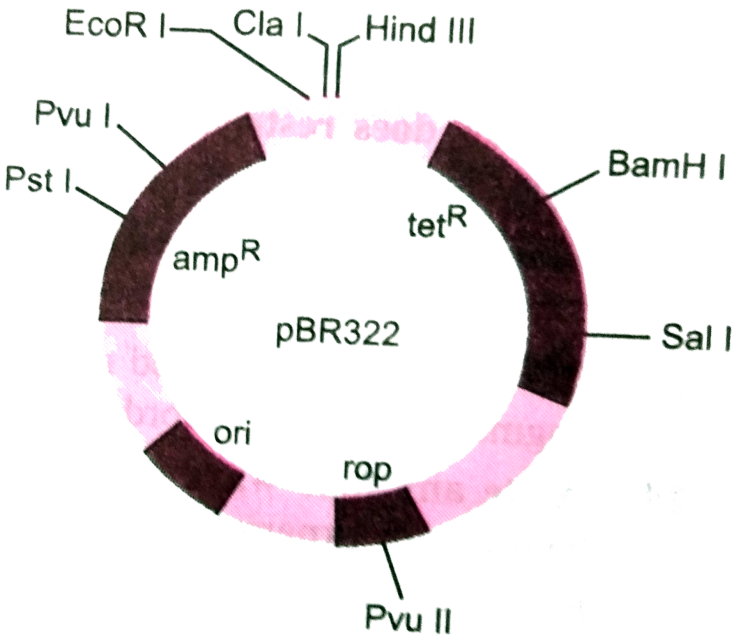
**36.** Explain the importance of a) ori, b) $amp^R$ and c) rop in the E, coli vector shown below:

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**37.** DNA being hydrophilic cannot pass through the cell membranes of a hot cell. Explain how does recombinant DNA gets

introduced into the host cell to transform the latter.

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**38.** Name and explain the technique that helps in the separation of DNA fragments for DNA recombinant technology experiments. How can these separated DNA fragments be visualized ?

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**39.** EcoRI is used to cut a segment of foreign DNA and that of a vector DNA to form a recombinant DNA. Show with the help of schematic diagrams.

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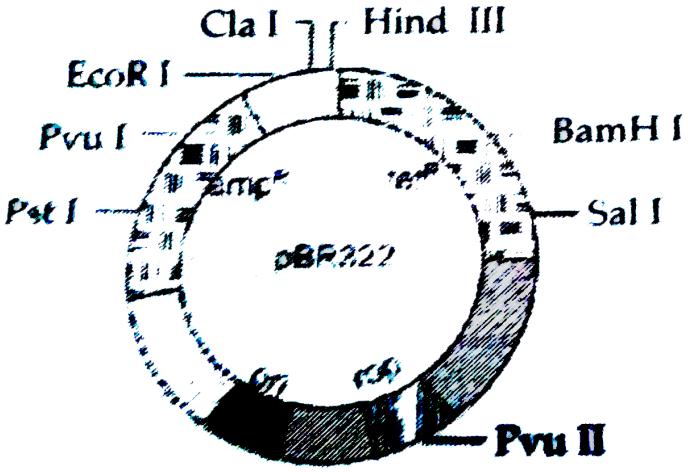
**40.** (i) Name the organism in which the vector shown in inserted to get the copies of the desired gene.

(ii) Mention the area labelled in the vector responsbile for controlling the copy number

of the inserted gene.

(iii) Name and explain the role of a selectable marker in the vector shown.

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**41.** Give reasons: a) Plasmids are suitable for use as a vehicle DNA. B) Restriction

endonucleases are used in genetic engineering. C) Recombinant DNA is formed of DNA from two sources.

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**42.** Fill in the blanks: a) The ..... Used as a carrier for transferring into a suitable host is called vehicle DNA.

b) Genetic engineering is also known as .....DNA technology.

c) Large scale production of biotechnological

products involves use of .....

d) The source DNA and the vector DNA are cut at specific points with the help of .....endonucleases.

e) DNA fragments are ligated with the help of enzymes.....

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**43.** Match the following:

| Column I | Column II |
|---|---|
| 1. Genetic engineering | (*a*) Vectorless gene transfer |
| 2. Vehicle DNA | (*b*) Large scale production |
| 3. Electroporation | (*c*) Cloning vector |
| 4. rDNA | (*d*) Restriction Endonucleases |
| 5. Sticky ends | (*e*) Vector + insert |
| 6. Bioreactors | (*f*) Recombinant DNA technology |

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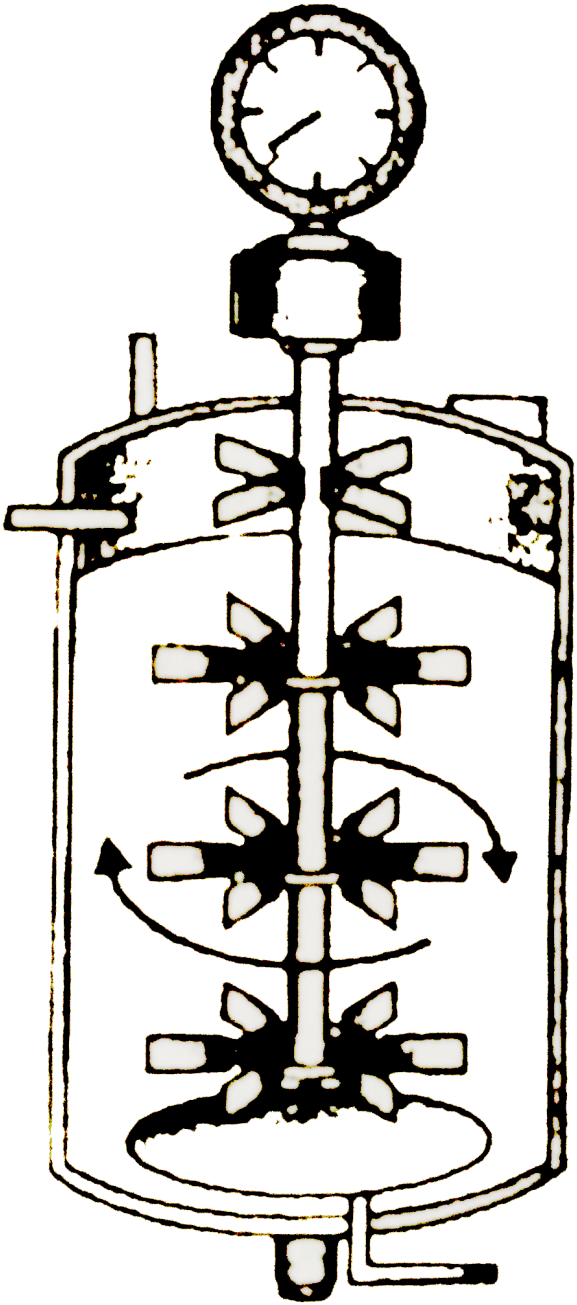
**44.** Name the type of bioreactor shown. Write the purpose for which it is used.



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**45.** What essential features must be present in a cloning vehicle?

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**46.** Draw a labelled sketch of sparged -stirred - tank bioreactor. Write its application.

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**47.** Rearrange the following in the correct sequences to accomplish an important biotechnological reaction:

a) In vitro synthesis of copies of DNA of interest

b) Chemically synthesized oligonucleotides.

c) Enzymes DNA polymerase

c) Complementary region of DNA.

e) Genomic DNA template

f) Nucleotides provided.

g) Primers

h) Thermostable DNA-polymerase (from

Thermus aquaticus).

i) Denaturatioin of ds-DNA.

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**48.** (a) Why must a cell made 'compelent' in biotechnology experiments ? How does calcium ion help in doing so ?

(b) State the role of 'biolistic gun' in biotechnology experiments.

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**49.** (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.

(b) Why is the coding sequence of an enzyme b-galactosidase a preferred selectable marker in comparison to the ones named above ?

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**50.** Explain the role(s) of the following Biotechnology:

a) Restriction endonuclease

b) Gel-electrophoresis

c) Selectable markers in pBR322.

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**51.** Write the stpes you would suggest to be undertaken to obtain a foreign-gene-product.

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**52.** (a) Explain the significance of palindromic nucleotide sequence in the formation of

recombinant DNA.

(b) Write the use of restriction endonuclease in the process.

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**53.** Describe the roles of heat , primers and the bacterium Thermus aquaticus in the process of PCR.

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**54.** a) How has the development of bioreactor helped in biotechnology?

b) Name the most commonly used bioreactor and describe its working.

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**55.** Explain three steps involved in polymerase chain reaction.

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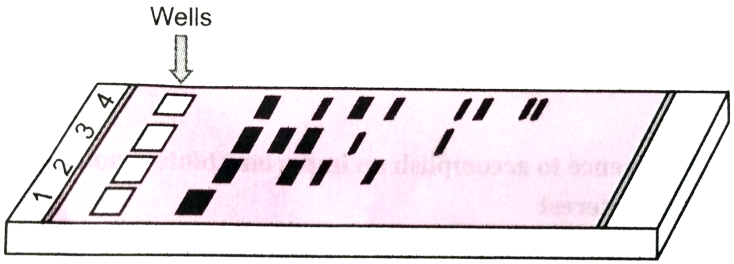
**56.** a) How do DNA fragments migrate and resolve in a Gel electrophoresis?

b) How lane one is different from lane 2,3 and 4 in the GEL electrophoresis set up?

c) How pure DNA fragments are made observable in the visible light?

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## LONG ANSWER QUESTIONS

**1.** Describe the tools of recombinant DNA technology.

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**2.** What are enzymes that have mde genetic engineeing a reality? How are they used to make recombinant DNA molecule?

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**3.** (a) Mention the role of vectors in recombinant DNA technology. Give any two examples.

(b) With the help of diagrammatic representation only show the site of DNA technology.

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**4.** Describe the role of agrobacterium in transforming a plant cell.

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**5.** For selection of recombinants, insertional inactivation of antibiotic marker has been supercoded by insertional inactivation of a marker gene coding for a chromogenic substrate. Give reasons.

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**6.** Illustrate the design of a bioreactor. Highlight the difference between a flask in

your laboratory and a bioreactor which allows cells to grow in a continous culture system.

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**7.** (i) Describe the characteristics that a cloning vector must posses.

(ii) why DNA can not pass through the cell membrane ? Explain. How is a bacterial cell made 'competent' to take up recombinant DNA from the medium ?

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**8.** If a desired gene is identified in an organism for some experiments, explain the process of the following

(i) Cutting this desired gene at specific location

(ii) Synthesis of multiple copies of this desired gene

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**9.** INSERTION OF RECOMBINANT DNA INTO THE HOST CELL/ORGANISM

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**10.** CUTTING OF DNA AT SPECIFIC LOCATIONS

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## ANALYTICAL QUESTIONS WITH ANSWERS

**1.** What does competent refer to in competent cells used in transformation experiments?

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**2.** What is the significance of adding proteases at the time of isolation of genetic material (DNA)?

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**3.** While doing a PCR, denaturations step is missed. What will be its effect on the process?


**4.** How is DNA isolated in purified from from a bacterial cell?

**5.** Explain the contributin of Thermus aquaticus in the amplification of a geme of interest.

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**6.** What are recombinant proteins? How do bioreactors help in their production?

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**7.** Name two commonly used bioreactors. State the importance of using a bioreactor.

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**8.** (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.

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

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**9.** Why and how bacteria can be made 'competent' ?

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**10.** How are 'sticky ends' formed on a DNA strand? Why are they so called ?

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**11.** Write the major steps involved in gene cloning.

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**12.** Few gaps have been left in the following table. Fill up the gaps.

| Restriction Enzyme | Source | Recognition sequence and site of cleavage |
|---|---|---|
| Bam HI | *Bacillus amyloliquiefaciens* H | *a* |
| Eco RI | *b* | 5′-G-A-A-T-T-C-3′<br>3′-C-T-T-A-A-G-5′ |
| *c* | *Haemophillus influenzae* Rd | 5′-G-T-C-G-A- C-3′<br>3′-C-A-G-C-T-G-5′ |

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**13.** Give an exmaple of a natural form of genetic engineering in which the bacterium inserts gene into plants to cause gall or tumour formation.

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**14.** Do you see the prospects of viroids being used as plants vectors in near future?

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**15.** Give an example where a disease causing of animals has been tranform normal animal cells into cancerous cells. These tools of pathogens are now used as vectors for delevering genes of interest to humans. T

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**16.** Write the name of genus, species, strain of source bacteria from which the following endonucleases are obtained. Also write the order of their identification in the bacteria.

i) Eco R I

ii) Hind II

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**17.** What is the function of restriction endonuclease inside the host bacterial cell? How do bacteria prevent their own DNA from being cut by endonucleases.

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**18.** Name the method/s by which the transgenic sheeps and goats are made. What are other methods?

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**19.** What will happen if-

i) A plasmid vector is digested with Eco RI at a single site

ii) A sample of human DNA is digested with Eco RI.

iii) The two samples (plasmid and human DNA) are allowed to hybridise in presence of DNA ligase.

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**20.** You have been a task to break the cellsof following organisms and to release DNA along with other macromolecules from them. Name the specific enzymes will select for the task:

i) Bacteria cell

ii) Plant cell

iii) Fungal cell

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## PRACTICAL QUESTIONS I. MULTIPLE CHOICE QUESTIONS

**1.** Who discovered recombinant DNA (rDNA) technology?

A. Har Gobind Khorana

B. James

C. Stanley Cohen and Herbert Boyer

D. Walter Sutton and Avery

**Answer: C**

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**2.** Find out the wrong statement

A. Mobile genetic elements, transposons were visualized by Barbara Mc Clintock.

B. Udder cell, a somatic cell is used to produce the cloned sheep by nuclear transplantation method.

C. In pedigree analysis, a person immediately affected by an action is called propositus.

D. DNA ligases are used to cleave a DNA molecule.

**Answer: D**

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**3.** Plasmids are

A. cDNA

B. mitochondrial DNA

C. Circular extrachromosomal DNA in bacteria

D. Viral RNA

**Answer: C**

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**4.** Which conserved motifs are found in E.coli genes

A. TATA box

B. CAAT box

C. Pribnow box

D. All of these

**Answer: C**

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**5.** A technique which involves deliberate manipulation of genes within or between species is called

A. Gene therapy

B. Hybridoma technology

C. Tissue culture

D. Genetic engineering

**Answer: D**

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**6.** One of the key factors, which makes the plasmid the vector in genetic engineering is

A. It is resistant to antibiotics.

B. It is resistant to restriction enzymes.

C. Its ability to carry a foreign gene.

D. Its ability to cause infection in the host.

**Answer: C**

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**7.** Which of the following is used as a best genetic vector in plants?

A. Bacillus thuriengenesis

B. Agrobacterium tumifaciens

C. Pseudomonas putida

D. All of these

**Answer: B**

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**8.** Which one among the following is just a cloning plasmid not an expression plasmid

A. pBAD-18-Cam

B. pB CSK

C. pUC 18

D. pET

**Answer: C**

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**9.** In plant biotechnology, root tumours are induced by

A. Agrobacterium rhizogenes

B. Agrobacterium basilis

C. Rhizobium

D. None of these.

**Answer: A**

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**10.** The polymerase chain reaction is a technique that

A. Is used for n vivo replication of DNA

B. It is used for in vivo synthesis of mRNA

C. Is used for in vitro synthesis of mRNA

D. Is used for in vitro replication of specific DNA sequence using thermostable DNA polymerase

**Answer: D**

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**11.** Construction of first recombinant DNA was done by using plasmid of

A. E. coli

B. Salmonella typhimurium

C. B. thuringiensis

D. Yeast

**Answer: B**

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**12.** The linking of antibiotic resistance gene with the plasmid vector became possible with

A. DNA polymerase

B. Exonuclease

C. DNA ligase

D. Enonucleases

**Answer: C**

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**13.** Gel electrophoresis is used for

A. Construction of recombinant DNA by joining with cloning vectors

B. Isolation of DNA molecules

C. Cutting of DNA into fragments.

D. Separation of DNA fragments according to their size

**Answer: D**

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**14.** Cry 1 endotoxins obtained from Bacillus Thuringiensis are effective against

A. Nematodes

B. Boll worms

C. Mosquitoes

D. Files

**Answer: B**

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**15.** Molecular scissors which cut DNA at specific site is

A. Pectinase

B. Polymerase

C. Restriction endonuclease

D. Ligase

**Answer: C**

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**16.** Function of restriction enzyme is to

A. Cut the DNA at specific site

B. Join the cut ends

C. Cut DNA at the ends

D. Cut RNA at specific sites

**Answer: A**

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**17.** Polyethylene glycol method is used for

A. Biodiesel production

B. Seedless fruit production

C. Energy production from sewage

D. Gene transfer without a vector

**Answer: D**

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**18.** An antibiotic resistance gene in a vector usually helps in the selection of

A. Competent cells

B. Transferred cells

C. Recombinant cells

D. None of the above

**Answer: B**

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**19.** Significance of 'heat shock' method in bacterial transformation is to facilitate:

A. Binding of DNA to the cell wall

B. Uptade of DNA through membrane transport proteins.

C. Uptake of DNA through transient pores in the bacterial cell wall.

D. Expression of antibiotic resistance gene.

**Answer: C**

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**20.** The role of DNA ligase in the construction of a recombinant DNA molecule is :

A. Formation of phosphodiester bond between two DNA fragments.

B. Formation of hydrogen bonds between sticky ends of DNA fragments.

C. Ligation of all purine and pyrimidine bases

D. None of the above

**Answer: A**

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**21.** Which of the following bacteria is not a source of restriction endonuclease

A. Haemophillus influenzae

B. Escherichia coli

C. Agrobacterium tumefaciens

D. Bacillius amyloli

**Answer: C**

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**22.** Which of the following steps are catalysed by Taq polymerase in a PCR reaction ?

A. Denaturation of template DNA

B. Annealing of primers to template DNA

C. Extension of primer end on the template DNA

D. All of the above

**Answer: C**

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**23.** 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. Reason could be

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

**Answer: A**

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**24.** Which of the following should be chosen for best yield if one were to produce a recmobinant protein in large amounts ?

A. Laboratory flask of largest capacity

B. A stirred-tank bioreactor without in-lets and out-lets.

C. A continuous culture system

D. Any of the above

**Answer: C**

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**25.** Who among the following was awarded the Nobal Prize for the development of PCR technique ?

A. Herbert Boyer

B. Hargovind Khurana

C. Kary Mullis

D. Arthur Kornberg

**Answer: C**

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**26.** Which of the following statements does not hold true for restriction enzyme?

A. It recognises a palindromic nucleotide sequence

B. It is an endonuclease

C. It is isolated from viruses

D. It produces the same kind of sticky ends in different DNA molecules.

**Answer: C**

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**27.** Restriction endonucleases are enzymes which:

A. remove nucleotides from the ends of DNA molecule.

B. make cuts at specific positions within the DNA molecules.

C. recognise a specific nucleotide sequence for binding of DNA ligase.

D. restrict the action of enzyme DNA polymerase.

**Answer: B**

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**28.** Which one of the following pallindromic base sequences in DNA can be easily cut at

about the middle by some particular restriction enzyme.

A. `5^(') CATCGTA 3^('), 3^(') CTCAGT 5^(')

B. 5^(') CGTTCG 3^('), 3^(') ATGGTA 5^(')

C. 5^(') GATATC 3^('),3^(') CTACTA 5^(')

D. 5^(') GAATTC 3^('), 3^(') CTTAAG 5^(')

**Answer: D**

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**29.** During transcription in eukaryotic cell the RNA splicing and RNA cappling takes place inside the

A. Nucleus

B. Ribosomes

C. Dictyosomes

D. ER

**Answer: D**

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**30.** Which is used in gene cloning

A. Nucleoids

B. Lomasomes

C. Mesosomes

D. Plasmids

**Answer: C**

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**31.** DNA gyrase, the enzyme that participates in the process of DNA replication, is a type of

A. DNA ligase

B. DNA polymerase

C. DNA topiosomerase

D. Reverse transcriptase

**Answer: D**

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**32.** Restriction anzymes

A. restrict elongation of DNA

B. cut DNA at specific locations

C. link together two pieces of DNA

D. restrict DNA replication

**Answer: B**

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**33.** A mixture containing DNA fragments A,B,C and D, with molecular weights of $A + B = C, A > B$ and $D > C$, was subjected to agarose gel electrophoresis. The positions of these fragments from cathode to anode sides of the gel would be

A. B,A,C,D

B. A,B,C,D

C. C,B,A,D

D. B,A,D,C

**Answer: A**

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**34.** What is correct gene expression pathway ?

A. gene $\rightarrow$ mRNA $\rightarrow$ transcription - translatio - protein

B. transcription -gene -translation - mRNA- protein

C. gene- transcription -mRNA- translation - protein

D. gene-translation-mRNA-transcription $\rightarrow$ protein

**Answer: C**

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**35.** Enzyms that cleaves nucleic acids within the polynucleotide chain is known as

A. endonuclease

B. exonuclease

C. arylsulfatase

D. phosphotriesterase

**Answer: A**

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**36.** Agarose extracted from sea weeds finds use in

A. spectrophotometry

B. tissue culture

C. PCR

D. gel electrophoresis

**Answer: D**

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**37.** Which technique made it possible to genetically engineer living organisms ?

A. recombinant DNA technique

B. X-ray diffraction

C. heavier isotope labelling

D. hybridization

**Answer: A**

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**38.** Read the following four statements (A-D)

A. The first transgenic buffalo, Roise produced milk which was human alpha-lactalbumin

enriched

B. Restriction enzymes are used in isolation of DNA from other macromolecules

C. Downstream processing is one of the step of rDNA technology

D. Disarmed pathogen vectors are also used in transfer of rDNA into the host

which of the two statements have mistakes ?

A. B and C

B. C and D

C. A and C

D. A and B

**Answer: D**

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**39.** Given below is a sample of a proton of DNA strand giving the base sequence on the opposite strands. What is so special shown in it?

$5'$.....GAATTC.....$3'$

$3'$..... CTTAAG.....$5'$

A. replication completed

B. deletion mutation

C. start codon at the 5' end

D. pallindromic sequence of base pairs

**Answer: D**

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**40.** There is a restriction endonuclease called EcoRI. What does 'co' part in it stand for?

A. colon

B. coelom

C. coenzyme

D. coli

**Answer: D**

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**41.** Which one is a true statement regarding DNA polymerase used in PCR

A. It is used to ligate introduced DNA in recipient cell

B. It serves as a selectable marker

C. It is isolated from a virus

D. It remains active at high temperature

**Answer: D**

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**42.** which one of the following is a case of wrong matching?

A. Somatic hybridization -Fusion of two diverse cells

B. Vector DNA-Site for t-RNA synthesis

C. Micropropogation- In vitro production of plants in large numbers.

D. Callus- Unorganised mass of cell produced in tissue culture.

**Answer: B**

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**43.** A single strand of nucleic acid tagged with a radioactive molecule is called:

A. Vector

B. Selectable marker

C. Plasmid

D. Probe

**Answer: D**

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**44.** For transformation, micro-particles coated with DNA to be bombarded from gene gun are made up of

A. Silver or Platinum

B. Platimum or Zinc

C. Silicon or Platinum

D. Gold or Tungsten

**Answer: D**

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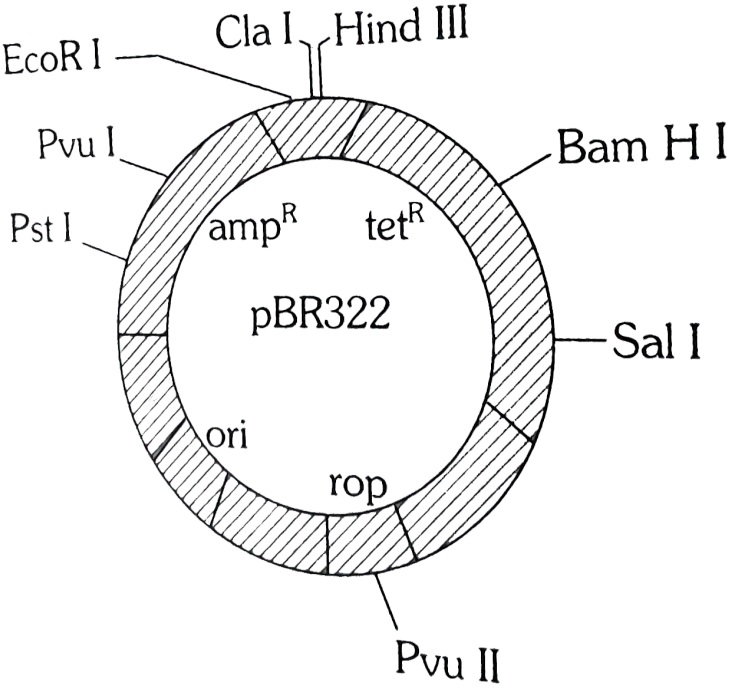
**45.** The figure below is the diagrammatic representation of the E.coli vector pBr 322. which one of the given options correctly

identifies its certain component (s)




A. ori-original restriction enzyme

B. rop-reduced osmotic pressure

C. Hind III, EcoRI-selectable markers

D. ampR, tetR-antibiotic resistance genes

**Answer: D**

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**46.** Biolistics (gene-gun) is suitable for

A. disarming pathogen vectors

B. transforming of plant cells

C. constructing recombinant DNA by joining with vectors

D. DNA fingerprinting.

**Answer: B**

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**47.** In genetic engineerig, the antibiotics are used

A. as selectable markers

B. to select healthy vectors

C. as sequences from where replication starts

D. to keep the cultures free of infection.

**Answer: A**

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**48.** Restriction enzyme Eco RI cuts the DNA between bases G and A only when the sequence in DNA is

A. GATATC

B. GAATTC

C. GATTCC

D. GAACTT

**Answer: B**

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**49.** Cohen and Boyer isolated an antibiotic resistance gene, by cutting out a piece of DNA from a plasmid which was responsible for conferring antibiotic resistance, in the year

A. 1962

B. 1965

C. 1972

D. 1982

**Answer: C**

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**50.** The restriction enzyme(s) used in recombinant DNA technology that makes

staggered cuts in DNA leaving sticky ends is/are

A. Eco R I

B. Hind II

C. Bam H I

D. all of these.

**Answer: D**

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**51.** The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of

A. insertional inactivation of alpha-galactosidase in non-recombinent bacteria.

B. Insertional inactivations of alpha-galactosidase in recombinant bacteria.

C. Inactivation of glycosidase enzyme in recombinant bacteria

D. non-recombinant bacteria containing beta-galactosidase.

**Answer: B**

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**52.** DNA fragments generated by restriction endonucleases in a chemical reaction can be separated by

A. polymerase chain reaction

B. electrophoresis

C. restriction mapping

D. centrifugation

**Answer: B**

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**53.** Which vector can clone only a small fragment of DNA ?

A. Bacterial artifical chromosomes

B. Yeast artificial chromosomes

C. Plasmid

D. Cosmid

**Answer: C**

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**54.** The cutting of DNA at specific locations became possible with the discovery of:

A. Ligases

B. Restriction enzymes

C. Probes

D. Selectable markers

**Answer: B**

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**55.** The DNA molecules of which the gene of interset is integrated for cloning is called

A. Carrier

B. Transformer

C. Vector

D. Template

**Answer: C**

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**56.** Biolistics (gene-gun) is suitable for

A. disarming pathogen vectors

B. transforming of plant cells

C. constructing recombinant DNA by joining with vectors

D. DNA fingerprinting.

**Answer: B**

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**57.** Which of the following is not a feature of the plasmids?

A. circular structure

B. Transferable

C. Single-stranded

D. Independent replication.

**Answer: C**

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**58.** Which of the following is a restriction endonuclease?

A. Protease

B. D Nase I

C. R Nase I

D. Hind II

**Answer: D**

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**59.** Stirred-tank bioreactors have been designed for

A. purification of product

B. addition of preservatives to the product

C. availability of oxygen throughout the process

D. ensuring anaerobic conditions in the culture vessel

**Answer: C**

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**60.** A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

A. Eco RI

B. Taq polymerase

C. Polymerase III

D. Ligase

**Answer: D**

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**61.** Which of the following is not a component of downstream processing

A. Separation

B. Purification

C. Preservation

D. Expression

**Answer: D**

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**62.** Which of the following restriction enzymes produces blunt ends ?

A. Sal I

B. Eco RV

C. Xho I

D. Hind III

**Answer: B**

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**63.** The DNA fragments separated on an agarose gel can be visualized after staining with

A. acetocarmine

B. aniline blue

C. ethidium bromide

D. bromophenol blue

**Answer: C**

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**64.** The process of separation and purificaition of expressed protein before marketing is called

A. downstream processing

B. bioprocessing

C. postproduction processing

D. upstream processing

**Answer: A**

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**65.** DNA fragments are

A. negatively charged

B. neutral

C. either positively or negatively charged depending on their size

D. positively charged

**Answer: A**

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**66.** A gene whose expression helps to identify transformed cell is known as

A. vector

B. plasmid

C. structural gene

D. selectable marker

**Answer: D**

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**67.** What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis ?

A. The smaller the fragment size, the farther it moves

B. positively charged fragments move to farther end

C. Negatively charged fragments do not move

D. The larger the fragment size, the farther it moves

**Answer: A**

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**68.** The correct order of steps in Polymerase Chain Reaction (PCR) is

A. extensin, denaturation, annealing

B. annealing , extensions, denaturation

C. denaturation, extension, annealing

D. denaturation, annealing, extension

**Answer: D**

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**69.** Which of the following is commolnly used as a vector for introducing a DNA fragement in human lymhocytes?

A. Retrovirus

B. Ti plasmid

C. $\lambda$ phage

D. pBRR32

**Answer: A**

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## ASSERTION-REASON TYPE QUESTIONS

**1.** Assertion: Asexual reproduction preserves the genetic information:

Reason: Sexual reproduction permits variation.

A. If both Assertion and Reason are trueand Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: B**

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**2.** Assertion: Genetic engineering overcomes the drawbacks of tradiational hybridisation.

Reason: Genetic engineeing involves creation of a recombinant DNA and introduce the desirable genes into target organisms.

A. If both Assertion and Reason are trueand Reason is a correct explanation

of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: A**

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**3.** Assertion: Recombinant DNA technology has become successful because of the presence of restriction endonucleases in eukaryotic cells.

Reason: Restriction endonucleases cut the DNA molecule to form blund ends.

A. If both Assertion and Reason are trueand Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation

of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: D**

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**4.** Assertion: The cut pieces of DNA are linked with plasmid DNA.

Reason: Plasmid DNA fails to act as vectors.

A. If both Assertion and Reason are trueand Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: C**

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**5.** Assertion: Exonucleases remove nucleotides from the ends of DNA.

Reason: Endonucleases make cuts at specific positions within the DNA.

A. If both Assertion and Reason are trueand Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: B**

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**6.** Assertion : Plasmids are single stranded extra chromosomal DNA.

Reason: Plasmids are found in Eukaryotic cells.

A. If both Assertion and Reason are trueand Reason is a correct explanation of the Assertion.

B. If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

C. If Assertion is true but the Reason is false.

D. If both Assertion and Reason are false.

**Answer: D**

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