



# Chapter

## Biotechnology

# 23

### TOPICAL MULTIPLE-CHOICE QUESTIONS INTRODUCTION; RECOMBINANT DNA TECHNOLOGY

#### KIRAMCOs

- (1) DNA molecule that contains DNA from two different sources is called:  
(a) Chimaeric DNA (b) Recombinant DNA  
(c) Plasmid DNA (d) Both a and b
- (2) All of the following are examples of genetic engineering except:  
(a) Artificial creation of a gene  
(b) Production of chemopesticides  
(c) Production of human antibodies in tobacco plant  
(d) Production of synthetic vaccine against hepatitis B by yeast cells
- (3) The gene of interest can be obtained by all of these except:  
(a) Make it from mRNA (b) Chemically synthesize it  
(c) Obtain it from bacterial vector (d) Isolate it from chromosome
- (4) pSC 101 plasmid has antibiotic resistance for:  
(a) Penicillin (b) Chloramphenicol  
(c) Tetracycline and ampicillin (d) Tetracycline only
- (5) Plasmids were discovered by studying sex life of intestinal bacterium:  
(a) *Escherichia coli* (b) *Salmonella*  
(c) *Clostridium* (d) *Bacillus*
- (6) The enzymes used for cutting DNA at different points are:  
(a) Ligases (b) Restriction endonucleases  
(c) Polymerases (d) Nucleases
- (7) Restriction endonucleases are the natural enzymes of:  
(a) Bacteria (b) Fungi  
(c) Viruses (d) Protozoa
- (8) Which solution is used to make bacterial cell more permeable for the uptake of recombinant DNA:  
(a) Cesium chloride (b) Calcium chloride  
(c) Calcium carbide (d) Calcium phosphate
- (9) The gene of interest produced by mRNA using reverse transcriptase is called:  
(a) Complementary RNA (b) Complementary mRNA  
(c) Complementary DNA (d) All of the above
- (10) The restriction enzymes cut DNA at specific nucleotides sequences called:  
(a) Nucleotide sequences (b) Promoter sequences  
(c) Restriction sequences (d) Palindromic sequences
- (11) The total number of discovered restriction enzymes are:  
(a) 200 (b) 400  
(c) 20 (d) 40

- (12) Plasmids are extra chromosomal circular DNA molecules which carry genes for:  
 (a) Antibiotic resistance (b) Fertility  
 (c) Metabolism (d) Both a and b
- (13) Palindromic sequences consist of \_\_\_\_\_ nucleotides.  
 (a) 2 or 4 (b) 4 only  
 (c) 6 or 8 (d) 4 or 6
- (14) The plasmid is cut to make recombinant DNA by the enzymes:  
 (a) Polymerases (b) Restriction endonucleases  
 (c) Ligases (d) Exonucleases
- (15) First Restriction enzyme was discovered by:  
 (a) J. Craig Venter (b) Kary B. Mullis  
 (c) Hamilton O. Smith (d) F. Sanger

**PAST PAPER MCQs**

- (16) First restriction enzyme was isolated by: (RWP 2017)  
 (a) Kary Mullis (b) Hamilton  
 (c) Sanger (d) Mendel
- (17) Hamilton O. Smith isolated the first restriction enzyme in: (MTN 2017)  
 (a) 1950 (b) 1960  
 (c) 1970 (d) 1980
- (18) The first restriction enzyme was isolated by: (FSD 2018, 2019)  
 (a) Kary Mullis (b) Hamilton O. Smith  
 (c) Sanger (d) Maxam Gilbert
- (19) DNA polymerase enzyme was isolated from: (BWP 2019)  
 (a) Viruses (b) Bacteria  
 (c) Fungi (d) Protozoa
- (20) Recombinant DNA is introduced into the host cell by means of a: (GRW 2021)  
 (a) Phase (b) Vector  
 (c) Bacterium (d) Fungi
- (21) The enzymes which are used to cut out the gene of interest are known as:  
 (SWL 2017, MTN 2021)  
 (a) DNA ligases (b) DNA polymerase  
 (c) RNA polymerase (d) Restriction endonuclease
- (22) Which of the enzymes act as molecular scissors?  
 (a) DNA ligase (b) Restriction endonucleases  
 (c) DNA polymerase (d) RNA polymerase
- (23) Plasmids were discovered while studying the sex life of:  
 (a) E. Coli (b) Hyphomicrobium  
 (c) Vibrio (d) Mycobacterium
- (24) Bacterial Cells take up recombinant plasmid if they are treated with: (BWP 2021)  
 (a) Calcium Chloride (b) Sodium Chloride  
 (c) Ammonium Chloride (d) Barium Chloride
- (25) During PCR thermostable enzyme is used named as: (LHR 2022)  
 (a) DNA polymerase (b) Taq polymerase  
 (c) Both A and B (d) None of these

**GENOMIC LIBRARY, THE POLYMERASE CHAIN REACTION****KIPS MCQs**

- (26) Taq polymerase is thermostable enzyme that is extracted from the bacterium:  
 (a) *Epulopiscium fishelsoni* (b) *Mycoplasma*  
 (c) *Thermus aquaticus* (d) *Acanthrus nigrofuscus*

- (27) The primer used in the process of PCR consist of about \_\_\_\_\_ nucleotides.  
 (a) 10 (b) 20  
 (c) 30 (d) 6
- (28) A genomic library is collection of:  
 (a) Clones of bacteria and bacteriophages (b) Only plasmid of bacteria  
 (c) Only genome of an individual (d) Nuclei of organism
- (29) A radioactive single stranded nucleotide sequence that will hybridize into a certain piece of DNA:  
 (a) Primer (b) Primase  
 (c) Probe (d) Vector
- (30) Which property is not related to Taq polymerase?  
 (a) Temperature insensitive (b) Initiates the replication of DNA  
 (c) Continuation of DNA replication (d) It is DNA polymerase
- (31) The use of PCR creates a \_\_\_\_\_ of copies within a laboratory test tube as compared to recombinant DNA technology:  
 (a) Lesser number (b) Greater number  
 (c) Equal number (d) None of these

**PAST PAPER MCQs**

- (32) Taq polymerase is obtained from: (LHR2016, MTN 2017)  
 (a) Fungi (b) Algae  
 (c) Bacteria (d) Virus
- (33) Enzyme extracted from *Thermus aquaticus* is commonly known as: (LHR 2017)  
 (a) DNA polymerase (b) RNA polymerase  
 (c) Taq ligase (d) Taq polymerase
- (34) PCR technique was developed by: (SGD 2017)  
 (a) Kary B Mullis (b) Hamilton  
 (c) Sanger (d) Maxam
- (35) Collection of bacterial and phage viruses clones containing a particular segment of DNA from the source cell is called: (LHR 2018)  
 (a) Recombinant DNA (b) Expressing system  
 (c) Genomic Library (d) Genome
- (36) A full set of genes of an individual is called its: (DGK 2017, GRW 2017, SWL 2021)  
 (a) Genome (b) Gene pool  
 (c) Genomic library (d) Recombinant DNA
- (37) The use of PROBE is: (SWL 2022)  
 (a) To study palindromic (b) To study bacterial plasmids  
 (c) To study phage DNA (d) To search genomic library

**ANALYZING DNA**

**KIPS MCQs**

- (38) DNA finger printing is not used in.  
 (a) Disputed paternity (b) Forensic studies  
 (c) Identifying casualties in accidents (d) Developing better varieties

**PAST PAPER MCQs**

- (39) Genomic fragments can be separated according to their lengths during: (GRW 2021)  
 (a) PCR (b) Gene cloning  
 (c) Gel electrophoresis (d) Chemical cleavage
- (40) A powerful tool of forensic science is a test: (LHR 2022)  
 (a) RNA (b) DNA  
 (c) mRNA (d) Trna

- (41) The fragments of DNA can be separated according to lengths by: (DGK 2022)  
 (a) PCR amplification (b) Gel electrophoresis  
 (c) Recombinant DNA technology (d) Gene Cloning
- (42) The process by which fragments of DNA can be separated according to their length molecular weight or size is called: (MTN 2022)  
 (a) Blooming (b) Radiography  
 (c) Electrophoresis (d) Restriction

### GENE SEQUENCING, HUMAN GENOME PROJECT

#### KIPS MCQs

- (43) What is expected to be one of the benefits of human genome project?  
 (a) It will prove the reliability of Mendel's law of Dominance  
 (b) It will offer a more precise understanding of defective genes causing inherited diseases  
 (c) It will help compare the chromosomes of humans and Drosophila  
 (d) It will show why the gene pool of a population remains stable
- (44) The position or arrangement of all the genes present on a chromosome is represented as:  
 (a) Genome (b) Genetic map  
 (c) Gene sequencing (d) Genomic library
- (45) First human chromosome that was completely sequenced in 1999 was:  
 (a) 1<sup>st</sup> Chromosome (b) 23<sup>rd</sup> Chromosome  
 (c) X Chromosome (d) 22<sup>nd</sup> Chromosome
- (46) A disease in which persons have a unique site where a restriction enzyme cuts DNA is:  
 (a) Non Hodgkin's lymphoma (b) Cystic fibrosis  
 (c) Huntington's disease (d) SCID
- (47) Dideoxynucleoside triphosphates are used to terminate DNA synthesis at different sites in:  
 (a) Sanger's method (b) Kary B. Mullis method  
 (c) Maxam-Gilbert method (d) None of these
- (48) Human genome is \_\_\_\_\_ times larger than any other genome sequenced so far.  
 (a) 20 (b) 25  
 (c) 200 (d) 1000
- (49) During DNA sequencing, the DNA fragments are obtained starting from \_\_\_\_\_ nucleotide and ending at \_\_\_\_\_ nucleotide.  
 (a) Same; different (b) Same; same  
 (c) Different; same (d) Different; different

#### PAST PAPER MCQs

- (50) How many base pairs are found in human genome? (GRW 2018)  
 (a) 3 billions (b) 5 billions  
 (c) 30 billions (d) 40 billions

### BIOTECHNOLOGY PRODUCTS, TRANSGENIC BACTERIA, TRANSGENIC PLANTS

#### KIPS MCQs

- (51) Transgenic bacteria are not used for:  
 (a) Biofilters for pollution (c) Plant health promotion  
 (b) Mass production of vaccines (d) DNA sequencing

- (52) If C4 pathway is introduced in rice, the advantage is:  
 (a) Disease – resistance  
 (b) Pest – resistance  
 (c) Avoiding inefficiency of rubisco carboxylase, by capturing CO<sub>2</sub> differently  
 (d) High reproduction rate
- (53) Genetically engineered plants are produced as a result of:  
 (a) Asexual reproduction  
 (b) Vegetative propagation  
 (c) Insertion of foreign gene  
 (d) All of the above
- (54) To produce transgenic plants the insertion of foreign gene into living protoplast is done by:  
 (a) Cutting the membrane  
 (b) Agrobacterium  
 (c) Diffusion  
 (d) Electric current
- (55) An antibody made by soybeans can be used to:  
 (a) Deliver radioisotopes to tumor cells  
 (b) Treat genital herpes  
 (c) Treat non Hodgkin's lymphoma  
 (d) Treat Huntington's disease
- (56) Since 1960s the World grain harvests have continued to rise due to use of high yield hybrid varieties, this period is called:  
 (a) Grain period  
 (b) Green revolution  
 (c) Generation period  
 (d) Incubation period
- (57) The transgenic protoplast of cereal grains (corn and wheat) are:  
 (a) Able to produce fertile plants  
 (b) Able to produce sexually reproducing plants  
 (c) Able to produce infertile plants only  
 (d) None of these
- (58) Extraction of metals from low grade sources by using living organism i.e. bacteria is called:  
 (a) Biological control  
 (b) Bioremediation  
 (c) Bioabsorption  
 (d) Bioleaching
- (59) The particle gun devised by Sanford and Klein is used to:  
 (a) Insert plasmid in protoplast  
 (b) Insert gene with intact cell wall  
 (c) Break DNA into various genes  
 (d) Remove cell wall to form protoplast
- (60) Herbicides can be used to kill weeds, if:  
 (a) Weeds are herbicides – sensitive  
 (b) Crops are herbicides - resistant  
 (c) Both of these  
 (d) None of these
- (61) Rice is reported to have all of the following improved agricultural traits except:  
 (a) Modified wood pulp  
 (b) Improved yield  
 (c) Drought, cold and salt tolerance  
 (d) Herbicide resistance
- (62) Salt tolerant crops are expected to be produced by:  
 (a) Introducing a gene for channel proteins  
 (b) Introducing Na<sup>+</sup> in the cells  
 (c) Inserting a gene for salt excretion  
 (d) Inserting a gene for Ca<sup>2+</sup> pump
- (63) After genetic engineering *Arabidopsis* plant is produced which is:  
 (a) Cold tolerant  
 (b) Salt tolerant  
 (c) Drought tolerant  
 (d) Herbicide resistant
- PAST PAPER MCQs**
- (64) The coconut milk contains the plant hormone called: (DGK 2017)  
 (a) Auxin  
 (b) Cytokinins  
 (c) Gibberellins  
 (d) Abscisic acid
- (65) *Arabidopsis* is (FSD 2017)  
 (a) Heat resistant  
 (b) Water absorbent  
 (c) Totipotent  
 (d) Salt tolerant

- (66) Meristem is: (DGK 2018)  
 (a) Virus free (b) Bacteria free  
 (c) Fungus free (d) Pathogen free
- (67) Transgenic bacteria are produced in large vats called: (GFV 2019)  
 (a) Transducer (b) Bioreactor  
 (c) Bio multiplier (d) Cutler media
- (68) The organisms used as bio filters is: (RWP 2019)  
 (a) Transgenic plant (b) Transgenic animal  
 (c) Transgenic bacteria (d) Transgenic virus
- (69) An antibody made by soybeans can be used for treatments of: (MTN 2019)  
 (a) AIDS (b) Hepatitis  
 (c) Herpes simplex (d) Genital herpes
- (70) Polyhydroxy butyrate is: (SGD 2019, 2021)  
 (a) Antithrombin III (b) Nutra sweet  
 (c) Biodegradable plastic (d) Anti body from soybean
- (71) In plant cells, there is full genetic potential of the organism, hence called: (SGD 2022)  
 (a) Totipotent (b) Erodent  
 (c) Meristems (d) Both A and C

### TRANSGENIC ANIMALS, CLONING OF TRANSGENIC ANIMALS

#### KIPS MCQs

- (72) To produce transgenic animals, during vortex mixing of eggs and DNA, the holes are made by:  
 (a) Calcium chloride needles (b) Silicon carbide needles  
 (c) Cesium carbide needles (d) Silicon chloride needles
- (73) Which one is better medium for transgenic products?  
 (a) Urine (b) Milk  
 (c) Meat (d) Blood
- (74) A factor produced by herd of goats, used to prevent clotting during surgery is:  
 (a) Fibrinogen (b) Plasminogen  
 (c) Prothrombin (d) Antithrombin III
- (75) In a procedure to produce cloned mice, the  $2n$  nuclei were taken from:  
 (a) Ovum (b) Germ cell  
 (c) Cumulus cell (d) Blood cell
- (76) Which of these would you not expect to be a biotechnology product:  
 (a) Steroid hormones (b) Modified enzymes  
 (c) DNA probes (d) Protein hormones

#### PAST PAPER MCQs

- (77) Which one of the following is mostly used to develop transgenic animal? (FSD 2022)  
 (a) Sanger method (b) Maxam Gilbert method  
 (c) Particle gun method (d) Microinjection method
- (78) Which one is used to make the animal eggs transgenic? (RWP 2022)  
 (a) Particle gun (b) By agrobacterium  
 (c) Vortex mixing (d) Micro propagation

### GENE THERAPY

#### KIPS MCQs

- (79) The insertion of gene into human cells for the treatment of a genetic disorder is called:  
 (a) Gene therapy (b) DNA sequencing  
 (c) Genetic engineering (d) Recombinant DNA technology

- (80) The children suffering with combined immunodeficiency syndrome lack an enzyme:  
 (a) Adenosine triphosphate (b) Adenine  
 (c) Adenosine deaminase (d) Adrenaline
- (81) Gene therapy is done to cure all these except:  
 (a) Hypercholesterolemia (b) Cancer  
 (c) Cystic fibrosis (d) T.B.
- (82) Organoids are artificial organs that can be implanted in the body, is used to cure:  
 (a) Haemophilia (b) Cancer  
 (c) Parkinson's disease (d) Both a and c
- (83) Which of the following is treated by ex-vivo therapy?  
 (a) Cystic fibrosis (b) SCID syndrome  
 (c) Haemophilia (d) Angioplasty

**PAST PAPER MCQs**

- (84) Cystic fibrosis patients lack a gene that codes for a trans-membrane carrier of:  
 (SWL 2018, GRW 2018, MTN 2018)  
 (a) Sodium ion (b) Potassium ion  
 (c) Carbonate ion (d) Chloride ion
- (85) Patients of cystic fibrosis often die due to numerous infection of the:  
 (LHR 2017, DGK 2018, LHR 2019)  
 (a) Respiratory tract (b) Excretory tract  
 (c) Digestive tract (d) Reproductive tract
- (86) The children with "SCID" lack an enzyme: (MTN 2019)  
 (a)  $\alpha$  - galactosidase (b) Phenylalanine hydroxylase  
 (c) Adenosine deaminase (d) Succinic dehydrogenase
- (87) The patients lack a gene that code for transmembrane carrier of the chloride ions:  
 (LHR 2021)  
 (a) Cancer (b) ADA  
 (c) SCID (d) Cystic fibrosis

**TISSUE CULTURE****KIPS MCQs**

- (88) Which of the following terms refer to that each cell has the full genetic potential of organism:  
 (a) Totipotent (b) Protoplast  
 (c) Genome (d) Genomic library
- (89) Coconut milk was added during tissue culture of carrot plant, it contains plant hormone:  
 (a) Auxins (b) Gibberellins  
 (c) Cytokinins (d) Abscisic acid

**PAST PAPER MCQs**

- (90) The cell suspension cultures of *Cinchona ledgeriana* produces: (RWP 2017)  
 (a) Aspartine (b) Cinchorine  
 (c) Quinine (d) Quina Quina
- (91) Cell suspension culture of *Cinchona ledgeriana* is used to produce: (BWP 2022)  
 (a) Luciferin (b) Digitoxin  
 (c) Dopamine (d) Quinine

**ANSWER KEY**

(Topic Wise Multiple Choice Questions)

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



**TRODUCTION, RECOMBINANT DNA TECHNOLOGY****KIPS SHORT QUESTIONS**

**Q:1 What is the use of DNA ligase in recombinant DNA technology?**

**Ans.** DNA ligase enzyme involves to chemically bind two DNA pieces. It is used to join gene of interest with the sticky ends of plasmid. This enzyme seals the foreign piece of DNA into the vector. As a result recombinant DNA is formed.

**Q:2 What is the significance of using a plasmid having antibiotic resistant gene?**

**Ans.** The antibiotic resistant gene on plasmid enables to separate transgenic colonies from non transgenic bacteria. When a particular antibiotic is applied, only those bacteria survive that have taken up the plasmid with gene of interest.

**Q:3 What is complementary DNA?**

**Ans.** Gene is synthesized in the laboratory from messenger RNA, using reverse transcriptase. This DNA molecule is called complementary DNA (cDNA).

**Q:4 What are the restriction endonucleases?**

**Ans.** These are natural enzymes of bacteria, which they use for their own protection against virus. The restriction enzyme cuts down the viral DNA, but does no harm to the bacterial chromosome. They are called restriction enzymes because they restrict the growth of viruses.

**Q:5 Name two enzymes that are required to inject foreign DNA into a cell and what do they do?**

**Ans.** **Restriction Enzymes** cuts DNA at specific site and used to open plasmid for gene insertion.

**Ligase** It joins the two DNA piece with the vector to form recombinant DNA.

**Q:6 What is palindromic sequence?**

**Ans.** Specific sequence of four or six nucleotides arranged symmetrically in the reverse order. Such sequences are known as palindromic sequences.

**Q:7 What are sticky ends?**

**Ans.** The single stranded but complementary ends of the two DNA molecules are called “Sticky ends” because they can bind by complementary base pairing. They, therefore, facilitate the insertion of foreign DNA into vector DNA.

**Q:8 What is vector?**

**Ans.** A vector is the means by which recombinant DNA is introduced into a host cell. One common type of vector is a plasmid.

**Q:9 What is chimaeric DNA?**

**Ans.** **Chimaeric DNA**

A DNA molecule which contains DNA from two different sources is called recombinant or chimaeric DNA.

**Q:10 What is clone?**

**Ans.** An organism and all its asexually reproducing progeny having identical genes is called clone. A clone can be a large number of molecules or cells or organisms that are identical to another.

**Q:11 What is the role of calcium chloride in recombinant DNA technology?**

**Ans.** Bacterial cells take up recombinant plasmid, especially, if they are treated with calcium chloride to make them more permeable.

**Q:12 What is primer? Give its use.**

**Ans.** **Primer** is the sequences of about 20 bases that are complementary to the bases on either side of the “target DNA”.

**Use:** The primers are needed because DNA polymerase does not start the replication process; it only continues or extends the process.

**PAST PAPER QUESTIONS**

- Q:13** Define plasmids, give examples. (DGK 2017)
- Q:14** Elaborate the uses of plasmids. (LHR 2017)
- Q:15** What are palindromic sequences? Give an example. (SWL 2017)
- Q:16** What do you know about recombinant DNA technology? (DGK 2017)
- Q:17** What are restriction enzymes? Give example. (SGD 2017, LHR 2018)
- Q:18** Why biotechnology is important for human beings? (GRW 2017)
- Q:19** What are restriction enzymes? (GRW 2018)
- Q:20** What is cloning of gene? (FSD 2018)
- Q:21** Define palindromic sequence. (SGD 2018)
- Q:22** What are requirements to produce recombinant DNA? (DGK 2018)
- Q:23** What are restriction enzymes? Who first isolated them? (RWP 2018)
- Q:24** Write three possible ways, how to get a gene? (FSD 2018)
- Q:25** Enlist three possible ways to get the gene of interest. (MTN 2018)
- Q:26** What is Recombinant DNA? (MTN 2018)
- Q:27** Define Biotechnology? (FSD 2018, 2019)
- Q:28** Give any two requirements to produce recombinant DNA. (LHR 2019)
- Q:29** Write three possible ways, how to get a gene. (FSD 2019)
- Q:30** Give the role of restriction endonucleases. (LHR 2019)
- Q:31** What are Restriction Endonucleases? (MLT 2019, DGK 2019)
- Q:32** Write possible ways to get the Gene of Interest. (BWP 2019)
- Q:33** What are palindromic sequences? (GRW 2018, DGK 2018, LHR 2019, SWL 2019)
- Q:34** What are plasmids? How they were discovered? (SWL 2021)
- Q:35** Write a note on recombinant DNA Technology. (BWP 2021)
- Q:36** How can we get a Gene Interest? (BWP 2021)
- Q:37** What are three possible ways to get a gene? (LHR 2021)
- Q:38** Write a role of Lambda phage as a vector. (LHR 2021)
- Q:39** Write down a note on restriction endonuclease and give its one function. (GRW 2021)
- Q:40** Write role of DNA Ligase. (MLT 2021)
- Q:41** What is a vector in biotechnology? Give its role. (FSD 2021)
- Q:42** What are restriction endonucleases? (RWP 2021)
- Q:43** What are plasmids? Give their role. (SGD 2021)
- Q:44** What are molecular scissors? How were they obtained? (LHR 2022)
- Q:45** Write down the role of lambda phages as a vector. (LHR 2022)
- Q:46** Describe molecular scissors. (DGK 2022)
- Q:47** What are molecular carriers? (MLT 2022)
- Q:48** What are restriction endonucleases? Give an example. (FSD 2022)
- Q:49** What are palindromic sequences? Write down palindromic sequence for *eco* R 1. (GRW 2022, RWP 2022)
- Q:50** How bacterial cells can take up recombinant plasmid? (GRW 2022, RWP 2022)
- Q:51** What is recombinant DNA? (BWL 2022)
- Q:52** Narrate how gene interest can be made from mRNA? (RWP 2022)

**GENOMIC LIBRARY, THE POLYMERASE CHAIN REACTION****KIPS SHORT QUESTIONS**

**Q:53 Differentiate between genome and genomic library.**

**Ans.**

Genome	Genomic Library
Full set of genes in an individual.	Collection of bacterial or bacteriophage clones.
Genome normally is divided into number of chromosomes in an individual.	Each clone containing a particular segment of DNA from the source cell.

**Q:54 Compare Recombinant DNA technology with PCR.**

**Ans.**

**Similarities:**

- Both processes are used to clone gene.

Recombinant DNA technology	PCR
Greater number of copies can be produced.	Lesser number of copies are produced than rDNA.
Process occurs in a living host cell usually bacteria.	Process occurs in a laboratory test tube or in an instrument called thermocycler.
Not a cyclic process.	It is a cyclic process as its name reflects "chain reaction".
DNA polymerase is not required instead metabolic machinery of host cell is used.	DNA polymerase is used called Taq polymerase.

**Q:55 What does PCR stand for? What is the use of PCR?**

**Ans. PCR:**

It stands for polymerase chain reaction.

**Use:**

PCR can create millions of copies of a single gene or any specific piece of DNA quickly in a test tube.

**Q:56 What is probe? Give its use?**

**Ans. Probe:** A probe is a single stranded nucleotide sequence that will hybridize (pair) with a certain piece of DNA. Location of the probe is possible because the probe is either radioactive or fluorescent.

**Use:** It is used to search gene of interest

**Q:57 Why PCR is considered as chain reaction?**

**Ans.** It is considered a chain reaction because DNA polymerase will carry out replication over and over again until there are millions of copies of the desired DNA.

**Q:58 What is Taq polymerase?**

**Ans.** DNA polymerase used in PCR is temperature- insensitive (thermostable) enzyme extracted from the bacterium *Thermus aquaticus*, which lives in hot springs this enzyme is also known as Taq polymerase. It can withstand high temperature, which is used to separate double stranded DNA.

**PAST PAPER QUESTIONS**

- Q:59 Give two advantages of PCR. (LHR 2017)
- Q:60 Discuss role of a particular probe. (GRW 2017)
- Q:61 Differentiate between probe and plasmid. (SGD 2017)
- Q:62 Define a probe? Write its role. (SWL 2017)
- Q:63 Write functions of PCR and EcoRI. (DGK 2017)
- Q:64 What is meant by genomic library? (RWP 2017)
- Q:65 Define genomic library. (SGD 2018, LHR 2018)
- Q:66 Write two applications of polymerase chain reactions. (SGD 2018)
- Q:67 What is Probe? How is it traced? (MTN 2018)
- Q:68 What is genomic library? (LHR 2017, 2018)
- Q:69 Define Taq Polymerase. Give its source. (MLT 2019)
- Q:70 What are probes? Give its use. (GRW 2019, MLT 2019)
- Q:71 What is Polymerase Chain Reaction (PCR)? (MLT 2021)
- Q:72 What do you know about palindromic sequence? Give an example. (LHR 2021)
- Q:73 What is probe? Write down its role. (GRW 2021)
- Q:74 Write down a note on Taq polymerase. (GRW 2021)
- Q:75 What are restriction enzyme, who isolated them? (SWL 2022)
- Q:76 What is PCR? Write the role of taq polymerase. (FSD 2022)
- Q:77 Define PCR. (BWL 2022)
- Q:78 Who and when developed the PCR? Why it is named so? (SGD 2022)

**ANALYZING DNA****KIPS SHORT QUESTIONS**

Q:79 Why RFLPs pattern is used to diagnose Huntington's disease?

Ans. A particular RFLP and a defective gene are often inherited together, which allow scientist to pinpoint disease-causing gene. Person with Huntington's disease have site where a restriction enzyme cuts DNA to develop particular RFLP pattern.

Q:80 Explain uses of DNA finger printing.

Ans. It can be used:

- (1) To diagnose viral infections, genetic disorders and cancer.
- (2) In forensic laboratories to identify criminals.

(3) To determine the evolutionary history of human population.

**PAST PAPER QUESTIONS**

- Q:81 Define gel electrophoresis. (GRW 2016, DGK 2018)
- Q:82 Write down two methods for solving dispute paternity. (DGK 2018)
- Q:83 Write two practical uses of DNA finger technology. (DGK 2019)
- Q:84 Write two uses of PCR amplification and analysis. (DGK 2019)
- Q:85 Give at least two uses of PCR amplification and analysis. (SGD 2019)
- Q:86 Write any two uses of PCR. (RWP 2019, LHR 2021, SGD 2021)

**GENE SEQUENCING, HUMAN GENOME PROJECT****KIPS SHORT QUESTIONS**

Q:87 What are the aims of "human genome project"?

Ans. The project has two primary goals.

- The first goal is to construct a genetic map of the human genome. The aim is to show the sequence of genes along the length of each type of chromosome.
- The second goal is to construct a base sequence map.

**Q:88 Narrate the main steps in gene sequencing.**

- Ans.** (1) To generate pieces of DNA of different sizes all starting from the same point and ending at different points.  
 (2) Separation of these different pieces of DNA on agarose gel.  
 (3) Reading of sequence from the gel.

**Q:89 Explain the importance of gene sequencing.**

- Ans.** The genomes of many organisms have been sequenced by gene sequencing.

**Example:**

Plant chloroplasts and animal mitochondria, large number of bacteria, many of the yeast, a nematode worm, *Drosophila*, the model plant *Arabidopsis* the mouse and human.

### **FAST TRACK QUESTIONS**

- Q:90** Briefly write down Maxam Gillbert method of gene sequencing. (DGK 2017)  
**Q:91** What is the use of dideoxynucleoside triphosphate? (RWP 2017)  
**Q:92** What are primary goals of human genome project? (FSD 2017)  
**Q:93** Give two goals of human genome project. (LHR 2018)  
**Q:94** Write two primary goals of human genome project. (MLT 2019)  
**Q:95** Give three main steps of dideoxy method of gene sequencing. (SWL 2021)  
**Q:96** What is gene sequencing? (SWL 2018, GRW 2021)  
 What are the two goals of the human genome project? (GRW 2019)

### **BIOTECHNOLOGY PRODUCTS; TRANSGENIC BACTERIA, TRANSGENIC PLANTS**

#### **KIPS SHORT QUESTIONS**

**Q:97 How plant health (or Productivity) can be improved by genetic engineering or using transgenic plants?**

- Ans.** Following alterations can be made in transgenic plant to improve health
- Structure of stomata may be altered to increase CO<sub>2</sub> uptake or cut down water loss.
  - Efficiency of Rubisco may be enhanced.
  - C<sub>4</sub> cycle is introduced into plants to avoid inefficiency of carboxylase.
  - New plant varieties can be developed which are herbicides or insects resistant or salt and cold tolerant.

**Q:98 List some of the products of genetic engineering produced from bacteria?**

- Ans.** Biotechnology products produced by bacteria are insulin, human growth hormone, tissue plasminogen activator, haemophilia factor VIII, and hepatitis B vaccine.

**Q:99 What are transgenic organisms?**

- Ans.** Organisms that have a foreign gene inserted into them are called transgenic organisms.

**Q:100 What are biotechnology products?**

- Ans.** Products produced from transgenic organisms are called biotechnology products. Today, bacteria, plants and animals are genetically engineered to produce biotechnology products.

**Q:101 What is the role of transgenic bacteria in plant health?**

- Ans.** Transgenic bacteria have been produced to promote health of plants for example,
- Bacteria that normally live on plants and encourage the formation of ice crystals have been changed from frost-plus to frost – minus bacteria.
  - A bacterium that normally colonizes the roots of corn plants has now been endowed with genes (from another bacterium) that code for an insect toxin. The toxin protects the roots from insects.

**Q:102 Define term biofilters.**

**Ans.** Bacteria can be used as biofilters to prevent airborne chemical pollutants from being vented into the air. They can also remove sulfur from coal before it is burned and help to clean up toxic waste dumps.

**Q:103 What is Nutra sweet?**

**Ans. Nutra sweet:**

A dipeptide called aspartame is used as artificial sweetener so, it is known as Nutra sweet. It is manufactured from Phenylalanine.

**Q:104 What is the function of antibodies produced by corn and soybean?**

**Ans.** Antibody made by corn can deliver radio isotopes to tumor cells, and another made by soybeans can be used as treatment for genital herpes.

**Q:105 How transgenic plants are developed?**

**Ans.** It is possible to treat protoplasts with an electric current while they are suspended in a liquid containing foreign DNA. The electric current makes tiny, self-sealing holes in the plasma membrane through which genetic material can enter. Then a protoplast will develop into a complete plant.

### **PAST PAPER QUESTIONS**

**Q:106** Give uses of Bioreactors. Name a few products.

**Q:107** Define transgenic organisms.

(LHR 2017)

**Q:108** What do you know about the term bioreactors?

(RWP 2017)

**Q:109** Define Transgenic Plants. Give its two uses.

(BWL 2018)

**Q:110** What are transgenic bacteria?

(RWP 2018)

**Q:111** Discuss any two benefits of transgenic bacteria to promote health of plants.

(SWL 2019)

**Q:112** What are bioreactors?

(RWP 2019)

**Q:113** What are bioreactors?

(SGD 2021)

**Q:114** What are protoplasts? Give scientific name of biodegradable plastic.

(LHR 2021)

**Q:115** What are transgenic plants?

(GRW 2021)

**Q:116** What are transgenic organisms?

(MLT 2021)

**Q:117** Define bioreactors. Name two products of bioreactors.

(MLT 2021)

**Q:118** How plant Health can be promoted by transgenic bacteria?

(BWP 2021)

**Q:119** How can we prepare biodegradable plastics?

(DGR 2022)

**Q:120** How transgenic bacteria promote health of plants? Give example.

(SWL 2022)

### **TRANSGENIC ANIMALS, CLONING OF TRANSGENIC ANIMALS**

#### **KIPS SHORT QUESTIONS**

**Q:121** What are transgenic animal?

**Ans.** Animal that has a foreign gene inserted into them are called transgenic animal.

**Q:122** Why urine is considered as better vehicle to obtain transgenic products than milk?

**Ans.** Urine is a preferable vehicle for a biotechnology product than milk because all animals in herd urinate while only females produce milk, animals start to urinate at birth while females don't produce milk until maturity and its easier to extract proteins from urine than from milk.

**Q:123 Give the methods to develop transgenic animals.**

**Ans.** Techniques have been developed to insert genes into the eggs of animals. It is possible to micro inject foreign genes into eggs by hand, but another method uses vortex mixing. The eggs are placed in an agitator with DNA and silicon-carbide needles, and the needles make tiny holes through which the DNA can enter.

**PAST PAPER QUESTIONS**

**Q:124** Why urine is preferred to isolate biotechnology products than milk? (MTN 2017)

**Q:125** Explain the importance of Gene Pharming. (MTN 2017)

**Q:126** How urine is preferable vehicle for biotechnology products? (DGK 2018)

**Q:127** Describe the term "gene pharming". (GRW 2017-18)

**Q:128** How urine is a preferable vehicle for biotechnology product than milk? (DGK 2019)

**Q:129** What is gene pharming? (SGD 2019, FSD 2021)

**Q:130** How transgenic animals are developed? (MLT 2022)

**Q:131** Write about vortex mixing method to insert genes into eggs of animals. (SGD 2022)

**GENE THERAPY****KIPS SHORT QUESTIONS****Q:132 Why the gene therapy to cure cystic fibrosis is not yet been successful?**

**Ans.** In case of cystic fibrosis, gene therapy provides limited gene transfer. Only epithelial cells can be genetically altered by using liposomes microscopic vesicles. These epithelial cells after some time are replaced by new cells from deeper layers that are not transgenic

**Q:133 What is cystic fibrosis?**

**Ans.** In cystic fibrosis patients lack a gene that codes for trans-membrane carrier of the chloride ion. Patients often die due to numerous infections of the respiratory tract.

**Q:134 Define gene therapy?**

**Ans.** Gene therapy is the insertion of genetic material into human cells for the treatment of a disorder. It includes procedures that give patient healthy genes to make up for faulty genes.

**Q:135 What is familial hypercholesterolemia?**

**Ans.** A condition that develops when liver cells lack a receptor for removing cholesterol from the blood. The high levels of blood cholesterol make the patient subject to fatal heart attacks at a young age.

**Q:136 How is gene therapy being studied in the treatment of cancer?**

**Ans.** In clinical trials researchers have given genes to cancer patient that either make healthy cells more tolerant of chemotherapy or make tumors more vulnerable to it. Once the bone marrow stem cells were protected it was possible to increase the level of chemotherapy to kill the cancer cells.

**PAST PAPER QUESTIONS**

**Q:137** What is meant by gene therapy? (BWP 2017)

**Q:138** Compare ex-vivo gene therapy with in vivo gene therapy. (LHR 2017)

**Q:139** What is ex-vivo gene therapy? For what purpose it is used? (FSD 2017)

**Q:140** What is in-vivo gene therapy? Give example. (SWL 2017)

**Q:141** When a balloon catheter is used? (MTN 2017)

**Q:142** What is "severe combined immunodeficiency syndrome" Also give its cause? (DGK 2017)

**Q:143** Define gene therapy. Name two methods of gene therapy. (GRW 2018)

**Q:144** What is Gene Therapy? Write names of two methods used for gene therapy. (MTN 2018)

**Q:145** What is gene therapy? How cancer cells are killed by gene therapy? (RWP 2018)

**Q:146** Compare ex-vivo and in-vivo gene therapy. (LHR 2019)

**Q:147** Describe various steps involved in Ex-vivo gene therapy. (SWL 2019)

**Q:148** Give difference between ex-vivo and in-vivo gene therapy. (FSD 2021)

**Q:149** How cancer patients are being treated by gene therapy? (FSD 2021)

- Q:150 How hypercholesterolemia can be cured by gene therapy? (DGK 2017, FSD 2021)
- Q:151 What is cystic fibrosis? (GRW 2021)
- Q:152 Write down the treatment of cancer through gene therapy. (SGD 2021)
- Q:153 How gene therapy helps cancer patients? (LHR 2022)
- Q:154 Describe Ex-vivo and In-vivo therapy. (DGK 2022)
- Q:155 Define examine method of gene Therapy. (SWL 2022)
- Q:156 What is gene therapy? What are its two methods? (FSD 2022)
- Q:157 Differentiate between Ex-vivo and In-vivo Gene therapy. (BWL 2018, BWL 2019, 2022)

### TISSUE CULTURE

#### KIPS SHORT QUESTIONS

Q:158 In tissue culture coconut milk was also added, what is the role of coconut milk in tissue culture?

Ans. Coconut milk contains the plant hormone, cytokinins. This hormone is involved in the growth and differentiation of plant tissues. So that the callus differentiated into shoot and roots developing a new plant.

Q:159 Plant cells are called totipotent, what do you mean by this?

Ans. Plant cells are totipotent as each cell has the full genetic potential of the organism- and, therefore, a single cell could become a complete plant.

Q:160 Define somaclonal variations.

Ans. Plants generated from the somatic embryo vary somewhat because of mutations that arise during the production process. These are called somaclonal variations. It is a method to produce new plants with desired traits.

#### PAST PAPER QUESTIONS

- Q:161 Define the term totipotent. (LHR 2017)
- Q:162 What is cell suspension culture? Give an example. (SWL 2018)
- Q:163 What is Anther Culture? (BWL 2018)
- Q:164 How foreign genes can be introduced into plant embryos or protoplasts? (SGD 2022)

### GENETIC ENGINEERING OF PLANTS, AGRICULTURAL PLANTS WITH IMPROVED TRAITS, PRODUCTION OF PRODUCTS

#### KIPS SHORT QUESTIONS

Q:165 Why there is need to develop particle gun method to produce transgenic corn and wheat?

Ans. Corn and wheat protoplasts produce infertile plants when treated with electric current, so other methods are developed to introduce DNA into plant cells with intact cell walls. One of these methods is particle gun method in this method gene coated with metal particle is bombarded on plant callus.

Q:166 What is a particle gun? Also give its working.

Ans. A device, called the particle gun that bombards a callus with DNA coated microscopic metal particles. Then genetically altered somatic embryos develop into genetically adult plants. Many plants including corn and wheat varieties have been genetically engineered by this method.

Q:167 Define protoplast.

Ans. The plant cells whose cell wall is removed are called protoplasts.

#### PAST PAPER QUESTIONS

- Q:168 Define hybridization. What is its use? (SGD 2017)
- Q:169 What do you know about the Particle Gun? (MTN 2018)
- Q:170 How salt tolerant plant Arabidopsis has been produce? (DGK 2018)