SAMPLE QUESTION PAPER (TERM I) 2021-22

CLASS XII

BIOTECHNOLOGY -045

Time: 90 Minutes

General Instructions:

1. The Question Paper contains three sections.
2. Section A has 24 questions. Attempt any 20 questions.
3. Section B has 24 questions. Attempt any 20 questions.
4. Section C has 12 questions. Attempt any 10 questions.
5. All questions carry equal marks.
6. There is no negative marking.

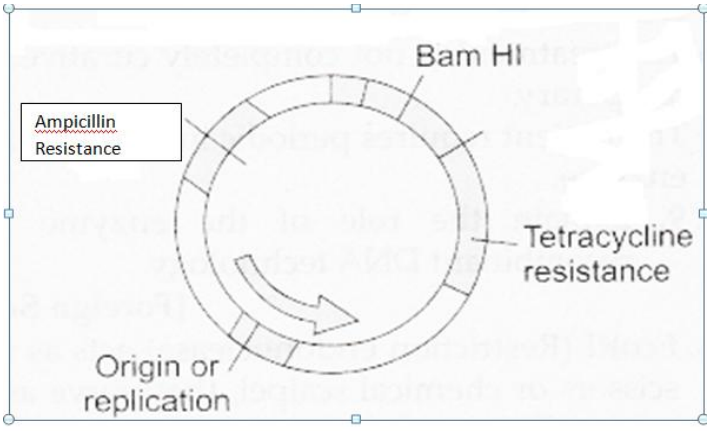
SECTION - A	
Section – A consists of 24 questions. Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.	
1.	It is possible to introduce colours into DNA by A. FISH B. Microaaray C. Nick translation D. SNP
2.	The protein that provides the body structure and protection to our bones is A. collagen. B. hemoglobin. C. actin D. myosin
3.	Restriction enzymes were discovered by A. W. Arber, H. Smith and D. Nathans B. Paul Berg and Herbert Boyer C. Annie Chang and Stanley Cohen D. Kerry Mullis
4.	Foreign DNA is directly introduced in to the recipient cell using a fine micro-syringe to transform it in the following technique- A. Electroporation B. Microinjection C. Biolistics D. Transfection

5.	Which feature of the vectors provides flexibility in the choice of restriction enzymes? A. MCS B. Ori C. Unique restriction enzyme recognition site D. Size
6.	Interferon β is used for the treatment of A. Hepatitis C B. Hepatitis B C. Multiple Sclerosis D. Chronic Granulomatous disease
7.	In-situ activation of chymotrypsin takes place in the A. jejunum. B. duodenum. C. ileum. D. pancreas.
8.	The enzymatic activity of subtilisin is contributed by A. Ser 221, His 64 and Asp 32 B. Ser 32, His 221 and Asp 64 C. Ser 221, His 32 and Asp 64 D. Ser 32, His 64 and Asp 221
9.	The most common type of restriction enzymes used in recombinant DNA technology are A. Type I restriction enzymes B. Type II restriction enzymes C. Type III restriction enzymes D. Type IV restriction enzymes
10.	After n cycles, the number of DNA copies produced are- A. n^2 B. 2^n C. nx2 D. n÷2
11	Cosmids have the cos site of A. BAC B. YAC C. Plasmid D. Lambda
12.	Following enzyme prevents self ligation A. DNA ligase B. Eco RI C. DNA polymerase D. Alkaline Phosphatase

13	Essential amino acids are those which A. have to be obtained from food B. can be made in our cells C. can not be obtained from food D. need not be essentially supplemented in the diet
14	Severe combined immunodeficiency is caused due to the absence of A. prions. B. chymotrypsin. C. esterases. D. adenosine deaminase.
15	Culture based approaches for detecting pathogens, as compared to PCR based assays are A. faster, safer but less specific. B. slower but safer and more specific. C. slower, less safer and less specific. D. slower, less safer but more specific.
16	A 100 Kb DNA fragment has to be cloned in a host cell. Which vector should be used for this experiment? A. Plasmid B. Cosmid C. BAC D. Bacteriophage lambda
17	The tripeptide present in whey that makes it a nutraceutical protein is A. Glutathione B. Kappa -casein C. Hexokinase D. Urease
18	Different proteins move differently in SDS –PAGE. It is due to varying A. size B. charge C. isoelectric point D. pH
19	The Bioactive molecule used to treat Myocardial Infarction is a A. proteolytic enzyme. B. monoclonal antibody. C. non-catalytic protein. D. polyclonal antibody.

20	In a PCR reaction, following components were taken- ds DNA, Taq polymerase, dNTPs and ds primer, but even after 30 cycles, no amplification of the target DNA could be seen. The reason for this is because the A. template is DNA and not RNA. B. ddNTPs are not added in the reaction mixture. C. primer is double stranded. D. reverse transcriptase is not added.
21	In Protein fingerprinting technique A. paper chromatography is followed by paper electrophoresis. B. paper electrophoresis is followed by paper chromatography. C. paper chromatography and paper electrophoresis are carried out simultaneously. D. neither paper chromatography nor paper electrophoresis takes place.
22	Who has received Nobel prize for deducing the structure of haemoglobin? A. Linus Pauling B. Max Perutz C. V.M Ingram D. Frederick Sanger
23	Which functional property of whey proteins, where they undergo maillard reaction, is used in confectionaries? A. Viscosity B. Gelation C. Browning D. Emulsification
24	Name the dye which is used for the visualization of Proteins in 2D gel electrophoresis? A. Ethidium bromide B. FDA C. Silver stain D. Evan's blue
	SECTION - B Section - B consists of 24 questions (Sl. No.25 to 48). Attempt any 20 questions from this section. The first attempted 20 questions would be evaluated.
25	Why are eukaryotic hosts preferred for expressing eukaryotic recombinant proteins? A. Enzymes necessary for the proper folding of the proteins are absent in eukaryotes. B. Enzymes necessary for the splicing mechanism are absent in eukaryotes. C. Machinery for removal of introns is not there in the prokaryotes. D. Enzymes necessary for post-translational modifications are also absent in eukaryotes.

26	The order of steps in an RFLP experiment is A. Isolation of DNA, Digestion with Restriction enzyme, Agarose gel electrophoresis B. Agarose gel electrophoresis, Isolation of DNA, Digestion with Restriction enzyme C. Digestion with Restriction enzyme, Isolation of DNA, Agarose gel electrophoresis D. Isolation of DNA, Agarose gel electrophoresis, Digestion with Restriction enzyme
27	Microscopic particles of gold or tungsten are coated with the DNA of interest and bombarded onto cells with a particle gun to introduce foreign DNA into host cells. What is this method known as? A. Biolistics B. Microinjection C. Electroporation D. Transfection
28	Identification and analysis of protein networks involved in the nuclear pore complex is one of the successes of A. structural proteomics. B. functional proteomics. C. expression proteomics. D. proteome mining.
29	In a 2'-3' dideoxynucleotide triphosphate- A. 5'phosphate group is absent B. 3'-OH group is absent C. 3' phosphate group is absent D. 5'-OH group is absent
30	A protein with a molecular weight of 10000 contains 5,4,3,2 and 1 charges. The mass spectrometer detects the protein ions respectively at mass/charge- A. 10001; 5001; 3334; 2501 and 2001 B. 2001; 2501; 3334; 5001 and 10001 C. 4001; 5001; 6668; 10001 and 20001 D. 20001; 10001; 6668; 5001 and 4001
31	Bacteria protect themselves from infection by bacteriophages by using A. DNA ligases B. DNA polymerases C. Restriction enzymes D. Cosmids

32	A sample of protein, $9x10^{-12}$ moles has to be analysed for its amino acid sequence. Which technique/s can be used for the analysis? A. 2 D Gel Electrophoresis B. Protein fingerprinting C. Mass Spectrometry D. Both (a) and (b)
33	Identify the gene transfer technique: *Mixing of DNA with charged substances like calcium phosphate, cationic liposomes or DEAE dextran and overlaying on recipient host cells. Host cells take up the DNA.* A. Transfection B. Transformation C. Biolistics D. Electroporation
34	From Blue-White selection, we infer that- A. White colonies represent non-recombinant bacteria B. Blue colonies represent non-recombinant bacteria C. Blue colonies represent recombinant bacteria D. Blue and white colonies represent non-recombinant bacteria
35	Transplant rejection can be prevented by administering a therapeutic antibody A. t-PA B. OKT-3 C. Humulin D. Platelet derived growth factor
36	Identify the vector shown below –  A. pUC 19 B. pBR 322 C. BAC D. YAC

37	The goal of mass spectrometric analysis is to create A. gas phase ions from polar charged molecules. B. polar charged molecules from gas phase ions. C. liquid ions from non-polar molecules. D. non-polar molecules from liquid ions.
38	Which technique is used for improving laundry detergent subtilisin? A. SDS-PAGE B. Mass Spectrometry C. Site directed Mutagenesis D. Protein fingerprinting
39	In the enzyme chymotrypsin, why does Ser 195 develop a negative charge on its -OH group? A. Negatively charged Asp COO^- residue pulls the Ser–OH proton through His B. Negatively charged Ser COO^- residue pulls the Asp–OH proton through His C. Positively charged Asp COO^- residue pulls the Ser–OH proton through His D. Positively charged Ser COO^- residue pulls the Asp–OH proton through His
40	Chymosin and Papain are industrial enzymes used respectively in A. cheese and beverage industries. B. beverage and cheese industries. C. soap and cheese industries. D. leather processing and meat industries.
41	Which one of the following is an autosomal recessive disorder? A. Cystic Fibrosis B. Huntington disease C. Alzheimer's disease D. Migraine

Question No. 42 to 44 consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: A. Both Assertion and Reason are true and the reason is the correct explanation of the assertion B. Both Assertion and Reason are true but the reason is not the correct explanation of the assertion C. Assertion is true but Reason are false D. Both Assertion and Reason are false	
42	**Assertion:** Human diet should compulsorily contain glycine, serine and tyrosine. **Reason:** Essential amino acids can be synthesized in the human body.
43	**Assertion:** Kappa casein is involved in micelle stabilization of milk proteins and keeps the proteins suspended uniformly in milk. **Reason:** Kappa casein behaves like a lipid molecule and 2/3 rd of milk protein is hydrophobic.
44	**Assertion:** At isoelectric point, the amino acid does not migrate under the influence of electrical field. **Reason:** The amino acid molecule at the isoelectric point exists as zwitter ion structure.
45	Which chromosome changes to Philadelphia chromosome due to reciprocal translocation? A. chromosome 9 B. chromosome 22 C. Either A or B D. chromosome 24
46	Physicians decide our susceptibility or resistance to a particular disease through- A. SNPs B. Nick translation C. FISH D. SDS-PAGE
47	Whey has been administered to the sick for the treatment of numerous ailments as it results in A. elevation of a tripeptide glutathione in cells. B. reduction of a tripeptide glutathione in cells. C. reduction of xenobiotic levels in our body. D. elevation of xenobiotic levels in our body.

48	Biological Value refers to A. the amount of protein nitrogen that is retained by the body from a given amount of protein nitrogen that has been consumed. B. growth expressed in terms of weight gain of an adult by consuming 1 gm of food protein. C. the total amount of protein nitrogen that has been consumed. D. growth expressed in terms of weight gain of an adult by consuming 1 Kg of food protein.

SECTION - C

Section- C consists of **one case** followed by 6 questions linked to this case (Q.No. 49 to 54). Besides this, 6 more questions are given. Attempt any 10 questions in this section. The first attempted 10 questions would be evaluated.

Case

Gene prediction and counting

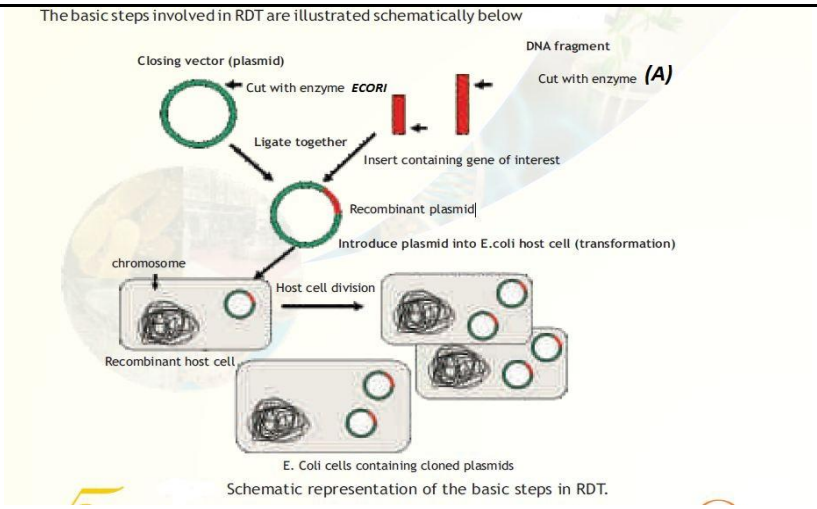
Gene prediction is an important problem for computational biology and there are various algorithms that do gene prediction using known genes as a training data set.

The following table shows Genome size and gene predictions between several organisms.

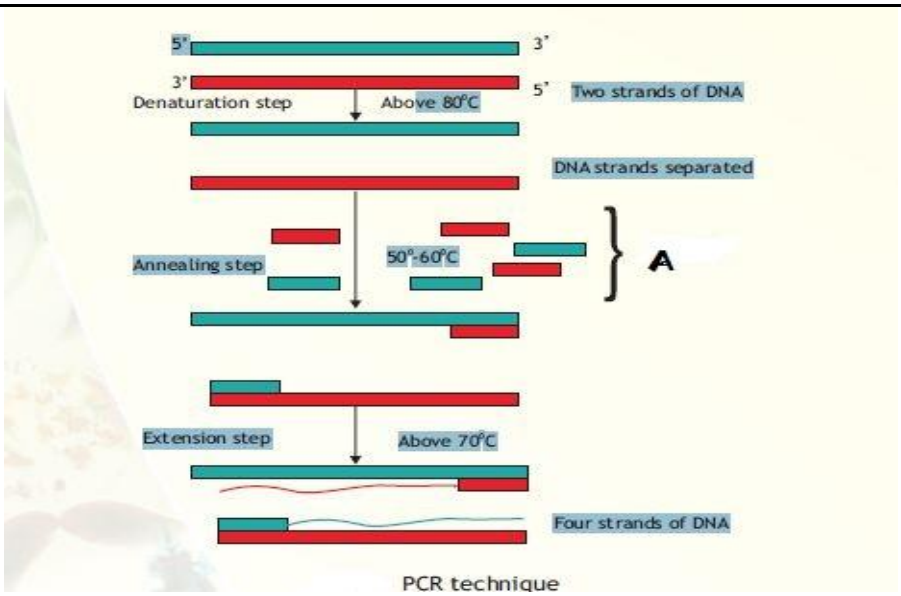
Organism	No. of chromo somes	Genome size in base pairs	The Number of Predicted genes	Part of the genome that encodes for protein
Bacteria *Escherichia coli*	1	500,000	5000	90%
Yeast *Saccharomyces cerevisiae*	16	12,068,000	6340	70%
Worm *Caenorhabditis elegans*	6	100,000,000	19,000	27%
Fly *Drosophila melanogaster*	4	175,000,000 - 196,000,000	13,600	20%
Weed *Arabidopsis thaliana*	5	157,000,000	25,498	20%
Human *Homo sapiens*	23	3,000,000,000	20,000 - 25, 000	< 5%

Based on your observation and analysis, answer the following questions.

49	Even if we know where the genes are in a given genome, it's difficult to count them due to A. splice Variants B. overlapping genes C. exons D. Both A and B
50	Which organism has the maximum part of the genome coding for the proteins? A. *Escherichia coli* B. *Saccharomyces cerevisiae* C. *Caenorhabditis elegans* D. *Drosophila melanogaster*

51.	Part of the genome that encodes for protein in *Homo sapiens* is less than 5 % , one of the probable reason/s for this could be A. Repeated Sequence B. Exons C. Both "a" and " b" D. SNP's
52	The relationship between number of chromosomes and genome size in base pairs is A. direct B. indirect C. no relationship D. correlation of 0.5
53	Computational Gene prediction is referred to as A. In –silico Gene prediction B. In –Vivo Gene prediction C. In - vitro Gene prediction D. Microarray prediction
54.	After observing the table, it seems that the relationship between the intuitive complexity of an organism and the number of genes in its genome is A. No simple correlation B. Simple correlation C. Inverse correlation D. Depending on the organism, can be simple or Inverse
55.	 In the given figure , DNA fragment is cleaved using enzyme "A" . Identify this enzyme. A. DNA ligase B. EcoRI C. DNA polymerase D. Alkaline phosphatase

56.

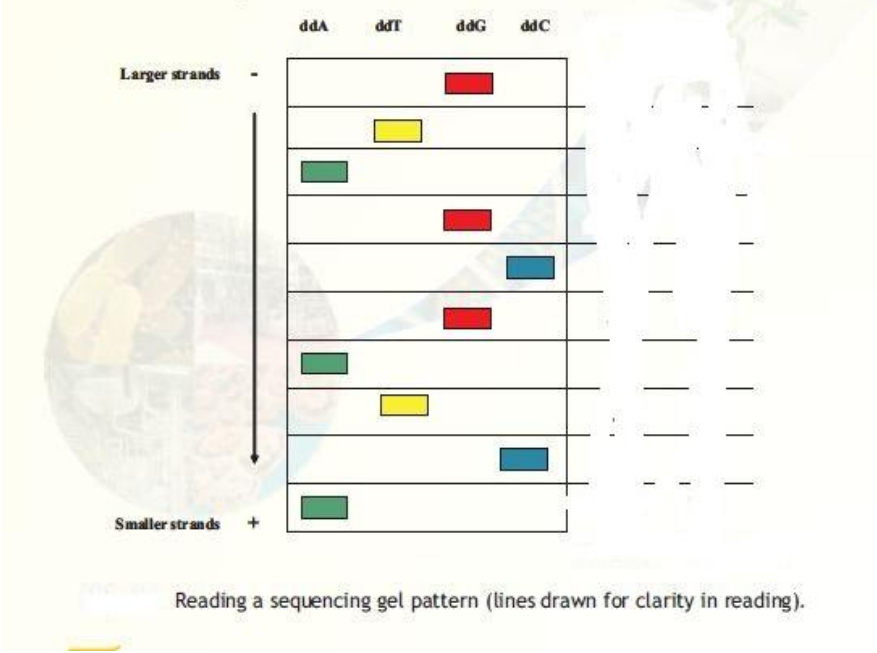


PCR technique

Identify the short, single-stranded DNA sequence (A) which anneal to the separated strands of DNA.

A. Primers
B. Template
C. Taq polymerase
D. dNTPs

57.

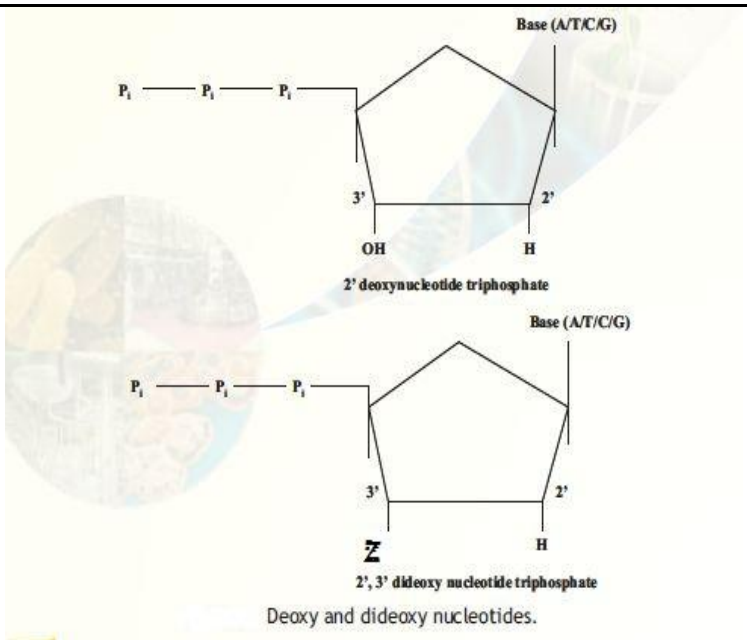


Reading a sequencing gel pattern (lines drawn for clarity in reading).

The sequence of original strand in the given autoradiogram is-

A. 5' ACTAGCGATG 3'
B. 5' CATCGCTAGT 3'
C. 3' ACTAGCGATG 5'
D. 3' CATCGCTAGT 5'

58.

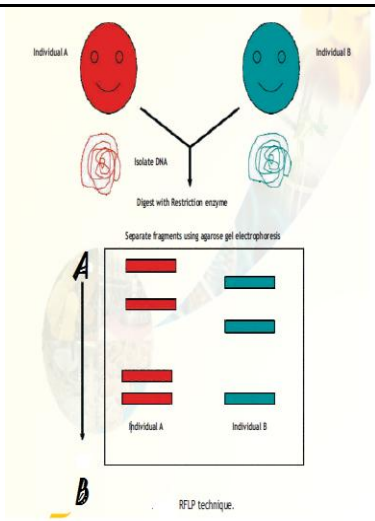


Deoxy and dideoxy nucleotides.

'Z' is an atom/group of atoms in the structure of dideoxynucleotide. Identify this.

A. Hydrogen
B. hydroxyl group
C. carboxyl group
D. phosphate group

59.

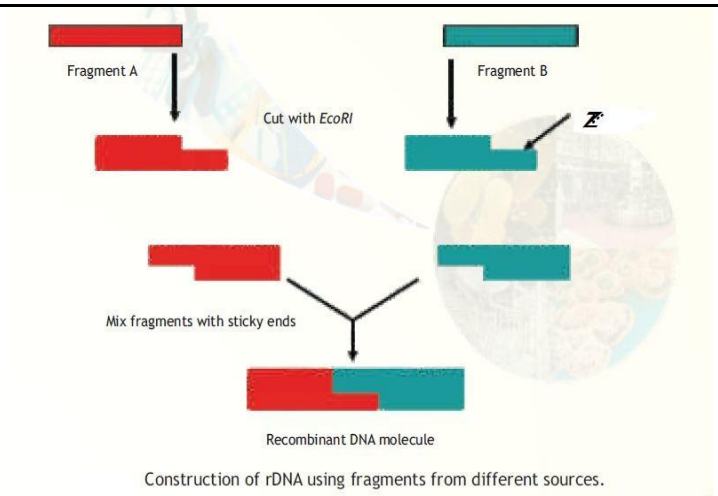


RFLP technique.

The terminals "A" and "B " as marked in Agarose gel electrophoresis (RFLP technique) are

A. Cathode and Anode respectively
B. Anode and Cathode respectively
C. Cathode and Neutral charge respectively.
D. Anode and Neutral charge respectively.

60.



Construction of rDNA using fragments from different sources.

The label “Z” is a type of end produced in a DNA molecule. Identify it?

A. Cohesive ends
B. Sticky ends
C. Blunt ends
D. Restricted ends

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Questions in lieu of diagram based questions for VI candidates Total Alternative Questions - 07	
Section - B	
36	The double stranded circular vector with antibiotic resistant genes as selectable markers is: A. pUC 19 B. pBR 322 C. BAC D. YAC
Section - C	
55.	In the formation of r DNA molecule , the enzyme which is used to cleave the Gene of interest and vector is : A. DNA ligase B. EcoRI C. DNA polymerase D. Alkaline phosphatase
56.	The short, single-stranded oligonucleotide DNA sequence which anneal to the 3' region of the denatured strands of DNA. A. Primers B. Template C. Taq polymerase D. dNTPs
57.	In an autoradiogram, we read the DNA sequence as 3' GTAGCGATCA 5'.Trace the sequence of original strand in the autoradiogram : A. 5' ACTAGCGATG 3' B. 5' CATCGCTAGT 3' C. 3' ACTAGCGATG 5' D. 3' CATCGCTAGT 5'
58.	Di-deoxynucleotide differs from deoxynucleotide in lacking an atom/group of atoms which is : A. hydrogen B. hydroxyl group C. carboxyl group D. phosphate group
59.	The movement of RFLP in Agarose gel electrophoresis is from : A. Cathode to Anode. B. Anode to Cathode. C. Cathode to Neutral charge. D. Anode to Neutral charge.

60.	The ends which are produced after digesting the genomic DNA with EcoRI are: A. Cohesive ends B. Sticky ends C. Blunt ends D. Restricted ends

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MARKING SCHEME BIOTECHNOLOGY -045 SESSION 2021-22 TERM 1	
Q. No.	**SECTION - A**
1.	C. Nick translation
2.	A. Collagen
3.	A. W.Arber, H.Smith and D.Nathans
4.	B. Microinjection
5.	A. MCS
6.	C. Multiple Sclerosis
7.	B. Duodenum
8.	A. Ser 221, His 64 and Asp 32
9.	B. Type II restriction enzymes
10.	B. 2^n
11.	D. Lambda
12.	D. Alkaline Phosphatase
13.	A. have to be obtained from food
14.	D. Adenosine deaminase
15.	C. Slower, less safer and less specific
16.	C. BAC
17.	A .Glutathione
18.	A. size
19.	A. proteolytic enzyme
20.	C.Primer is double stranded
21.	B. paper electrophoresis is followed by paper chromatography
22.	B. Max Perutz
23.	C. Browning,
24.	C. Silver stain
SECTION - B	
25.	C. Machinery for removal of introns is not there in the prokaryotes
26.	A. Isolation of DNA, Digestion with Restriction enzyme, Agarose gel electrophoresis
27.	A. Biolistics
28.	A. Functional proteomics
29.	B. 3'-OH group is absent
30.	B. 2001; 2501; 3334; 5001 and 10001

31.	C. Restriction enzymes
32.	C.Mass Spectrometry
33.	A. Transfection
34.	B. Blue colonies represent non-recombinant bacteria
35.	B. OKT-3
36.	B. pBR 322
37.	A. Create gas phase ions from polar charged molecules
38.	C. Site directed Mutagenesis
39.	A. Negatively charged Asp COO^- residue pulls the Ser–OH proton through His
40.	A. Cheese and Beverage industries
41.	A. Cystic Fibrosis
42.	Ans. D.
43.	Ans. A.
44.	Ans. A.
45.	B. chromosome 22
46.	A. SNPs
47.	A. elevation of a tripeptide glutathione in cells
48.	A. the amount of protein nitrogen that is retained by the body from a given amount of protein nitrogen that has been consumed
SECTION - C	
49.	D. Both “a” and “b”.
50.	A. *Escherichia coli*
51.	A. Repeated Sequence
52.	C. No relationship (instead of A. Direct)
53.	A. In – silico Gene prediction
54.	A. No simple correlation (instead of B. Simple correlation)
55.	A. DNA ligase
56.	A. Primers
57.	B. 5’ CATCGCTAGT 3’
58.	A. hydrogen
59.	A. Cathode and Anode respectively
60.	B. Sticky ends

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Marking Scheme in lieu of diagram based questions for VI candidates	
Section - B	
36.	B. pBR 322
Section - C	
55.	A. DNA ligase
56.	A. Primers
57.	B. 5’ CATCGCTAGT 3’
58.	A. hydrogen
59.	A. Cathode to Anode
60.	B. Sticky ends

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