MARKING SCHEME (2023-24)

Class XII

Biotechnology (Subject Code-045)

Q. No.	Answer	Marks
	Section - A	
1	(b) They lyse specifically within the restriction site.	1
2	(d) Prion	1
3	(a) It measures both live and dead cells.	1
4	(c) Alkaline Phosphatase	1
5	(d) All of these	1
6	(c) HeLa cell line	1
7	(d) Whey	1
8	(d) Diosgenin	1
9	(b) To identify protein networks in nuclear pore complex.	1
10	(d) SV40	1
11	(c) Cystic Fibrosis	1
12	(a) Dextran	1
13	(a) Both Assertion and Reason are true and reason is the correct explanation of the assertion.	1
14	(c) Assertion is true but the reason is false.	1
15	(b) Both the Assertion and reason are true but reason is not the correct explanation of the assertion.	1
16	(c) The assertion is true but the reason is false.	1
	Section – B	
17	**X** is Subtilisin. The native enzyme subtilisin is easily inactivated by bleach (up to 90%). Solution to the problem is to use the detergent that contains Subtilisin that is modified by Site directed mutagenesis which is not affected by bleach. (1/2x4=2)	2
18	Safety for human or animal consumption/ Effect on Biodiversity/Effect on beneficial insects or microbes Gene pollution/Development of superweeds/Change in fundamental vegetable nature of plants/ Antibiotic resistance in humans or animal pathogens/Changes in evolutionary pattern. (Any 4 for ½ mark each)	2

19 — 2

Preparation is time consuming/Requires use of live animal or fresh tissue/ Variations in one preparation to another. (Any two for ½ mark each)

Trypsin is used to dissociate the adhered animal cells during sub culturing. (1 mark)

OR

Finite Cell Lines	Continuous Cell Lines
grow upto a limited number of generations	Grow continuously
Finite cell lines show contact inhibition, density limitation and anchorage dependence	No contact inhibition and anchorage dependence. Density limitation lost or reduced.
/ Finite cell lines show slow growth rate or doubling time as 24-96 hours	continuous cell lines show rapid growth with doubling time as 12 to 24 hours.

(Any two points of difference with 1 mark each)

20 — 2

FISH	Karyotyping	
Interphase chromosomes can be used	Metaphase chromosomes are needed	(1 Mark)
Easy Technique as it gives colour to the chromosome	No such specific colour	(1 Mark)

21 — 2

(a) Protein samples A and B will get separated using this set up. (1 Mark)

(b) Using ampholytes with broader range covering pH value range from 3 to 11 will be able to isolate all the four proteins. (1Mark)

Section – C

22 — 3

Replica plating.

Plasmid pBR322 carrying the insert in tet^r gene in Multiple Cloning Sites (MCS) is used to transform the host cells which are first plated on solid media containing ampicillin. Overnight colonies from every single cell plated will develop which all have the plasmid. Replica plating is next performed to select colonies from this plate which are tetracycline sensitive due to insertional inactivation. The non recombinant colonies will grow on media with tetracycline and thus differentiate between recombinant and non recombinant cells.

23 — 3

In Situ Activation means activation of zymogens at their site of activity in the presence of their biological target by alteration in its shape. (1 Mark)

Due to constellation of three amino acids because of unique folding of chymotrypsin, the asp 102 is able to hydrogen bond with the adjacent his 57 by borrowing a hydrogen ion. The his 57 in turn attracts a hydrogen ion from the adjacent ser 195 which allows its negatively charged oxygen anion to be able to make a nucleophilic attack on the peptide bond of the substrate. (2 Marks)

24 — 3

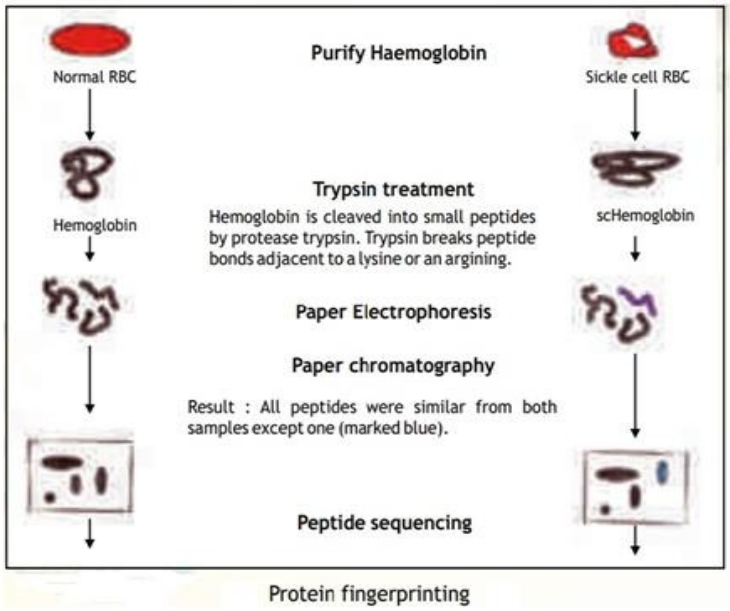
(a) Lab media contain highly purified and costly chemical constituents which can't be economically used for large scale production.

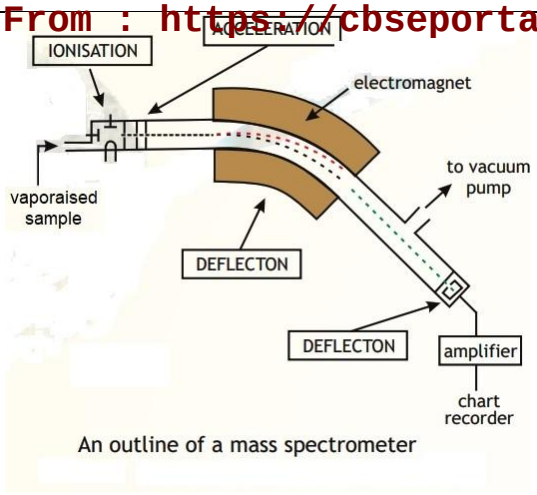
(b) Provides uniform mixing of the medium and avoids development of anaerobic pockets thus ensuring optimum oxygen availability for growth.

(c) Foaming denatures the proteins so it is undesirable. (1 x 3 marks)

	OR Somaclones through tissue culture, Mutant selection where mutants are produced using a mutagen like UV light, or Genetic Engineering can improve the production of the active compound. (Any 2 for 1 Mark each) The gene can be put under the control of a regulatory switch such that the production of recombinant protein does not occur until required. (1 Mark)	
25	The name of the technique is Protoplast Fusion and chemicals fusion like PEG can be used to fuse protoplasts from two different plants/ Electro-fusion. (1 Mark) Somatic hybrids and Cybrids can be produced using this method. (1 Mark) Example: Intergeneric somatic hybrid between potato and tomato called Pomato/Topato or inter specifc somatic hybrid between two species of Nicotiana (any one, 1Mark)	3
26	(a) Introduction of modified gene that encodes for overproduction herbicide target enzyme into crop plant making it insensitive to herbicide. (b) Introduction of gene that encodes for Bt toxin into the crop plant. (c) Introduction of gene that encodes for viral coat protein into the crop plant. (1 x 3Marks)	3
27	Leukemia, Heart disease/Heart attack, Paralysis/Spinal cord injury, Alzheimer's disease, Parkinson's disease, Huntington's disease, Burns (Any 6 for ½ mark each)	3
28	(a) rHuEPO is used to treat anemia due to kidney failure/cancer treatment/treatment of AIDS/ blood loss during surgery. (Any one for 1 Mark) (b) tPA is used for dissolution of blood clots during a heart attack or stroke. (1 Mark) (c) OKT3 binds to CD3 receptors of T lymphocytes causing immuno-suppression thus preventing rejection of kidney transplant. (1 Mark)	3
Section – D		
29	(i) 16 DNA molecules would be generated after 4 cycles. (1 Mark) (ii) Both the strands will act as the template in this case. (1 Mark) (iii) 5' CTGAA 3' and 5' CAATT 3' (2 Marks) **OR** (iii) PCR can amplify the genome sequence from parents and offspring and DNA fingerprinting can match the pattern obtained. (2 Marks)	4
30	(i) Metabolite specific purification methods used are solvent extraction/ ion exchange chromatography/ salt precipitation. (Any two for ½ Mark each) (ii) Flocculation/ Centrifugation/Ultrafiltration. (Any two for ½ Mark each) (iii) For higher yields/higher stability of proteins/ cost reduction. (Any two for 1 Mark each) **OR** (iii) Using specific Antibodies and probes which enable the detection of the organism capable of producing specific products. (2 Marks)	4

Section-E

31	(a) Restriction site of EcoRI is 5'-GAATTC-3' (1 Mark) The ends generated will be called sticky. (½ Mark) No, all the Restriction sequences may not be palindromic. (½ Mark) (b)Microinjection can inject foreign DNA into plant and animal cells Biolistics makes use of particle gun to bombard gold coated DNA Into cells, (c)Small size of vector facilitates entry of recombinant molecules into the host cells. (1 Mark) (Any two, 1 Mark each) **OR** (a)3' AGCTTCAGTC 3' (1 Mark) (b)Principle – When a ddNTP gets incorporated in the growing chain, the reaction stops due to non availability of 3'hydroxyl group. (1 Mark) Steps- Each test tube out of four carries single stranded DNA templates, dNTPs and DNA polymerase. Small amount of four ddNTPs are added separately into the four test tubes. For example in test tube containing ddATP, all chains will terminate at ddA but at different positions of T present in the template. The prematurely terminated fragments are resolved and read with agarose gel electrophoresis. (3 Marks)	5
32	Steps of Protein Fingerprinting (5 Marks)  Protein fingerprinting **OR** (a) Mass Spectrometer (2 Marks)	5



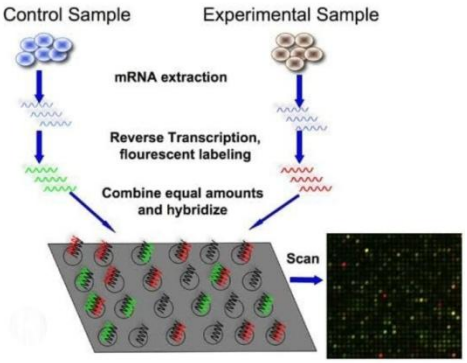
An outline of a mass spectrometer

(b) The protein molecules can be vaporized by using the method called matrix assisted laser desorption ionisation where a pulsed laser beam is directed onto sample suspended in a matrix. (1 Mark)

The protein molecules can be analysed by separating and directing the charged ions by electrostatic lenses from ionisation source to the mass analyses. (1 Mark)

(a) It can provide information about molecular weight of unknown molecules/ structural information/Pico moles of protein samples can be analyzed too. (Any one for 1 Mark)

33 MICROARRAY (1 Mark) 5



(4 Marks)

OR

(a) Database retrieval tools – ENTREZ gives access to literature, sequences and structures. TAXONOMY BROWSER provides information on taxonomic classification of over 79000 organisms. LOCUS LINK carries information on official gene names and other description. (3 Marks)

(b) EMBL–nucleotide sequences (1 Mark)
PDB - 3D structure of proteins (1 Mark)