

Marking Scheme
Class XII (2020-21)
Biotechnology

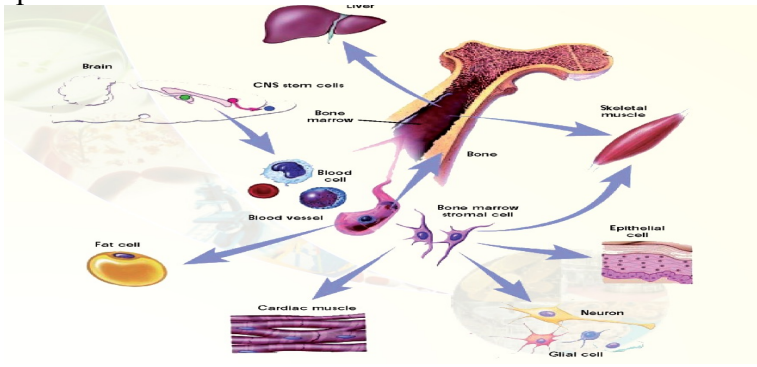
Q. No	SECTION A	Marks
1.	Vectors used in eukaryotic cells which are constructed in such a way so that they can exist both in eukaryotic cells and <i>E. coli</i> .	1
2.	His-57, Asp-102 and Ser-195	1
3.	Genes cloned can be obtained in the form of single stranded DNA. Since genome is less than 10 kb in size, RF can be purified and manipulated exactly like a plasmid.	1
4.	Chromosome 4	1
5.	<i>Gelidium amansii</i>	1
6.	Restriction Fragment Length Polymorphism	1
7.	The proteins which have both nutritional and pharmaceutical values.	1
8.	Primary culture is time consuming and requires the use of live animals or fresh tissue. There can also be considerable variation from one preparation to another, particularly, if prepared by different people.	1
9.	Due to the existence of splice variants and overlapping genes.	1
10.	Peptide mapping/ Protein fingerprinting, V.M Ingram	1
11.	(i) (b) Both Assertion and Reason are true, but the reason is not the correct explanation of the assertion OR (ii) (a) Both Assertion and Reason are true, and the reason is the correct explanation of the assertion	1
12.	(b) Buffalo milk	1
13.	(a) mRNA and Proteins	1
14.	(b) subjected to liquid-liquid extraction chromatography	1
15. (i)	(a) Denaturation, annealing, extension	1
(ii)	(a) short ss piece of DNA	1
(iii)	(b) 2 ⁿ	1
(iv)	(a) thermostable	1

(v)	(c) Slower, less safer and less specific	1
16. (i)	a) MS medium	1
(ii)	d) 5.7	1
(iii)	a) Somatic hybridisation	1
(iv)	b) transgenic	1
(v)	a) any part of the plant	1
SECTION B		
17	<p>$m/z = M + nH + /n$</p> <p>$m/z = 20,005/5 = 4001$</p> <p>$m/z = 20,004/4 = 5001$</p> <p>$m/z = 20,003/3 = 6668$</p> <p>$m/z = 20,002/2 = 10,001$</p> <p>$m/z = 20,001/1 = 20,001$</p> <p>Sequence—It detects protein ions at $m/z = 4001, 5001, 6668, 10001$ and $20,001$ respectively</p> <p style="text-align: center;">OR</p> <p>Normal and thalassaemic erythrocytes obtained and their lysates analysed</p> <p>Protein fingerprinting/2-D gel electrophoresis/MALDI-TOF/SDS-PAGE can identify if α or β chain is absent.</p> <p><i>(Any one technique can be described)</i></p>	2
18	<p>(i) Nucleotide Sequence</p> <p>(ii) Three dimensional structure of proteins</p>	1 1
19	<p>Two diseases showing gene polymorphism with complex inheritance</p> <ul style="list-style-type: none"> • Common late-onset Alzheimer's disease • Migraine <p style="text-align: center;">OR</p> <p>a) Unigene</p> <p>b) The curator reviews and checks newly submitted data to ensure that biological features are adequately described and the conceptual translations of any coding regions obey known rules.</p>	1 1 1 1
20	<p>Leukemia (Cancerous blood cells), Heart disease, Heart attack (cardiac tissue damage). Paralysis (spinal cord injury), Alzheimer's, Parkinson's, Huntington's (dead brain cells) and Burns (damaged skin cells)</p> <p><i>(Any two).</i></p>	2

21	While somaclones are plant variants obtained from tissue cultures of somatic tissues, gametoclones are plant variants with gametophytic origin obtained from tissue such as pollen or egg cell. Larkin and Scowcroft (1981) proposed the term 'somaclones'	1 1
22	Bulk purchase of chemicals and other raw materials would bring down costs. The labour cost decreases sharply with increase in production.	1 1
23	a) No, animal cells need a CO ₂ incubator. b) Interferons are proteins secreted by virally infected cells and interfere with viral propagation.	1 1
24	Metagenomics approach has been developed to identify and select microbial genes synthesizing novel molecules. This approach utilizes the large number of microbial genomes present in an environmental niche (eg. in soil, in water such as ocean or in human gut). These genomes are contributed by both the culturable and the nonculturable variety of microbes and together constitute metagenome.	2
25	Advantages : Homogenous genetic population//Controlled physico-chemical environment// Easy to add genes (Transfection) // regulate protein levels (RNAi). Available in adequate numbers to do chemical study//Easy production of biopharmaceuticals. //No ethical clearance required. //Cost effective screening assays. (Any two)	2

SECTION C

26	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Food systems</th> <th style="width: 33%;">Functional Property</th> <th style="width: 33%;">Mode of action</th> </tr> </thead> <tbody> <tr> <td>(i) Eggless cakes</td> <td>Whipping/foaming</td> <td>Forms Stable film</td> </tr> <tr> <td>(ii) Soups</td> <td>Viscosity</td> <td>Thickening/ water binding</td> </tr> <tr> <td>(iii) Coffee whiteners</td> <td>Emulsification</td> <td>Formation and stabilization of fat emulsions</td> </tr> </tbody> </table>	Food systems	Functional Property	Mode of action	(i) Eggless cakes	Whipping/foaming	Forms Stable film	(ii) Soups	Viscosity	Thickening/ water binding	(iii) Coffee whiteners	Emulsification	Formation and stabilization of fat emulsions	3
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27	<p>(a) ACTCCAGAATTCACCTCCG</p> <p>(c) GCCTCATTCTGAAGCCTGA</p> <p>Restriction enzymes recognize palindromic sequences.</p> <p style="text-align: center;">OR</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p><i>Haemophilus Aegyptus</i></p> <p><i>HaeIII</i></p> </div> <div style="text-align: center;"> <p>5'G-G-C-C 3'</p> <p>3'C-C-G-G 5'</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p><i>Providencia stuartii</i></p> <p><i>Pst I</i></p> </div> <div style="text-align: center;"> <p>5'C-T-G-C-A-G 3'</p> <p>3'G-A-C-G-T-C 5'</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p><i>Streptomyces albus</i></p> <p><i>Sal I</i></p> </div> <div style="text-align: center;"> <p>5'G-T-C-G-A-C 3'</p> <p>3'C-A-G-C-T-G 5'</p> </div> </div>	<p>1</p> <p>1</p> <p>1</p> <p>3</p>
28.	<p>Cultivation of adult stem cells from bone marrow and their differentiation into specialized cells</p>  <p>Ernest McCulloch and James Till</p>	<p>2</p> <p>1</p>
29	<ul style="list-style-type: none"> • Production of healthy oils with altered fatty acid profiles. • Modification of starch properties for specific uses. • Favourable change of grain storage products and their chemical composition to improve the processing of bread making with wheat flour, malting of barley and brewing of beer. 	3

	<ul style="list-style-type: none"> • Removal of undesirable toxic compounds in certain plants. • Development of blue roses/ blue coloured cotton which is otherwise not possible by conventional plant breeding because of the absence of blue pigment in roses/ cotton • Development of tear-less onions, caffeine-free coffee and low nicotine tobacco. <p><i>(Any three)</i></p>	
30	<p>Processing raw information: The experimentally determined sequence (raw information) is processed using bioinformatics tools into genes, the proteins encoded and their function, the regulatory sequences, and inferring phylogenetic relationships.</p> <p>Genes: Gene prediction can be done by using computer programs like GeneMark for bacterial genomes and GENSCAN for eukaryotes.</p> <p>Proteins: Protein sequences can be inferred from the predicted genes by using simple computer programs.</p> <p>Regulatory sequences: Regulatory sequences can also be identified and analysed by using bioinformatics tools.</p> <p>Inferring phylogenetic relationships: Information regarding the relationships between organisms can be obtained by aligning multiple sequences, calculating evolutionary distance and constructing phylogenetic trees.</p> <p>Making a Discovery: Using the bioinformatics tools and databases, the functions of unknown genes can be predicted.</p> <p><i>(Any three)</i></p>	3
SECTION D		
31	<p>BCAA are Branched chain amino acids BCAA: ile, leu, val, lys, trp <i>(Any two)</i></p> <p>They-</p> <ul style="list-style-type: none"> • are essential for the biosynthesis of muscle protein • help in increasing the bio-availability of high complex carbohydrates • reduce muscle breakdown and act as an energy source before and after exercise. Hence while maintaining exercise performance and delaying exhaustion BCAAs are very important for muscle growth. <p><i>(Any 2 points)</i></p> <p>Biological value- It measures the amount of protein nitrogen that is retained by the body from a given amount of protein nitrogen that has been consumed</p>	<p>2</p> <p>2</p> <p>1</p>

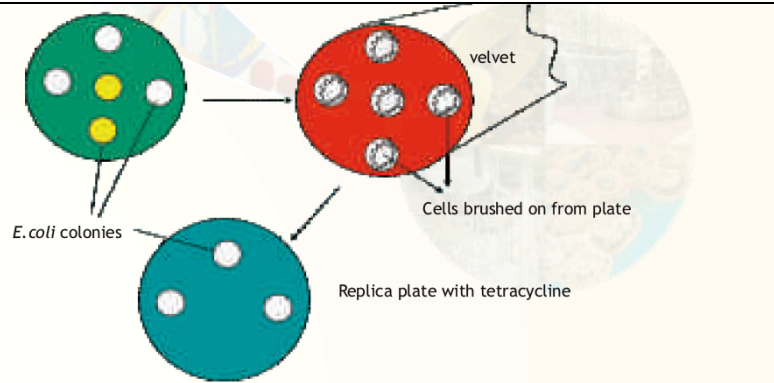


Fig. 7. Replica plating (note only colonies marked yellow have insert).

1
(diagram)

OR

Steps involved:

1. Isolation of a DNA fragment containing a gene of interest that needs to be cloned (called as insert).
2. Generation of a recombinant DNA (rDNA) molecule by insertion of the DNA fragment into a carrier DNA molecule called vector (e.g. plasmid) that can self replicate within a host cell.
3. Transfer of the rDNA into an E. coli host cell (process called transformation).
4. Selection of only those host cells carrying the rDNA and allowing them to multiply thereby multiplying the rDNA molecules.

4

Paul Berg, Herbert Boyer, Annie Chang and Stanley Cohen.

1

(Any two)

33

a) The sample containing the microbes (e.g. soil) is put in a nutritive medium and allowed to grow in shake cultures.

The growth conditions (e.g. temperature, nutrients) in the medium are provided and these favour the growth of microbes of our interest.

b) Screening is done using a method where the organism will show its desired properties.

For example, if we are looking for a microorganism, which produces an antibiotic, we may detect it by growing the culture on an agar plate in the presence of that bacterium against which antimicrobial activity is desired.

Immunological methods are also available in which the microbes producing products are detected using specific antibodies.

Use of probes, which enable the detection of organisms capable of producing specific products.

5

OR

S.No	Fed Batch Culture	Continuous Microbial Culture
1.	Nutrients added without removal of culture	Nutrients added with removal of culture
2.	Volume increases	Volume constant
3.	Used for high cell density	Used for Biomass or metabolite production

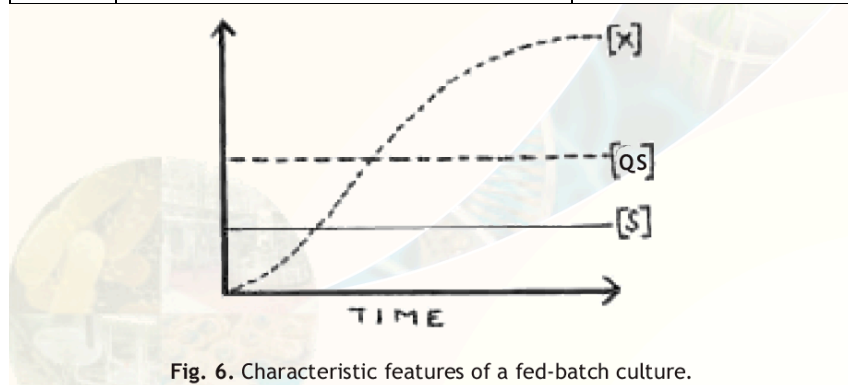


Fig. 6. Characteristic features of a fed-batch culture.

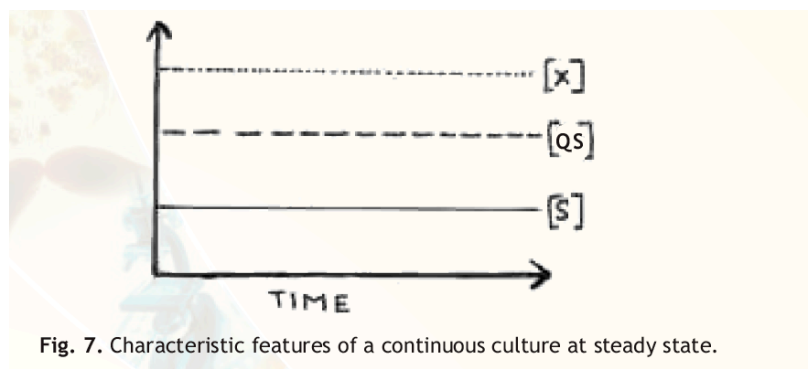


Fig. 7. Characteristic features of a continuous culture at steady state.

(X)- Cell density

(S) – Substrate concentration

(QS)- Cell Specific substrate turn over rate