MARKING SCHEME

BIOTECHNOLOGY (045)

TERM 2 (2021-22)

<table>
<tr><th colspan="3">SECTION A</th></tr>
<tr><td>1</td><td>No donor is required for transfusion, no transfusion facilities, no risk of transfusion related infection (any two)
OR
The maintenance of growth of cells under laboratory conditions in suitable culture medium is known as primary cell culture.
The primary cell culture is sub-cultured in fresh growth media to develop secondary cultures.</td><td>2</td></tr>
<tr><td>2</td><td>a. Abnormal development of the endosperm causes premature death of the hybrid embryo and leads to sterile seeds.
b. The embryo from such sterile hybrid seeds can be excised at an appropriate time and cultured on a suitable nutrient medium to produce novel hybrid.</td><td>1
1</td></tr>
<tr><td>3</td><td>a. It has strong inducible promoters.
b. It is capable of making post-translational modifications similar to those performed by human cells.
c. Downstream processing is simpler as Pichia does not secrete its own proteins into the fermentation medium.
(Any two)</td><td>2</td></tr>
<tr><td>4</td><td><table><tr><td>Database</td><td>Information Available</td></tr><tr><td>EMBL(European Molecular Biology Laboratory)</td><td>Nucleotide sequence</td></tr><tr><td>Nucleotide sequence</td><td>Annotated protein sequence</td></tr><tr><td>PDB (Protein Database)</td><td>Three dimensional structure of proteins</td></tr><tr><td>Ribosomal RNAdatabase</td><td>rRNAsubunit sequences</td></tr><tr><td>PALI database</td><td>Phylogenetic analysis and alignment of proteins</td></tr></table>(Any two)</td><td>2</td></tr>
</table>

	OR 1. 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. 2. Genes: Gene prediction can be done by using computer programs like Gene Mark for bacterial genomes and GENSCAN for eukaryotes. 3. Proteins: Protein sequences can be inferred from the predicted genes by using simple computer programs. 4. Regulatory sequences: Regulatory sequences can also be identified and analysed by using bioinformatics tools. 5. Inferring phylogenetic relationships: Information regarding the relationships between organisms can be obtained by aligning multiple sequences, calculating evolutionary distance and constructing phylogenetic trees. 6. Making a Discovery: Using the bioinformatics tools and databases, the functions of unknown genes can be predicted. (Any Two)	
5	a. Somatic Hybrids b. Cybrids (Cytoplasmic hybrids) c. Genetic trasformations d. Metabolic studies	2
6	T-cells play a major role in rejection of foreign grafts and hence they are responsible for the kidney transplant rejection. OKT3 is a monoclonal antibody that targets CD3 surface markers (antigens) present on mature T- cells and remove them from circulation and hence prevent acute renal allograft rejection.	1 1
SECTION B		
7	a. Gene knock out- selectively remove a gene. b. Used to understand genetic basis of diseases, new diagnostic and therapeutic modalities. (Any two)	1 2
8	a. Use of certain hormones can convert somatic cells into state similar to embryos which are encapsulated to produce artificial seeds. b. Artificial seeds are bigger in size/ long term storage/potential for automation. (Any two)	1 2
9	• The given sequence is compared with sequences in the database using substitution matrices that specify scores to either 'reward' a match or 'penalize' a mismatch. • Top scoring matches are ranked according to set criteria that serve to distinguish between a similarity due to ancestral relationship or due to random chance. • True matches are further examined thoroughly with other details accessible through Entrez and other tools available at NCBI.	1 1 1

10	a. Production of food, vaccines/ Production of primary metabolites; acids, alcohol/ Production of secondary metabolites: antibiotics/ Biotransformation reactions: enzymatic, steroids (Any one) b. Strain improvement is done in order to maximize metabolite production by: • Mutant selection : There are two methods - Physical method; Chemical Method • Genetic engineering	1 1 1
11	a. The genes encoding antigenic proteins can be isolated from pathogens and expressed in plants. Such transgenic plants or their tissues producing antigens can be eaten for vaccination / immunization. These are called edible vaccines. b. Edible vaccines offer following advantages over conventional vaccines. • Low cost • Alleviation of storage problems • Easy delivery system by feeding (any other relevant point) (Any Two) **OR** Micropropagation using meristems. No, these are not virus resistant. Because meristems are virus-free but do not have resistance genes.	3
12	a. Using HAT medium b. Monoclonal antibody which is used to treat early stages of breast cancer is Herceptin (trastuzumab). It works by attaching itself to HER2 receptors by blocking them from receiving the growth signals.	1 1 1
	SECTION C	
13	a. The phase in which microbial cell specific growth rate is calculated is BC. Log phase b. $n = 3.3 (\log10^{7}-\log10^{4})$ $3.3(3) = 10$ t = 240/10 = 24 min Specific Growth rate constant = 0.693/1440 = $4.8x10^{-4}$ /s **OR** a. The recombinant insulin is intracellular and to isolate it , we need to rupture the cells as broth will be lacking the recombinant insulin. b. Minimizing steps: Cost effective/ less denaturation of protein /higher yield. c. Recombinant insulin d. Antibiotics(term) /any example of antibiotics e. Crude protein will have number of unwanted proteins which needs to purified.	1 1 1 1 1