SAMPLE QUESTION PAPER

BIOTECHNOLOGY (045)

Class XII (2021-22)

Max. Marks 35 **Time allowed: 2 hours**

General Instructions:

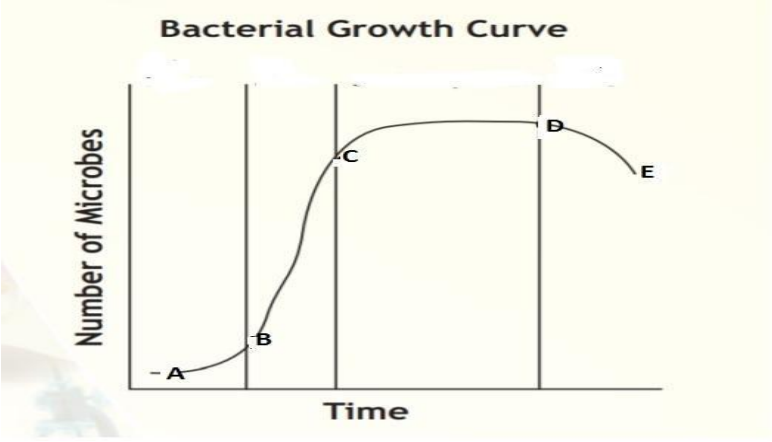
i) All questions are compulsory.

ii) The question paper has three sections. All questions are compulsory.

iii) Section–A contains 6 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has case-based question of 5 marks.

iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

	SECTION A	
1	Why is r-HUEPO preferred over blood transfusion in such cases where a person has excessive blood loss due to accidents? **OR** Differentiate between primary and secondary animal cell cultures.	2
2	Sterile seeds may be formed during crosses between distantly related plants. What could be the reason for this and how can it be overcome?	2
3	*Pichia pastoris* has many advantages as a eukaryotic expression host. Justify giving two reasons.	2
4	Name any two databases important in bioinformatics. Mention the type of information which may be obtained from these databases. **OR** Suggest two possible ways for analyzing a given sequence using bioinformatics.	2
5	State any two applications of *protoplast culture* in plant biotechnology.	2
6	Patients who are administered OKT3 do not suffer from an acute renal allograft rejection. Why?	2
	SECTION B	
7	a. What do you mean by gene knock out? (1) b. Give any two advantages of the preparation of mouse models using gene knockouts useful? (2)	3

8	a. How are artificial seeds produced? (1) b. State two ways in which artificial seeds are different from embryonic seeds. (2)	3
9	Write the steps of BLAST involved in comparison of DNA sequences.	3
10	a. How can microbial cultures be used for the production of different metabolites? (1) b. A recently discovered microbial strain gives us the desired metabolite in nanomolar concentration. Suggest two ways of improving the production of the desired metabolite. (2)	3
11	a. What are edible vaccines? (1) b. How are edible vaccines advantageous over recombinant vaccines produced by bacterial fermentation? (2) **OR** How can one obtain virus-free sugarcane plants from virus-infected plants? Are these plants virus-resistant? Give reason for your response.	3
12	a. How are the hybridoma cells selected from the culture of B-cells and Myeloma cells while fusing them in hybridoma technology? (1) b. Which monoclonal antibody is used to treat early stages of breast cancer and how does it work? (2)	3
SECTION C		
13	***Microbial growth kinetics*** Cell growth includes increase in its number. A typical bacterial growth curve is shown in the figure below-  *Diagram 1* Growth kinetics is an autocatalytic reaction which implies that the rate of growth is directly proportional to the concentration of cell.	5

As the cell divides, we shall have:

No. of cell division	0	1	2	3	n
No. of cells	1	2	4	8	2^n
Mathematically	N_0	$N_0 \times 2$ $N_0 2^1$	$N_0 \times 2 \times 2$ $N_0 2^2$	$N_0 \times 2 \times 2 \times 2$ $N_0 2^3$	- $N_0 2^n$

TABLE 1

Doubling time which is the time taken by the population to double through one round of cell division is inversely related to specific growth rate.

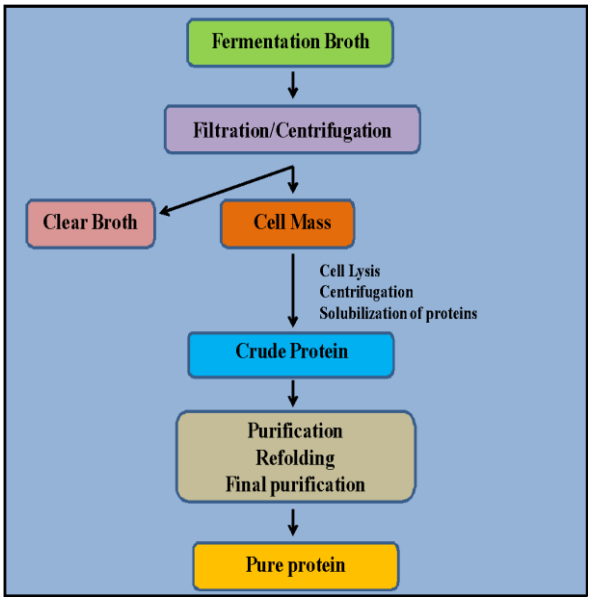
a. In the microbial growth curve depicted above (Diagram 1), in which phase is the microbial cell specific growth rate calculated (from phases AB/BC/CD/DE)? What is this phase called? (2)

b. Refer to Table 1 and calculate the generation time and specific growth rate constant of a bacterial population in which the number of bacteria increases from 10^4cells /ml to 10^7 cells /ml during four hours of exponential growth. (3)

OR

Management of Diabetes

Insulin delivery is still the most effective method of pharmacotherapy in cases of extremely high hyperglycemia. The production process has been divided into several stages as depicted below in the flow chart:



At each stage of insulin production, qualitative and quantitative analyses were performed to confirm identity and purity of the desired protein. (1X5)

	a. In a fermentation medium depicted above, few workers processed clear broth for the production of desired protein, but were unable to get any yield. What could be the possible reason for this? b. How is the outcome of the process affected if the number of processing steps are reduced while obtaining pure protein from the fermentation medium? c. Which type (recombinant insulin or cattle derived insulin) will be produced in the above depicted flow chart? d. Name a metabolite which is produced using clear broth rather than cell mass. e. How is crude protein different from the desired protein?	

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