2021

MICROBIOLOGY — HONOURS

Paper : DSE-A-1

[Microbial Biotechnology]

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.* 1** and ***any three*** from the rest.

1. Answer ***any ten*** questions : 2×10

(a) Name one non-antibiotic secondary metabolite produced by microorganism and mention its use.

(b) What is asymmetric catalysis? Give example of any one which is used in pharmaceutical and agrochemical industries.

(c) What is the main difference between miRNA and siRNA?

(d) Why is high concentration of NaCl used during elution in ion exchange chromatography?

(e) What is a peptide vaccine? How do they work?

(f) Give one therapeutic use each of Avermectins and of fungal zaragozic acids.

(g) Give an example of microbial biosensor.

(h) State the importance of cry toxins of *Bacillus thuringiensis* in agriculture.

(i) '*Agrobacterium* is nature's smallest genetic engineer.' Explain the statement in brief.

(j) Why is biomining considered to be more environment friendly than typical traditional mining techniques?

(k) What are the main problems of using bacterial cells for production of recombinant therapeutic proteins?

(l) How can the plant growth be increased under stress condition by using microbes?

(m) 'Trademark once registered is for lifelong.' Justify whether this statement is true or false.

(n) Name the enzymes involved in the production of HFCS.

(o) 'In some cases encapsulation method is advantageous over crosslinking method for enzyme immobilization.' Justify.

2. (a) Give any one example of steroid hydroxylation by fungi that is used in pharmaceutical industry.

(b) State two advantages of microbial biotransformation of steroids that make it commercially more viable than chemical synthesis.

(c) Give example of a microbial exopolysaccharide and name its producer microbe. State its commercial importance.

(d) What is microbial PHA? 2+2+(1+1+2)+2

3. (a) Active insulin is composed of two polypeptide chains held together by disulfide linkages. How was the first recombinant insulin produced in bacterial cells having highly reducing cytosol?

(b) How did protein engineering help to increase the short half life of streptokinase in vivo?

(c) What are the advantages of using bacterial cells as factories for production of therapeutics?

(d) What is immune therapy? How can that be used to treat autoimmune diseases? 3+3+2+2

4. (a) Briefly discuss miRNA processing.

(b) What is RISC?

(c) How RNAi can be used to combat drug resistance?

(d) Synthetic siRNA used as therapeutics are very prone to nuclease digestion. How can their stability be increased? 3+2+3+2

5. (a) What type of filter systems should be used to filter bacterial cultures? On what factors does the efficiency of filtration depend?

(b) State with proper justification which type of chromatography should be preferred for purification of

(i) antibiotics

(ii) an enzyme requiring NAD^+ as cofactor.

(c) How microfine particulate matter is removed from the air using whole cell immobilization? (2+2)+(2+2)+2

6. (a) What is patent information? Briefly explain the significance of using the patent information.

(b) How does a patent document help in research and development?

(c) What is Trademark? Write down any one ground for the refusal of registration of a trademark. (1+3)+2+(2+2)

7. Write short notes on (***any four***) : 2½×4

(a) Budapest Treaty.

(b) Subunit Vaccine.

(c) Microbial production of cocoa butter substitute.

(d) Production of Biogas.

(e) Recombinant hepatitis B vaccine production.