2022

MICROBIOLOGY — HONOURS

Paper : CC-10

(Recombinant DNA Technology)

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*** questions from the rest.

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

(a) What is meant by star activity of restriction enzymes? Under what conditions does it occur?

(b) State the importance of terminal deoxynucleotidyl transferase (TdT) in genetic engineering.

(c) Differentiate between cloning vector and expression vector.

(d) '*Agrobacterium* is nature's smallest genetic engineer'– Explain.

(e) A researcher wanted to study a particular enhancer element of an eukaryotic organism and started working with its cDNA library. Will the researcher be successful?

(f) What is RFLP analysis?

(g) Mention two factors that determine the rate of migration of DNA through agarose gel.

(h) Which technology helped to develop FLAVR SAVR tomato?

(i) Why is Klenow fragment often preferred to DNA polymerase I in RDT?

(j) When and how is homopolymer tailing performed?

(k) What are the characteristic features of YAC?

(l) Mention any two advantages of liposome mediated gene delivery.

(m) What is directional cloning?

(n) What is MCS in a cloning vector?

(o) Why is Taq polymerase the desired enzyme in PCR?

2. Justify whether the following statements are true or false (***any five***) : 2×5

(a) His-tagged recombinant proteins can be purified from inclusion bodies by affinity chromatography.

(b) Same specific DNA sequence, one amplified by PCR and another one isolated from a bacterial cell will have different sensitivity to restriction enzyme.

(c) Blue white screening is a method to identify recombinants from non-recombinants.

(d) YIp must always integrate in yeast chromosome.

(e) DNA desaturation is not needed in Southern blot.

(f) Attenuated mode of vaccine preparation kills the pathogen concerned.

(g) α^{32}– ATP is used for end-labelling of probes by polynucleotide kinase.

(h) End labelled primers are preferred to labelled ddNTPs in Sanger sequencing.

3. (a) What are the major difficulties encountered while expressing an eukaryotic protein in a prokaryotic system?

(b) Which promoter is used in baculovirus based vectors and why? Name a host used for these vectors.

(c) Differentiate between Taq polymerase and Pfu polymerase. Which one should be preferred for gene cloning? 3+(1+2+1)+(2+1)

4. (a) Schematically represent the steps for cDNA synthesis from the total mRNA population of a cell.

(b) How can you identify a specific gene from a genomic library?

(c) How is DNA visualised in agarose gel electrophoresis?

(d) Name one restriction enzyme that generates 5′ overhang. 3½+3½+2+1

5. (a) State the role of SDS, APS, TEMED, Glycine in SDS-PAGE.

(b) The same plasmid exhibits multiple bands in agarose gel. Explain with diagram.

(c) Why is blocking important in Western Blot?

(d) State one disadvantage of electroporation method. (1×4)+(2+1)+2+1

6. (a) Briefly mention the cloning strategy in YAC.

(b) What is the significance of Ct value in real time PCR?

(c) 'Colony PCR is a high throughput, rapid and cost-effective technique.' — Justify the statement.

(d) State the essential features of a transformation host. 3+2+3+2

7. Write short notes on ***any four*** of the following : 2½×4

(a) Viral vector mediated gene delivery

(b) DNA microarray

(c) Site directed mutagenesis

(d) Bt cotton

(e) Recombinant human growth hormone

(f) Northern blot hybridisation.
