2015

BIOCHEMISTRY

Paper – BCT–302

(Molecular Genetics)

Full Marks – 25

The figures in the margin indicate full marks

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

1. Bacteriophage T4 and T7 used two different mechanisms for injecting its own DNA. Discuss the event considering the differences in their genome organisation. 3+3

Or

2. (a) Translational repressor is different from transcriptional repressor. Justify.

(b) How using genetic mutants the first visible appearance of Synthetase proteins after Qbeta bacteriophage infection be explained? 3+3

3. What would you expect to happen when phage λ infects E. coli cells that are growing in rich medium and at the optimal temperature of 37°C — lysogeny or lysis? Explain your answer. PRE and PRM are two important promoters that are activated in the early stages of phage growth. Why these promoters are named so? How their activities are regulated ? 3+1+2

Or

4. Explain what is meant by immunization and immunity in the context of the CRISPR mediated resistance to bacteriophage attack. Why is the Type 2 CRISPR system referred to as dual RNA guided system. How can we use Type 2 system for genome engineering? 6

5. Describe with the help of a schematic diagram the steps in tumor metastasis. The major components of the invasion are cell adhesion, matrix degradation and cell motility. Discuss any two of them. 2+(2+2)

Or

6. EMT plays a critical role in early developmental processes. Briefly discuss its role in cancer metastasis. What do you mean by reactive or desmoplastic stroma ? Write down the features of tumor angiogenesis. 3+(2+1)

7. (a) How competence development in *Bacillus subtilis* is regulated by quorum sensing ? 3

(b) How would you determine if a piece of DNA contains the uptake sequence for that species ? 2

(c) A competent culture of *S. pneumonial* is mixed with ^{14}C DNA having a radioactivity of 10^4 counts per minute (cpm). After 5 minutes, the cells are centrifuged. No acid-precipitable radioactivity can be found in the supernatant fluid. How much radioactivity do you expect to find associated with the cells ? Justify your comment. 2

Or

8. (a) How does an Hfr cell differ from an F^+ cell ? 2

(b) How are F' plasmids produced ? 2

(c) Why do self-transmissible plasmids usually encode their own primase function ? How do you experimentally prove that donor cell primase can substitute the recipient primase in replication in these cells? 3