

MOLECULAR BIOLOGY

Paper 17

THEORY

(48 Periods)

Unit 1: Nucleic Acids

(6)

Salient features of DNA double helix: Watson and Crick model of DNA, DNA denaturation and renaturation; DNA topology - linking number and DNA topo-isomerases, C_{ot} curves

Unit 2: DNA Replication

(9)

Mechanism of DNA replication: Enzyme involved in DNA replication - DNA polymerases, DNA ligase, primase, topoisomerase, telomerase and other accessory proteins; Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear *ds*-DNA, Replication of the 5' end of linear chromosome

Unit 3: Transcription

(5)

RNA polymerase and transcription unit, Transcription in prokaryotes and eukaryotes

Unit 4: Translation

(10)

Structure of tRNA, Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation

Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA

(4)

Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing. Processing of tRNA

Unit 6: Gene Regulation

(10)

Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from *lac* operon and *trp* operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencers elements; Gene silencing, Genetic imprinting

Unit 7: Regulatory RNAs

(4)

Ribo-switches, RNA interference, miRNA, siRNA

MOLECULAR BIOLOGY

Paper 17

PRACTICAL

1. Preparation of liquid culture medium (LB) and raise culture of *E. coli*.
2. Estimation of the growth kinetics of *E. coli* by turbidity method.
3. Preparation of solid culture medium (LB) and growth of *E. coli* by spreading and streaking.
4. Demonstration of antibiotic sensitivity/resistance of *E. coli* to antibiotic pressure and interpretation of results.
5. To understand the structure of the *lac* operon and its working in the presence/absence of glucose.
6. Quantitative estimation of salmon sperm/calf thymus DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement).

ESSENTIAL READINGS

- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: *Molecular Biology of the Cell*, IV Edition.
- Cooper G. M. and Robert E. Hausman R. E. *The Cell: A Molecular Approach*, V Edition, ASM Press and Sinauer Associates.

SUGGESTED READINGS

- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Karp, G. (2010) *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.
- Lewin B. (2008). *Gene XI*, Jones and Bartlett