

2021**Molecular Biology & Biotechnology****[HONOURS]****Paper : II**

Full Marks : 75

Time : 4 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Write the answers to questions of each Unit in separate books.***Answer all the questions.****UNIT-I****(Cell Biology)****(Marks : 50)**

1. Answer any **two** of the following: $1 \times 2 = 2$
- What do you mean by light harvesting complex?
 - State the basic difference in the action of cohesin and condensin.
 - What are the role of Kinetochore?
 - What is Q bonding?
 - What is chromocentre?

[Turn over]

2. Answer any **five** questions: $2 \times 5 = 10$
- What is APC and how does it regulate anaphase?
 - What are apoptosome and what are caspases?
 - What are the functions of PEP carboxylase?
 - What are the main enzymes found in the stroma of C_3 plants?
 - Differentiate apoplast and symplast theory.
 - What is C value and why paradox is associated with it?
 - What are TOM and TIM complexes?
3. Answer any **three** questions: $6 \times 3 = 18$
- What are the basic differences between C_3 and C_4 plants? What are kleptoplastids? $4+2$
 - What are the physiological role of hemidesmosome? Z_{0-1} is a common protein. State its functions. What do you mean by focal contact? $3+2+1$
 - How does condensin carry out compaction of chromosome? How does phragmoplast take part in cell plate formation in plants? $4+2$
 - What is Calvin cycle? How is ATP synthesized in the light phase of photosynthesis? $3+3$

4. Answer any **two** questions: $10 \times 2 = 20$
- a) What is spectrin? What is the effect of colchicine in microtubule assembly? What is tan factor? In brief state the role of intermediate filaments in cell division.
 $2+3+2+3$
- b) Describe β -oxidation of unsaturated fatty acids. Write a note on biomedical importance of β -oxidation. What is ketogenesis?
 $6+2+2$
- c) Describe the molecular events during cell cycle progression from G to M phase.
10

UNIT-II

(Biophysics and Instrumentation)

(Marks : 25)

5. Answer any **eight** of the following: $1 \times 8 = 8$
- a) Write the principle of functioning of a 'Gas Ionization Counter' for detection of radioactivity.
- b) Why there is a deviation from Beer-Lambert's law at higher concentration of Analyte?
- c) Describe the law of Radioactive Decay.

- d) State some properties of Alpha rays.
- e) What is a state function?
- f) State the basic difference between 'RPM' and 'RCF'.
- g) What is an Isotone?
- h) Explain the thermodynamics of ATP hydrolysis.
- i) State the differences between 'Phagocytosis' and 'Pinocytosis'.
- j) Explain the phenomenon of Osmosis.
6. Answer any **six** of the following: $2 \times 6 = 12$
- a) Which kind of Electromagnetic Radiation is used in ESR-Spectroscopy? Does the type of radiation used have any effect on the applications of ESR-Spectroscopy in analysis of biological samples?
1+1
- b) What is the fundamental difference in the principle of working of 'Flame Photometry' and 'Atomic Absorption Spectroscopy'? 2
- c) Explain the second law of thermodynamics, with an example. 2
- d) What is 'Chemical Shift'? How does 'Shielding' and 'Deshielding' effect, affect 'Chemical Shift' in NMR-Spectroscopy?
1+1

- e) Explain 'Bragg's law' for X-ray diffraction. 2
- f) Explain the differences between an 'Enthalpy driven process' and an 'Entropy driven process'. 2
- g) Describe the functioning of a 'Liquid Scintillation Counter' used for detection of radioactivity. 2
- h) How 'Mass Spectrometry' can be used in sequencing of proteins? 2

7. Answer any **one** of the following: 5×1=5

- a) What is 'London dispersion force'? State 'Pauli's exclusion principle'. Explain the difference between 'Nuclear Spin' and 'Electron Spin'. In order to prepare a protein sample for denaturing (SDS) PAGE, SDS (detergent), β-Mercaptoethanol (reducing agent) and heat is used. Which kinds of chemical bonds are disrupted by the above chemicals and heat in the protein sample? 1+2+2
- b) What is the significance of 'Clathrin Coated Vesicles'? How 'Specific Cargo' in the vesicle is selected for transport? What is the role of 'SNARE Proteins' in vesicle targeting? 1+2+2

- c) State Fick's law of Diffusion. How 'Dynamic Light Scattering' (DLS) can be used to determine the hydrodynamic radius of a molecule? Based on the principle of the technique, explain why 'Gel-Filtration' chromatography is also called 'Size Exclusion' chromatography. 1+2+2
