

3 Hours

(100 Marks)

Instructions: Please check that you have received the correct question paper

- (i) All questions are compulsory.
- (ii) Choice is internal
- (iii) Figures to the right indicate full marks.
- (iv) Draw structures and diagrams wherever necessary.

Q.1 A) Name the physicochemical property associated with the following scientists: (04)

- (i) Adolf Fick (ii) Poiseuille (iii) Du Noüy (iv) Jacobus Van't Hoff

Q.1 B) Answer any three of the following: (09)

- (i) Explain the applications of viscosity.
- (ii) Define Ionic strength. Calculate the ionic strength of 0.5 M CaCl_2 .
- (iii) Discuss reverse osmosis and its applications.
- (iv) Write a note on protective colloid.
- (v) What is normality? Calculate the amount of potassium dichromate required to prepare 500 ml of 0.05 N solution for estimation of COD of water. (MW of potassium dichromate=294)
- (vi) Differentiate between active and passive transport.

Q.1 C) Answer any two of the following: (12)

- (i) Explain renal dialysis.
- (ii) Give an account of properties of lyophilic and lyophobic sol.
- (iii) Describe Donnan membrane equilibrium and explain its relation with osmotic pressure.
- (iv) "Bile helps in digestion" – Justify. Elaborate on the factors which may affect the process.

Q.2 A) State True or False: (04)

- (i) Liquid shear techniques use water as an abrasive material in order to break the microbial cells.
- (ii) *C. elegans* is a model organism for study of genetics of regeneration and healing.
- (iii) Phosphate buffer was designed to approximate ionic composition of mammalian serum.
- (iv) High temperature is used as a technique to separate cells.

Q.2 B) Answer any three of the following: (09)

- (i) Justify the statement using examples: "Selection of suspending medium is crucial for biochemical investigations".
- (ii) State TRUE or FALSE giving reasons: "Fishes cannot be used as a model organism".
- (iii) Discuss in short giving examples on "Biochemical methods for shearing are better than physical methods".
- (iv) Briefly explain a technique that uses high pressure for cell disruption.
- (v) What is 'Salt Fractionation'? Add a note on its applications.
- (vi) Give the advantages and disadvantages of *Drosophila melanogaster* as a model organism.

Q.2 C) Answer any two of the following: (12)

- (i) With the help of a schematic representation depict path analysis of a biochemist's approach to study exogenous compound.
- (ii) Give a detailed account of cell counting and sizing techniques.

- (iii) Discuss the role of the following in biochemical investigations: (a) Ultrasonicator
(b) Organic solvents (c) Enzymes.
- (iv) Write an elaborate note on different techniques of membrane separation.

Q.3 A) Match the following:**(04)**

Column A	Column B
(i) Dark field microscope	a) Polarizer
(ii) Fluorescent microscope	b) Laser light source
(iii) DIC microscope	c) Carbon arc lamp
(iv) Confocal microscope	d) UV halogen lamp
	e) Normal sunlight
	f) Electron gun

Q.3 B) State true or false, giving reasons: (Any three)**(09)**

- (i) Higher numerical aperture, better is the resolution.
- (ii) Phase contrast microscopy is useful for observing gram stained bacteria.
- (iii) Red colour of light gives better resolution.
- (iv) Confocal microscopy is useful for live cell imaging.
- (v) Any sample slide can be observed by electron microscope.
- (vi) Fluorescence microscope has a special type of condenser.

Q.3 C) Answer any two of the following:**(12)**

- (i) Elaborate on the similarities and dissimilarities between light and electron microscopy.
- (ii) Describe any two fluorescence microscopic techniques mentioning components and applications.
- (iii) Give comparative account of bright field, dark field and phase contrast microscopy.
- (iv) Discuss **any four** techniques used for sample preparation for electron microscopy.

Q.4 A) Define any five of the following:**(10)**

- (i) Autoradiography (ii) Magnification (iii) Complex media (iv) Electron gun
- (v) Perfusion (vi) Dynamic equilibrium (vii) Coefficient of viscosity

Q4 (B) Answer any three of the following:**(15)**

- (i) Why immersion oil is necessary for 1000X but not with lower power objective? Would you use standard immersion oil on the plastic slide? Explain.
- (ii) List the properties of light. Explain how they are useful for observing small objects?
- (iii) Write an informative note on routes of administration in whole plant studies. Add a note on *Arabidopsis* as a model organism.
- (iv) Give a detailed account of use of radioactive compounds in biochemical studies.
- (v) Explain the factors affecting diffusion.
- (vi) Explain the principles of measurements of surface tension.