

M.SC. CHEMISTRY
FOURTH SEMESTER
ADVANCED PHYSICAL CHEMISTRY
MSC - 402C

**SET
A**

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs

Full Marks: 70

Time: 30 min.

(Objective)

Marks: 20

Choose the correct answer from the following:

1×20=20

- With increase in dilution, degree of dissociation for weak electrolyte-
 - Increases
 - Decreases
 - First increases then decreases
 - None of the above
- At infinite dilution, the ratio of degree of ionization for strong and weak electrolyte is-
 - 1
 - >1
 - <1
 - 0.5
- The ionic mobility of Na⁺ is more than Li⁺ due to -
 - Small size
 - High atomic mass
 - Smaller hydration sphere
 - None of the above
- Ag/AgCl electrode is an example of-
 - Polarizable electrode
 - Semi-polarizable electrode
 - Non-Polarizable electrode
 - Calomel electrode
- The curve obtained from polarography is-
 - Linear
 - Exponential
 - Hyperbolic
 - Sigmoid type
- Migration of charged particles through a solution with the influence of electric field is known as-
 - Osmosis
 - Electrolysis
 - Electrophoresis
 - Diffusion
- The glass transition temperature of polymer can be determined by
 - Differential scanning Calorimetry
 - Gel Permeation Chromatography
 - X-ray Diffractometer
 - Dynamic Mechanical Analysis
- Limiting Oxygen test is performed to study the
 - Chemical Resistance
 - Flammability
 - Thermal resistance
 - Rheology of the polymer
- Stress-strain curves of a polymeric material gives the idea about
 - Young's modulus
 - Yield strength
 - Ultimate tensile strength
 - All of the above

10. The study of flow and deformation of polymers with temperature is studied using
 a. Dynamic Mechanical Analyzer b. Rheometer
 c. Elemental Analyzer d. None of the above
11. The molecular weight of polymer can be determined by
 a. Thermogravimetric Analysis (TGA) b. Gel Permeation Chromatography
 c. Elemental Analyzer d. NMR spectroscopy
12. Match the polymer of column I with correct monomer of column II.

Column I	Column II
(i) High density polythene	(a) Isoprene
(ii) Neoprene	(b) Tetrafluoroethene
(iii) Natural rubber	(c) Chloroprene
(iv) Teflon	(d) Acrylonitrile
(v) Acrilan	(e) Ethene

- a. (i)- (e)
 (ii)- (a)
 (iii)- (c)
 (iv)- (d)
 (v) - (b)
- b. (i)- (e)
 (ii)- (c)
 (iii)- (a)
 (iv)- (b)
 (v) - (d)
- c. (i)- (e)
 (ii)- (d)
 (iii)- (a)
 (iv)- (b)
 (v) - (c)
- d. (i)- (d)
 (ii)- (c)
 (iii)- (b)
 (iv)- (a)
 (v) - (e)
13. Bakelite is an example of
 a. Thermosetting plastic which is prepared from styrene and butadiene.
 b. Thermoplastic which is prepared from phenol and formaldehyde
 c. Thermosetting plastic which is prepared from phenol and formaldehyde
 d. Thermoplastic which is prepared from styrene and butadiene
14. Which of the following materials exhibits ferromagnetism at room temperature?
 a. Aluminum b. Copper
 c. Iron d. Silicon
15. The phenomenon in which a material becomes magnetic when an external magnetic field is applied and loses its magnetism when the field is removed is called
 a. Diamagnetism b. Paramagnetism
 c. Ferromagnetism d. Antiferromagnetism
16. In a P-N junction diode, what type of charge carriers are found in the P-type region?
 a. Electrons b. Holes
 c. Protons d. Neutrons

17. Which of the following materials is a typical insulator?
 - a. Silicon
 - b. Diamond
 - c. Graphite
 - d. Gold
18. What effect explains the generation of an electric field in a material upon application of mechanical stress?
 - a. Photoelectric effect
 - b. Thermoelectric effect
 - c. Piezoelectric effect
 - d. Hall effect
19. Which type of magnetism is characterized by the alignment of magnetic moments in parallel and anti-parallel arrangements?
 - a. Diamagnetism
 - b. Paramagnetism
 - c. Ferromagnetism
 - d. Antiferromagnetism
20. Which material exhibits strong magnetic properties and can be permanently magnetized?
 - a. Diamagnetic
 - b. Paramagnetic
 - c. Ferromagnetic
 - d. Non-magnetic

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(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1.
 - a. What is interionic effect? 2+2+3+3
=10
 - b. State different types of polarography.
 - c. Why it is very much essential to study the thermal properties of a polymer? Explain the thermal resistance properties with the help of a thermogravimetric curve.
 - d. Describe the phenomenon of Anti-ferromagnetism. Discuss the key properties of Anti-ferromagnetic materials
2.
 - a. Explain capillary electrophoresis. 2+3+2+3
=10
 - b. What are the differences between polarizable and non-polarizable electrode?
 - c. Why dropping mercury electrode (DME) is used in polarography?
 - d. Explain electrophoretic and asymmetric effect.

3. a. What are the key criteria of Debye-Huckel theory for strong electrolytes? 3+3+2+2
=10
- b. Explain the effect of dilution on weak electrolyte. How at infinite dilution this effect becomes comparable with that of strong electrolyte?
- c. What is electrical double layer (EDL)?
- d. Explain the term 'ionic doublet' with reference from Debye-Huckel theory.
4. a. Write about the key contributors to resistivity. 3+3+2+2
=10
- b. Explain in detail about band theory.
- c. Draw the formation of P-N junction showing all the regions.
- d. Write about four applications of Superconductors.
5. a. Describe diamagnetic, paramagnetic, ferrimagnetic and ferromagnetic materials and their properties. How do they respond to external magnetic fields? 5+2+2+1
=10
- b. Explain two application of p-n junction.
- c. What are type I and type II superconductors.
- d. What is Meissner effect?
6. a. Write the procedure of chemical resistance and water resistance study of a polymer. 3+2+4+1
=10
- b. How morphology of a polymer can be determined. Explain.
- c. Explain the different phase transitions shown by BaTiO₃. What are the coordination numbers of Ba, Ti and O - atom in BaTiO₃?
- d. What do you mean by Electro-luminescence?
7. a. With the help of stress-strain curve explain the properties of a polymer? 3+2+3+2
=10
- b. How the UV stability of a polymer can be improved. Explain.
- c. Which analytical instruments are mainly used to determine the mechanical properties? Describe the different techniques used for the determination of mechanical strength of a polymer.
- d. What are the applications of cyclic voltammetry?

8. a. What do you understand by UV stability of polymer? Explain the methodologies to determine the UV stability of a polymer?
- b. Explain the procedure to determine the chemical resistance properties of a polymer?
- c. What is photodegradation and Ultrasonic degradation of polymers? Explain.
- d. Write the applications of HDPE, LDPE, PV and Bakelite.

3+2+3+2
=10

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