

CLASS: M.Sc. CHEMISTRY

15A / 260

St. JOSEPH'S COLLEGE (AUTONOMOUS) TIRUCHIRAPPALLI – 620 002

SEMESTER EXAMINATIONS – APRIL 2015

TIME: 3 Hrs.

MAXIMUM MARKS: 100

SEM	SET	PAPER CODE	TITLE OF THE PAPER
IV	2013	12PCH4117	PHYSICAL CHEMISTRY – IV

SECTION – A

Answer all the questions:

20 x 1 = 20

Choose the correct answer:

- Residual current encountered in polarography is due to
 - Diffusion
 - migration
 - convection
 - impurities of supporting electrolyte
- The increase in scan rate will alter the cyclic voltammogram in terms of
 - current
 - potential
 - $E_{1/2}$
 - none of the above
- The important difference between MO and VB theory is
 - ionic contribution
 - energy
 - overlap integral
 - coulomb integral
- The value of the term $(-1/2)$ in the energy expression of hydrogen molecule indicates
 - stability
 - hydrogen atom
 - molecular orbital
 - all the above
- Living polymer is a term associated with _____ polymerization.
 - Free radical
 - cationic
 - anionic
 - emulsion

Fill in the blanks:

6. Triton – X100 is a commercial substance used as _____.
7. The half wave potential is derived based on _____ equation.
8. The number of hybrid orbitals present in C_2H_6 is _____.
9. The element H_{12} of benzene in the secular determinant is _____.
10. The polymer which can be moulded and remoulded any no of times is called _____.

Answer in one or two sentences:

11. Write down illkovic equation.
12. What is counter electrode?
13. Define faradays second law.
14. Mention two characteristics of metal deposits.
15. What is perturbation?
16. What is kinetic chain length?
17. Define degree of polymerization.
18. Is He_2 a stable molecule?
19. What is exchange integral?
20. What is Ultracentrifugation?

SECTION – B

Answer all the questions:

5 x 6 = 30

21. a. Neatly draw a cyclic voltammogram and explain the various significant data that can be derived from it.

OR

- b. With a neat sketch explain the instrumentation of cyclic voltammetric technique.

22. a. When same quantity of electricity is passed through Ag.AgNO₃ & CuSO₄, 3.175g of Ag and 1.078g of Cu are deposited. Calculate equivalent weight of Cu if the equivalent weight of silver is 107g.

OR

- b. What are coupled chemical reactions? What are their types?
23. a. Derive the expression for the wave function of sp hybridization of BeH₂.

OR

- b. Write a note on coulomb integral of H₂ according to VB theory.
24. a. Write the variation principle and arrive at its proof.

OR

- b. Write a short not on Born-open heimer approximation.
25. a. What is thermogravimetric analysis? Write the application of TGA with reference to polymers.

OR

- b. Explain average molecular weight determination by osmotic pressure method.

SECTION – C

Answer any FIVE questions:

5 x 10 = 50

26. a. Write a short notes on the various types of current encountered in Polarography. (8)
- b. What are the requisites for a reservisible electrochemical couple? (2)
27. a. What are amperometric titrations? Explain with the neat sketch the various types of Amperometric titrations. (8)

- b. What are the advantages of DME? (2)
28. Explain the following
- (i) Principle and experiment setup of controlled potential Coulometry. (6)
- (ii) What are the factors which affect the physical characteristics of metal deposits? (4)
29. Determine the molecular orbitals that correspond to E_+ and E_- of hydrogen molecular ion.
30. State the assumptions of Huckel molecular orbital theory and derive the expression for the energy of butadiene.
31. a. Explain in detail the kinetics of free radical polymerization.(8)
- b. What is glass transition temperature? (2)
