

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2015**Fourth Semester**

Complementary : Chemistry—ADVANCED PHYSICAL CHEMISTRY—II

(For students who have opted Physical Sciences and Geology as main)

[Prior to 2013 Admissions]

Time : Three Hours

Maximum Weight : 25

Section A*Answer all questions.*** Each bunch of four questions carries a weight of 1. **

- I. 1 The vibrational spectra of molecules are obtained in _____ region.
2 A molecule which rotates such that its internuclear bond distances do not change during rotation is called a _____.
3 Zero point energy is _____.
4 Mathematical expression of Faradays first law of electrolysis is _____.
- II. 5 In electrolytic conduction, flow of electricity is due to flow of _____.
6 A Galvanic cell is a device in which _____ energy is converted into electrical energy by redox reaction.
7 For a spontaneous cell reaction, the e.m.f. of the cell should be _____.
8 One example for Auxochrome is _____.
- III. 9 One concentration cell is _____.
10 Give the oxidation no of chromium in $K_2Cr_2O_7$.
11 One example of Bioluminescence is _____.
12 What do you mean by Blue Shift ?
- IV. 13 Quantum yield is _____.
14 Selection rule for vibrational spectrum obeying Harmonic oscillator is _____.
15 Define electrochemical equivalent.
16 One Redox indicator is _____.

(4 × 1 = 4)

Turn over

Section B

Answer any five questions.

Each question carries a weight of 1.

- 17 Which of the following molecules will be microwave active :—
 CO_2 , CO , H_2 , HCl . Give reason for your answer.
- 18 Sketch the fundamental modes of vibration of H_2O molecule and explain its IR activity.
- 19 Aqueous solution of copper sulphate is acidic. Give reason.
- 20 How do specific and molar conductance vary on dilution. Give reason for your answer.
- 21 What is Fluorescence, explain ?
- 22 What is Quin-hydrone electrode ?
- 23 What do you mean by liquid junction potential ? How can it be eliminated ?
- 24 State and explain Oswald's dilution law.

(5 × 1 = 5)

Section C

Answer any four questions.

Each question carries a weight of 2.

- 25 What are Fuel cells ? How is hydrogen oxygen fuel cell constructed ?
- 26 (a) State Frank-Condon principle.
(b) What is chemi Luminescence, explain ?
- 27 Discuss any two methods used for the determination of order of reaction.
- 28 State Kohlrausch's law and explain any two applications of the law.
- 29 Give one oxidation reduction titrations and give the reactions involved in it.
- 30 Discuss the principles of the following conductance titration :—
 - (i) $\text{HCl} \times \text{NaOH}$.
 - (ii) $\text{CH}_3\text{COOH} \times \text{NaOH}$.

(4 × 2 = 8)

Section D

Answer any two questions.

Each question carries a weight of 4.

- 31 Define Transport number. How will you determine the transport number of an ion by Hittorf's method ?
- 32 Describe glass electrode and explain how it can be used to measure the pH of a solution.
- 33 (a) Explain how rotational spectroscopy can be used to calculate the bond lengths in Diatomic molecules.
(b) What are the different fundamental modes of vibration of CO_2 molecule. Classify them as IR active and IR inactive. Give reason for your answer.

(2 × 4 = 8)