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Reg. No. | | | | | | | | | |

V Semester B.Sc. Degree Examination, March - 2021

CHEMISTRY

Physical Chemistry

(CBCS - 2020 - 21 Onwards)

Paper : VI

Time : 3 Hours **Maximum Marks : 70**

***Instruction to Candidates*:**

1) The question paper has two parts. Answer both the parts.
2) Draw diagrams and chemical equations wherever necessary.

PART - A

Answer any **Eight** of the following questions. Each question carries **Two** marks. **(8×2=16)**

1. Give any two limitations of standard hydrogen electrode.
2. What is salt bridge? Mention its importance.
3. The limiting ionic conductance for Na^+ ion is 4.929×10^{-3} s m^2 mol^{-1}. Calculate the ionic mobility of Na^+ ion. (F=96500C).
4. What are concentration cells?
5. What are the advantages of potentiometric Titration?
6. What is half-wave potential? Mention its significance.
7. Calculate the number of vibrational degrees of freedom for a water molecule.
8. Carbon monoxide is microwave active but oxygen molecule is microwave inactive. Give reason.
9. Write claussius - Mossotti equation and indicate the terms involved in it.
10. Why excess of hydrochloric acid is added prior to H_2S gas during the detection of second group basic radicals in the inorganic qualitative analysis?
11. Explain the term piezoelectricity.
12. What is cyclic voltammogram?

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PART - B

Answer any **Nine** of the following questions. Each question carries **Six** marks. **(9×6=54)**

13. a) Explain the method of determination of transport number of H^+ and Cl^- ions in hydrochloric acid by the moving boundary method.

b) Define the term molar conductance.

(4+2)

14. a) How is emf of a cell experimentally determined by Poggendorff's compensation method?

b) The standard electrode potentials of zine and copper electrodes in their salt solutions are -0.76v and +0.34v respectively. Calculate emf of the Daniel cell.

(4+2)

15. a) Derive Nernst equation for single electrode potential, thermodynamically.

b) Mention two limitations of Arrhenins theory of electrolytic dissociation.

(4+2)

16. a) With a neat labelled diagram, explain construction and working of calomel electrode.

b) Define the term, standard electrode potential.

(4+2)

17. a) State Kohlransch's law. Calculate λ_∞ for NH_4OH, if the molar conductances for Nacl, NH_4Cl and NaOH at infinite dilution are 12.6×10^{-3}, 15.0×10^{-3} and 24.82×10^{-3} sm^2 mol^{-1} respectively.

b) How do you set up a quinhydrone electrode? Represent it symbolically.

(4+2)

18. a) Explain acid-base theory of indicators by taking phenolphthalein as an example.

b) Define: dipole moment. Mention its SI unit.

(4+2)

19. a) Derive Henderson's equation for calculation of pH of an acid buffer.

b) What is Thomson effect?

(4+2)

20. a) Derive the relationship between internuclear distance and moment of inertia for a rigid rotor diatomic molecule.

b) State Born - Oppenheimer approximation.

(4+2)

21. a) Explain Raman Scattering and differentiate between stoke's and antistokes lines.

b) What are the selection rules for molecular transition between rotational and vibrational levels.

(4+2)

22. a) Calculate the Force constant and zero point energy for carbon monoxide if $\bar{\omega}_{osc} = 219 m^{-1}$. Given: h=6.627×10^{-34}Js, C=3×10^{8}m/s and $\mu = 11.39 \times 10^{-28} kg$.

b) Mention any two advantages of Raman Spectra over IR spectra.

(4+2)

23. a) Differentiate between paramagnetic and Ferromagnetic substances. Give one example for each type.

b) What is Seebeck effect?

(4+2)

24. a) Draw the current - potential curve for an electrochemical reaction taking place at dropping mercury electrode and explain the different types of currents.

b) Write Ilkovic equation and indicate the terms.

(4+2)

25. a) Name the different types of molecular spectra and mention the region of electromagnetic spectrum in which they appear.

b) Explain why only two absorption bands are observed in IR spectrum of Co_2 instead of Four.

(4+2)