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V Semester B.Sc. Examination, December - 2019
(CBCS) (F+R) (2016-17 and Onwards)
CHEMISTRY
Physical Chemistry Paper - VI

Time : 3 Hours Max. Marks : 70

Instructions : *(i) The question paper has **two** parts. Answer **both** the parts.*
(ii) Draw diagrams and write chemical equations wherever necessary.

PART - A

Answer **any eight** of the following questions. Each question carries **two** marks. **8x2=16**

1. What is Transport number of ion ?

2. What are concentration cells ?

3. Mention two advantages of conductometric titration.

4. The specific conductance of 0.1 M solution of an electrolyte at a given temperature is 0.5092 $\Omega^{-1}m^{-1}$. Calculate its molar conductance.

5. Give two limitations of standard hydrogen electrode.

6. Write clausius-Mosotti equation and explain the terms involved in it.

7. Write the selection rule for rotational and vibrational transitions.

8. What is solubility product of a sparingly soluble salt ?

9. Name the region of electromagnetic spectrum in which rotational spectrum and vibrational spectrum occur.

10. State Hooke's Law.

11. What are inelastic collisions ?

12. Give any two applications of polarography.

P.T.O.

PART - B

Answer **any nine** of the following questions. Each question carries **six** marks. **9x6=54**

13. (a) Describe the principle involved in the conductometric titration of strong acid versus weak base graphically. **4+2**

(b) The Molar conductance of infinite dilution for NaCl, NH_4Cl and NaOH are 12.6×10^{-3}, 15.0×10^{-3} and 24.81×10^{-3} S m^2 mol^{-1} respectively. Calculate the λ_∞ of NH_4OH.

14. (a) State Kohlrausch's Law. Describe the determination of solubility of AgCl from conductance measurement. **4+2**

(b) Define standard electrode potential.

15. (a) Mention any four limitations of Arrhenius theory. **4+2**

(b) The transport number of NO_3^- ion at infinite dilution in $AgNO_3$ is 0.52. The molar conductivity of $AgNO_3$ at infinite dilution is 12.0×10^{-3} S m^2 mol^{-1}. Calculate the ionic conductance of NO_3^- ion at infinite dilution.

16. (a) Describe the determination of pH of a solution using quinhydrone electrode. **4+2**

(b) What is liquid junction potential ? How it is eliminated ?

17. (a) The emf of a cell $Ag|AgCl(s)$, 0.01M KCl$||$0.01M $AgNO_3|Ag$ was found to be 0.455 V at 298 K. Calculate the solubility product and solubility of AgCl. **4+2**

(b) Write Nernst equation for single electrode potential and explain the terms.

18. (a) Derive Henderson - Hasselbakh equation for acidic buffer. **4+2**

(b) Explain why phenolphthalein is not a suitable indicator in the titration of ammonium hydroxide and hydrochloric acid.

19. (a) Define : **4+2**

(i) Pyroelectricity (ii) Piezoelectricity

(iii) Peltier effect (iv) Seebeck effect

(b) Mention any two applications of semiconductors.

20. (a) What are paramagnetic and diamagnetic substances ? Give two examples for each type. **4+2**

(b) State Born-Oppenheimer approximation.

21. (a) The separation of rotational spectral lines occurred 332 m^{-1} for NO molecule. Calculate the internuclear distance.
Reduced mass of NO $= 1.24 \times 10^{-26}$kg $h = 6.626 \times 10^{-34}$Js
$C = 3 \times 10^8$ ms^{-1}. **4+2**

(b) H_2 does not show rotation spectrum while HCl shows rotation spectrum. Give reason.

22. (a) Derive an expression for vibrational energy levels of SHO (Simple Harmonic Oscillator). **4+2**

(b) Define zero point energy of a vibrating molecule. Give its equation.

23. (a) Write any four advantages of Raman spectroscopy over IR spectroscopy.

(b) The reduced mass of a diatomic molecule is 2.5×10^{-26} kg and its vibrational frequency is 29×10^4 m^{-1}. Calculate its force constant. **4+2**

24. (a) Explain in brief : stokes and antistokes lines. **4+2**

(b) Give any two applications of Raman spectroscopy.

25. (a) Define the terms : (i) Diffusion current **4+2**
(ii) Half wave potential

(b) Write two advantages of using Dropping Mercury Electrode (DME).

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