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Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics

CH 1331.1 : PHYSICAL CHEMISTRY II

(2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark.

1. What happens to the most probable velocity of a gas with increase in temperature?
2. Define unit cell.
3. What is the SI unit of van der Waals constant 'a'?
4. Give one example for zero order reaction.
5. What is the unit of rate constant for the second order reactions?
6. Find the point group for BF_3 .
7. State Grotthuss Draper law.
8. Give one example for photo sensitizer.

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9. Name one redox electrode.
10. Name two elements of symmetry.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. What is the RMS velocity of O₂ at 25° C?
12. Define the term critical temperature of gas.
13. Distinguish between amorphous and crystalline solids.
14. Derive relationship between molecular velocities.
15. At what angle would be the second order diffraction be observed in X-ray diffraction of a set of crystal planes for which d is $2.06 \times 10^{-10} m$, if the wavelength of X-ray used is $1.54 \times 10^{-10} m$.
16. Derive Michaelis Menten constant K_M for enzyme catalysis.
17. What is liquid junction potential and how it can be eliminated?
18. Explain one method for determination of the order of the reactions.
19. In a Lambert-Beer cell, the aqueous solutions of a substance of known concentration absorbs 10 per cent of the incident light. What fraction of the incident light will be absorbed by the same solution in a cell five times long?
20. What are the characteristics of a reversible electrode?
21. Write a brief notes on chemiluminescence.
22. What are the advantages of using calomel electrodes as reference electrode?.
23. Draw the conductometric titration curve for weak acid and strong base.

24. What are the significance of Van der Waals constants a and b ?
25. What are Weiss indices?
26. Differentiate between order and molecularity.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

27. Explain redox potentiometric titrations.
28. Using van der Waals equation, calculate the pressure exerted by 1 mole of a gas enclosed in a 1.5 dm^3 flask at 400 K, $a = 3.0 \text{ atm dm}^6 \text{ mol}^{-2}$; $b = 0.05 \text{ dm}^3 \text{ mol}^{-1}$.
29. Write any two factors that affect the EMF of the cell.
30. Write Linde's process for the liquefaction of gases.
31. State two laws of crystallography.
32. Derive third order integrated rate equation.
33. Discuss the influence of temperature on reaction rates.
34. How to determine transport number by Hittorf's method.
35. Distinguish between phosphorescence and fluorescence.
36. Sketch the (100), (110) (200) and (111) planes of a primitive cubic lattice.
37. A first order reaction is 20 % complete in 15 minutes at 40°C and in 3 minutes at 60° . Calculate energy of activation of a reaction.
38. Write a brief note on photosensitization in photochemistry.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

39. (a) Discuss the crystal structure of NaCl. 8
(b) Explain collision theory of reacting rate. 7
40. (a) Briefly explain mean free path of a gas molecule and show how it varies with temperature and pressure. 7
(b) Explain concentration cell without transference. 8
41. (a) What is meant by standard electrode? Describe the construction and working of a calomel electrode. 10
(b) Calculate the EMF of the cell $Cu / Cu^{2+}(0.25 M) // Ag^+(0.6 M) / Ag$ at 298 K, given $E_{Cu / Cu^{2+}}^0 = 0.34 V$ and $E_{Ag / Ag^+}^0 = 0.80 V$ 5
42. (a) Discuss the photochemistry of H_2-Br_2 reaction. 8
(b) What are the general characteristics of catalytic reactions? 7
43. Discuss the method of determination of Arrhenius parameters.
44. (a) What are the elements of symmetry present in group theory? 8
(b) Construct group multiplication table for H_2O molecules. 7

(2 × 15 = 30 Marks)