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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

(2020 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

Answer **all** question in a word or **one** or **two** sentences. **Each** question carries **1** mark.

1. What is collision frequency?

2. Give the mathematical expression for RMS velocity.

3. Define space lattice.

4. A lattice plane intercepts the three crystallographic axes at multiples of unit distances 3/2, 2 and 1. Find Miller indices.

5. Name a redox electrode?

6. Write Nernst equation and explain the terms.

7. What is the unit of rate constant of first order reaction?

8. Write Beer-Lambert's law.

P.T.O.

9. Explain plane of symmetry with an example.

10. The order of the C_{2v} point group is —————.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

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

11. What is meant by Boyle temperature of a gas?

12. Distinguish between ideal and real gases.

13. What is meant by the term Bravais lattices? How many Bravais lattices are possible in crystal systems?

14. The diffraction of a crystal with X-rays of wavelength 2.29×10^{-10} m gives a first order reflection at 30°. Calculate the distance between the lattice planes.

15. Define transport number.

16. Discuss the functions of salt bridge.

17. Describe calomel electrode.

18. What are the different types of catalysis?

19. Explain Grotthus-Draper Law.

20. Differentiate between fluorescence and phosphorescence.

21. How order is different from molecularity?

22. Give Arrhenius equation and explain the terms.

23. What is meant by pseudo-order reaction? Give an example.

24. What are promoters in catalysis? Give an example.

25. Explain proper and improper axis of symmetry.

26. What is an identity operation

<div align="right">(8 × 2 = 16 Marks)</div>

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SECTION – C

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

27. Give a brief account of Maxwell's distribution of molecular velocities. Give the relationship between RMS velocity and density?

28. Derive the relationship between Van der Waals constants and critical constants.

29. Discuss the powder method of X ray diffraction of crystal?

30. Sodium (Atomic Mass=23) crystalizes with a bcc structure. Calculate the number of unit cells in 9.2 g of sodium?

31. Write a short note on concentration cells.

32. Discuss potentiometric titrations.

33. Describe moving boundary method for the determination of transport number.

34. Explain the theories of catalysis with suitable examples.

35. Define quantum efficiency. Explain the abnormality in quantum yield of H_2-Cl_2 reaction.

36. Explain the Collision theory of reaction rates.

37. Write a short note on chemiluminescence and photosensitization.

38. Construct the group multiplication table for water molecule.

(6 × 4 = 24 Marks)

SECTION – D

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

39. What is Joule Thomson effect? Describe Linde's and Claude's method for liquefaction of gases.

40. (a) Explain enzyme catalysis with two examples? **5**

    (b) Derive Michaelis-Menton equation. **10**

41. (a) Derive an expression for rate constant of a first order reaction. **10**

    (b) A first order is 40% complete in 50 min. How long will it take for the reaction to be 80% complete? **5**

42. Write short notes on

    (a) Bravais Lattice **4**

    (b) Crystal structure of NaCl **4**

    (c) Bragg Equation. **7**

43. Write a note on

    (a) Conductometric titration

    (b) Fuel Cells

    (c) Nernst equation

44. (a) What are the symmetry elements present in NH_3 and BF_3 molecules. Find out their appropriate point groups. **10**

    (b) What are point groups? Explain D_{3h} point group with a suitable example. **5**

(2 × 15 = 30 Marks)

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