Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, March 2022

First Degree Programme under CBCSS

Chemistry

Complementary Course for Botany

CH 1331.3 — PHYSICAL CHEMISTRY

(2020 Admission)

Time : 3 Hours　　　　　　　　　　　　　　　　　　　Max. Marks : 80

PART – A

Answer **all** questions. One word type. Each question carries **1** mark.

1. What is meant by bathochromic shift?

2. What are isotonic solutions?

3. What is a sol? Give one example.

4. Why TMS is used as reference compound in NMR spectroscopy?

5. Benzene, Naphthalene and Anthracene among this, which molecules have the lowest electronic transitions. Why?

6. The half-life of a given reaction is doubled if the initial concentration of the reactant is doubled. What is the order of the reaction?

7. Calculate the pH of a 0.01 M HCl solution.

8. What is meant by buffer capacity?

9. Define critical solution temperature.

10. Give two examples each for Lewis acids and bases.

$(10 \times 1 = 10$ Marks$)$

PART – B

Answer **any eight** questions. Short answer type. Each question carries **2** marks.

11. Differentiate between order and molecularity of a chemical reaction.

12. Give an example of zero order and first order reactions, justify the answer.

13. A first-order reaction was 25 percent complete in 10 minutes. What is the rate constant of the reaction?

14. Describe two applications for osmotic pressure.

15. The resulting solution when sodium acetate is dissolved in water is basic. Why?

16. Explain the term distribution coefficient.

17. What are azeotropes?

18. What are the conditions of validity for Nernst distribution law?

19. What are the conditions for a nucleus to be NMR active?

20. What are chromophores and auxochromes? Give examples.

21. What is vant-Hoff equation for dilute solutions?

22. Distinguish between ideal and non-ideal solutions.

23. Discuss the Bredig arc method for the preparation of colloids.

24. Arrange the following molecules in the order of coagulation ability of negatively charged sol KCl, $MgCl_2$ and $AlCl_3$ and justify.

25. Explain why the addition of a non-volatile solute increases the boiling point of a liquid.

26. What are colligative properties? Give examples.

$(8 \times 2 = 16 \text{ Marks})$

PART – C

Answer **any six** questions. Short essay type. Each question carries **4** marks.

27. Derive integrated rate equation for first order reaction.

28. The rate constants of a reaction at 500 K and 700 K are $0.02s^{-1}$ and $0.07s^{-1}$ respectively calculate the activation energy.

29. What is heterogeneous catalysis? Discuss with examples.

30. Derive Henderson equation for basic buffer.

31. Prove that pKw = 14. Derive relationship between pKa, pKb and pKw.

32. Discuss the principle of steam distillation.

33. Discuss the phase diagram of phenol-water system.

34. Define molar extinction coefficient. How it relates to the concentration of molecules.

35. Sketch the schematic NMR spectrum of CH_3CH_2OH TMS as reference.

36. The depression of freezing point of a solution containing 3 gm of a solute in 22 gm of water is 1.45 K. Determine molecular mass of solute? (Kf = 1.86 KKg/mol)

37. Briefly discuss about the electrical double layer and how it relates to zeta potential.

38. How does reverse osmosis work?

$(6 \times 4 = 24 \text{ Marks})$

PART – D

Answer **any two** questions. Long essay type. Each question carries **15** marks.

39. (a) What is meant by rate of reaction? How temperature affects the rate of reaction? How.

    (b) How collision theory explains reaction rate?

40. What are abnormal colligative properties? Discuss its causes and derive Van't Hoff factor in each case.

41. (a) Discuss the applications of UV spectroscopy.

    (b) Discuss the principle of MRI.

42. Discuss the optical, kinetic and electrical properties of colloids.

43. (a) Describe the process of fractional distillation of completely miscible liquid pairs. (10)

    (b) Discuss the applications of solvent extractions. (5)

44. (a) What is a buffer solution and buffer action. Discuss the different types of buffer solutions with examples.

    (b) Derive the salt hydrolysis constant for NH_4Cl and CH_3COONa.

(2 × 15 = 30 Marks)

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