Reg. No. : ....

Name : ....

Second Semester B.Sc. Degree Examination, September 2022

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics

CH 1231.1 – PHYSICAL AND INDUSTRIAL CHEMISTRY

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **1** mark.

1. Give an example for ore of aluminium.

2. Aluminium metal is purified by which process?

3. Define an adiabatic process.

4. Name the environment in which a system is studied.

5. Give the unit of heat in the SI system.

6. What should be the band gap of the semiconductors to be used as solar cell materials?

7. Which raw material obtained from petroleum can be in preparation of acetic acid?

8. Which secondary raw material is produced from propylene?

9. What change will occur for the equilibrium constant of a reaction when increasing the concentration of reactants in a reversible reaction?

10. Name the chemicals which can form an basic buffer.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Give the mathematical expression for first law of thermodynamics.

12. What are macroscopic properties? Give two examples.

13. What is bond dissociation energy?

14. The enthalpy, internal energy during a process and change in volume are 500 units, 400 units, and 2 units. What is the pressure that is exerted on the gas during this process?

15. If 315 cal of heat is given to the system, and the system does 20 cal of work, find the change in internal energy.

16. How is standard free energy change related to equilibrium constant?

17. Define degree of dissociation of an electrolyte in solution. What happens to the degree of dissociation of a weak electrolyte on dilution?

18. Calculate the pH of 10^{-3} M HCl.

19. What is the importance of electrometallurgy?

20. How will you differentiate between liquation and distillation processes in metallurgy?

21. What is smelting? Give an example.

22. What is isochoric process?

23. Discuss the process of smelting of ores.

24. Briefly describe about the importance of roasting in the process of concentration of ores.

25. What is the carbonization of coal?

26. Briefly discuss about the emergence of H_2 as future fuel.

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

SECTION – C

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

27. Briefly explain the factors that influence the equilibrium.

28. Explain the Lowry-Brønsted concept of acids and bases with suitable examples.

29. A buffer solution was obtained by mixing 8.3 g of acetic acid and 16.0 g of sodium acetate. The buffer is diluted to one litre. Calculate the pH of the solution if 0.70 ml of 1 M HCl is added to it. The dissociation constant of acetic acid is 1.80×10^{-5}. [Molecular mass of acetic acid and sodium acetate are respectively 60 and 82].

30. Write notes on the concentration process of an oxide ore and a sulphide ore.

31. Discuss about the following reactions on the basis of Le Chatelier principle.

    (a) $N_2 + 3H_2 \rightleftharpoons 2NH_3$

    (b) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

32. Derive expressions for the hydrolysis constant of a salt of a weak acid and a weak base in aqueous solution.

33. Write a note on photosynthesis.

34. Write a note on photovoltaic cells.

35. Determine the pH of a solution obtained by mixing equal volumes of 0.1 M ammonium nitrate and 0.02 M ammonium hydroxide. K_b for $NH_4OH = 1.8 \times 10^{-5}$.

36. Explain the terms levelling solvents and differentiating solvents with suitable examples.

37. What is the spontaneity of a process? Derive the relations between ΔG, ΔH and ΔS. What are the conditions for spontaneity of a process?

38. What are the need for the search of alternative energy sources other than fossil fuels?

(6 × 4 = 24 Marks)

SECTION – D

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

39. Discuss the metallurgy of cobalt and thorium.

40. (a) What are buffer solutions? How they are classified? Discuss the methods of preparation and the mechanism of actions.

(b) Derive the Henderson equation.

41. (a) Discuss van Arkel method.

(b) Discuss about green chemistry approaches for sustainable development.

42. Discuss in detail the constitution, distillation and composition of crude oil.

43. (a) What is Kirchoff's equations? What are the applications?

(b) Discuss the calculation of bond dissociation energies of different types of bonds.

44. (a) Differentiate between conventional and nanostructured solar cell. What are the advantages of nanostructured solar cells over conventional solar cells?

(b) Write a note on pyrometallurgy.

(2 × 15 = 30 Marks)

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