(Pages : 4) **T – 3201**

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, August 2024

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** marks.

1. Enthalpy of neutralization is always constant for a strong acid and a strong base. Why?
2. Write Kirchhoff's equation in thermodynamics and explain the terms.
3. Which is the major component present in LPG.
4. Define Flash point.
5. Which is the by-product formed after the combustion of hydrogen?
6. Define pyro-metallurgy?
7. Write the name of the ore of (a) uranium and (b) nickel.
8. Ammonium chloride solution in water is slightly acidic. Why?

9. What is levelling effect in water?

10. How does the pressure affect the following equilibrium where all the reactant and products are in the gaseous phase?

$2HI \rightleftharpoons H_2 + I_2$.

(10 × 1 = 10 Marks)

SECTION – B

Answer **any eight** questions from the following. Each question carries **2** marks.

11. How heat of a reaction varies at (a) constant volume and (b) constant pressure?

12. At 298 K, the reduction of copper (I) oxide, ΔH = 58.1 kJ, ΔS = 165 J/K is nonspontaneous, ΔG = 8.9 kJ. Calculate the temperature at which the reaction becomes spontaneous.

13. State first law of thermodynamics. What are its applications?

14. Differentiate between calcinations and roasting.

15. State and explain Lowry-Bronsted concept of acids and bases.

16. Explain Mond's Process.

17. State and explain Pearsons's HSAB principle.

18. What is the hydrolysis constant? Explain with an example.

19. Compare the advantages of CNG over LPG.

20. Explain the process carbonisation of coal.

21. How octane number is used to rate the fuel efficiency.

22. Explain the process Zone refining.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions from the following. Each question carries **4** marks.

23. Determine the total enthalpy change for the production of one mole of aqueous nitric acid by using the following data.

$4NH_3(g) + 5\,O_2(g) \rightarrow 4NO(g) + 6H_2O(l)\ \Delta H = -907\ kJ$

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)\ \Delta H = -113\ kJ$

$3NO_2 + H_2O(l) \rightarrow 2HNO_2(aq) + NO(g)\ \Delta H = -139\ kJ$

24. Write a short note on the fractional distillation and components of petroleum.

25. What are buffer solutions? How they are classified? Give their applications.

26. Explain Le Chatelier's principle. How it can be used to predict the shift in equilibrium.

27. Write a short note on Green Chemistry approaches for sustainable development.

28. How pH can be determined potentiometric method? Explain.

29. Explain (a) hydration enthalpy (b) formation enthalpy and (c) combustion enthalpy.

30. Discuss the metallurgy process of titanium.

31. Explain different methods used for the refining of metals.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions from the following. Each question carries **15** marks.

32. (a) What is the relationship between bond enthalpy and bond dissociation energy?

(b) Do double bonds have higher bond dissociation energy? Explain.

(c) Calculate the O-H bond energy from the following data.

$0.5H_2(g) + 0.5O_2(g) \longrightarrow OH(g);\ \Delta H = +42\ kJ$

$H_2(g) \longrightarrow 2H(g);\ \Delta H = +435\ kJ$

$O_2(g) \longrightarrow 2O(g);\ \Delta H = +495\ kJ$

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33. Derive the relationships is connecting K_p, K_c and K_x

34. (a) Why do we need to think about alternative fuels other than fossil fuels?

(b) Write a short note on photosynthesis

(c) Explain the working of photovoltaic cell

35. Derive the relationships between Kh and Kw for salts of (a) strong acid - weak base and (b) weak acid - weak base.

(2 × 15 = 30 Marks)
