(Pages : 4) J – 2696

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, May 2020

First Degree Programme Under CBCSS

Chemistry

Complementary Course

CH 1231.1/CH 1231.2 – Physical Chemistry – I

(Common for Physics and Geology)

(2017 admn onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. What is an *Arrhenius* acid?
2. What is meant by Gibb's free energy?
3. Define entropy.
4. What is common ion effect?
5. What is standard enthalpy of combustion?
6. State Le Chatlier principle.
7. Write the relationship between ΔG and K_p.

P.T.O.

8. Define bond energy.

9. What is standard enthalpy of neutralisation?

10. What is enthalpy of a system?

(10 × 1 = 10 Marks)

SECTION – B

(Answer **any eight** questions Each question carries **2** marks)

11. Define the term equilibrium constant.

12. What is meant by leveling effect?

13. Why HNO_3 behaves as weak acid in acetic acid?

14. Calculate the *pH* of 0.0001*M* HNO_3 solution.

15. Define C_p and C_v.

16. Calculate the change in entropy when 10 moles of an ideal gas expands reversibly from a volume of $10dm^3$ to $100\ dm^3$ at 27°C.

17. State second law of thermodynamics.

18. Equilibrium constant for a reaction is 3.0 at 400°C and 4.0 at 500°C. Calculate $\Delta H°$ for the reaction. (K = 1.987 cal deg^{-1} mol^{-1})

19. What is the effect of change of pressure on the reaction involving combination of nitrogen and hydrogen to form ammonia?

20. Calculate the enthalpy change for the transition of graphite to diamond. (Standard enthalpies of combustion for graphite and diamond are -393.5 kJ mol^{-1} and -395.4 kJ mol^{-1} respectively)

21. What are conjugate acids? Give an example.

22. Explain the term salt hydrolysis with a suitable example.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Calculate the hydrolytic constant and degree of hydrolysis of CH_3COONH_4 in a $0.1M$ solution at 298K.

    $(K_b \text{ for } NH_4OH = 1.81\times10^{-5}; K_a \text{ for } CH_3COOH = 1.75\times10^{-5}\ K_w = 1\times10^{-14})$.

24. Explain the solvent effect on the strength of an acid with suitable examples.

25. Derive Gibb's Helmholtz equation. Explain its significances.

26. One mole of an ideal gas expands against a constant pressure of 1 atm from a volume of 10 dm^3 to a volume of 30 dm^3 and absorbs 1.5 kJ of thermal energy from its surroundings.

    Calculate ΔU for the process in joules.

27. Two moles of PCl_5 were introduced in 2L flask and heated to 250°C to establish equilibrium when 60% of PCl_5 was dissociated into PCl_3 and Cl_2. Calculate the equilibrium constant.

28. Discuss the limitations of 1st law of thermodynamics.

29. State and explain the law of mass action.

30. State and explain Kirchoff's equation.

31. Establish the relationship between q_p and q_v for the formation of ammonia through Haber process, assuming ideal nature for the gaseous reactants and products.

(6 × 4 = 24 Marks)

SECTION – D

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

32. (a) Derive van't Hoff's equation.

    (b) Derive the relationship between K_p and K_c.

    (c) The equilibrium constant of a reaction doubles on rising the temperature from 30°C to 40°C. Calculate ΔH° for this reaction.

33. (a) Derive the relationship between the molar heat capacity of a gas at constant volume and constant pressure.

    (b) Define

        (i) Intrinsic energy

        (ii) Gibb's free energy

        (iii) Available work

34. (a) Write a brief note on buffer solutions

    (b) Derive Henderson's equation for the pH of an acidic buffer

    (c) What are the applications of Henderson's equation.

35. Discuss about Hess's law and its applications.

(2 × 15 = 30 Marks)