

Instructions

- Question paper has FIVE parts. All parts are compulsory.
- Part-A carries 20 marks. Each question carries 1 mark.
 - Part-B carries 10 marks. Each question carries 2 marks.
 - Part-C carries 18 marks. Each question carries 3 marks.
 - Part-D carries 10 marks. Each question carries 5 marks.
 - Part-E carries 12 marks. Each question carries 4 marks.
- In Part-A questions, first attempted answer will be considered for awarding marks.
- Write balanced chemical equations and draw neat labeled diagrams and graphs wherever necessary.
- Direct answers to the numerical problems without detailed steps and specific unit for final answer will not carry any marks.
- Use log tables and simple calculator if necessary (use of scientific calculator is not allowed).

PART-A
I. Select the correct option from the given choices.
15×1=15

- Patient suffering from AIDS can be helped using which of the following drugs?
 a) Cisplatin b) AZT c) Taxol d) Codeine
- If two volumes of gas gives one volume of $A_{2(g)}$ and one volume of $B_{2(g)}$, then molecular formula of the gas will be
 a) A_2B_2 b) A_4B_4 c) AB d) AB_3
- How many orbitals are possible for the following quantum numbers: $n = 3, l = 0, m = 0$?
 a) 1 b) 2 c) 3 d) 4
- de- Broglie's wave equation is given by
 a) $\lambda = h/mv$ b) $\lambda = h/p$ c) both a and b d) none of these
- Which of the following does not follow Law of triads?
 a) Li, Na, K b) Ca, Sr, Ba c) P, C, N d) Cl, Br, I
- Which of the following elements can show covalency greater than 4?
 a) Be b) P c) S d) Al
- The shape of the molecule depends on the ____
 a) adjacent atom b) valence electrons c) core electrons d) neutrons
- For a cyclic process, the change in internal energy of the system is
 a) always positive b) always negative c) equal to zero d) equal to infinity
- The entropy of a pure crystal is zero at absolute zero. This is statement of
 a) first law of thermodynamics b) second law of thermodynamics
 c) third law of thermodynamics d) Hess 's law
- If a mixture where $Q = k$ is combined, what happens?
 a) Forward and reverse reaction continuing at the same rate
 b) the reaction shifts toward products
 c) the reaction shifts toward reactants
 d) none of these
- Two oxidation states for chlorine are found in the compound
 a) $CaOCl_2$ b) KCl c) $KClO_3$ d) C_2O_7
- Optical isomerism is a type of ____
 a) metamerism b) stereoisomerism c) geometrical isomerism d) tautomerism
- Nucleophilic reagent behaves as
 a) water b) Lewis acid c) Lewis base d) salt
- Which of the following will not show resonance?
 a) C_6H_6 b) C_6H_{12} c) CH_3NO_2 d) $C_6H_5COO^-$

15. Which of the following reagent will produce trans alkenes from reduction of alkynes?
 a) H_2/Pt b) H_2/Pd c) H_2/Ni d) Na/ liquid NH_3

II. Fill in the blanks by choosing the appropriate word from those given in the brackets: 5×1=5

(dumbbell, non-metal displacement, free radical, stronger, zero)

16. Greater the extent of overlapping, _____ is the covalent bond
 17. The shape of orbital having $l = 1$ is _____
 18. A process is taking place at constant temperature and pressure then Gibbs free energy will be _____
 19. Alkali metals displace hydrogen from cold water is an example of _____ reaction
 20. Organic reaction which proceeds by homolytic fission is called _____

Part B

III. Answer any FIVE of the following. Each question carries two marks. 5×2=10

21. Give any 2 drawbacks of Rutherford model of an atom.
 22. Explain Fajans rule.
 23. Explain sp^2 hybridization by taking BCl_3 as example.
 24. Define specific heat capacity. Write the relation between C_p , C_v and R .
 25. Define standard enthalpy of formation. Give an example.
 26. Explain Bronsted – Lowry theory of acids and bases.
 27. What are the effects of the following conditions on equilibrium for a given reaction?
 $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
 i) addition of argon gas at constant volume
 ii) increase in pressure
 28. What is chain isomerism? Give example.
 29. Give the difference between inductive effect and mesomeric effect.
 30. What happens to the boiling points of isomeric alkanes with increase in branching? Give reason.

Part C

IV. Answer any THREE of the following. Each question carries three marks. 3×3 =9

31. Define electron gain enthalpy. How does it vary along the period and down the group?
 32. Predict the shape on H_2O molecule on the basis of VSEPR theory.
 33. Using molecular orbital theory, calculate bond order and magnetic property of C_2 molecule.
 34. The resultant dipole moment of NH_3 is greater than NF_3 . Give reasons .
 35. Balance the following redox reaction by half reaction method
 $Fe^{2+} (aq) + Cr_2O_7^{2-} (aq) \rightarrow Fe^{3+} (aq) + Cr^{3+} (aq)$ (Acidic medium)

V. Answer any THREE of the following. Each question carries three marks. 3×3 =9

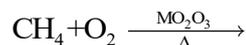
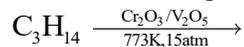
36. a) State Gay Lussac's law of gaseous volume.
 b) Define mole.
 37. A neutral atom has two electrons, eight electrons and six electrons in K, L and M shells respectively. From this predict,
 i) it's atomic number
 ii) total number of s electrons
 iii) total number of p- electrons
 38. Describe the measurement of change in internal energy by using Bomb calorimeter with a neat labelled diagram.
 39. a) What happens to the pH of water when NH_4Cl solid is dissolved in it and why?
 b) What is the relationship between $[H_3O^+]$ and $[OH^-]$ for neutral solution?
 40. a) State Le-Chateliers principle.
 b) Chemical equilibrium is a dynamic equilibrium. Explain.
 c) On what factors does the acid strength depend?

Part D

VI. Answer any TWO of the following. Each question carries five marks. 2×5=10

41. a) For the compound $Cl_2CHCH_2CH_2OH$
 i) Write the IUPAC name and bond line formula.
 ii) Identify the functional group.
 b) Give one example of each benzenoid and non- benzenoid compound.

42. a) Complete the following reaction



b) Explain the mechanism of sulphonation of benzene.

43. a) Define polymerization. Mention any one use of polymer.

b) Draw the staggered conformation of ethane.

c) Give equation for the reaction that occurs when ethene is treated with Baeyer's reagent.

Part E

VII. Answer any THREE of the following. Each question carries four marks.

3×4=12

44. A compound with a molecular mass of 34 g/mol is known to contain 5.88% hydrogen and 94.12% oxygen. Find the molecular formula of this compound.

45. Calculate the amount of water (g) produced by the combustion of 16g of methane.

46. Calculate the energy associated with first orbit of He^+ . What is the radius of this orbit?

47. Calculate the standard enthalpy of combustion of methane. Given that standard enthalpy of combustion of carbon and hydrogen are -393.5kJ and -285.83kJ respectively. Standard enthalpy of formation of methane is -75.16kJ.

48. Calculate pH of a 1.0×10^{-8} M solution of HCl.
