Subject Code : 34 Dept. of Pre-Univeristy Education No. of Questions : 47

FIRST P.U.C. ANNUAL EXAMINATION – FEBRUARY 2023

Time: 3 Hours 15 min CHEMISTRY Max. Marks-70

General Instructions:

1. The Question paper has four parts. All the four parts are Compulsory
   PART - A *Carries 20 marks, Each question carries one mark.*
   PART – B *Carries 8 marks, Each question carries Two marks.*
   PART – C *Carries 12 marks, Each question carries Three marks.*
   PART – D *carries 30 marks. Each question carries Five marks.*
2. Write balanced chemical equations and draw diagrams wherever necessary. Use log table and simple calculators if necessary (Use of scientific Calculator is not allowed.

PART – A

I Select the correct option from the given choices. **1 X 15=15**

1. The value of Avagadro's constant is
   a) 6.023×10^{23} b) 6.023×10^{22}
   c) 6.023×10^{24} d) 6.023×10^{27}

2. According to Modern Periodic Law the properties of the elements are periodic functions of their
   a) Atomic mass b) Atomic number
   c) Number of neutrons d) number of mesons

3. The bond angle in water molecule is
   a) 104.5^0 b) 105.4^0
   c) 150.4^0 d) 140.5^0

4. The Normal boiling point is
   a) The boiling point of the liquid at 1 bar pressure
   b) The boiling point of the liquid at 1 atm pressure
   c) The boiling point of the liquid at any pressure
   d) The boiling point of the liquid at 10 bar pressure

5. For a Spontaneous process
   a) $\Delta G=0$ b) $\Delta G>0$
   c) $\Delta G<0$ d) $\Delta G=1$

6. The conjugate base of H_2O is
   a) O_2 b) OH^-
   c) H^+ d) O_2^-

7. Based on Stock notation, FeO can be represented as
   a) Fe(II)O b) $Fe_2(III)O_3$
   c) Fe(III)O d) $Fe_2(II)O_3$

8. The Chlorides and Sulphates of Which of these elements causes Permanent Hardness
   a) Na and K b) Ca and Mg
   c) Fe and Cu d) Ba and Al

9. Which of the following has high hydration energy?
   b) K^+
   d) Cs^+

10. C_{60} Fullerene contains
    a) 12 six membered rings and 12 five membered rings
    b) 12 six membered rings and 20 five membered rings
    c) 20 six membered rings and 12 five membered rings
    d) 20 six membered rings and 20 five membered rings

11. Thermodynamically the most stable form of Carbon is
    a) Diamond b) Graphite
    c) Fullerenes d) Coal

12. The best and latest technique for isolation, purification and separation of Organic compounds is
    a) Crystallisation b) Distillation
    b) Sublimation d) Chromatography

13. Which of the following is a non-benezenoid aromatic compound?
    a) Benzene b) Aniline
    c) Tropolone d) Naphthalene

14. The each carbon in Benzene molecule is
    a) sp-hybridised b) sp^2-hybridised
    b) sp^3-hybridised d) dsp^2-hybridised

15. The pH of Normal rain water is around
    a) 6.5 b) 7.6
    c) 8.6 d) 5.6

II Fill in the blanks by choosing the appropriate word from those given in the brackets: **1X5=5**

[Hydrogen, limiting reagent, Carbondioxide, Sodalime, Cation]

16. The reactant which gets consumed and limits the amount of product formed is called_____
17. _____ have smaller radius than their Parent atom.
18. Arrehenius acids are the substances that dissociates in water to give _____ ions.
19. The composition of dry ice is _____
20. Sodium salt of Carboxylic acids on heating with _____ forms alkanes.

PART-B

III Answer any FOUR of the following. Each question carries two marks. **4X2 = 8**

21. How many moles of Methane are required to produce 22g of CO_2 after combustion?
22. Give VanderWaal's equation for 'n' moles of real gases and explain the terms.
23. NH_3 is more polar than NF_3. Give reason.
24. Write the composition of :
    (i) Plaster of Paris
    (ii) Caustic Soda
25. Write any two differences between Diamond and Graphite.
26. Draw the Newman projections for Staggered and Eclipsed Conformation of Ethane.
27. Expalin Wurtz reaction with an example.
28. What is Biological Oxygen Demand (BOD)? What is its significance?

IV. Answer any FOUR of the following. **PART- C** **Each question carries three marks. 4X3=12**

29. Define Ionization energy. How does it vary across the period and down the group?

30. Calculate the Formal charge on each oxygen atom in Ozone molecule.

31. Explain sp^2 hybridisation by taking BCl_3 as an example.

32. For Li_2 molecule:

(i) Write the Electronic configuration.

(ii) Calculate its bond order

(iii) State its magnetic property. (1+1+1)

33. Balance the following Redox reactions by Half-reaction method

MnO_4^- + I^- ---------> MnO_2 + I_2 (in acid medium)

34. (i) Which is the gas released When Zinc metal is added to dil HCl?

(ii) Give an example for Electon-deficient Molecular hydride.

(iii) Name the radioactive isotope of Hydrogen (1+1+1)

35. (i) What is the role of Gypsum in Cement?

(ii) List any two reasons for anomalous behaviour of Lithium. (1+2)

36. In a Diborane molecule:

(i) What is the hybridisation on each Boron atom?

(ii) How many Bridging Bonds (BHB) are there?

(iii) Write its structure (1+1+1)

PART-D

V. Answer any FOUR of the following. Each question carries five marks. 4X5=20

37. (a) A carbohydrate contains 40% C, 6.73% H, and 53.3 % O. The molecular mass of the compound is 180. Determine its Empirical and Molecular Formula.

(b) Define Molality. (4+1)

38. (a) Write any three postulates of Bohr's atomic model.

(b) Calculate the energy associated with first orbit of He^+. (3+2)

39. (a) List any two characteristic properties of Cathode Rays.

(b) State Heisenberg's Uncertainty Principle. Give its mathematical form.

(c) Write the Electronic configuration of Cr (At no = 24) (2+2+1)

40. (a) Write any three postulates of Kinetic theory of gases.

(b) Derive an ideal gas equation PV=nRT (3+2)

41. (a) The standard enthalpies of Combustion of $Carbon_{(s)}$, $hydrogen_{(g)}$ and $Benzene_{(l)}$ are -393.5 kJ, -285.83 kJ and -3267.0 kJ respectively. Calculate the standard enthalpy of formation of liquid benzene.

(b) State First Law of thermodynamics. Write its mathematical form for an adiabatic process. (3+2)

42. (a) Derive $C_p - C_v = R$.

(b) What are Extensive properties ? Give an example.

(c) Predict whether entropy increases or decreases when a liquid crystallises in to solid? (2+2+1)

(a) At Equilibrium , the concentrations of N_2= 3.0 X 10^{-3}M, O_2=4.2 X 10^{-3}M and NO =2.8 X 10^{-3}M in a sealed vessel at 800K. What will be 'Kc' for the reaction

$$N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$$

(b) Define Common ion effect

(c) If $Q_c < K_c$ for a system then in which direction does the reaction proceed. (3+1+1)

44. (a) State Lechatlier's principle. Discuss the effect of temperature and pressure on the equilibrium $2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$. ΔH=-57.2 kJ

(b) Define solubility product. Give the relation between Solubility and Solubility product for AB type of salt (3+2)

VI Answer any TWO of the following. Each question carries five marks **2 X5=10**

45. (a) Explain the estimation of carbon and hydrogen by Leibig's method.

(b) Write IUPAC nomenclature of the molecule

CH_3-CH=CH-CH_2-CH_3

(c) What type of cleavage results in the formation of Free radicals? (3+1+1)

46. (a) Explain positional isomerism with an example.

(b) How many σ and π bonds are present in the moleule CH_2=C=CH_2.?

(c) Define inductive Effect. (2+2+1)

47. (a) Explain the mechanism of Chlorination of Methane.

(b) Give any two conditions for aromaticity. (3+2)

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