Answer any four questions from 1 to 5. Each carries 1 score. (4×1=4)
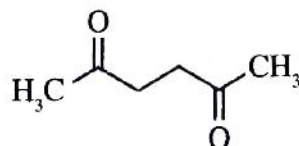
1. The prefix for 10^{-15} is _____

   a) peta   b) nano

   c) pico   d) femto

2. What would be the IUPAC name for the element with atomic number 120 ?

3. The equilibrium constant for a reaction is 'x' for the forward direction. The equilibrium constant for the reverse reaction at the same temperature would be _____

4. Write the IUPAC name of the compound given below.

5. The alkane which cannot be prepared by Kolbe's electrolytic method is _____

Answer any eight questions from 6 to 15. Each carries 2 scores. (8×2=16)

6. i) 'Molarity of a solution depends upon temperature'. Justify this statement. **(1)**

   ii) 4g of NaOH was dissolved in sufficient water to form 250 mL of the solution. Calculate the molarity of this solution.

   (Na = 23, O = 16, H = 1) **(1)**

7. i) What is photoelectric effect ? **(1)**

ii) How is kinetic energy of the ejected electron in photoelectric effect related to the frequency of the electromagnetic radiation ? **(1)**

8. State Heisenberg's uncertainty principle. Give its mathematical representation.

9. What are isoelectronic species ? Give two ions that are isoelectronic with Mg^{2+}.

10. Give two demerits of Mendeleev's periodic table.

11. State the first law of thermodynamics and give its mathematical form.

12. Differentiate homogeneous equilibrium from heterogeneous equilibrium. Give an example for each.

13. Identify the oxidation state of chlorine in each of the following.

a) ClO_3^-

b) HCl

14. Explain Carius method for the estimation of halogens in an organic compound.

15. Draw the cis and trans isomers of the compound given below and label them correctly.

$C_6H_5CH = CH - CH_3$.

**Answer any eight questions from 16 to 26. Each carries 3 scores.** (8×3=24)

16. i) How many volumes of water vapour would be produced if 12 volumes of dihydrogen gas reacts with 6 volumes of dioxygen gas ? (1)

   ii) An organic compound is made up of 67.9% C, 5.70% H and 26.4% N. Calculate its empirical formula. (2)

17. Calculate the frequency and wavelength of a photon emitted during a transition from $n = 5$ state to $n = 2$ state in the hydrogen atom.

18. Define ionisation enthalpy. How does it vary in a period and in a group ? Give reasons for your answer.

19. Explain intermolecular and intramolecular hydrogen bonding with an example.

20. Discuss the hybridisation of phosphorous in PCl_5 molecule. Based on this, predict the shape and bond angles in it.

21. Calculate the standard enthalpy of formation of benzene. Given

   $C(s) + O_2(g) \rightarrow CO_2(g)$; $\Delta H = -393.5$ kJ mol^{-1}

   $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g)$; $\Delta H = -285.83$ kJ mol^{-1}

   $C_6H_6(l) + 15/2\ O_2(g) \rightarrow 6CO_2(g) + 3H_2O(g)$; $\Delta H = -3267$ kJ mol^{-1}.

22. i) Consider the reaction $2A(g) \rightleftharpoons 2B(g) + C(g)$. Write the expression for K_c for this reaction. (1)

   ii) If K_c for this reaction is 3.8×10^{-6} at 1070 K, calculate K_p at this temperature. (2)

23. Balance following redox reaction taking place in basic medium using oxidation number method.
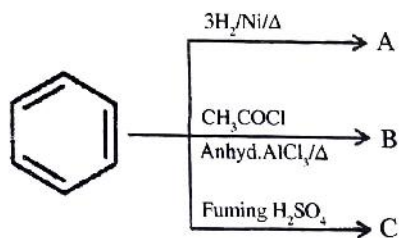
$$MnO_4^- (aq) + Br^- (aq) \rightarrow MnO_2(s) + BrO_3^- (aq)$$
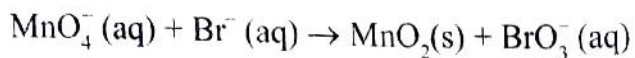
24. i) What are nucleophiles and electrophiles ? **(2)**

    ii) Give an example each for charged and neutral nucleophiles. **(1)**

25. i) State and illustrate Markovnikov rule with an example. **(2)**

    ii) What are the products obtained when propene undergoes ozonolysis ? **(1)**

26. Identify the major products A, B and C in the following reactions.

Answer any four questions from 27 to 31. Each carries 4 scores. **(4×4=16)**

27. i) What are quantum numbers ? Explain any two quantum numbers. **(3)**

    ii) Arrange 3d, 4s, 4p and 3p in the increasing order of their energies. **(1)**

28. i) Write the MO electronic configuration of N_2. **(2)**

    ii) Calculate its bond order and predict the magnetic behaviour. **(2)**

29. i) What is Gibb's free energy ? (1)

  ii) Give the relation between Gibb's free energy and enthalpy. (1)

  iii) Predict the spontaneity of a reaction in the following cases.

    a) ΔH and ΔS +ve (high T) (1)

    b) $\Delta H = +ve$; $\Delta S = -ve$ (1)

30. i) What are buffer solutions ? Give an example each for acidic and basic buffers. (2)

  ii) What is the effect of dilution on the pH value of a buffer solution ? Give reason. (1)

  iii) Explain common ion effect. (1)

31. i) Define resonance effect. (1)

  ii) Explain the two types of resonance effect with suitable examples. (2)

  iii) Which among the following is a group showing +R effect ?

    $- CN, - OH, - NO_2, - COOH$ (1)

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