Choose the most appropriate answer

1. The mass of a chlorine atom is ........
   (a) \(5.90 \times 10^{-23}\) g    (b) \(5.90 \times 10^{-23}\) kg    (c) \(5.90 \times 10^{-23}\) g    (d) \(5.90 \times 10^{-23}\) kg
2. ........ is used as a foaming agent.
   (a) water    (b) Lignite    (c) Pine oil    (d) Caster oil
3. Consider the following statements.
   (i) Fluorine has low electron affinity than chlorine.
   (ii) I.E. decreases with increase in atomic size.
   (iii) Actinide elements are not radio active
   Which of the following statements given above is / are not correct
   (a) (i), (ii) and (iii)    (b) only (ii)    (c) only (iii)    (d) (ii) and (iii)
4. Match the list I with list II and select the correct answer using the code given below the lists
   List - I
   A C\(_2\)H\(_4\) + D\(_2\)  1 Deuterium Fluoride
   B D\(_2\) + O\(_2\)  2 Ethylene deuteride
   C D\(_2\) + N\(_2\)  3 Heavy water
   D D\(_2\) + F\(_2\)  4 Heavy ammonia
   Code:
   (a) 1 2 3 4
   (b) 4 3 2 1
   (c) 2 3 4 1
   (d) 1 3 4 2
5. The basic character of oxides down the group.....
   (a) increases    (b) decreases    (c) remains same    (d) no change
6. The plane is parallel to z-axis and makes unit intercept an X and Y axis its plane is designated as .....
   (a) (111)    (b) (010)    (c) (110)    (d) (100)
7. Excluded volume per molecule is......
   (a) \(4V_m\)    (b) \(2V_m\)    (c) \(V_m/2\)    (d) \(4V_m\)
8. The compound which contains both ionic and covalent is ......
   (a) CH\(_4\)    (b) H\(_2\)    (c) KCN    (d) KCl
9. Work done in the reversible expansion is......
   (a) Minimum    (b) Maximum    (c) Zero    (d) Not predictable
10. The equilibrium constant for the reaction CO\(_2\)(g) + C\(_s\) \(\leftrightarrow\) 2CO\(_g\)(g). When the partial pressure of CO\(_2\) and CO are 0.04 atm and 0.2 atm respectively is .......
    (a) 1.9 atm    (b) 1 atm    (c) 2 atm    (d) 0.04 atm
11. IUPAC name of CH\(_2\) = CH – CH\(_2\)Cl is......
    (a) Allyl chloride    (b) 3- chloro 1- propene    (c) 1- chloro 2-propene    (d) Vinyl chloride
12. In the detection of sulphur using Lassaigne’s test the purple colour is developed due to........
    (a) Na\(_4\)[Fe(CNS)\(_4\)]NO    (b) Na\(_4\)[Fe(CN)\(_3\)]NO\(_2\)    (c) Fe(CNS)\(_3\)    (d) Na(CNS)
13. Diels – Alder reaction is a reaction between......
    (a) diene and dieneophile    (b) electrophile and nucleophile(c) Oxidant and reductant    (d) free radicals
14. The ortho and para directing groups are......
    (a) activating groups    (b) deactivating group(c) both (a) & (b)    (d) No effect
   a) Both the statements are individually true but statement – II is not the correct explanation of statement – I.
   b) Both the statements are individually true and statement – II is not correct explanation of statement - I.
   (a) Statement – I is true but statement – II is false.  b)Statement - I is false, but statement – II is true.
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PART- II

Answer any six Questions in which Question No. 21 is compulsory. 6 x 2 = 12

16. What is the molality of the solution containing 25 g of sugar (C\textsubscript{12}H\textsubscript{22}O\textsubscript{11}) in 1000 g of water?
17. How many electrons can have S + \(\frac{1}{2}\) in a d-shell?
18. Mention any two uses of ozone.
19. Define Boyle’s law and charle’s law.
20. Calculate the vapor pressure of the solution. The mole fraction of the solute is 0.25. The vapor pressure of the pure solvent is 0.8 atm.
21. Substantiate with reason NH\textsubscript{3} is a nucleophile and BF\textsubscript{3} is an electrophile.

PART- III

Answer any Six Questions in which Question No. 30 is compulsory. 6 x 3 = 18

25. How is pure H\textsubscript{2}O\textsubscript{2} manufactured?
26. Why the IE\textsubscript{2} of the alkaline earth metals is much higher than the IE\textsubscript{1}?
27. Explain why Na atom bigger than the atoms of both lithium and magnesium?
28. What are miller indices?
29. Write the expression for the equilibrium constant (k\textsubscript{c}) for the reaction and how is it related to k\textsubscript{p} for the reaction.
30. What are the scope of chemical kinetics?
31. How would you convert the following.
32. Explain the following terms.

PART – IV

Answer All the Questions. 5 x 5 = 25

34. (a) (i) 4.5g of urea (molecular mass = 63 g/mol) are dissolved in water and solution is made to 100 ml in a volumetric flask. Calculate the molarity of solution. (2)
(ii) A flask contains 53.1 ml of 0.150M Ca(OH)\textsubscript{2} solution. How many ml of 0.350 M Na\textsubscript{2}CO\textsubscript{3} are required to react completely with Ca(OH)\textsubscript{2} in the following reaction. (3) (OR)
(b) What is roasting? Explain different types of roasting with suitable example. (5)
35. (a) (i) Give the values for all quantum numbers for 2p electrons in nitrogen (z = 7) (2)
(ii) Distinguish between an orbit and orbital. (3) (OR)
(b) (i) Explain the liquefaction of gases by Linde’s method. (3)
(ii) Write the Limitations of Vanderwaal’s equation of state. (2)
36. (a) (i) Mention the general characteristics of resonance. (3)
(ii) Distinguish between sigma and pi bonds. (2) (OR)
(b) Describe the factors on which the rate of reaction depends. (5)
37. (a) (i) Write the differences between an exothermic and an endothermic process. (3)
(ii) Explain thermal and mechanical equilibrium process (2) (OR)
(b) (i) Explain the purification of compounds by using thin layer chromatography. (3)
(ii) Under what conditions, would you prefer steam distillation as a purification technique? (2)
38. (a) Give the structural formula for (i) pent-1-ene-3-one, (ii) prop (iii) 3-methyl butanoic acid, (iv) Neopentane, (V) 3-ethyl-2-methyl hexane. (5) (OR)
(b) An organic compound ‘A’ having molecular formula C\textsubscript{7}H\textsubscript{7}Cl gives the following reactions.
(i) on reduction with Zn-Cu couple, it gives toluene.
(ii) on oxidation with alkaline K\textsub{MnO}_4 it gives benzoic acid.
Identify the compound ‘A’ and write equation for reactions (i) and (ii). (5)

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Choose the most appropriate answer

1. The oxidation number of M in MnSO₄ …….
   (a) +4  (b) +2  (c) +6  (d) 0

2. An example for platinum metal is………
   (a) Ge  (b) Ir  (c) As  (d) Sb

3. Consider the following statements ……..
   (i) Transition metals have the ns²-(n-1)d¹⁰ electronic configuration
   (ii) Second ionisation potential is lesser than the first ionisation potential
   (iii) Cl⁻ ion is bigger than Cl atom
   Which of the following statement(s) given above is / are not correct
   (a) (i), (ii) and (iii)  (b) only (ii)  (c) only (iii)  (d) (ii) and (iii)

4. Match the list-I with list-II and select the correct answer using the code given below the lists.

<table>
<thead>
<tr>
<th>List-I</th>
<th>List-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Li vapour</td>
<td>1. Bleaching agent</td>
</tr>
<tr>
<td>B Na + liq. NH₃</td>
<td>2. Artificial rubber</td>
</tr>
<tr>
<td>C Isoprene</td>
<td>3. Intense blue solution</td>
</tr>
<tr>
<td>D H₂O₂</td>
<td>4. Calamin red colour</td>
</tr>
</tbody>
</table>

Code:
(a) 1 2 3 4
(b) 4 3 2 1
(c) 2 3 4 1
(d) 1 2 4 2

5. …….. is known as inorganic benzene.
   (a) BF₃  (b) B₂O₃N₂  (c) C₂H₂  (d) Diborane

6. Crystalline solids that exhibit different physical properties in all directions are called as ……..
   (a) anisotropic  (b) isotropic  (c) symmetric  (d) differential

7. The rate of diffusion of gas is …….. To square root of molecular mass.
   (a) inversely proportional  (b) directly proportional  (c) is equal  (d) not related

8. The molecule which has two bond pairs and two lone pairs of electrons……
   (a) NH₄⁺  (b) PCl₅  (c) SO₂  (d) H₂O

9. Freezing of a liquid at the freezing point is an…….. process.
   (a) reversible  (b) endothermic  (c) exothermic  (d) spontaneous

10. Kp ≠ Kc for equilibrium……
    (a) PCl₅↔ PCl₃ + Cl₂  (b) H₂ + I₂ ↔ 2HI  (c) N₂O₄ ↔ 2NO₂  (d) N₂ + O₂ ↔ 2NO

11. The unsaturated hydrocarbon which contains one C – C sigma bond and one C – C pi bond are known as…….
    (a) alkanes  (b) alkenes  (c) alkynes  (d) alkyls

12. 0.12g of an organic compound gave on combustion 0.11g of CO₂. Calculate the percentage of carbon is ……..
    (a) 23%  (b) 25%  (c) 27%  (d) 28%

13. CH₃C ≡ CH → A: A is ……..
    (a) CH₂CHO  (b) CH₂COCH₃  (c) CH₂CH₂CHO  (d) CH₂CH₂COCH₃

14. Benzene does not decolourise alkaline …….. Solution
    (a) KMnO₄  (b) FeSO₄  (c) NaCl  (d) K₂Cr₂O₇

15. Statement – I: Organic halides are insoluble in water
    Statement – II: Organic halides are unable to form strong H- bond with water
    (a) Both the statements are individually true but statement – II is not the correct explanation
    (b) Both the statements are individually true and statement – II is the correct explanation of statement – I
    (c) Statement – I is true but statement – II is false
    (d) Statement – I is false, but statement – II is true

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PART – II Answer any six Questions in which Question No. 21 is compulsory

16. Calculate the oxidation number of underlined elements in the following species.
   (a) $\text{Cr}_2\text{O}_7^{2-}$   (b) $\text{K}_2\text{MnO}_4$

17. Write the electronic configuration of chromium and copper.
18. Why $\text{NH}_3$ has high boiling point than $\text{PH}_3$?
19. What are the units of van der waal’s constants ‘a’ and ‘b’?
20. 10g of an organic substance when dissolved in two litres of water gave an osmotic pressure of 0.59 atm, at 7°C. Calculate the molecular weight of the substance.
21. Explain the term “Catenaion”.
22. 0.36g of a nitrogenous compound was kejldahilised and the ammonia liberated was exactly neutralized by 20ml of 0.3N $\text{H}_2\text{SO}_4$. Calculate the percentage of nitrogen in compound.
23. Convent sodium benzoate $\rightarrow$ Benzene.
24. Give the electron dot representation for $\text{PH}_3$ and ethane.

PART - III Answer any six Questions in which Question No. 30 is compulsory.

25. Explain why alkali metals possess only +1 oxidation state.
26. Bring out the relationship between Be and Al.
27. Out of fluorine and chlorine, which has greater electron gain enthalpy?
28. Calculate the miller indices of crystal planes which cut through the crystal axes at
   (i) $(2a, 3b, c)$ (ii) $(a, b, c)$ (iii) $(6a, 3b, 3c)$
29. The value of the equilibrium constant for the reaction $\text{H}_2 + \text{I}_2 \leftrightarrow 2\text{HI}$ is 54 at 700°k. In one experiment the equilibrium concentrations of iodine and hydrogen iodide are 1.3 $\times$ 10$^{-5}$ and 1.6 $\times$ 10$^{-2}$ moles respectively. Calculate the equilibrium concentrations of hydrogen.
30. (i) Explain why the rate of a reaction increases with the increase in temperature.
   (ii) Write the rate law of $pA + pB \rightarrow lC + mD$ reaction.
31. Write note on Wurtz – Fitting reaction.
32. Give an example of monohydric, dihydric and trihydric alcohols. Write their IUPAC name.
33. Complete the following reactions.
   (i) $\text{CH} = \text{CH} \rightarrow $ (ii) $\text{CH}_3 - \text{CHBr} - \text{CH}_2\text{Br} \rightarrow $ (iii) $\text{C}_6\text{H}_5\text{COONa} \rightarrow $ 
34. (a) (i) Identify oxidized and reduced species in $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow 2\text{HCl} + \text{S}$.
   (ii) Balance the following redox reaction.
      $\text{MnO}_2 + \text{Cl} \rightarrow \text{Mn}^{2+} \text{Cl}_2 + \text{H}_2\text{O}$ (acid medium) (OR)
35. (a) (i) Describe Aufbau principle. Explain its significance in the electronic build up of atoms.
   (ii) Using s, p, d, f notations. Describe the orbital with the following quantum numbers
      (a) $n = 2, l = 1$   (b) $n = 4, l = 0$   (c) $n = 5, l = 3$   (d) $n = 3, l = 2$ 
36. (b) (i) Describe Claude’s process of liquefaction of gases with neat diagram.
   (ii) Define Joule – Thomson effect.
37. (a) (i) Explain how the valence bond theory accounts for
      (i) a carbon – carbon double (C = C) (ii) a carbon - carbon triple bond (OR)
38. (b) Compare and contrast the terms, order and molecularity of a reaction.
39. (a) (i) Calculate the heat of formation of ethylene from the following data:
      $\text{H}_2(g) + \frac{1}{2} \text{O}_2(g) \rightarrow \text{H}_2\text{O} (l)$ $\Delta H_1 = -65,000 \text{ cal}$
      $\text{C}(s) + \frac{1}{2} \text{O}_2(s) \rightarrow \text{CO} (g)$ $\Delta H_2 = -97,000 \text{ cal}$
      $\text{C}_2\text{H}_4(g) + 3\text{O}_2(g) \rightarrow 2\text{CO}_2(g) + 2\text{H}_2\text{O} (l)$ $\Delta H_3 = -340,000 \text{ cal}$
      (ii) $\Delta H$ for the reaction at 298 k $\text{CO} (g) + \frac{1}{2} \text{O}_2 (g) \rightarrow \text{CO}_2 (g)$ is 282.85 $\text{kJ mol}^{-1}$.Calculate $\Delta U$ of the reaction. (2) (OR)
40. (b) Define and explain the types of paper chromatography.
41. (a) Give equations for the following reactions of acetylene with (i) $\text{H}_2 / \text{Ni}$ (ii) $\text{Br}_2$ (iii) $\text{HBr}$ $\text{(iv) H}_2\text{SO}_4$ and $\text{HgSO}_4$ (v) $\text{HOCl}$ (vi) $\text{O}_3$ (5) (OR)
42. (b) An element occupies group No. 16 and period number 2. This element on passing through silence electric discharge forms (A). (A) also reacts with lead sulphide and forms (B). (A) also reacts with $\text{BaO}_2$ and forms (C). It reacts with $\text{H}_2\text{O}_2$ and forms (D). Identify the element (A), (B), (C) and (D) 

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