
SAMPLE PAPER - I (SOLVED)

(ACCORDING TO CBSE CURRICULUM : 2012-13)

CHEMISTRY - XI

Time : 3 hours

Class : XI

Maximum Marks : 70

General Instructions :

1. All questions are compulsory.
2. Question no.1 to 8 are very short answer questions and carry 1 mark each.
3. Question no.9 to 18 are short answer questions and carry 2 marks each.
4. Question no.19 to 27 are also short answer questions and carry 3 marks each.
5. Question no. 28 to 30 are long answer questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

QUESTIONS

1. What happens when sodium metal is dropped in water? (1 Mark)
2. For an isolated system $\Delta U = 0$, What will be ΔS ? (1 Mark)
3. Explain why BeH_2 molecule has zero dipole moment although the Be-H bonds are polar? (1 Mark)
4. Predict the shape of the NH_3 molecule according to VSEPR theory. (1 Mark)
5. Which isotope of hydrogen is radioactive? (1 Mark)
6. Write the correct IUPAC name of the compound given below:
 $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{CH}$ (1 Mark)

7. What type of hybridisation of carbon is involved in Benzene? **(1 Mark)**
8. Name any two gases responsible for greenhouse effect. **(1 Mark)**
9. Arrange the following ions in order of increasing ionic radius:
 K^+ , P^{3-} , S^{2-} , Cl^- . Give reason. **(2 Marks)**
10. Why ionisation energy of Be is greater than Boron? **(2 Marks)**
11. A sample of gas occupies 3.00 L at 760 torr. Calculate the volume the gas will occupy if the pressure is changed to 1.45 atm and the temperature remains constant. **(2 Marks)**
12. Write the units of vanderWaals constant a and b . **(2 marks)**
13. Complete the following reactions: **(2 Marks)**
- (i) $Al + NaOH + H_2O \rightarrow$
- (ii) $SiCl_4(l) + H_2O(l) \rightarrow$ **(2 Marks)**
14. Explain : **(2 Marks)**
- (i) Alkali metals are soft and can be cut with help of a knife.
- (ii) Potassium is more reactive than sodium.
15. (a) Explain why Be and Mg do not give colour to the flame whereas other alkaline earth metals do. **(1 Mark)**
- (b) Why alkali and alkaline earth metals cannot be prepared by chemical reduction methods? **(1 Marks)**
16. Why $SiCl_4$ can be easily hydrolysed buy CCl_4 cannot be hydrolysed easily? Explain with reaction. **(2 Marks)**
17. Arrange benzene, hexane and ethyne in decreasing order of acidic behaviour. Also give reasons for this behaviour. **(2 Marks)**
18. 50 kg of $N_2(g)$ & 10.0 kg of $H_2(g)$ are mixed to produce $NH_3(g)$, identify the limiting reagent. Also, calculate the amount of NH_3 formed. **(3 Marks)**
19. Mohan was going with his friend Soham on a motorcycle. Their motorcycle was producing a lot of smoke. On the way, a Policeman stopped them and asked them to show pollution check certificate.

They did not have that certificate and the Policeman challan their vehicle. After reading this passage answer the following questions :

- (i) Why did Policeman Challan their vehicle?
(ii) What human values do you associate with the act of Policeman?
20. **(3 Marks)**

- (i) Calculate the wavelength in nanometers, of visible light having a frequency of $4.37 \times 10^{14} \text{ S}^{-1}$.
(ii) What are frequency and wavelength of a photon emitted during a transition from $n = 6$ to $n = 1$ state in the hydrogen atom.

21. (i) Explain why the following electronic configuration is not possible:

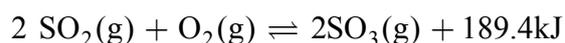
$$n = 1, l = 0, m_l = +1, m_s = +\frac{1}{2}$$

- (ii) Write electric configurations of Cu^{2+} . ($Z=29$) **(3 Marks)**

22. (i) Draw the resonating structures of O_3 .
(ii) Why is NF_3 trigonal pyramidal while BF_3 is trigonal planar, though both are tetra atomic molecules?
(iii) State the hybridization of 3rd & 4th Carbon atom **(3 Marks)**



23. Consider the reason: **(3 Marks)**



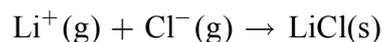
Indicate the direction in which the equilibrium will shift when:

- (i) Concentration of SO_2 is increased.
(ii) Concentration of SO_3 is increased.
(iii) Temperature is increased.
24. Define : **(3 Marks)**
- (i) Common ion effect
(ii) Buffer Solution
(iii) pH

25. Write the balanced equation by half-reaction method: **(3 Marks)**
 $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow \text{S} + \text{Cl}^-$ (in acidic medium)
26. Explain why: **(3 Marks)**
- $(\text{CH}_3)_3\text{C}^+$ is more stable than CH_3CH_2^+ and CH_3^+ is the least stable cation.
 - On adding AgNO_3 to CCl_4 solution white precipitate of AgCl is not obtained.
 - Nitric acid is added to sodium extract before adding AgNO_3 for testing halogens.
27.
 - 0.2475 g of an organic compound gave on combustion 0.4950 g of carbon dioxide and 0.2025 g of water. Calculate the percentage of C and H in it.
 - What will happen during Lassaigne's test for nitrogen if the compound also contains sulphur? **(3 Marks)**
28.
 - In a process, 701 J of heat is absorbed by a system and 394 J of work is done by the system. What is the change internal energy for the process?
 - The equilibrium constant for the reaction is 10. Calculate the value of ΔG^θ . Given $R = 8.0 \text{ J mol}^{-1} \text{ K}^{-1}$; $T = 300 \text{ K}$ **(5 Marks)**

OR

- (i) Calculate lattice energy for the change



Given that:

$$\Delta_{\text{sub}}H^\theta \text{ of Li} = 160.67 \text{ kJ/mol}$$

$$\Delta_{\text{diss}}H^\theta \text{ of Cl}_2 = 244.34 \text{ kJ/mol}$$

$$\Delta_{\text{ie}}H^\theta \text{ of Li}(\text{g}) = 520.07 \text{ kJ/mol}$$

$$\Delta_{\text{eg}}H^\theta \text{ of Cl}(\text{g}) = -365.26 \text{ kJ/mol}$$

$$\Delta_{\text{f}}H^\theta \text{ of LiCl}(\text{s}) = -401.66 \text{ kJ/mol}$$

- (ii) For a reaction; $2\text{A}(\text{g}) + \text{B}(\text{g}) \rightarrow 2\text{D}(\text{g})$

$$\Delta U^\theta = -10.5 \text{ kJ} \ \& \ \Delta S^\theta = -34.1 \text{ J}$$

Calculate ΔG° for the reaction and Predict whether the reaction is spontaneous or not at 298 K.

29. (i) What happens when borax solution is acidified. Write the chemical reactions for the reaction.
- (ii) Lead(IV) chloride is highly unstable towards heat. Why?
- (iii) Boric acid is not protic acid. Why?
- (iv) SiO_2 is solid but CO_2 is a gas at room temperature. Why?

(5 Marks)

OR

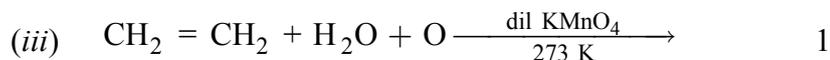
When a metal X is treated with NaOH a white precipitate (A) is obtained, which is soluble in excess of NaOH to give soluble complex (B). Compound (A) is soluble in dilute HCl to form compound (C). The compound (A) when heated strongly gives D which is used to extract metal. Identify (X), (A), (B), (C) & (D). Write suitable equations to support their identities.

30. (a) How will you convert: **(3 Marks)**
- (i) Benzene to acetophenone
- (ii) Benzene to *p*-nitrophenone
- (iii) Ethanoic acid to methane
- (b) Write the name of product obtained by the HBr with hex-1-ene in the presence of a peroxide. 1
- (c) Hydrogen atoms of ethyne are acidic in nature, why? 1

OR

- (a) Complete the following reactions:

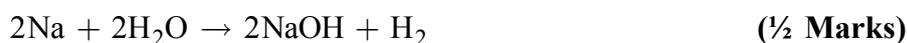




- (b) $-\text{NO}_2$ group attached to benzene is meta directing but $-\text{OH}$ group is ortho and para directing. Explain why? 2

SOLUTIONS OF SAMPLE PAPER

Ans 1. When sodium metal is dropped in water, hydrogen gas is evolved which catches fire (½ Marks)



Ans 2. $\Delta S = 0$ (1 Marks)

Ans 3. BeH_2 is a linear molecule with H-Be-H bond angle as 180° . Although the Be-H bonds are polar, the bond polarities cancel each other and the net dipole moment is zero. (1 Marks)

Ans 4. Trigonal pyramidal (1 Marks)

Ans 5. Tritium (1 Marks)

Ans 6. But-1-en-3-yne (1 Marks)

Ans 7. Sp^2 (1 Marks)

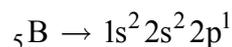
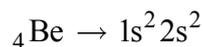
Ans 8. Carbon dioxide and methane (1 Marks)

Ans 9. $\text{K}^+ < \text{Cl}^- < \text{S}^{2-} < \text{P}^{3-}$ (1 Marks)

Reason : All the ions are isoelectronic with 18 electrons. If the number of electrons is the same, as the number of protons increase, the nuclear charge increase and hence the outermost electrons will experience a greater force of attraction towards the nucleus. This results in the decrease in ionic radii. Since the nuclear charge decreases from K^+ to P^{3-} , the ionic radii increase from K^+ to P^{3-} . (1 Marks)

Ans 10. The I.E of Be is greater than Born of because of :- (2×1 Marks)

(I) **Electronic configuration :** Be have fully filled stable configuration, so difficult to remove electron



- (2) **Penetration effect** : In case of Be, electron is to be removed from s-subshell while in Boron from p-subshell penetration effect of s is greater than p so difficult to remove electron from Be. **(1 Mark)**

Ans 11. The given question is based on Boyle's Law. Therefore,

$$P_1V_1 = P_2V_2 \quad \text{(2×1 Marks)}$$

$$\Rightarrow \frac{760 \text{ torr}}{760 \text{ torr/atm}} \times 3\text{L} = 1.45\text{atm} \times V_2\text{L}$$

$$\Rightarrow V_2 = 2.07\text{L} \quad \text{(1 Mark)}$$

Ans 12. Unit of a is $\text{atm lit}^2 \text{ mol}^{-2}$ and of b is lit mol^{-1} **(2×1 Marks)**

Ans 13. (i) $2\text{Al} + 2\text{NaOH} + 6\text{H}_2\text{O} \rightarrow 2\text{Na} [\text{Al} (\text{OH})_4] + 3\text{H}_2$ **(1 Mark)**

(ii) $\text{SiCl}_4 (\text{l}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{SiO}_2(\text{s}) + 4\text{HCl}(\text{aq})$ **(1 Mark)**

Ans 14. (i) Alkali metals have large atomic size with only one valence electron. Thus, they have weak metallic bonding between the atoms of the metal. Because of weak metallic bonding, alkali metals are soft and can be cut with a knife. **(1 Mark)**

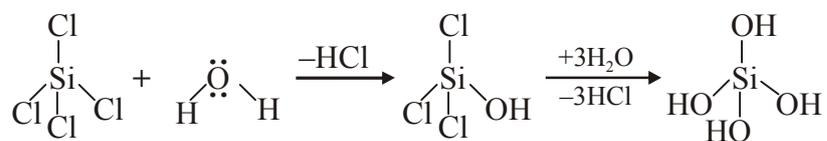
(ii) Reactivity of metals depends on ionization enthalpy. Smaller is the ionization enthalpy, greater is the reactivity. Potassium has a larger atomic size than sodium. Thus, the ionization enthalpy of potassium is less than sodium. Hence, potassium is more reactive than sodium. **(1 Mark)**

Ans 15. (a) Be and Mg both have high Ionisation enthalpy **(1 Mark)**

(b) Alkali metals and alkaline earth metals are good reducing agents and have high negative $E_{\text{m}^{n+}}^0 / m$ values, therefore they can not be reduced by chemical Methods. **(1 Mark)**

Ans 16. In SiCl_4 , Si atom has empty d-orbitals in its valence shell.

These empty d orbitals of Si can accept lone pair of electrons from water molecule. Eventually this leads to hydrolysis of SiCl_4 and $\text{Si}(\text{OH})_4$ is formed. **(½ Mark)**



(½ Mark)

Carbon atom on the other hand does not have any vacant d-orbitals in its valence shell. Hence, it cannot accept the electron pair from water molecule. Thus, CCl_4 does not hydrolyse. (1 Mark)

Ans 17. The decreasing order of acidic behaviour is:

Ethyne > benzene > n-pentane (1 Mark)

The C–H bond in ethyne, benzene and n-pentane are formed by $sp-s$, sp^2-s and sp^3-s overlap. Now, greater the percentage s character, greater is the electronegativity. Therefore, sp -hybridised carbon in ethyne is more electronegative than sp^2 hybridised carbon of benzene which in turn is more electronegative than sp^3 hybridised carbon of n-pentane. Therefore, the polarity of the C-H bond is in order of:

Ethyne > benzene > pentane

Hence the acidity order is:

Ethyne > benzene > pentane (1 Mark)

Ans 18. Moles of $\text{N}_2 = \frac{\text{Mass}}{\text{Molar mass}}$

$$= \frac{50 \times 10^3 \text{ g}}{28 \text{ g/mol}}$$

$$= 1.786 \times 10^3 \text{ mol}$$

Moles of $\text{H}_2 = \frac{\text{Mass}}{\text{Molar mass}}$ (½ Mark)

$$= \frac{10 \times 10^3 \text{ g}}{2 \text{ g/mol}}$$

$$= 5.0 \times 10^3 \text{ mol}$$



According to equation (1),

1 mole of $\text{N}_2 (\text{g})$ reacts with = 3 moles of $\text{H}_2 (\text{g})$

Therefore $1.786 \times 10^3 \text{ mol}$ of $\text{N}_2 (\text{g})$ will react with

$$\begin{aligned} &= \frac{3 \times 1.786 \times 10^3}{1} \text{ moles of } \text{H}_2 (\text{g}) \\ &= 5.36 \times 10^3 \text{ mol} \end{aligned}$$

But we are having $5.0 \times 10^3 \text{ mol}$ of $\text{H}_2 (\text{g})$ only.

Hence, $\text{H}_2 (\text{g})$ is the limiting reagent. (½ Mark)

To calculate the amount of NH_3 formed,

3 moles of $\text{H}_2 (\text{g})$ give = 2 moles of $\text{NH}_3 (\text{g})$

Therefore,

$$\begin{aligned} 5.0 \times 10^3 \text{ moles of } \text{H}_2 \text{ will give} &= \frac{2}{3} \times 5 \times 10^3 \text{ moles of } \text{NH}_3 \\ &= 3.3 \times 10^3 \text{ moles of } \text{NH}_3 \end{aligned}$$

(½ Mark)

Mass of NH_3 produced = $3.3 \times 10^3 \times 17 \text{ g}$ of NH_3

$$= 56.1 \text{ Kg} \quad (\text{½ Mark})$$

Ans 19. (i) The exhaust of motorcycle was producing smoke which causes air pollution. The smoke is due to incomplete combustion of fuel producing CO and unburnt carbon. They are very harmful air pollutants. (1 Mark)

(ii) The act of policeman shows his Sincerity towards his duty and concern for mankind. He was not only doing his duty but was helping to maintain clean environment which is the need of the hour. We all should get our vehicles checked for air pollution timely to save our environment or our life. (½ Mark)

Ans 20. (i) $v = \frac{c}{\lambda}$ (½ Mark)

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8 \text{ m/s}}{4.37 \times 10^{14} \text{ s}^{-1}}$$

$$\therefore \lambda = 0.686 \times 10^{-6} \text{ m}$$

$$\therefore \lambda = 686 \text{ nm} \quad \text{(1/2 Mark)}$$

(ii) Here $n_1 = 6$ & $n_2 = 1$

The energy gap between two orbits for a hydrogen atom is given as

$$\Delta E = 2.18 \times 10^{-18} \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \quad \text{(1/2 Mark)}$$

$$= 2.18 \times 10^{-18} \text{ J} \left(\frac{1}{6^2} - \frac{1}{1^2} \right)$$

$$= 2.18 \times 10^{-18} \text{ J} \left(\frac{1 - 36}{36} \right)$$

$$\Delta E = -2.11 \times 10^{-18} \text{ J} \quad \text{(1/2 Marks)}$$

Since ΔE is negative energy is emitted, frequency of photon is given by

$$\nu = \frac{\Delta E}{h} \quad \text{(1/2 Mark)}$$

$$= \frac{2.11 \times 10^{-18} \text{ J}}{6.626 \times 10^{-34} \text{ Js}}$$

$$= 3.18 \times 10^{15} \text{ s}^{-1}$$

$$= 3.18 \times 10^{15} \text{ Hz} \quad \text{(1/2 Mark)}$$

Ans 21. (i) For $n = 1$,

$$\text{Value of } l = n - 1$$

$$= 1 - 1$$

$$= 0$$

For each value of l ,

$$\text{Value of } m_l = -1, \dots, 0, \dots, +1 \quad \text{(1 Mark)}$$

Therefore,

For $n = 1, l = 0,$

$m_l = 0$

Thus the value of $m_l = 1$ is not possible. (1 Mark)

(ii) Electronic configuration of Cu^{2+} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$
(1 Mark)

Ans 22. (i) Resonating structure of O_3 molecule (1 Mark)



(ii) In NF_3 , N atom involves sp^3 hybridization and one position is occupied by a lone pair. Therefore the molecule is trigonal pyramidal. But in BF_3 , B atom involves sp^2 hybridization having trigonal planar geometry. Thus NF_3 is trigonal pyramidal while BF_3 is trigonal planar, even though both are tetra atomic molecules. (1 Mark)

(iii) $\text{C}_3 \rightarrow sp^3$
 $\text{C}_4 \rightarrow sp$ ($\frac{1}{2} \times 2$ Marks)

Ans 23. (i) If the concentration of SO_2 is increased the equilibrium will shift in the forward direction to consume the reactant SO_2 . (1 Mark)

(ii) If the concentration of SO_3 increased the equilibrium will shift in the backward direction to consume the product SO_3 . (1 Mark)

(iii) If the temperature is increased, the equilibrium will shift in the backward direction as the increase in temperature will be compensated by absorbing heat. (1 Mark)

Ans 24. (i) **Common ion effect :** The suppression in degree of dissociation of weak electrolyte by adding in it a strength electrolyte having the common ion is called common ion effect. (1 Mark)

(ii) **Buffer Solution :** Buffer solution is that which resist the change in pH on addition of small amount of acid or base in it. (1 Mark)

(iii) **pH** : It is the negative logarithm of hydronium ion concentration.

(1 Mark)

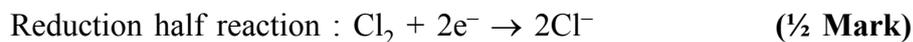
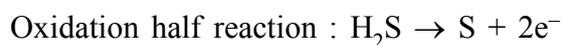
Ans 25. Step 1 : Write the oxidation numbers and separate the reaction into oxidation half and reduction half reactions.



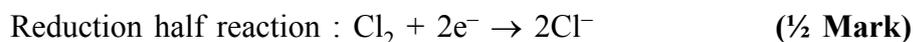
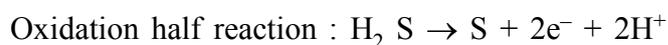
Step 2 : The half reaction are :



Step 3 : Balance oxidation number by adding electrons.

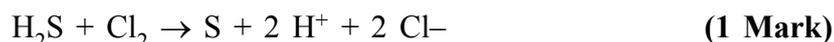


Step 4 : There are no oxygen atoms. So, balance the hydrogen atoms. Since the reaction takes place in acidic medium, the balancing of hydrogen atoms is done by adding the appropriate number of hydrogen ions to the deficient side.



Step 5 : Add the two reactions to get a balanced redox reaction.

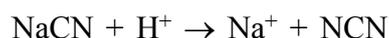
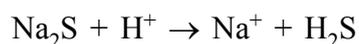
Balanced reaction :



Ans 26. (i) $(\text{CH}_3)_3\text{C}^+$ is stable due to hyperconjugation but CH_3^+ lacks hyperconjugation stability. **(1 Mark)**

(ii) In CCl_4 the C–Cl bonds are covalent which do not furnish Cl^- in solutions. **(1 Mark)**

(iii) Conc. HNO_3 is added to the sodium extract to decompose cyanide or sulphide of sodium if present. **(1 Mark)**



Ans 27. (i) Mass of organic compound = 0.2457 g

Mass of CO₂ produced = 0.4950 g

Mass of H₂O produced = 0.2025 g

$$\% \text{ of C} = \frac{12}{44} \times \frac{\text{Mass of CO}_2}{\text{Mass of compound taken}} \times 100$$

$$\% \text{ of H} = \frac{2}{18} \times \frac{\text{Mass of H}_2\text{O}}{\text{Mass of compound taken}} \times 100$$

$$= \frac{2}{18} \times \frac{0.2025}{0.2475} \times 100$$

$$= 9.09$$

$$= \frac{12}{44} \times \frac{0.4950}{0.2475} \times 100 = 54.54 \quad \text{(1 Mark)}$$

(ii) Blood red colouration due to Fe (CNS) will be produced.

(1 Mark)

Ans 28. (i) Heat absorbed by the system (q) = + 701 J **(½ Mark)**

Work done by the system (w) = -394 J **(½ Mark)**

Change in internal energy (ΔU) = q + w **(½ Mark)**

$$= 701 - 394$$

$$= + 307 \text{ J} \quad \text{(½ Mark)}$$

(ii) $\Delta G^\theta = -2.303 RT \log K$ **(1 Mark)**

$$R = 8.0 \text{ JK}^{-1} \text{ mol}^{-1}$$

$$T = 300 \text{ K}$$

$$K = 10$$

$$\Delta G^\theta = - 2.303 RT \log K$$

$$= - 2.303 \times 8.0 \times 300 \times \log 10 \quad \text{(1 Mark)}$$

$$= 5527. 2 \text{ Jmol}^{-1} \quad \text{(1 Mark)}$$

OR

Ans 28. (i) $\Delta_f h^\theta = \Delta_{\text{sub}} H^\theta + \Delta_{\text{ie}} H^\theta + \frac{1}{2} \Delta_{\text{diss}} H^\theta + \Delta_{\text{eg}} H^\theta + \Delta_{\text{lattice}} H^\theta$
(½ Mark)

$$\Delta_{\text{lattice}} H^\theta = -401.66 - (160.67) - (520.07) - \frac{1}{2} (244.34) - (-365.26)$$

$$\Delta_{\text{lattice}} H^\theta = -839.31 \text{ kJ/mol} \quad \text{(½ Mark)}$$

(ii) $\Delta U^\theta = -10.5 \text{ kJ}$, $\Delta n (\text{g}) = -1 \text{ mol}$, $T = 298 \text{ K}$

$$R = 8.314 \times 10^{-3} \text{ kJ K}^{-1} \text{ mol}^{-1}$$

$$\Delta H^\theta = \Delta U^\theta + \Delta n (\text{g}) RT \quad \text{(½ Mark)}$$

$$\Delta H^\theta = -10.5 + [-1 \text{ mol} \times 8.314 \times 10^{-3} \times 298]$$

$$= -10.5 \text{ kJ} - 2.478 \text{ kJ}$$

$$= -12.978 \text{ kJ} \quad \text{(½ Mark)}$$

$$\Delta G^\theta = \Delta H^\theta - T\Delta S^\theta \quad \text{(½ Mark)}$$

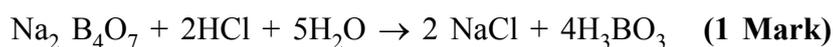
$$= -12978 \text{ J} - 298 (-34.1 \text{ J}) \quad \text{(½ Mark)}$$

$$= -12978 + 10161.8$$

$$= -2816.2 \text{ J} \quad \text{(½ Mark)}$$

Since the value of ΔG^θ is negative, the reaction is spontaneous.
(½ Mark)

Ans 29. (i) Borax solution on acidification forms boric acid.



(ii) Pb (IV) state is unstable due to inert pair effect. **(1 Mark)**

(iii) Boric acid ($\text{B}(\text{OH})_3$) accept OH from water and H^+ is released by H_2O molecule. **(1 Mark)**

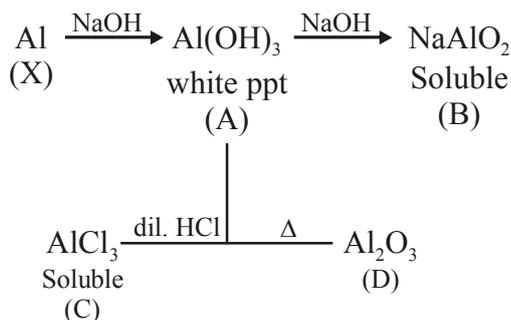
(iv) Carbon is able to form $p\pi-p\pi$ bond with O atom and constitute a stable non-polar molecule $\text{O} = \text{C} = \text{O}$. Due to weak inter particle force its boiling point is low and it is gas at room temperature. **(1 Mark)**

Si on the other hand is not able to form $pp-pp$ bond with O atoms because of its relatively large size. In order to complete

its octet Si is linked to four O atoms around it by sigma bond & these constitutes network structure, which is responsible for its solid state. **(1 Mark)**

OR

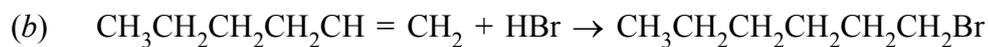
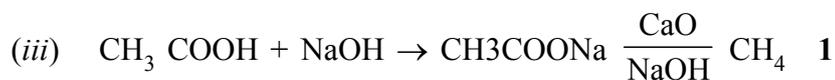
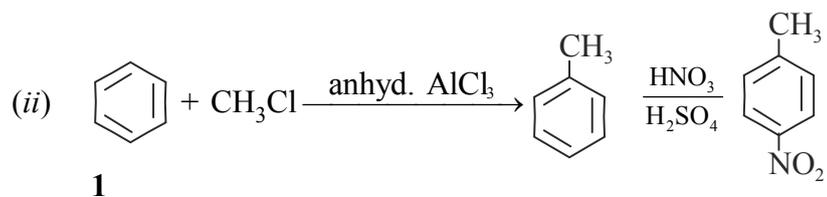
Ans 29.



2 Marks for writing reactions

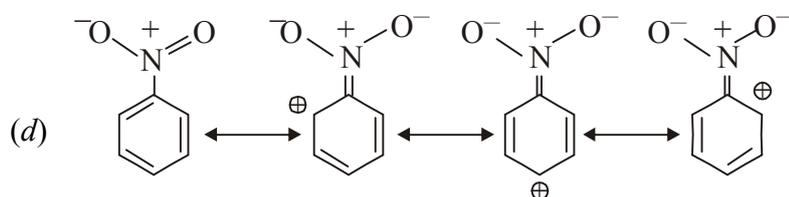
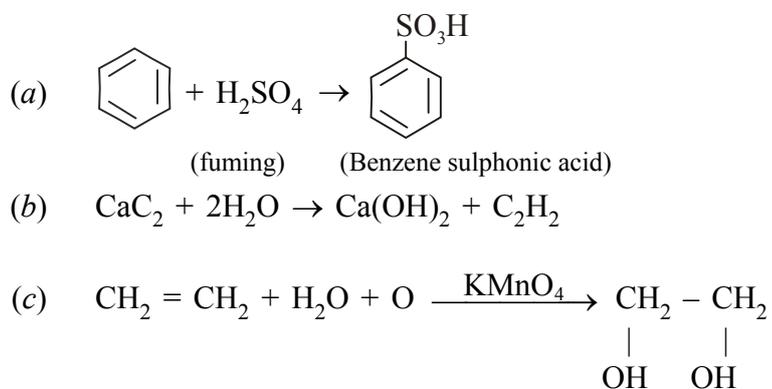
1 Marks for identifying X

½ mark each for correctly identifying A, B, C and D.

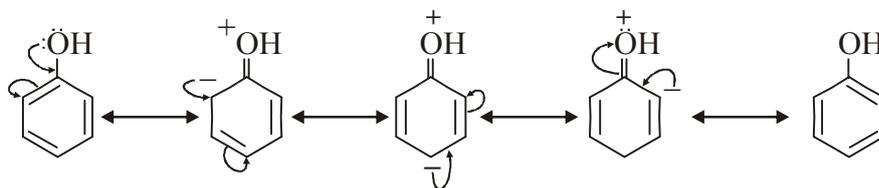


(c) The H attached to *sp* hybrid carbon becomes acidic due to high electronegativity of (*sp* hybridised). C

OR



The electron density decreases on *o*- and *p*- positions as a result the electrophile attacks on *m*- position.



The electron density increase on *o*- and *p*- positions, therefore electrophile attacks on *o*- and *p*- positions.

SAMPLE PAPER - I (UNSOLVED)

(ACCORDING TO CBSE CURRICULUM : 2013-14)

CHEMISTRY - XI

Time : 3 hours

Class : XI

Maximum Marks : 70

General Instructions :

1. All questions are compulsory.
2. Question no. 1 to 5 are very short answer questions and carry 1 mark each.
3. Question no. 6 to 10 are short answer questions and carry 2 marks each.
4. Question no. 11 to 22 are also short answer questions and carry 3 marks each.
5. Question no. 23 is value based question carrying 4 marks.
6. Question no. 24 to 26 are long answer questions and carry 5 marks each.
7. Use log tables if necessary, use of calculators is not allowed.

QUESTIONS

1. How many atoms of helium are present in 64 u of helium? (1 Mark)
2. Write IUPAC name and symbol of element having atomic no. 110? (1 Mark)
3. What is absolute zero? (1 Mark)
4. What is the designation of an orbital having $n = 3, l = 2$? (1 Mark)
5. Define residual entropy. (1 Mark)
6. Commercially available sulphuric acid contains 93% acid by mass and has density of 1.84mL^{-1} . Calculate its molarity. (2 Marks)

7. Which out of NH_3 and NF_3 has higher dipole moment and why?
(2 Marks)
8. (a) State Hess's law of constant heat summation?
(b) For a reaction:

$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g}) \quad \Delta_r H^\ominus = -92.4 \text{ KJ}$$
 What is the standard enthalphy of formation of NH_3 ?
9. Balance the following redox reaction in acidic medium by ion electron method–

$$\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{Cr}^{3+}$$
10. (i) Write IUPAC name of $\text{CH}_3 - \text{CH}_2 - \text{CO} - \text{CH}_2 - \text{CHO}$.
(ii) How many sigma and pi bonds are present in $\text{CH}_3\text{CH}=\text{CHCH}_2\text{Cl}$.
11. Why ethyne is acidic in nature? Give a chemical test to distinguish between ethene and ethyne.
12. (a) Why does boron triflouride behave as lewis acid?
(b) What are fullerenes?
13. An electron has a speed of 600 m/s with uncertainty of .025%. What is the uncertainty in locating its position?

OR

- (a) Which atom is indicated by following configuration $[\text{Ne}]3s^23p^4$?
(b) How many nodes are present in 3d orbital?
(c) Give an example of disproportionate reaction.
14. Of the following species which one is most stable and why–
 $(\text{CH}_3)_3\text{C}^+$, $(\text{CH}_3)_2\text{CH}^+$, CH_3CH_2^+ , CH_3^+
15. What happens when–
(a) Sodium Metal is heated in free supply of air.
(b) Gypsum is heated to 393 K.
(c) Why are group of 2 elements harder than group 1 elements.
16. (a) Assign the position to the element having outer electronic configuration $(n-1)d^2ns^2$ for $n=4$.

- (b) Explain why cations are smaller and anions are bigger in radii than their parents?
17. (a) Why H_2O is a liquid and H_2S is a gas?.
- (b) On the basis of MOT explain why Ne_2 molecule does not exist?
18. A sample of a gas contains
15 molecules with a speed of 3 ms^{-1} ,
25 molecules with a speed of 5 ms^{-1} and
30 molecules with a speed of 8 ms^{-1}
Calculate root mean square speed of these molecules.
19. Give reason Why?
- (a) Be and Mg do not give colour to flame whereas other alkaline earth metal do so?
- (b) A solution of Na_2CO_3 is alkaline.
- (c) Solution of alkali metal in ammonia is coloured?
20. In Dumas method for estimation of nitrogen .03g of an organic compound gave 50 ml of nitrogen collected at 300K temperature and 715 mm pressure. Calculate the percentage composition of nitrogen in the compound? (Aqueous tension at 300K = 15mm)
21. (a) What is biochemical oxygen demand?
- (b) Write down the reactions involved in ozone layer depletion?
22. (a) Name the series of hydrogen spectrum which lies in visible region?
- (b) Calculate the kinetic energy of an electron emitted when radiation of frequency $1.1 \times 10^{15} \text{ s}^{-1}$ hits the metal. Threshold frequency of metal is $7.0 \times 10^{14} \text{ s}^{-1}$?
23. Rashmi observed that whenever her mother washes clothes, the soap does not produce lather. Instead the water became cloudy. Her mother even changed the soap brand but was not able to get good lather. As a student of chemistry.

- (i) How would you analyse the problem of Rashmi's mother and help her?
- (ii) What are the values associated with your suggestion?
24. (a) Balance and complete the following reactions–
- (i) $\text{Al} + \text{NaOH} + \text{H}_2\text{O} \rightarrow \underline{\hspace{2cm}}$
- (ii) $\text{H}_3\text{BO}_3 \xrightarrow{\Delta} \underline{\hspace{2cm}}$
- (b) What is Inorganic Benzene?
- (c) Name the compound used as catalyst in petrochemical industry for cracking of hydrocarbons?
- (d) Conc. HNO_3 can be transported in aluminium container why?

OR

A certain salt X gives the following results–

- (i) Its aqueous solution is alkaline to litmus.
- (ii) It swells up to glassy material Y on strong heating.
- (iii) When conc. H_2SO_4 is added to a hot solution of X, white crystal of an acid Z separate out.

Identify X, Y, Z and write equation for all the above reactions.

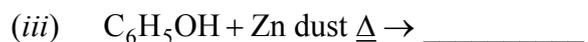
25. (a) Why does the dissociation of PCl_5 decreases in presence of Cl_2 ?
- (b) State Le Chatelier's principle?
- (c) 3.00 moles of PCl_5 kept in one litre closed reaction vessel was allowed to attain equilibrium at 380 K. Calculate composition of the mixture at eq.(Equilibrium constant = 1.80)

OR

- (a) What is Buffer Solution?
- (b) Write difference between Ionic Product and Solubility product?
- (c) Calculate pH of a solution formed by dissolving 0.3g of NaOH in water to make 200 ml of solution?

26. (a) Which one is having high dipole moment and why.
cis-but-2-ene and trans-but-2-ene.

(b) Complete the following reactions:



OR

(b) Draw Sawhorse projections of ethane?

(c) An alkene 'A' contains three C-C, eight C-H σ bonds and one C-C π bond. 'A' on ozonolysis gives two moles of an aldehyde of molar mass 44u. Write IUPAC name of 'A'.

SAMPLE PAPER - II (UNSOLVED)

(ACCORDING TO CBSE CURRICULUM : 2013-14)

CHEMISTRY - XI

Time : 3 hours

Class : XI

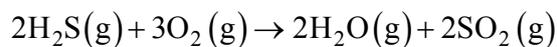
Maximum Marks : 70

General Instructions :

1. All questions are compulsory.
2. Question no.1 to 5 are very short answer questions and carry 1 mark each.
3. Question no. 6 to 10 are short answer questions and carry 2 marks each.
4. Question no. 11 to 22 are also short answer questions and carry 3 marks each.
5. Question no. 23 is value based question carrying 4 marks.
6. Question no. 24 to 26 are long answer questions and carry 5 marks each.
7. Use log tables if necessary, use of calculators is not allowed.

QUESTIONS

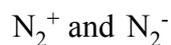
1. Which series of lines of the hydrogen spectrum lie in the ultra violet region.
2. What would be the IUPAC name and symbol for the element with atomic number 114?
3. Which of the following has maximum bond angle?
 H_2O , CO_2 , NH_3 , CH_4
4. Write van der Waals equation for one mole of a gas.
5. Predict the sign of ΔS° for the following reaction:



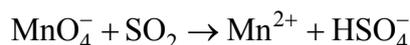
6. Identify 'A' and 'B' in the following:



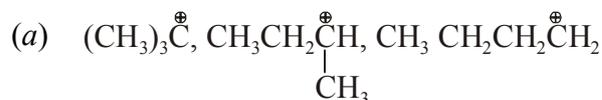
7. The mass of an electron is 9.1×10^{-31} kg. If its K.E. (kinetic energy) is 3×10^{-25} J. Calculate its velocity.
8. Give two differences between σ and π bonds.
9. Compare the relative stability of the following species on the basis of molecular orbital theory and indicate their magnetic properties:



10. Balance the following equation in acidic medium by ion electron method:



11. Arrange the following:



[Increasing order of stability]

- (b) I, -Br, -Cl, -F [Decreasing order of -I effect]
- (c) Write structural formula of 3, 4, 4, 5, 5-tetramethylheptane
12. Compare the alkali metals and alkaline earth metals with respect to:
- (a) Ionization enthalpy
- (b) Basicity of oxides.
- (c) Electronic configuration
13. Give a brief account on the following:
- (a) KO_2 is paramagnetic in nature.
- (b) Sodium is stored under kerosene oil.

- (c) Name the alkali metal which shows diagonal relationship with magnesium.
14. In carius method of estimation of halogen, 0.15 g of an organic compound gave 0.12 g of AgBr. Find out the percentage of bromine in the compound.
[Molar mass of AgBr = 188 mol⁻¹, At mass of Br = 80 g mol⁻¹]
15. Dinitrogen and dihydrogen react with each other produce ammonia according to the chemical equation:
- $$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$$
- (a) Calculate the mass of ammonia produced if 2 × 10³ g dinitrogen reacts with 1 × 10³ g dihydrogen.
- (b) Will any of the two reactant remain unreacted?
- (c) If yes, which one and what would be its mass?
16. (a) What causes the temporary and permanent hardness of water?
- (b) Compare the structures of H₂O and H₂O₂.
17. (a) Write the conjugate acids for the Bronsted base NH₂⁻ and HCOO⁻?
- (b) The concentration of hydrogen ion in a sample of soft drink is 3.8 × 10⁻³ M. What is its pH? [log 3.8 = 0.5798]
- (c) Equilibrium constant for a reaction is 4.0, what will be the equilibrium constant for the reverse reaction.
18. Explain the following:
- (a) Boyle's law
- (b) Avogadro's law
- (c) Critical Temperature

OR

- (a) In terms of Charles' law explain why -273°C is the lowest temperature.
- (b) Calculate the total pressure in a mixture of 8 g of oxygen and

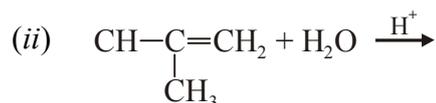
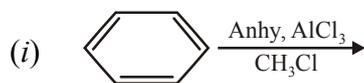
4 g of hydrogen. Confined in a vessel of 1 dm³ at 27°C. $R = 0.083 \text{ bar dm}^3 \text{ K}^{-1} \text{ mol}^{-1}$.

19. (a) How many electrons in an atom can have $n + l = 6$?
(b) Write the electronic configuration of Cr^+ [Atomic number of Cr = 24]
(c) Define Hund's rule of Maximum multiplicity.
20. Give a brief account for the following:
(a) Anions are bigger in size than their parent atom.
(b) Oxygen has lesser first ionization enthalpy than nitrogen.
(c) Fluorine has less negative electron gain enthalpy than chlorine.
21. (a) The reaction quotient of a reversible reaction is Q_c and the equilibrium constant is K_c . What do you conclude for the reaction if $Q_c < K_c$?
(b) State Le Chatelier's principle.
(c) In qualitative analysis, NH_4Cl is added before adding NH_4OH solution for testing of III group radicals [Fe^{3+} , Cr^{3+} and Al^{3+}]. Explain by using concept of common ion effect.
22. (a) What type of isomerism is shown by pentane and 2-Methyl (isopentane).
(b) Why is an organic compound fused with sodium for testing halogen, nitrogen, sulphur and phosphorus?
(c) Write the I.U.P.A.C name of $\text{CH}_2 = \text{CHCH}_2\text{CH}(\text{OH})\text{CH}_3$
23. Chlorofluorocarbons commonly known as Freons have the properties such as low boiling points, odourless, non-toxic, non-flammable, least chemical reactivity and thermally stable. These have been extensively used in air-conditions, refrigerators, spraycans, etc. In the group discussion in a school, Rakesh strongly supported the use of freons for making our life comfortable. However Rajnish strongly opposed the excessive use of these freons for their ill effects on the environment on the basis of the passage, answer the following questions:

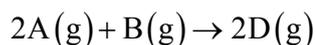
- (i) In this situation, whom will you support, Rakesh or Rajnish?
- (ii) What are the values associated with your decision or support.
24. (a) How can you convert the following:
- (i) Methane into Ethane
- (ii) Benzene into acetophenone
- (b) Give a chemical test to distinguish between ethene and ethyne?
- (c) Give a brief account for the following statements:
- (i) *n*-pentane has greater boiling point than isopentane.
- (ii) CH_4 cannot be synthesized by Wurtz reaction.

OR

- (a) An alkyl halide (X) of formula $\text{C}_6\text{H}_{13}\text{Cl}$ on treatment with alcoholic KOH or potassium *tert*-butoxide gives two isomeric alkenes Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2, 3-dimethylbutane. Predict the structure of X, Y and Z.
- (b) Give the main products of the reactions:



25. (a) State Hess's law.
- (b) When $\Delta H > 0$ and $\Delta S < 0$, a reaction is never spontaneous. Explain.
- (c) For the reaction:



$$\Delta U^\circ = -10. \text{kJ} \text{ and } \Delta S^\circ = -44.1 \text{ JK}^{-1} \text{ mol}^{-1}.$$

Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously.

OR

(a) For the reaction at 298 K



$$\Delta H = 400 \text{ kJ mol}^{-1} \text{ and } \Delta S = 0.2 \text{ kJ mol}^{-1} \text{ K}^{-1}$$

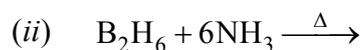
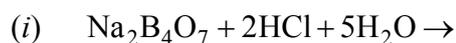
At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.

- (b) State first law of thermodynamics.
- (c) Give one point to differentiate the following thermodynamic terms:
- (i) Extensive properties and intensive properties.
 - (ii) Isothermal process and adiabatic process.

26. (a) Account for the following:

- (i) Boron trihalides (BX_3) act as Lewis acids.
- (ii) $PbCl_4$ is a powerful oxidising agent.
- (iii) Graphite acts as a good lubricant.

(b) Complete the following reactions:



OR

(a) Draw the shape of B_2H_6 molecule.

(b) Give suitable reasons for the following:

- (i) $[SiF_6]^{2-}$ is known whereas $[SiCl_6]^{2-}$ not

(ii) diamond is covalent, yet it has high melting point.

(c) Complete the reactions: (5)

