CBSE CLASS – XI CHEMISTRY SAMPLE PAPER 4

Time: 3 Hours

Marks: 70

General Instructions

- All questions are compulsory.
- Section A: Q.no. 1 to 5 are very short answer questions and carry 1 mark each.
- Section B: Q.no. 6 to 12 are short answer questions and carry 2 marks each.
- Section C: Q.no. 13 to 24 are also short answer questions and carry 3 marks each.
- Section D: Q.no. 25 to 27 are long answer questions and carry 5 marks each.
- There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, four questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
- Use of log tables if necessary, use of calculators is not allowed.

Section A

1.	. Why is an organic compound fused with sodium for testing halogens, nitrogen, sulphu	ır
	and phosphorous?	[1]
	OR	
	What kind of isomers are the compounds: CH ₃ CH ₂ OCH ₂ CH ₃ and CH ₃ OCH ₂ CH ₂ CH ₃ ?	
2.	What shapes are associated with sp ³ d and sp ³ d ² hybrid orbitals?	[1]
OR		
	Arrange the following bonds in the order of increasing ionic character: C-H, F-H, Br-H, Na-I, K-F, Li-Cl	
3.	Although benzene is highly unsaturated it does not undergo addition reactions.	[1]
4.	What is siltation?	[1]
5.	Why alkali and alkaline earth metals cannot be obtained by chemical reduction metho)d?
		[1]

Section B

6. Which of the following has largest size? Mg, Mg ²⁺ , Al ³⁺ , Al	[2]
7. Consider the following species: N ³⁻ , O ^{2-,} F ⁻ , Na ⁺ , Mg ^{2+,} Al ³⁺	[2]
(a) What is common in them?	
(b) Arrange them in order of increasing ionic radii?	
8. The wavelength of first spectral line in Balmer series is 6561 Å. Calculate th of second spectral line in Balmer series.	e wavelength [2]
9. On a ship sailing in Pacific Ocean where temperature is 23.4°C, a balloon is f air. What will be the volume of the balloon when the ship reaches Indian Oc temperature is 26.1°C?	ìlled with 2 L ean, where

10. Balance the following equation in an alkaline medium by half reaction method. [2]

$$\operatorname{Cr(OH)}_3 + \operatorname{IO}_3 \rightarrow \operatorname{I} + \operatorname{CrO}_4^{2-}$$

solute.

OR

- **11.**Give reasons:[2](a) Anhydrous AlCl3 is covalent but hydrated AlCl3 is electrovalent. Explain(b) Boric acid behaves as Lewis acid? Explain
- **12.** Which of the two is more concentrated and why? 1 M or 1 m aqueous solution of a

OR

[2]

How many moles and how many grams of NaCl are present in 250 cm³ of 0.500 M naCl solution?

Section C

13. If the photon of the wavelength 150 pm strikes an atom and one of its inner bound electrons is ejected out with a velocity of 1.5×10^7 m/s, calculate the energy with which it is bound to the nucleus. [3]

OR

(a) What are degenerate orbitals? Give examples.

- (b) Show that the circumference of the Bohr's orbit for H atom is an integral multiple of wavelength associated with the electron revolving aroun the orbit.
- **14.** Which out of NH_3 and NF_3 has higher dipole moment and why? [3]

OR

- (a) For the complex [Fe(H₂O)₆]⁺³, write the hybridisation, magnetic character and spin of the complex. (At, number : Fe = 26)
- (b) Draw one of the geometrical isomers of the complex [Pt (en)₂Cl₂]⁺² which is optically inactive.
- 15. 0.2325g of an organic compound was analysed for nitrogen by Duma's method. 31.7mL of moist nitrogen was collected at 250C and 755.8mm Hg pressure. Calculate the percentage of N in the sample. (Aq. Tension of water at 250C is 23.8mm). [3]
- **16.** Calculate the enthalpy of combustion of glucose from the following data [3]

C (graphite)
$$+0_2 \rightarrow C0_2$$
 (g) ; $\Delta_r H^{\theta} = -395 kJ$
 H_2 (g) $+ \frac{1}{2} O_2$ (g) $\rightarrow H_2 O(l)$; $\Delta_r H^{\theta} = -269.4 kJ$
6C (graphite) $+ 6H_2(g) + 3O_2(g) \rightarrow C_6 H_{12} O_6(s)$; $\Delta_r H^{\theta} = -1169.9 kJ$

17.Calculate the molar solubility of Ni (OH)₂ in 0.10 M NaOH. The solubility product of Ni (OH) ₂ is 2.0 × 10⁻¹⁵.
 [3]

OR

The pH of 0.1 M solution of cynic acid (HCNO) is 2.34. Calculate the ionization constant of the acid and its degree of ionization in the solution.

18.

(a) Consider the voltaic cell constructed with the following substances: [3] $Cr^{3+}_{(aq)} + 3e^- \rightarrow Cr_{(s)}$

 $\mathrm{MnO^{4-}_{(aq)}+8H^{+}_{(aq)}+Se^{-}\rightarrow \ \mathrm{Mn^{2+}_{(aq)}+4H_2O_{(l)}}$

 $\mathrm{E}^{\mathrm{o}}=-0.74\,\mathrm{V}$

 $E^{o} = +1.51V$

- (i) Which substances are oxidised and reduced in this cell?
- (ii) Which are the negative and positive electrodes?

(b) Write the oxidation number of the following atoms:

- (i) KMnO₄
- (ii) K₂Cr₂O₇

OR

Write the half reactions for each of the following redox reactions:

- (a) $\operatorname{Zn}_{(s)} + 2\operatorname{H}^{+}_{(aq)} \rightarrow \operatorname{Zn}^{2+}_{(aq)} + \operatorname{H}_{2(g)}$
- (b) $Al_{(s)} + 3Ag^{+}_{(aq)} \rightarrow Al^{3+}_{(aq)} + 3Ag_{(s)}$
- (c) $Mg_{(s)} + Cl_{2(g)} \rightarrow MgCl_{2(s)}$

19. Arrange the following:

[3]

- (a) CaH₂, BeH₂ and TiH₂ in order of increasing electrical conductance.
- (b) LiH, NaH and CsH in order of increasing ionic character.
- (c) H–H, D–D and F–F in order of increasing bond dissociation enthalpy.

20.

[3]

- (a) Why cannot sulphuric acid be used to acidify sodium extract for testing S using lead acetate solution?
- (b) Which of the carbocations is most stable and why?

 $(CH_3)_{3}C^{+}$, $CH_3CH_2CH_2^{+}$, $CH_3CHCH_2CH_3^{+}$

- (c) Why does a liquid vaporize below its boiling point in steam distillation process?
- **21.** What type of isomerism is exhibited by following pair of compounds? [3]
 - (i) Ethanol and Methoxy methane
 - (ii) o-cresol and m-cresol
 - (iii) Pentan-3-one and pentan-2-one

22. Explain

[3]

- (a) Fish do not grow as well in warm water as in cold water. Why?
- (b) Why does rain water normally have a pH about 5.6?
- (c) Name two major greenhouse gases.
- **23.** Write the IUPAC names of the following compounds: [3]
 - (a) CH₃CH–C(CH₃)₂
 - (b)



24. When a metal X is treated with sodium hydroxide, a white precipitate A is obtained, which is soluble in an excess of NaOH to give soluble complex B. Compound A is soluble in diluted HCl to form compound C. The compound A when heated strongly gives D, which is used to extract metal. Identify X, A, B, C and D. Write suitable equations to support their identities. [3]

Section D

25.

- (a) What is spontaneous change? What is the condition for spontaneity in terms of free energy change?
- (b) At 60°C, dinitrogen tetroxide is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere.

OR

(a)

- (i) Why standard enthalpy of an elementary substance is not zero wheras standard enthalpy of formation is taken as zero?
- (ii) Under what conditions will the reaction occur, if, Both ΔH and ΔS are positive Both ΔH and ΔS are negative
- (b) Calculate the enthalpy change for the reaction :
 - $H_{2(g)} + Cl_{(2)(g)} \rightarrow 2HCl_{(g)}$

Given that bond energies of H-H, Cl-Cl and H-Cl bonds are 433, 244 and 431 kJ/mol respectively.

26. Give reasons for the following

- (a) Unlike Na₂CO₃, K₂CO₃ cannot be prepared by Solvay process. Why?
- (b) Why are alkali metals not found in nature?
- (c) Sodium is less reactive than potassium why?
- (d) Alkali metals are good reducing agents. Why?
- (e) Alkali metals are paramagnetic but their salts are diamagnetic. Why?

[5]

[5]

Complete the following reactions:

- (a) Why does the solubility of alkaline earth metal carbonates and sulphates in water decrease down the group?
- (b) (b)Arrange the following alkali metal ions in decreasing order of their mobility: Li⁺, Na⁺, K⁺, Rb⁺, Cs⁺.Explain
- (c) NaOH is a stronger base than LiOH. Explain
- (d) Why are alkali metals kept in paraffin or kerosene?
- (e) Why does lithium show properties uncommon to the rest of the alkali metals?
- 27.
- (a) Convert:
 - (i) Propene to propane-1,2-diol
 - (ii) Isopropylbromide to n-propylbromide
- (b) An alkene on ozonolysis gives butan-2-one and 2-methylpropanal.Give the structure and IUPAC name of Alkene. What products will be obtained when it is treated with hot, concentrated KMnO₄?

OR

(c) Complete the equations:

- (i) $CH_2 = CHBr \xrightarrow{NaNH_2} A \xrightarrow{Red hot iron tube} B$
- (ii) $C_6H_6 + CH_3COCl \xrightarrow{Anhdrous} A + B$
- (iii) $CH_3COOH \xrightarrow{NaOH(aq)} A \xrightarrow{Sodalime} B$
- (iv) $CH_2 = CH CH_2 CH_2 CH_3 + HBr \xrightarrow{\text{No peroxide}}$
- (v) $CH_2 = CH CH_2 CH_2 CH_2 CH_3 + HBr \xrightarrow{Peroxide}$