

CBSE Board
Class XI Chemistry
Sample Paper - 4

Time: 3 Hours
Total Marks: 70
General Instructions

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer questions and carry 3 marks each.
5. Question nos. 28 to 30 are long answer questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

- Q. 1** Write the formula of the compound Nickel (II) sulphate? [1]
- Q. 2** Temporary hardness in water is due to presence of which salts? [1]
- Q. 3** What is the mass of one atom of oxygen? [1]
- Q. 4** What is the ratio of molecules between 1 mole of H₂O and 1 mole of sucrose (C₁₂H₂₂O₁₁)? [1]
- Q. 5** Give the values for principal quantum number and magnetic quantum number for 19th electron of K (Potassium). [1]
- Q. 6** What shapes are associated with sp³d and sp³d² hybrid orbitals? [1]
- Q. 7** Why is an organic compound fused with sodium for testing halogens, nitrogen, sulphur and phosphorous? [1]
- Q. 8** $2A(g) + B(g) \rightarrow 4C(g) + \text{Heat}$ [1]
 What is the effect of adding He at a constant volume on above equilibrium?
- Q. 9** Which of the following has largest size? Mg, Mg²⁺, Al³⁺, Al [2]
- Q. 10** Give IUPAC name and symbol of element with atomic number 110 and 115. [2]
- Q. 11** Give reasons: [2]
 (i) Anhydrous AlCl₃ is covalent but hydrated AlCl₃ is electrovalent. Explain
 (ii) Boric acid behaves as Lewis acid? Explain
- Q. 12** $N_2 \rightarrow N_2^+$ $O_2 \rightarrow O_2^+$ [2]
 Why is there an increase in bond order in going from O₂ to O₂⁺ while a decrease in going from N₂ to N₂⁺ ?
- Q. 13** Calculate the total pressure of a mixture of 8g of O₂ (g) and 4g of H₂ (g) in a

- vessel of 1 dm^3 at 27°C . (Atomic mass of $\text{O}=16\text{ gmol}^{-1}$ and $\text{H}=1\text{ gmol}^{-1}$. $R=0.083$ bar $\text{dm}^3/\text{K mol}$). [2]
- Q. 14** Give equations to prove amphoteric nature of water. [2]
- OR**
- Arrange benzene, hexane and ethyne in decreasing order of acidic behavior. Also give reasons for this behaviour.
- Q. 15** Balance the following equation in an alkaline medium by half reaction method. [2]
- $$\text{Cr}(\text{OH})_3 + \text{IO}_3^- \rightarrow \text{I}^- + \text{CrO}_4^{2-}$$
- Q. 16** The wavelength of first spectral line in Balmer series is 6561 \AA . Calculate the wavelength of second spectral line in Balmer series. [2]
- Q. 17** On a ship sailing in Pacific Ocean where temperature is 23.4°C , a balloon is filled with 2 L air. What will be the volume of the balloon when the ship reaches Indian Ocean, where temperature is 26.1°C ? [2]
- Q. 18** All C-O bond lengths in CO_3^{2-} are equal. Account for this observation. [2]
- Q. 19** (a): Which of the two is more concentrated and why? 1 M or 1 m aqueous solution of a solute. [3]
- (b) Calculate the total number of molecules of methane present in 1.6 g ?
- Q. 20** At 60°C , dinitrogen tetroxide is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere. [3]
- Q. 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
- Q. 22** 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,

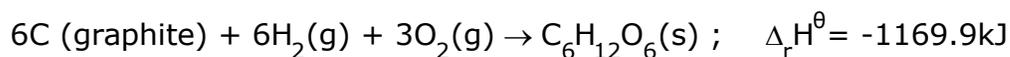
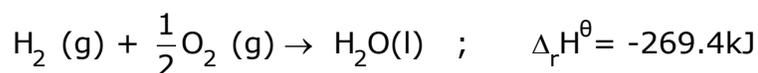
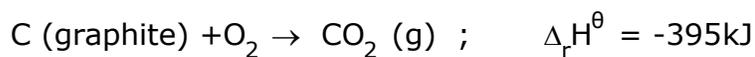
C and D. Write suitable equations to support their identities. [3]

Q. 23 Calculate the energy associated with the first orbit of He^+ . What is the radius of this orbit? [3]

Q. 24 Rashmi and Rekha are doing a research on the people working with coal tar. According to the report prepared by them, people who work under prolonged exposure to coal tar suffers from skin cancer and asks the authorities to vacate the factories. [3]

- (a) What is the reason behind the people getting infected with skin cancer?
 (b) What values are associated with it?

Q. 25 Calculate the enthalpy of combustion of glucose from the following data [3]



Q. 26 [3]

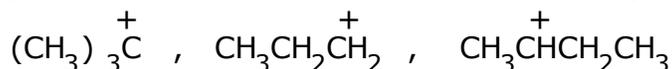
- (a) Fish do not grow as well in warm water as in cold water. Why?
 (b) Why does rain water normally have a pH about 5.6?
 (c) Name two major greenhouse gases.

Q. 27 0.2325g of an organic compound was analysed for nitrogen by Duma's method. 31.7mL of moist nitrogen was collected at 25°C and 755.8mm Hg pressure. Calculate the percentage of N in the sample. (Aq. Tension of water at 25°C is 23.8mm). [3]

OR

(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?



(c) Why does a liquid vaporize below its boiling point in steam distillation process?

Q. 28

[5]

(a) Convert:

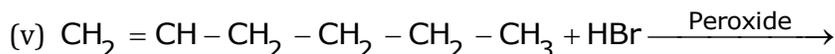
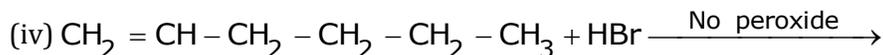
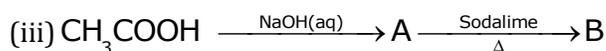
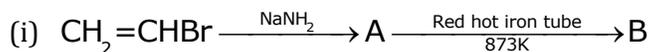
(i) Propene to propane-1,2-diol

(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 KMnO_4 ?

OR

Complete the equations:


Q. 29 Calculate the pH of a 0.10M ammonia solution. Calculate the pH after 50.0 mL of this solution is treated with 25.0 mL of 0.10M HCl. The dissociation constant of ammonia, $K_b = 1.77 \times 10^{-5}$.

[5]

OR

Calculate the pH of the resultant mixtures:

 10mL of 0.2M Ca(OH)_2 + 25 mL of 0.1 M HCl

Q. 30 Give reasons for the following

[5]

- Unlike Na_2CO_3 , K_2CO_3 cannot be prepared by Solvay process. Why?
- Why are alkali metals not found in nature?
- Sodium is less reactive than potassium why?
- Alkali metals are good reducing agents. Why?
- Alkali metals are paramagnetic but their salts are diamagnetic. Why?

OR

Complete the following reactions:

- (a) Why does the solubility of alkaline earth metal carbonates and sulphates in water decrease down the group?
- (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?