



DELHI PUBLIC SCHOOL SURAT
CHEMISTRY (THEORY)

Roll No :

Class : XI

Marks : 70

Time Allowed : 3 Hrs

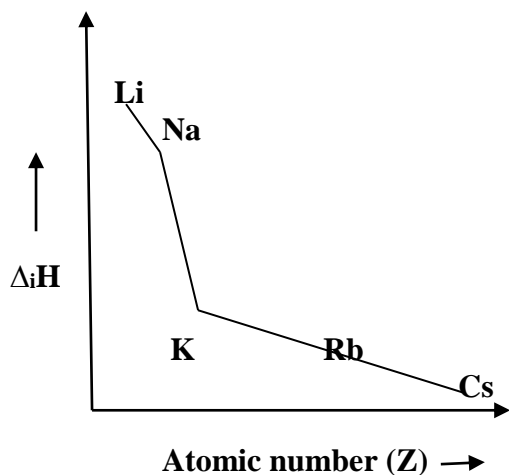
Instructions:

1. All questions are compulsory.
2. Q.No.1 to 5 are very short answer questions, carrying 1 mark each.
3. Q.No. 6 to 10 are short answer questions carrying 2 marks each.
4. Q.No. 11 to 22 are also short answer questions carrying 3 marks each.
5. Q.No. 23 is long answer question carrying 4 marks.
6. Q.No. 24 to 26 are long answer question carrying 5 marks .
7. No overall choice is given.
8. Use of Calculators is not allowed. However if required use of Log tables is permitted.

1. State Hess 's Law of Constant Heat Summation. [1]
2. Identify the substance oxidised, reduced, oxidising agent and reducing agent for the following reaction: [1]

$$\text{N}_2\text{H}_4(\text{l}) + 2\text{H}_2\text{O}_2(\text{l}) \rightarrow \text{N}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l})$$
3. For the equilibrium, $2\text{NOCl}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Cl}_2(\text{g})$ the value of the equilibrium constant , Kc is 3.75×10^{-6} at 1069 K. Calculate the Kp for the reaction at this temperature? [1]
4. BeH_2 can be prepared by the reaction of BeCl_2 with LiAlH_4 . Write the reaction. [1]
5. Compare the alkali metals and alkaline earth metals with respect to their 1st and 2nd ionisation enthalpies. [1]
6. Answer the following: [2]
 - a) If the density of methanol is 0.793 kg/L, what is its volume needed for making 2.5 L of its 0.25 M solution ?
 - b) Calculate the amount of carbon dioxide that could be produced when 2 moles of carbon are burnt in 16 g of $\text{O}_2(\text{g})$.
7. Which of the following pairs of elements would have a more negative electron gain enthalpy? Justify your answer. [2]
 - i) O or F
 - ii) F or Cl

8. Graph shown below shows ionization enthalpies of alkali metals as a function of Z.
Answer the questions based on the graph: [2]



- a) What is the trend observed as we descend down the alkali metals group?
b) Why are the values of ionization enthalpy always positive? [2]
9. Answer the following: [2]
a) Which out of NH_3 and NF_3 has higher dipole moment and why?
b) Write the resonance structures for NO_3^- .
10. Predict giving reason in which of the following, entropy increases/decreases : [2]
i) A liquid crystallises into a solid
ii) Temperature of a crystalline solid is raised from 0 K to 115 K.
11. Answer the following:
i) Electrons are emitted with zero velocity from a metal surface when it is exposed to radiation of wavelength 6800 \AA . Calculate threshold frequency (ν_0) and work function (W_0) of the metal. [2]
ii) 2×10^8 atoms of carbon are arranged side by side. Calculate the radius of carbon atom if the length of this arrangement is 2.4 cm. [1]
12. Answer the following questions:
i) Calcium carbonate reacts with aqueous HCl to give CaCl_2 and CO_2 according to the reaction,
 $\text{CaCO}_3 (\text{s}) + 2\text{HCl} (\text{aq}) \rightarrow \text{CaCl}_2 (\text{aq}) + \text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{l})$
What mass of CaCO_3 is required to react completely with 25 ml of 0.75 M HCl? [2]
ii) If ten volumes of H_2 gas reacts with five volumes of O_2 gas, how many volumes of water vapour would be produced? [1]
13. Answer the following questions:
a) Explain the term electrochemical series with example. [1]
b) Permanganate(VII) ion, MnO_4^- in basic solution oxidises iodide ion, I^- to produce molecular iodine (I_2) and manganese(IV) oxide (MnO_2). Write a balanced ionic equation to represent this redox reaction. (by half reaction method) [2]
14. Explain the following: [3]
a) Explain hybridisation in ethene (C_2H_4) molecule with proper pictorial description.
b) Discuss the shape of the following molecules using the VSEPR model: i) BCl_3 ii) H_2S
c) Describe the change in hybridisation (if any) of the Al atom in the following reaction.
 $\text{AlCl}_3 + \text{Cl}^- \rightarrow \text{AlCl}_4^-$

15. Answer the following questions: [3]
 a) Draw the structure of i) BeCl_2 (vapour) ii) BeCl_2 (solid)
 b) Why is Li_2CO_3 decomposed at a lower temperature whereas Na_2CO_3 at higher temperature?
 c) What happens when milk of lime reacts with chlorine?
16. When electromagnetic radiation of wavelength 300 nm falls on the surface of sodium, electrons are emitted with a kinetic energy of $1.68 \times 10^5 \text{ J/mol}$. What is the minimum energy needed to remove an electron from sodium? What is the maximum wavelength that will cause a photoelectron to be emitted? [3]
17. Answer the following questions:
 a) 2.9 g of a gas at 95°C occupied the same volume as 0.184 g of hydrogen at 17°C , at the same pressure. What is the molar mass of the gas? [2]
 b) Explain the term equilibrium vapour pressure. [1]
18. i) The drain cleaner, Drainex contains small bits of aluminium which reacts with caustic soda to produce dihydrogen. What volume of dihydrogen at 20°C and one bar will be released when 0.15 g of aluminium reacts? Write the reaction involved. [2]
 ii) What is the unit of coefficient of viscosity in cgs system? [1]
19. Write the structures for the following compounds: [3]
 i) 3-Chloro propanal
 ii) 2,2,4-Trimethylpentane
 iii) 3-Nitrocyclohexene
20. i) An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write structure and IUPAC name of 'A'. [2]
 ii) Write chemical name and structure of gammaxane. [1]
21. Calculate the enthalpy change for the process [3]
 $\text{CCl}_4(\text{g}) \rightarrow \text{C}(\text{g}) + 4 \text{Cl}(\text{g})$ and calculate bond enthalpy of C – Cl in $\text{CCl}_4(\text{g})$.
 Given $\Delta_{\text{vap}}H^\circ \text{CCl}_4 = 30.5 \text{ kJ/mol}$
 $\Delta_f H^\circ \text{CCl}_4 = -135.5 \text{ kJ/mol}$
 $\Delta_a H^\circ (\text{C}) = 715 \text{ kJ/mol}$ (enthalpy of atomisation)
 $\Delta_a H^\circ (\text{Cl}_2) = 242 \text{ kJ/mol}$
22. Answer the following questions: [3]
 i) How do you account for the formation of ethane during chlorination of methane?
 ii) Write any two rules required for a compound to be aromatic.
 iii) Write the preparation of benzene by decarboxylation of aromatic acids.
23. Answer the following questions: [4]
 a) What are electron precise molecular hydrides?
 b) How is hydrogen prepared industrially? Write reactions for any two methods.
 c) Explain amphoteric behaviour of water with reactions.
 d) Write any one reaction involved in Clark's method for removing temporary hardness.
24. Answer the following: [1]
 i) For the following equilibrium, $K_c = 6.3 \times 10^{14}$ at 1000K
 $\text{NO}(\text{g}) + \text{O}_3(\text{g}) \rightleftharpoons \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
 Both the forward and reverse reactions in the equilibrium are elementary bimolecular reactions.

What is K_c for the reverse reaction?

- ii) $K_p = 0.04$ atm at 899 K for the equilibrium shown below. What is the equilibrium concentration of C_2H_6 when it is placed in a flask at 4.0 atm pressure and allowed to come in equilibrium ? [2]



- iii) Describe the effect of the following : [2]

a) addition of H_2

b) removal of CH_3OH on the equilibrium of the reaction: $2 H_2(g) + CO(g) \rightleftharpoons CH_3OH(g)$

25. Answer the following questions:

- a) A certain salt X, gives the following results, [3]

i) Its aqueous solution is alkaline to litmus.

ii) It swells up to a glassy material Y on strong heating.

iii) When concentrated H_2SO_4 is added to a hot solution of X, white crystal of an acid Z separates out.

Write equations for all the above reactions and identify X, Y and Z.

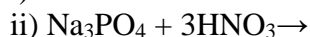
- b) What are silicones? [1]

- c) How would you explain lower atomic radius of Ga as compared to Al ? [1]

26. Answer the following:

- a) Why is a solution of KOH used to absorb CO_2 evolved during the estimation of carbon present in an organic compound? [1]

- b) Complete the following reactions: [2]



- c) An organic compound contains 69% carbon and 4.8% hydrogen, the remainder being oxygen.

Calculate the masses of carbon dioxide and water produced when 0.20 g of this substance is subjected to complete combustion. [2]

END OF EXAMINATION