

Roll No. \_\_\_\_\_

Code : 11201819CH-A

Please check that this question paper contains 27 questions and 8 printed pages.

**Class : XI**  
**CHEMISTRY (THEORY)**

Time Allowed : 3 Hours

Maximum Marks : 70

**General Instructions :**

- All the questions are compulsory.
- There are 27 questions in total.
- Questions 1 to 5 are very short answer type questions and carry one mark each.
- Questions 6 to 12 carry two marks each.
- Questions 13 to 24 carry three marks each.
- Questions 25 to 27 carry five marks each.
- There is no overall choice. However internal choice has been provided in two question of one marks, two questions of two marks, four questions of three marks and one question of five marks each. You have to attempt only one of the choices in such questions.
- Use of calculator is not permitted. However, you may use log tables if necessary.

**SECTION - A**

1. Write the IUPAC name and symbol of the element with atomic number 149? 1

**OR**

Write the formulae of compounds which are formed by the following pairs of elements. 1

- (a) Silicon and bromine  
(b) Aluminium and Sulphur

2. Given the standard electrode potentials, 1

$$E^{\circ}(\text{K}^+/\text{K}) = -2.93\text{V}$$

$$E^{\circ}(\text{Ag}^+/\text{Ag}) = 0.80\text{V}$$

$$E^{\circ}(\text{Hg}^{+2}/\text{Hg}) = 0.79\text{V}$$

$$E^{\circ}(\text{Mg}^{+2}/\text{Mg}) = -2.37\text{V},$$

Which metal has maximum reducing power?

3. How does  $H_2O_2$  behave as a bleaching agent? 1
4. Write the name of the element which is estimated quantitatively in an organic compound, when it is heated with dry copper oxide in the atmosphere of  $CO_2$  gas. 1

OR

Diphenyl Ketone ( $C_6H_5 - \overset{O}{\parallel} C - C_6H_5$ ) does not show tautomerism. Why? 1

5. Write the names of the two gases which are responsible for green house effect. 1
6. Explain giving reasons, why the following sets of quantum numbers are not possible. 2
- (a)  $n = 0, l = 0, m_l = 0, m_s = +1/2$
- (b)  $n = 3, l = 3, m_l = -3, m_s = +1/2$
7. Write Molecular orbital configuration of  $Ne_2$  molecule. Also show that  $Ne_2$  molecule does not exist. 2
8. (i) Gold with atomic radius 0.144nm crystallises in a face centred unit cell. Calculate the length of the side of the unit cell. 1
- (ii) Classify the following as being either a p-type or n-type semiconductor, when B doped with Si 1

OR

- (i) Refractive index of a solid is observed to have the same value along all the directions. Comment on the nature of the solid. 1
- (ii) Define F-centre. 1
9. The following reaction represents a gaseous system at equilibrium. 2
- $$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) + \text{heat}$$
- Indicate the direction in which the equilibrium will shift
- (i) When temperature is decreased
- (ii) When pressure is increased.

10. When water is added to a compound (A) of Calcium, the solution of the compound (B) is formed. When  $\text{CO}_2$  is passed into this solution, it turns milky due to formation of a compound (C). If excess of  $\text{CO}_2$  is passed into the solution, the milkiness disappears due to formation of the compound (D). Identify the compounds (A), (B), (C) and (D). 2

**OR**

When an alkali metal dissolves in liquid ammonia, It acquires different colour. Explain.

- (i) Why does solution appeared to be coloured. 1
- (ii) Under what condition the solution acquire different colours. 1
11. Select the members of group 14 that 2
- (i) forms the most acidic oxide.
- (ii) is commonly found in +2 oxidation state.
- (iii) used as semiconductor.
- (iv) exhibits highest catenation tendency.
12. Convert Benzene into m-nitrochlorobenzene. 2
13. Copper (II) carbonate reacts with  $\text{H}_2\text{SO}_4$  to give copper sulphate, carbondioxide and water
- (i) Write the balanced chemical equation for this reaction. 1
- (ii) What mass of  $\text{CuCO}_3$  is required to react completely with 8.1 ml of 0.5M  $\text{H}_2\text{SO}_4$ ? 2
14. (i) Why are Bohr's orbits called stationary states? 1
- (ii) Calculate the energy required for the process 2
- $$\text{He}^+(\text{g}) \longrightarrow \text{He}^{+2}(\text{g}) + \text{e}^-$$
- the ionization energy for the H-atom in the ground state is  $2.18 \times 10^{-18} \text{ J atom}^{-1}$ .

**OR**

- (i) Which of the following transition will have minimum wavelength and why? 1



- (ii) The uncertainty in the position of a moving bullet of mass 10g is  $10^{-5}$  m. Calculate the uncertainty in its velocity. 2

15. Account for the following

- (i) Fluoride ion can not be formed as easily as compared to chloride ion from their respective elements. 1

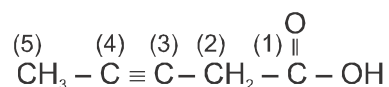
- (ii) The increasing order of reactivity among group I elements is 1



- (iii)  $\text{Mg}^{+2}$  is smaller than  $\text{O}^{-2}$  in size, though both have same electronic configuration. 1

16. (i) In  $\text{SF}_4$  molecule, the lone pair of electrons occupies an equatorial position rather than axial position in the overall trigonal bipyramidal arrangement. Why? 1

- (ii) In the given molecule 2



Mention the hybrid state of Carbon atoms numbered as 1, 2 and 3, and arrange them in the decreasing order of S-character.

17. (i) Draw the graph for a gas for which PV is plotted against P at constant temperature. 1

- (ii) A gas occupies a volume of 250 ml at 745 mm Hg and  $25^\circ\text{C}$ . What additional pressure is required to reduce the gas volume to 200 ml at the same temperature? 2

**OR**

- (i) In a compound, oxide ions form hcp while  $\text{Al}^{3+}$  ions occupy two third of octahedral voids. What is the formula of the compound? 1

(ii) An element with molar mass  $2.7 \times 10^{-2} \text{ kg mol}^{-1}$ , forms a cubic cell with Edge length 405 pm. If density is  $2.7 \times 10^3 \text{ kg m}^{-3}$ , what is the nature of unit cell. 2

18. The ionization constant of acetic acid is  $1.74 \times 10^{-5}$ . Calculate the degree of dissociation of acetic acid in its 0.05 M solution. Calculate the concentration of acetate ion in the solution and its pH. 3

OR

(i) Define solubility product. 1

(ii) The value of  $K_{sp}$  of a sparingly soluble salt  $\text{Ni}(\text{OH})_2$  is  $3.2 \times 10^{-14}$ , calculate its solubility. 2

19. (i) Represent the galvanic cell in which the following reaction takes place. 1



(ii) Balance the following equation in basic medium by half reaction method 2



20. (i) What do you mean by autoprotolysis of water? What is its significance? 2

(ii) Name the class of hydrides to which  $\text{H}_2\text{O}$  and  $\text{NaH}$  belongs. 1

21. State as to why -

(i) Beryllium and magnesium do not give colour to flame whereas other alkaline earth metals do so. 1

(ii) In an aqueous solution,  $\text{Li}^+$  ion has lowest ionic mobility among all the alkali metals. 1

(iii) Lithium shows similarities to magnesium in its chemical behaviour. 1

22. (i) Write structural formula for 1

2, 3 - dibromo - 1 - phenylpentane

(ii) Identify the most stable carbocation from the following : 1



Give reason for your choice.

(iii) Classify the following reaction in one of the reaction type : 1



**OR**

(a) Which of the two :  $\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^-$  or  $\text{CH}_3\text{CH}_2\text{O}^-$  is expected to be more stable and why? 1

(b) What are electrophiles and nucleophiles? Explain with examples. 2

23. Write the structure of the following compound named as -

(i) 4, 4 - dimethyl - 3 - ethylpentane  
Write its correct name if required. 1

(ii) 0.16g of an organic substance was heated in carius tube and the sulphuric acid formed was precipitated as  $\text{BaSO}_4$  with  $\text{BaCl}_2$ . The mass of dry  $\text{BaSO}_4$  was 0.35g. Calculate the percentage of sulphur in the organic compound. 2

24. Give reasons for the following :

(i) The presence of CO reduces the amount of haemoglobin available in the blood for carrying oxygen to the body cells. 1

(ii) Statues and monuments in India are affected by acid rain. 1

(iii) Fishes die in a water body with abundance of phytoplankton. 1

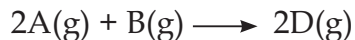
25. (i) State Hess's law 1

(ii) Give one point to differentiate the following thermodynamic terms 1

(a) Extensive properties and intensive properties.

(b) Isothermal process and isobaric process


(ii) For the reaction to be occur at 298K. 3



$$\Delta\text{U}^0 = -10.5\text{KJ} \text{ and } \Delta\text{S}^0 = -44.1 \text{ JK}^{-1} \text{ mol}^{-1}$$

Calculate  $\Delta^0\text{G}$  for the reaction. Also predict whether the reaction may occur spontaneously.

**OR**

- (i) Predict in which of the following, entropy increases / decreases.
- (a) Temperature of crystalline solid is raised from 0 K to 115 K 1
- (b)  $\text{H}_2(\text{g}) \longrightarrow 2\text{H}(\text{g})$  1
- (ii) The combustion of 1 mole of benzene takes place at 298 K and 1 atm. After combustion,  $\text{CO}_2(\text{g})$  and  $\text{H}_2\text{O}(\text{l})$  are produced and 3267.0 kJ of heat is liberated. Calculate the standard enthalpy of formation  $\Delta_f H^\circ$  of benzene. Standard enthalpies of formation of  $\text{CO}_2(\text{g})$  and  $\text{H}_2\text{O}(\text{l})$  are  $-393.5 \text{ kJ mol}^{-1}$  and  $-285.83 \text{ kJ mol}^{-1}$  respectively. 3
26. (i) Draw the structure of Diborane 1
- (ii) What happens when :
- (a) Boric acid is added to water?
- (b) Aluminium is treated with dilute NaOH? 2
- (iii) Give suitable reason for the following : 2
- (a) Nitrogen does not form pentahalide.
- (b) Ammonia is more basic than  $\text{PH}_3$
- OR**
- (i) Write Balanced chemical equations for the followings.
- (a) Borax is heated strongly 1
- (b) Silicon is heated with methyl chloride at high temperature in the presence of copper. 1
- (c) Boron trifluoride reacts with Lithium hydride. 1
- (ii) Arrange the following in order of property indicated for each set.
- (a)  $\text{NH}_3, \text{PH}_3, \text{AsH}_3, \text{SbH}_3, \text{BiH}_3$  - increasing base strength 1
- (b)  $\text{NH}_3, \text{PH}_3, \text{AsH}_3, \text{SbH}_3, \text{BiH}_3$  - increasing boiling point. 1
27. (i)   $\text{CH}_2$  is not aromatic. Why? 1
- (ii) An alkene is subjected to ozonolysis followed by reduction of ozonide with zinc and water. The main products formed are ethanal and propanone. Predict the structure of alkene and write its IUPAC name. 2

- (iii) Addition of HBr to propene in presence of benzoyl peroxide yields 1-bromopropane. Explain with suitable mechanism steps. 2

**OR**

- (i) Out of benzene, chlorobenzene and toluene which one will undergo nitration more easily and why? 2
- (ii) Give a three step mechanism for the following reaction : 3

