

# Newton's Academy

## CHEMISTRY

Time: 3 Hrs

Max. Marks: 70

**General Instructions:**

The question paper is divided into **four** sections.

- (1) **Section A:** Q. No. 1 contains **Ten** multiple choice type of questions carrying **One** mark each.  
Q. No. 2 contains **Eight** very short answer type of questions carrying **One** mark each.
- (2) **Section B:** Q. No. 3 to Q. No. 14 are **Twelve** short answer type of questions carrying **Two** marks each. (Attempt **any Eight**).
- (3) **Section C:** Q. No. 15 to Q. No. 26 are **Twelve** short answer type of questions carrying **Three** marks each. (Attempt **any Eight**).
- (4) **Section D:** Q. No. 27 to Q. No. 31 are **Five** long answer type of questions carrying **Four** marks each. (Attempt **any Three**).
- (5) Use of log table is allowed. Use of calculator is not allowed.
- (6) Figures to the right indicate full marks.
- (7) For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabet. e.g. (a)...../(b)...../(c)...../(d)..... etc.

No marks(s) shall be given, if **ONLY** the correct answer or the alphabet of the correct answer is written. Only the first attempt will be considered for evaluation.

### SECTION – A

**Q.1. Select and write the correct answer for the following multiple choice type of questions:** **[10]**

- (i) The co-ordination number of atoms in body centred cubic structure (bcc) is \_\_\_\_\_.  
(a) 4                      (b) 6                      (c) 8                      (d) 12
- (ii) In calculating osmotic pressure, the concentration of solute is expressed in \_\_\_\_\_.  
(a) molarity                      (b) molality  
(c) mole fraction                      (d) percentage mass
- (iii) The enthalpy change for the chemical reaction  $\text{H}_2\text{O}_{(s)} \longrightarrow \text{H}_2\text{O}_{(l)}$  is called enthalpy of \_\_\_\_\_.  
(a) vapourisation                      (b) fusion  
(c) combustion                      (d) sublimation
- (iv) Which of the following transition element shows maximum oxidation state?  
(a) Sc                      (b) Fe                      (c) Mn                      (d) V
- (v) The correct formula for the complex compound, sodium hexacyanoferrate (III) is \_\_\_\_\_.  
(a)  $\text{Na} [\text{Fe}(\text{CN})_6]$                       (b)  $\text{Na}_2 [\text{Fe}(\text{CN})_6]$   
(c)  $\text{Na}_3 [\text{Fe}(\text{CN})_6]$                       (d)  $\text{Na}_4 [\text{Fe}(\text{CN})_6]$
- (vi) Isopropylbenzene on air oxidation followed by decomposition by dilute acid gives \_\_\_\_\_.  
(a)  $\text{C}_6\text{H}_5\text{OH}$                       (b)  $\text{C}_6\text{H}_5\text{COOCH}_3$   
(c)  $\text{C}_6\text{H}_5\text{COOH}$                       (d)  $\text{C}_6\text{H}_5\text{CHO}$
- (vii) The name of metal nanoparticle which acts as highly effective bacterial disinfectant in water purification process is \_\_\_\_\_.  
(a) carbon black                      (b) silver  
(c) gold                      (d) copper
- (viii) Acid anhydride on reaction with primary amine gives compound having a functional group \_\_\_\_\_.  
(a) amide                      (b) nitrile  
(c) secondary amine                      (d) imine

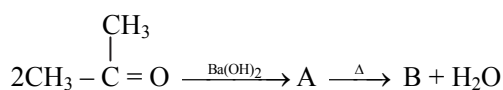
- (ix) The standard potential of the cell in the following reaction is \_\_\_\_\_.
- $$\text{Cd}_{(s)} + \text{Cu}_{(aq)}^{2+} \longrightarrow \text{Cd}_{(aq)}^{2+} + \text{Cu}_{(s)}$$
- ( $E_{\text{Cd}}^{\circ} = -0.403\text{V}$ ,  $E_{\text{Cu}}^{\circ} = 0.334\text{V}$ )
- (a)  $-0.737\text{V}$  (b)  $0.737\text{V}$   
 (c)  $-0.069\text{V}$  (d)  $0.069\text{V}$
- (x) The value of  $[\text{H}_3\text{O}^+]$  in mol  $\text{lit}^{-1}$  of 0.001 M acetic acid solution ( $K_a = 1.8 \times 10^{-5}$ ) is \_\_\_\_\_.
- (a)  $1.34 \times 10^{-1}$  (b)  $1.34 \times 10^{-2}$   
 (c)  $1.34 \times 10^{-3}$  (d)  $1.34 \times 10^{-4}$

**Q.2. Answer the following questions:**
**[8]**

- (i) Write the product formed when alkyl halide reacts with silver nitrite.
- (ii) Write the name of product formed, when acetone is treated with 2, 4-dinitrophenyl hydrazine.
- (iii) Write the name of biodegradable polyamide copolymer.
- (iv) Identify the molecularity of following elementary reaction:  
 $\text{NO}_{(g)} + \text{O}_{3(g)} \longrightarrow \text{NO}_{3(g)} + \text{O}_{(g)}$
- (v) What is the action of selenium on magnesium metal?
- (vi) Write the name of isomerism in the following complexes:  
 $[\text{Cu}(\text{NH}_3)_4]$   $[\text{PtCl}_4]$  and  $[\text{Pt}(\text{NH}_3)_4]$   $[\text{CuCl}_4]$
- (vii) Write the name of the alloy used in Fischer Tropsch process in the synthesis of gasoline.
- (viii) Henry's law constant for  $\text{CH}_3\text{Br}_{(g)}$  is  $0.159\text{ mol dm}^{-3}\text{ bar}^{-1}$  at  $25^\circ\text{C}$ . What is solubility of  $\text{CH}_3\text{Br}_{(g)}$  in water at same temperature and partial pressure of 0.164 bar?

**SECTION – B**
**Attempt any EIGHT of the following questions:**
**[16]**

- Q.3.** Explain pseudo-first order reaction with suitable example.
- Q.4.** Write the consequences of Schottky defect with reasons.
- Q.5.** What is the action of following on ethyl bromide:  
 (i) Na in dry ether  
 (ii) Mg in dry ether
- Q.6.** Explain formation of peptide linkage in protein with an example.
- Q.7.** Derive an expression to calculate molar mass of non volatile solute by osmotic pressure measurement.
- Q.8.** Explain monodentate and ambidentate ligands with example.
- Q.9.** Explain the trends in the following atomic properties of group 16 elements:  
 (i) Atomic radii  
 (ii) Ionisation enthalpy  
 (iii) Electronegativity  
 (iv) Electron gain enthalpy
- Q.10.** Write preparation of phenol from aniline.
- Q.11.** Write chemical reactions to prepare ethanamine from:  
 (i) acetonitrile  
 (ii) nitroethane
- Q.12.** Identify A and B from the following reaction:



- Q.13.** One mole of an ideal gas is expanded isothermally and reversibly from 10 L to 15 L at 300 K. Calculate the work done in the process.
- Q.14.** How many moles of electrons are required for reduction of 2 moles of  $\text{Zn}^{2+}$  to Zn? How many Faradays of electricity will be required?

**SECTION – C**

**Attempt any EIGHT of the following questions:**

**[24]**

- Q.15.** Write chemical composition of haematite. Write the names and electronic configurations of first two elements of group 17.
- Q.16.** Write classification of polymers on the basis of structure.
- Q.17.** Define green chemistry. Write two disadvantages of nanotechnology.
- Q.18.** Write commercial method for preparation of glucose. Write structure of adipic acid.
- Q.19.** Write chemical reactions of following reagents on methoxyethane:  
 (i) hot HI  
 (ii)  $\text{PCl}_5$   
 (iii) dilute  $\text{H}_2\text{SO}_4$
- Q.20.** Explain cationic, anionic and neutral sphere complexes with example.
- Q.21.** Calculate spin only magnetic moment of divalent cation of transition metal with atomic number 25. Salts of  $\text{Ti}^{4+}$  are colourless. Give reason.
- Q.22.** What is lanthanoid contraction?  
 Write preparation of acetic acid from  
 (i) dry ice  
 (ii) acetyl chloride
- Q.23.** Write the classification of aliphatic ketones with example. What is the action of sodium hypiodite on acetone?
- Q.24.** Define half life of first order reaction. Obtain the expression for half life and rate constant of the first order reaction.
- Q.25.** Calculate the standard enthalpy of formation of  $\text{CH}_3\text{OH}_{(l)}$  from the following data  
 (i)  $\text{CH}_3\text{OH}_{(l)} + \frac{3}{2}\text{O}_{2(g)} \longrightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)} \quad \Delta H^\circ = -726 \text{ kJ mol}^{-1}$   
 (ii)  $\text{C}_{(s)} + \text{O}_{2(g)} \longrightarrow \text{CO}_{2(g)} \quad \Delta_c H^\circ = -393 \text{ kJ mol}^{-1}$   
 (iii)  $\text{H}_{2(g)} + \frac{1}{2}\text{O}_{2(g)} \longrightarrow \text{H}_2\text{O}_{(l)} \quad \Delta_f H^\circ = -286 \text{ kJ mol}^{-1}$
- Q.26.** Calculate the pH of buffer solution composed of 0.01 M weak base BOH and 0.02 M of its salt BA. [ $K_b = 1.8 \times 10^{-5}$  for weak base]

**SECTION – D**

**Attempt any THREE of the following questions:**

**[12]**

- Q.27.** Define the following terms:  
 (i) Isotonic solution  
 (ii) Osmosis  
 Gold crystallises into face-centred cubic cells. The edge length of unit cell is  $4.08 \times 10^{-8}$  cm. Calculate the density of gold. [Molar mass of gold =  $197 \text{ g mol}^{-1}$ ]
- Q.28.** Write the mathematical equation for the first law of thermodynamics for  
 (i) isothermal process  
 (ii) adiabatic process  
 Derive the relationship between pH and pOH.

- Q.29.** Define reference electrode. Write functions of salt bridge. Draw neat, labelled diagram of standard hydrogen electrode (SHE).
- Q.30.** Explain metal deficiency defect with example. Write chemical equation for preparation of sulphur dioxide from sulphur. Write uses of sulphur.
- Q.31.** Write chemical reactions for the following conversions:
- Ethyl bromide to ethyl methyl ether.
  - Ethyl bromide to ethene,
  - Bromobenzene to toluene.
  - Chlorobenzene to biphenyl.

