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 mark(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.
Given:

(8) Physical constant:
Avogadro Number = $N_A = 6.022 \times 10^{23}$

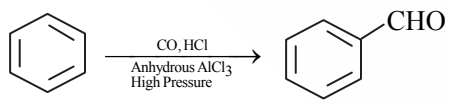
SECTION – A

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

(i) Anisole on heating with concentrated HI gives _____.
(a) Iodobenzene (b) Phenol + Methanol
(c) Iodobenzene + Methanol (d) Phenol + Iodomethane

(ii) Which solution shows positive deviation from Raoult's law?
(a) Phenol and Aniline (b) Chloroform and Acetone
(c) Ethanol and Acetone (d) Chloroform and Ethanol

(iii) The coordination number of cobalt in $[CoCl_2(en)_2]^+$ is
(a) 6 (b) 4
(c) 2 (d) 0

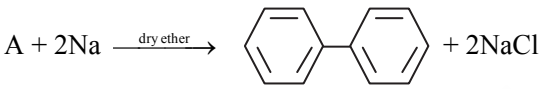
(iv) 

The name of above reaction is _____.
(a) Etard reaction (b) Friedel Craft acylation reaction
(c) Stephen reaction (d) Gatterman-Koch reaction

(v) Which is an example of thermoplastic polymer?
(a) Bakelite (b) Polystyrene
(c) Nylon 6, 6 (d) Urea formaldehyde resin

(vi) Nichrome is an alloy of _____.
(a) Cu, Sn (b) Cu, Ni
(c) Ni, Cr (d) Fe, Cr

(vii) Identify 'A' in the following reaction:



(a) Bromobenzene (b) 1, 4-dichlorobenzene
(c) Naphthalene (d) Chlorobenzene

(viii) Which amine does NOT react with Hinsberg reagent?
(a) Ethanamine (b) N-ethylethanamine
(c) N, N-diethylethanamine (d) 2-methyl-propan-2-amine

(ix) The dissociation constant of NH_4OH is 1.8×10^{-5}. The degree of dissociation in its 0.01 M solution is _____.
(a) 0.04242 (b) 0.4242
(c) 0.004242 (d) 4.242

(x) Half-life of a first order reaction is 30 minutes at 300 K. The value of its rate constant, K is _____.
(a) 2.31 min^{-1} (b) 0.0231 min^{-1}
(c) 0.231 min^{-1} (d) 2.310×10^{-3} min^{-1}

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

(i) Write the name of radioactive element in group 16.

(ii) Write the structure of glycine.

(iii) Write the unit of cell constant.

(iv) Write the number of particles present in FCC per unit cell.

(v) Name the γ-isomer of BHC.

(vi) Write the IUPAC name of isobutyraldehyde.

(vii) Which alloy is used in Fischer Tropsch process in the synthesis of gasoline?

(viii) Three moles of an ideal gas are expanded isothermally from 15 dm^3 to 20 dm^3 at constant external pressure of 1.2 bar. Estimate the amount of work in Joules.

SECTION-B

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

Q.3. Write four postulates of Werner theory of coordination complexes.

Q.4. Why fluorine shows anomalous behaviour?

Q.5. What is the mass of Cu metal produced at the cathode during the passage of 5 ampere current through $CuSO_4$ solution for 6000 seconds. Molar mass of Cu is 63.5 g mol^{-1}.

Q.6. How is glucose prepared from sucrose?

Q.7. Derive integrated rate law for zero order reaction.

Q.8. The normal boiling point of ethyl acetate is 77.06 °C. A solution of 50 g of a non-volatile solute in 150 g of ethyl acetate boils at 84.27 °C. Evaluate the molar mass of solute if K_b for ethyl acetate is 2.77 °C kg mol^{-1}.

Q.9. How is phenol prepared from cumene?

Q.10. Why do d-block elements form coloured compounds?

Q.11. Write a note on: Wolf-Kishner reduction reaction.

Q.12. How is Nylon 6, 6 prepared?

Q.13. Derive Ostwald's dilution law equation for weak acid.

Q.14. What is Grignard reagent? How it is prepared?

SECTION-C

Attempt any EIGHT of the following questions: **[24]**

Q.15. Calculate the standard enthalpy of the reaction:

$SiO_{2(s)} + 3C_{(graphite)} \longrightarrow SiC_{(s)} + 2CO_{(g)}$

From the following reactions,

(i) $Si_{(s)} + O_{2(g)} \longrightarrow SiO_{2(s)}$, $\Delta_r H° = -911$ kJ

(ii) $2C_{(graphite)} + O_{2(g)} \longrightarrow 2CO_{(g)}$, $\Delta_r H° = -221$ kJ

(iii) $Si_{(s)} + C_{(graphite)} \longrightarrow SiC_{(s)}$, $\Delta_r H° = -65.3$ kJ

Q.16. Write a note on Hofmann bromamide degradation.
Convert benzene diazonium chloride into benzene.

Q.17. Write any three advantages and disadvantages of nanoparticles and nanotechnology.

Q.18. Write molecular formula and structure of:

(i) Sulphuric acid (ii) Peroxy monosulphuric acid

(iii) Thiosulphuric acid

Q.19. Explain optical activity of 2-chlorobutane.

Q.20. Write different oxidation states of manganese. Why +2 oxidation state of manganese is more stable?

Q.21. Prepare the following by using methyl magnesium iodide:

(i) Ethanol (ii) Propan-2-ol (iii) 2-methylpropan-2-ol

Q.22. Define: Ebullioscopic constant.
Derive the relation between freezing point depression and molar mass of solute.

Q.23. Define: Buffer solution.
Write any four applications of buffer solution.

Q.24. An element with molar mass 27 g/mol forms cubic unit cell with edge length of 405 pm. If density of the element is 2.7 g/cm^3 what is the nature of cubic unit cell?

Q.25. On the basis of valence bond theory explain the nature of bonding in $[Ni(Cl)_4]^{2-}$ complex ion.

Q.26. Convert:

(i) Acetic acid to acetamide (ii) Acetyl chloride to acetic anhydride

(iii) Sodium acetate to methane

SECTION - D

Attempt any THREE of the following questions: **[12]**

Q.27. Define isomorphism.
Write Arrhenius equation. Derive an expression to determine activation energy for two different temperatures T_1 and T_2.

Q.28. What are interhalogen compounds?
Write any two general characteristics of interhalogen compounds.
Draw the Fischer projection formula for α –D– (+) glucose.
Write reaction involved in the formation of Teflon.

Q.29. Describe the construction and working of Standard Hydrogen Electrode.
Write any two difficulties in setting SHE.

Q.30. Write any two statements of first law of thermodynamics.
For a certain reaction $\Delta H°$ is –224 kJ and $\Delta S°$ is –153 Jk^{-1}. At what temperature the change over from spontaneous to nonspontaneous will occur?

Q.31. Define:

(i) Gangue (ii) Ionization isomer

(iii) Aromatic ketones

Write the use and environmental effect of methylene chloride.