

SAINIK SCHOOL NALANDA

WINTER VACATION ASSIGNMENT

CLASS-VI, IX, X, XI & XII

CHEMISTRY (043)

CLASS-VIB

Q1. Make a project on "JOURNEY THROUGH STATES OF WATER" & METHODS OF SEPARATION" in everyday life (A4 SIZE PAPER)

Q2. Frame '30' Mcqs on METHODS OF SEPARATION in everyday life.

NOTE: CADETS CAN USE COLOUR PEN AND MARKER

CLASS-IX(A+B + C)

Q1. Make a project on "NITROGEN CYCLE" & "CARBON CYCLE"

Q2. Frame '30' Mcqs on ATOMIC FOUNDATION OF MATTER" (USE A4 SIZE PAPER)

NOTE: CADETS CAN USE COLOUR PEN AND MARKER

CLASS-X(A+ B)

Q1. Make a project on FUNCTIONAL GROUPS and NOMENCLATURE.(use A4 Size paper)

Q2. Frame '30' Mcqs. On METAL AND NON-METALS.(based on properties of Elements)

NOTE: CADETS CAN USE COLOUR PEN AND MARKER

CLASS-XI

SECTION – A (MCQ)

SET-I

- The oxidation number of **Mn** is maximum in
(a) MnO_2 (b) K_2MnO_4
(c) Mn_3O_4 (d) KMnO_4
- Thermodynamics is not concerned about.
(a) energy changes involved in a chemical reaction.
(b) the extent to which a chemical reaction proceeds.
(c) the rate at which a reaction proceeds.
(d) the feasibility of chemical reaction.
- We know that the relationship between K_C and K_P is $K_P = K_C (RT)^{\Delta n}$. What would be the value of Δn for this reaction? $\text{NH}_4\text{Cl(s)} \rightarrow \text{NH}_3\text{(g)} + \text{HCl(g)}$
(a) 1 (b) 0.5
(c) 1.5 (d) 2
- Which of the following statements is correct?
(a) The presence of reacting species in a covered beaker is an example of open system.
(b) There is an exchange of energy as well as matter between the system and the surroundings in a closed system.
(c) The presence of reactants in a closed vessel made up of copper is an example of a closed system.
(d) The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.
- The state of gas can be described by quoting the relationship between
(a) pressure, volume, temperature
(b) temperature, amount, pressure
(c) amount, volume, temperature
(d) pressure, volume, temperature, amount
- The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound
(a) is always negative (b) is always positive
(c) may be positive or negative (d) is never negative
- Which of the following is not correct?
(a) ΔG is zero for a reversible reaction.
(b) ΔG is positive for a spontaneous reaction
(c) ΔG is negative for a spontaneous reaction
(d) ΔG is positive for a non-spontaneous reaction
- In which of the following compounds, an element exhibits two different oxidation states
(a) NH_4OH (b) NH_4NO_3
(c) N_2H_4 (d) N_3H
- For the reaction $\text{H}_2\text{(g)} + \text{I}_2\text{(g)} \rightleftharpoons 2\text{HI(g)}$, the standard free energy is $\Delta G^\circ > 0$. The equilibrium constant (K) would be
(a) $K = 0$ (b) $K > 1$
(c) $K = 1$ (d) $K < 1$
- Which one is Weak acid
(a) H_2CO_2 (b) H_2CO_3
(c) $\text{H}_2\text{C}_2\text{O}_4$ (d) All of these
- Which of the following options will be correct for the stage of half completion of the reaction $\text{A} \rightleftharpoons \text{B}$.
(a) $\Delta G^\circ = 0$ (b) $\Delta G^\circ > 0$
(c) $\Delta G^\circ < 0$ (d) $\Delta G^\circ = -RT \ln 2$
- Which of the following is not an example of redox reaction?
(a) $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$
(b) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
(c) $2\text{K} + \text{F}_2 \rightarrow 2\text{KF}$
(d) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$
- Which of the following always has a negative value?
(a) heat of reaction (b) heat of solution

- (c) heat of combustion (d) heat of formation
14. The more positive the value of E° , the greater is the tendency of the species to get reduced. Using the standard electrode potential of redox couples given below, find out which of the following is the strongest oxidizing agent. E° values: $\text{Fe}^{3+}/\text{Fe}^{2+} = +0.77$; $\text{I}_2(\text{g})/\text{I}^- = +0.54$; $\text{Cu}^{2+}/\text{Cu} = +0.34$; $\text{Ag}^+/\text{Ag} = +0.80$ V
- (a) Fe^{3+} (b) $\text{I}_2(\text{g})$
(c) Cu^{2+} (d) Ag^+
15. E° values of some redox complexes are given below. On the basis of these values choose the correct option.
 E° values: $\text{Br}_2/\text{Br}^- = +1.90$; $\text{Ag}^+/\text{Ag}(\text{s}) = +0.80$ $\text{Cu}^{2+}/\text{Cu}(\text{s}) = +0.34$; $\text{I}_2(\text{s})/\text{I}^- = +0.54$ V
- (a) Cu will reduce Br^- (b) Cu will reduce Ag
(c) Cu will reduce I^- (d) Cu will reduce Br_2
16. Which one is Lewis acid
- (a) AlCl_3 (b) NH_3
(c) CH_4 (d) C_2H_4

SET-II

17. In the modern Periodic Table, the period indicates the value of
- a) atomic number b) atomic mass
c) principal quantum number d) azimuthal quantum number
18. Which of the following statements related to the modern Periodic Table is incorrect?
- a) The p-block has 6 columns, because a maximum of 6 electrons can occupy all the orbitals in a p-sub shell
b) The d-block has 8 columns, because a maximum of 8 electrons can occupy all the orbitals in a d-sub shell
c) Each block contains a number of columns equal to the number of electrons that can occupy that subshell
d) The block indicates value of azimuthal quantum number(l) for the last subshell that received electrons in building up the electronic configuration.
19. Anything that influences the valence electrons will affect the chemistry of the element. which one of the following factors does not affect the valence shell?
- a) Valence Principal Quantum Number (n) b) Nuclear Charge(Z)
c) Nuclear Mass d) Number of Core Electrons.
20. Which one of the following statements is incorrect in relation to ionization enthalpy?
- a) Ionization enthalpy increases for each successive electron.
b) The greatest increase in ionization enthalpy is experienced on removal of electrons from core noble gas configuration.
c) End of valence electrons is marked by a big jump in ionization enthalpy.
d) Removal of electrons from orbitals bearing lower n value is easier than from an orbital having higher n value.
21. Considering the elements F, Cl, O and N the correct order of their chemical reactivity in terms of oxidizing property is
- a) $\text{F} > \text{Cl} > \text{O} > \text{N}$ b) $\text{F} > \text{O} > \text{Cl} > \text{N}$
c) $\text{Cl} > \text{F} > \text{O} > \text{N}$ d) $\text{O} > \text{F} > \text{N} > \text{Cl}$
22. Which of the following contains peroxide bond
- a) H_2SO_4 b) H_2SO_5
c) HNO_3 d) H_3PO_3
23. How many water molecules are required to formed H-bonding by a single molecule of water
- a) 2 b) 4
c) 6 d) 8
24. Choose the Correct Answer. a Thermodynamic State Function Is a Quantity
- a) used to determine heat changes b) whose value is independent of path
c) used to determine pressure volume work d) Whose value depends on temperature only.
25. Which one has more bond angle
- a) NH_3 b) H_2O
c) CH_4 d) CO_2
26. For the Process to Occur Under Adiabatic Conditions, the Correct Condition Is:
- a) $\Delta T = 0$ b) $\Delta p = 0$

- c) $q=0$ d) $w=0$
27. The Enthalpies of All Elements in Their Standard States Are:
 a) unity b) zero
 c) < 0 d) different for each element
28. ΔU^θ of combustion of methane is $-X \text{ kJ mol}^{-1}$. The value of ΔH^θ is
 a) $= \Delta U^\theta$ b) $< \Delta U^\theta$
 c) $> \Delta U^\theta$ d) zero
29. Bond order of H_2 , O_2 & N_2 will be
 a) 2, 4 & 6 b) 1, 2 & 3
 c) zero d) 1.5, 2.5 & 3.0
30. The amount of energy required to remove the valence electron of an isolated gaseous atom to form a cation is called its
 a) Electro negativity b) Ionization potential
 c) Electron gain enthalpy d) Lattice enthalpy
31. Select the species which are isosteres
 a) CH_4 & H_2O b) CO_2 & O_2
 c) CO & N_2 d) NH_3 & PH_3
32. Which one has more Ionization potential
 a) Na^+ b) Mg^{+2}
 c) Al^{+3} d) Si^{+4}
33. Which one has other than sp^3 hybridization
 a) H_3PO_3 b) C_6H_{14}
 d) H_2SO_5 c) $\text{CH}_3^\bullet$
34. Which one has more Electron affinity
 a) F b) N
 d) Cl c) Br

For questions number **35** to **37**, two statements are given – one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below

Both Assertion (A) and Reason (R) are true and Reason(R) is the correct explanation of the Assertion(A).

Both Assertion (A) and Reason (R) are true but Reason(R) is not correct explanation of the Assertion(A).

Assertion(A) is true, but Reason(R) is false.

Assertion(A) is false, but Reason(R) is true.

35. Assertion (A): Nuclear charge does not affect the ionization potential of the atom.
 Reason (R): Nuclear charge talks about the stability of configuration.
36. **Assertion (A):** According to Mendeleev, periodic properties of elements is a function of their atomic masses.
Reason (R): Atomic number is equal to the number of protons.
37. **Assertion (A):** Group 15 is commonly called Pnictogen.
Reason (R): N, P, As, Sb & Bi are generally used in the preparation of drugs.

SECTION – B (SUBJECTIVE)

SET-I

38. What is the enthalpy of formation of the most stable form of an element in its standard state?
39. What is K_c for the following reaction in state of equilibrium?

$$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$$
 Given: $[\text{SO}_2] = 0.6 \text{ M}$; $[\text{O}_2] = 0.82 \text{ M}$; and $[\text{SO}_3] = 1.90 \text{ M}$
40. Classify the following species into Lewis acids and Lewis bases and show how these can act as Lewis acid/Lewis base?
 (a) OH^- ions (b) F^- (c) H^+ (d) BCl_3

41. Assuming complete dissociation, calculate the pH of the following solutions:
 (a) 0.003 M HCl (b) 0.005 M NaOH (c) 0.002 M HBr (d) 0.002 M KOH
42. The enthalpy of formation of methane at constant pressure and 300 K is -78.84 kJ. What will be the enthalpy of formation at constant volume?
43. The following concentration were obtained for the formation of NH_3 from N_2 and H_2 at equilibrium at 500 K. $[\text{N}_2(\text{g})] = 1.5 \times 10^{-2}$ M $[\text{H}_2(\text{g})] = 3.0 \times 10^{-2}$ M $[\text{NH}_3] = 1.2 \times 10^{-2}$ M. Calculate equilibrium constant.
44. Assign oxidation number to the underlined elements in each of the following species:
 (a) $\text{H}_2\text{S}\underline{\text{O}}_5$ (b) $\underline{\text{Cr}}\text{O}_5$ (c) $\text{K}_2\underline{\text{Cr}}_2\text{O}_7$ (d) $\text{CaO}\underline{\text{Cl}}_2$
45. Balance the following redox reactions
 (a) $\text{C} + \text{HNO}_3 \rightarrow \text{CO}_2 + \text{NO}_2 + \text{H}_2\text{O}$
 (b) $\text{MnO}_4^- + \text{Fe}^{+2} + \text{H}^+ \rightarrow \text{Mn}^{+2} + \text{Fe}^{+3} + \text{H}_2\text{O}$

46. Read the passes carefully and answer the following question:(case-based question carrying 4(1+1+1+1) marks)

In 1830, Michael Faraday showed that if electricity is passed through a solution of an electrolyte, chemical reactions occurred at the electrodes, which resulted in the liberation and deposition of matter at the electrodes. In mid-1850s Faraday began to study electrical discharge in partially evacuated tubes, known as cathode ray discharge tubes. When sufficiently high voltage is applied across the electrodes, current starts flowing through a stream of particles moving in the tube from the negative electrode to the positive electrode. These were called cathode rays or cathode ray particles. J.J. Thomson measured the ratio of electrical charge (e) to the mass of the electron (m_e) by using a cathode ray tube and applying electrical and magnetic fields perpendicular to each other as well as to the path of electrons. A positively charged particle was characterised in 1919. Later, a need was felt for the presence of an electrically neutral particles as one of the constituents of the atom.

In these questions, a statement of assertion followed by the statement of reason is given.

Choose the correct answer out of the following choices:

- A. Assertion and reason both are correct statements and reason is the correct explanation for assertion.
 B. Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
 C. Assertion is the correct statement but reason is wrong statement.
 D. Assertion is the wrong statement but reason is correct statement.

1. **Assertion:** The cathode rays start from cathode and move towards the anode.
Reason: In the absence of electrical or magnetic field, cathode rays travel in straight lines.

2. **Assertion:** Thomas argued that the lighter the particle, greater the deflection.
Reason: Deflection depends upon the mass of the particle.

3. **Assertion:** Television picture tubes are anode ray tubes.
Reason: Electrons are the basic constituent of all the atoms.

4. **Assertion:** The charge to mass ratio of the particles depends on the gas from which these originate.
Reason: The smallest and lightest positive ion was obtained from hydrogen and was called proton.

47. Calculate the enthalpy change on freezing of 1.0 mol of water at 10.0°C to ice at -10.0°C .
 $A, H = 6.03$ KJ mol⁻¹ at 0°C . $C_p [\text{H}_2\text{O}(\text{l})] = 75.3$ J mol⁻¹ K⁻¹; $C_p [\text{H}_2\text{O}(\text{s})] = 36.8$ J mol⁻¹ K⁻¹.

OR

Derive the relation between

- i. K_p and K_c .
 ii. K_p and K_x .

48. (A) Give reason for the following

- (a) Why does entropy of a solid increases on fusion?
 (b) Why a non-spontaneous reaction becomes spontaneous when it is coupled with a suitable spontaneous reaction?

(B) Define entropy

Give the change in entropy in the following daily life process:

- (a) Melting of ice cream
 (b) Kid making a car by his blocks
 (c) Breaking of glass tumbler
 (d) Condensation on mirror during bath in winters.

SET-II

49. Which element do you think would have been named by (i) Lawrence Berkeley Laboratory (ii) Seaborg's Group?
50. Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, the bond angle in water is less than that of ammonia. Discuss.

51. Write the IUPAC name for $Z = 111$ & 121 ?

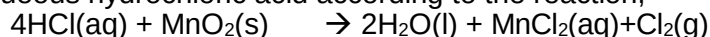
OR

Determine Period number and Group number (According to New IUPAC System) for

- a) Cu
b) Zn
c) Describe the hybridization in case of PCl_5 . Why are the axial bonds longer as compared to equatorial bonds?
52. Enthalpy of combustion of carbon-to-carbon dioxide is $-393.5 \text{ kJ mol}^{-1}$. Calculate the heat released upon formation of 35.2 g of CO_2 from carbon and dioxygen gas.
53. How would you explain the fact that the first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium?
- OR**
54. Explain why cations are smaller and anions larger in radii than their parent atoms.

OR

Chlorine gas is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction,



How many grams of HCl reacts with 5.0 g of manganese dioxide?

55. In the modern periodic table, elements are arranged in order of increasing atomic numbers which is related to the electronic configuration. Depending upon the type of orbitals receiving the last electron, the elements in the periodic table have been divided into four blocks, viz, s, p, d and f. The modern periodic table consists of 7 periods and 18 groups. Each period begins with the filling of a new energy shell. In accordance with the Aufbau principle, the seven periods (1 to 7) have 2, 8, 8, 18, 18, 32 and 32 elements respectively. The seventh period is still incomplete. To avoid the periodic table being too long, the two series of f-block elements, called lanthanoids and actinoids are placed at the bottom of the main body of the periodic table.
- i. The element with atomic number 57 belongs to which block? (1)
ii. What is the outermost electronic configuration of last element of the p-block in 6th period?
iii. Can an element with atomic number 126, if discovered be accommodated in the present set up of the long form of the periodic table.

OR

- iii. What is the electronic configuration of the element which is just above the element with atomic number 35 in the same group?
56. The molecular orbital theory is based on the principle of a linear combination of atomic orbitals. According to this approach when atomic orbitals of the atoms come closer, they undergo constructive interference as well as destructive interference giving molecular orbitals, i.e., two atomic orbitals overlap to form two molecular orbitals, one of which lies at a lower energy level (bonding molecular orbital). Each molecular orbital can hold one or two electrons in accordance with Pauli's exclusion principle and Hund's rule of maximum multiplicity. For molecules up to N_2 , the order of filling of orbitals is: $\sigma(1s)*\sigma(1s), \sigma(2s)*\sigma(2s), \pi(2p_x)\sigma(1s)*\sigma(1s), \sigma(2s)*\sigma(2s), \pi(2p_x) = \pi(2p_y), \sigma(2p_z), *\pi(2p_x) = \pi(2p_y), \sigma(2p_z), \pi*(2p_x) = \pi*(2p_y), \sigma*(2p_z) = \pi*(2p_y), \sigma*(2p_z)$ and for molecules after N_2 , the order of filling is: $\sigma(1s)*\sigma(1s), \sigma(2s)*\sigma(2s), \sigma(2p_z), \pi(2p_x)\sigma(1s)*\sigma(1s), \sigma(2s)*\sigma(2s), \sigma(2p_z), \pi(2p_x) = \pi(2p_y), *\pi(2p_x) = \pi(2p_y), \pi*(2p_x) = \pi*(2p_y), \sigma*(2p_z) = \pi*(2p_y), \sigma*(2p_z)$

Bond order = $\frac{1}{2}[\text{bonding electrons} - \text{antibonding electrons}]$

Bond order gives the following information:

- ♦ If bond order is greater than zero, the molecule/ion exists otherwise not.
- ♦ Higher the bond order, higher is the bond dissociation energy.
- ♦ Higher the bond order, greater is the bond stability.

- ♦ Higher the bond order, shorter is the bond length.
- i. Arrange the following negative stabilities of CN , CN^+ and CN^- in increasing order of bond.
- ii. The molecular orbital theory is preferred over valence bond theory. Why?
- iii. Ethyne is acidic in nature in comparison to ethene and ethane. Why is it so?

OR

- iii. Bonding molecular orbital is lowered by a greater amount of energy than the amount by which antibonding molecular orbital is raised. Is this statement correct?

57. Attempt any five of the following

- i. Covalent bond are directional bonds while ionic bonds are non-directional.
- ii. Water molecule has bent structure whereas carbon dioxide molecule is linear.
- iii. Ethyne molecule is linear while PCl_5 is trigonal bipyramidal;
- iv. Why N_2 is diamagnetic while O_2 is paramagnetic?
- v. Why H_2O is liquid while H_2S is gas?

OR

Attempt any five of the following

- a) Why nitrogen(N) is more stable than oxygen(O)?
- b) Why cuprous (Cu^+) is more stable than cupric (Cu^{++})?
- c) What is the lowest value of n that allows g orbitals to exist?
- d) What is the maximum number of emission lines when the excited electron of a H-atom in $n = 6$ drops to the ground state?
- e) Name the longest period of Periodic table.
- f) Why the empirical formula of benzene is CH ?
- g) How many subshells are associated with $n = 4$?
- h) How many electrons will be present in the subshells having m_s value of $-1/2$ for $n = 4$?

CLASS-XII

SECTION – A (MCQ)

SET-I

1. Which of the following solutions will have the highest conductivity at 298K?
 - a) 0.01M HCL solution
 - b) 0.1 M HCL solution
 - c) 0.01 M CH_3COOH solution
 - d) 0.1 M CH_3COOH
2. Identify A and B
 $\text{A} + \text{B} (\text{dil NaOH}) \rightarrow \text{C}_6\text{H}_5\text{-CH=CH-CO-C}_6\text{H}_5$
 - a) A=1-phenylethanal, B= acetophenone
 - b) A= Benzophenone, B= Formaldehyde
 - c) A= Benzaldehyde, B= Acetophenone
 - d) A= Benzophenone, B= Acetophenone
3. Which of the following is not considered a transition element?
 - a) Scandium
 - b) Silver
 - c) Vanadium
 - d) Zinc
4. Which of the following statement is true?
 - a) molecularity of reaction can be zero or a fraction
 - b) molecularity has no meaning for complex reactions
 - c) molecularity of a reaction is an experimental quantity
 - d) reactions with the molecularity three are very rare but are fast
5. Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?
 - a) Zn
 - b) Mn
 - c) Au
 - d) Cd
6. A voltaic cell is made by connecting two half cells represented by half equations below:
 $\text{Sn}^{+2}(\text{aq}) + 2\text{e}^- \rightarrow \text{Sn}(\text{s}) \quad E^\circ = -0.14\text{V}$
 $\text{Fe}^{+3}(\text{aq}) + \text{e}^- \rightarrow \text{Fe}^{+2}(\text{aq}) \quad E^\circ = +0.77\text{V}$
 Which statement is correct about this voltaic cell?
 - a) Fe^{+2} is oxidised and the voltage of the cell is -0.91V

- b) Sn is oxidised and the voltage of the cell is 0.91 V
 c) Fe^{+2} is oxidised and the voltage of the cell is 0.91 V
 d) Sn is oxidised and the voltage of the cell is 0.63 V
7. Acetamide is treated with the following reagents separately. Which one of these would yield methyl amine
 a) $\text{Br}_2 + \text{KOH}$ (alc.)
 b) Soda lime
 c) NaOH (aqu.)
 d) CaCO_3
8. Carbyl amine test applicable for
 a) 1° amine
 b) 2° amine
 c) 3° amine
 d) All of these
9. Neo-pentane on photo-chemical chlorination gives how many chloro product
 a) 4
 b) 2
 c) 5
 d) 3
10. Which of the following statements is not true about glucose?
 a) It is an aldohexose
 b) On heating with HI it forms n-hexane
 c) It is present in pyranose form
 d) It gives 2,4 DNP test
11. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.
 a) $1.925 \times 10^{-4} \text{ s}^{-1}$
 b) $19.25 \times 10^{-24} \text{ s}^{-1}$
 c) $4.925 \times 10^{-14} \text{ s}^{-1}$
 d) $11.25 \times 10^{-14} \text{ s}^{-1}$
12. On Ozonolysis of Benzene gives
 a) Propanone
 b) Ethan-dial
 c) Acetone
 d) All of these

Directions (Q. Nos. 13-16): Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer:

13. **Assertion:** Alcohol react both as nucleophiles and electrophiles
Reason: The bond between C-O is broken when alcohols react as nucleophiles
 (a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
 (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 (c) Assertion is fake but Reason is true.
 (d) Assertion is true but Reason is fake.
14. **Assertion:** Strong oxidising agents oxidise toluene and its derivatives to benzoic acids.
Reason: It is possible to stop the oxidation of toluene at the aldehyde stage with suitable reagents
 (a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
 (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 (c) Assertion is fake but Reason is true.
 (d) Assertion is true but Reason is fake.
15. **Assertion:** Conductivity of an electrolyte increases with decrease in concentration
Reason: Number of ions per unit volume decreases on dilution
 (a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
 (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 (c) Assertion is fake but Reason is true.
 (d) Assertion is true but Reason is fake.
16. **Assertion:** Proteins are polymers of α -amino acids connected by a peptide bond
Reason: A tetrapeptide contains 4 amino acids linked by 4 peptide bonds.
 (a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
 (b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 (c) Assertion is fake but Reason is true.
 (d) Assertion is true but Reason is fake.

SET-II

17. The mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution.

the treatment with a base.

(b) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.

(b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(c) Assertion is false but Reason is true.

(d) Assertion is true but Reason is false.

32. Assertion: IUPAC name of the compound tert.butyl alcohol is 2-Methyl-2-propanol.

Reason: Alcohol and Ether form functional isomer

(a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.

(b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(c) Assertion is false but Reason is true.

(d) Assertion is true but Reason is false.

SECTION – B (SUBJECTIVE)

SET-I:

33. Determine the amount of CaCl_2 ($i = 2.47$) dissolved in 2.5 litre of water such that its osmotic pressure is 0.75 atm at 27°C .

34. $[\text{NiCl}_4]^{2-}$ is paramagnetic while $[\text{Ni}(\text{CO})_4]$ is diamagnetic though both are tetrahedral Why?

35. Why is sulphuric acid not used during the reaction of alcohols with KI?

36. Among the isomeric alkanes of molecular formula C_5H_{12} , identify the one that on photochemical chlorination yields

(i) A single monochloride.

(ii) Three isomeric monochlorides.

37. A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single mono chloro compound $\text{C}_5\text{H}_9\text{Cl}$ in bright sunlight. Identify the hydrocarbon.

OR

What are the different types of RNA found in the cell?

38. Calculate the mass of ascorbic acid (vitamin C, $\text{C}_6\text{H}_8\text{O}_6$) to be dissolved in 75 g of acetic acid to lower its melting point by 1.5°C . (K_f for CH_3COOH) = $3.9 \text{ K kg mol}^{-1}$)

39. Write the equations involved in the following reactions:

(i) Reimer-Tiemann reaction

(ii) Kolbe's reaction

40. Explain the fact that in alkyl aryl ethers, alkoxy group:

(i) activates the benzene ring towards electrophilic substitution.

(ii) directs the incoming substituents towards ortho and para positions in the ring.

41. An organic compound (A) (molecular formula $\text{C}_8\text{H}_{16}\text{O}_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.

42. Calculate the emf of the cell in which the following reaction takes place:

$\text{Ni(s)} + 2\text{Ag}^+ (0.002 \text{ M}) \rightarrow \text{Ni}^{2+} (0.160 \text{ M}) + 2\text{Ag(s)}$ Given that $E^\ominus_{(\text{cell})} = 1.05 \text{ V}$.

43. Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (a) reacted with alcoholic KOH to give compound (b) Compound (b) is reacted, with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

44. Write the important structural and functional differences between DNA and RNA.

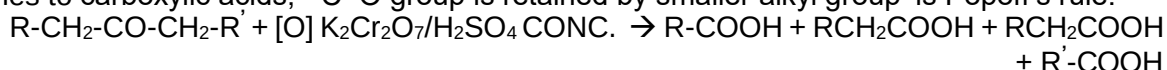
45. There are 13 vitamins known till today. Four of which are fat soluble (A, D, E, K) and rest of which are water soluble (B_1 , B_2 , B_3 , B_5 , B_6 , B_7 , B_9 , B_{12} , C). Let's know the history how vitamins were discovered. By the end of mid-1800 scientists had discovered that pathogens caused various diseases. It was assumed that patchy skin, falling eye-sight etc. is also caused by germs instead of vitamin deficiency. Dutch Bio Scientist Dr. Christiaan Eijkman reported in 1895, that chickens that ate polished rice developed beriberi. He was awarded Noble Prize in 1929 for his contribution in discovery of vitamins. 'Vita' (Latin—for important to life), amine (a specific group which Funk believed is present in all vitamins). In the beginning vitamin C was called Scurvy Vitamin, Vitamin-B was called Beri-Beri vitamin

when rats were fed a diet heavy in lard and olive oil, they died but with the addition of tiny amount of butter fat they survived. McCollum called vitamin in butter fat. Fat soluble Vitamin A, Vitamin B₁₂ and Vitamin D were discovered later. Now we also know vitamin E, K and H also.

Answer the following questions:

- (a) Name four vitamins that are stored in liver and adipose (fat storing) tissues.
 - (b) Out of B, C and B₁₂ which vitamin cannot be stored in our body and why?
 - (c) Name a vitamin which helps in blood clotting and name source of this vitamin.
 - (d) Name a vitamin which is fat soluble and anti-oxidant. What are sources of this vitamin and its deficiency disease?
- 46.** Oxidation of Aldehydes and Ketones (Popoff's Rule) Aldehydes differ from ketones in their oxidation reactions. Aldehydes are easily oxidised to carboxylic acids on treatment with common oxidising agents like HNO₃, KMnO₄, K₂Cr₂O₇, etc. Even mild oxidising agents mainly Tollen's reagent, Fehling's solution, Benedict reagents, also oxidise aldehydes.

Ketones are difficult to oxidise. They are oxidised by strong oxidising agents at elevated temperature. Their oxidation involves C—C cleavage to form mixture of carboxylic acids. The oxidation of ketones is governed by Popoff's rule. 'In unsymmetrical ketones, on oxidation of ketones to carboxylic acids, =C=O group is retained by smaller alkyl group' is Popoff's rule.



Ketones do not react with Tollen's reagent and Fehling's solutions. Methyl ketones give yellow precipitate of iodoform with I₂ and NaOH. Ketones can be oxidised by haloform reaction if they have one methyl group.

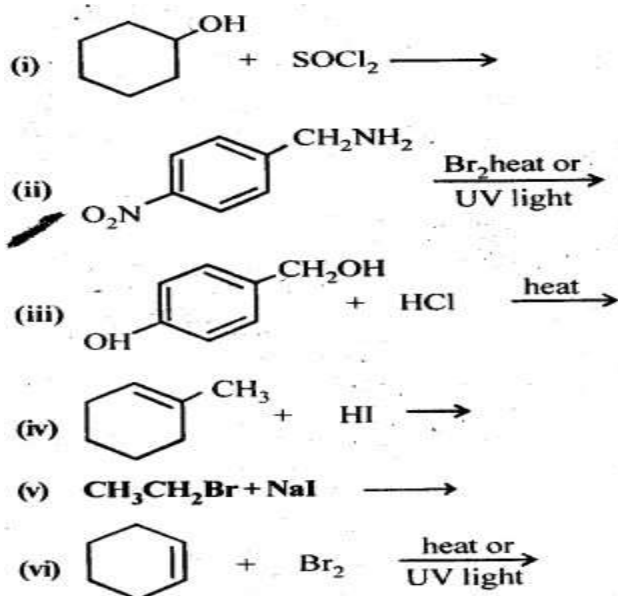
Answer the following questions:

- (a) Why is it difficult to oxidise ketone as compared to aldehyde?
 - (b) What happens when 3-methyl-pentan-2-one reacts with sodium hypochlorite? Write chemical reaction involved?
 - (c) A compound A C₅H₁₀O does not give silver mirror with Tollen's reagent, it gives iodoform test with I₂/NaOH. Write possible structures of compounds and write the chemical reactions involved.
 - (d) What happens when Pentan-2-one is oxidised with K₂Cr₂O₇/H₂SO₄ (conc.) on heating.
- 47.** Two elements A and B form compounds having formula AB₂ and AB₄. When dissolved in 20g of benzene (C₆H₆), 1 g of AB₂ lowers the freezing point by 2.3 K whereas 1.0 g of AB₄ lowers it by 1.3 K. The molar depression constant for benzene is 5.1 K g mol⁻¹. Calculate atomic masses of A and B.

OR

What is meant by the following terms? Give an example of the reaction in each case.

- (i) Cyanohydrin
 - (ii) Acetal
 - (iii) Semi carbazone
 - (iv) Aldol
 - (v) Hemiacetal
- 48.** The molar conductivity of 0.025 mol L⁻¹ methanoic acid is 46.1 S cm² mol⁻¹. Calculate its degree of dissociation and dissociation constant Given λ°(H⁺) = 349.6 S cm² mol⁻¹ and λ°(HCOO⁻) = 54.6 S cm² mol⁻¹ **OR**
- Using IUPAC norms write the systematic names of the following:
- (i) [Co (NH₃)₆]Cl₃,
 - (ii) [Pt (NH₃)₂Cl (NH₂CH₃)] Cl
 - (iii) [Ti(H₂O)₆]³⁺
 - (iv) [Co(NH₃)₄Cl(NO₂)]Cl
 - (v) [Mn(H₂O)₆]²⁺
- 49.** Draw the structures of major mono halo products in each of the following reactions:



SET-II

50. What is meant by the hydroboration-oxidation reaction? Illustrate it with an example.
Can you store copper sulphate solutions in a zinc pot?

OR

Why is sulphuric acid not used during the reaction of alcohols with KI?

51. Using IUPAC norms, write the systematic names of the following:

- (i) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
(ii) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$

OR

What is meant by unidentate, bidentate and ambidentate ligands? Give two examples for each.

52. (i) Draw the structures of all isomeric alcohols of molecular formula $\text{C}_5\text{H}_{12}\text{O}$ and give their IUPAC names.

(ii) Classify the isomers of alcohols in question.

53. Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses. Explain this fact.

54. Give the equations of reactions for the preparation of phenol from cumene.

55. What is meant by the following terms? Give an example of the reaction in each case.

- (i) Imine
(ii) Oxime
(iii) Schiff's base

56. What happens when D-glucose is treated with the following reagents.

- (i) HI
(ii) Bromine water
(iii) HNO_3

57. A reaction is first order in A and second order in B.

- (i) Write the differential rate equation.
(ii) How is the rate affected by increasing the concentration of B three times?
(iii) How is the rate affected when the concentrations of both A and B are doubled?

58. Show how will you synthesise:

- (i) 1-phenylethanol from a suitable alkene.
(ii) cyclohexyl methanol using an alkyl halide by an $\text{S}_\text{N}2$ reaction.
(iii) pentan-1-ol using a suitable alkyl halide?

59. Write the equations involved in the following reactions:

- (i) Reimer-Tiemann reaction
(ii) Kolbe's reaction

60. Determine the molarity of each of the solutions given below:

- (a) 30 g of $\text{Co}(\text{NO})_3 \cdot 6\text{H}_2\text{O}$ in 4.3 L of solution.
(b) 30 mL of 0.5 M H_2SO_4 diluted to 500 mL.

61. Those reaction in which atoms or groups are attached to the molecule by the displacement of any other molecule is called Nucleophilic substitution reaction. There are two types of nucleophilic reaction $\text{S}_\text{N}1$ & $\text{S}_\text{N}2$ reaction. $\text{S}_\text{N}1$ is the properties of more stable

alkyl halide while SN_2 is the properties of less stable alkyl halide. SN_1 has two steps mechanism while SN_2 involves in one steps mechanism.

SN_1 is commonly called uni-molecular nucleophilic substitution reaction while SN_2 reaction is commonly called Bi-molecular nucleophilic substitution reaction.

When alkyl halide is treated with KOH (aqu.) then alkyl alcohol is formed. It is also called Basic hydrolysis.

Answer the following questions:

(I) Which one shows SN_1 fast?

- (a) CH_3Cl (b) $\text{CH}_3\text{CHClCH}_3$ (c) $\text{CH}_3\text{CH}_2\text{Cl}$ (d) CO_2

(II) Which one shows SN_1 fast?

- (a) $(\text{CH}_3)_3\text{CCl}$ (b) $(\text{CH}_3)_2\text{CHCl}$ (c) CH_3Cl (d) $\text{CH}_3\text{CH}_2\text{CHClCH}_3$

(III) Which one shows SN_2 fast?

- (a) CH_3Cl (b) $\text{CH}_3\text{CHClCH}_3$ (c) $\text{CH}_3(\text{CH}_2)_4\text{Cl}$ (d) CH_4

(IV) Which one shows SN_2 fast?

- (a) CH_3Cl (b) CH_3I (c) CH_3Br (d) CH_4

62. Beta elimination reaction may be defined as that reaction in which leaving group leaves with its Beta hydrogen. This reaction is controlled by Saytzeff's rule. According to Saytzeff's rule "During Beta-Elimination reaction Beta hydrogen leaves from that Beta carbon which has less number of hydrogens. "Common example of Beta elimination reaction is Dehydrohalogenation and Dehydration. When alkyl halide is treated with KOH (alc) or NaOH(alc), alkene is formed. Alkene on ozonolysis gives aldehyde and ketone like ethene on ozonolysis gives formaldehyde while but-2-ene on ozonolysis gives acetaldehyde.

Answer the following questions:

(I) Which of the following alkene on ozonolysis gives both formaldehyde & acetaldehyde?

- (a) Propene (b) But-1-ene (c) Pent-1-ene (d) But-2-ene

(II) Which of the following alkenes on ozonolysis gives only Acetone?

- (a) Propene (b) But-1-ene (c) Pent-1-ene (d) 2,3-dimethyl But-2-ene

(III) Which of the following on dehydrohalogenation gives 2-methyl But-2-ene acetaldehyde?

- (a) 2-chloro-2-methyl Propane (b) 2-chloro-2-methyl Butane
(c) 2-chloro Pentane (d) 1-chloro Butane

(IV) Which of the following on dehydrohalogenation gives But-2-ene?

- (a) 1-chloro Butane (b) 2-chloro Butane (c) 1-chloro Propane (d) 2-chloro Propane

63. Name the reagents used in the following reactions:

- (i) Oxidation of primary alcohol to a carboxylic acid.
(ii) Oxidation of primary alcohol to aldehyde.
(iii) Bromination of phenol to 2,4,6-tribromophenol.
(iv) Benzyl alcohol to benzoic acid.
(v) Dehydration of propan-2-ol to propene

.OR

What is meant by the following terms? Give an example of the reaction in each case.

- (i) Cyanohydrin
(ii) Acetal
(iii) Semi carbazone
(iv) Aldol
(v) Hemiacetal

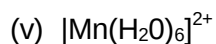
64. Predict all the alkenes that would be formed by dehydrohalogenation of the following halides with sodium ethoxide in ethanol and identify the major alkene:

- (i) 1-Bromo-1-methylcyclohexane
(ii) 2-Chloro-2-methylbutane
(iii) 2,2,3-Trimethyl-3-bromopentane.
(iv) 1-chloro-2-methyl cyclopropane
(v) 2,3-dichloro pentane

OR

Using IUPAC norms write the systematic names of the following:

- (i) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$,
(ii) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$
(iii) $\text{K}_3[\text{Fe}(\text{CN})_6]$
(iv) $[\text{Co}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)]\text{Cl}$



65. Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

OR

What happens when

- (i) n-butyl chloride is treated with alcoholic KOH,
- (ii) bromo benzene is treated with Mg in the presence of dry ether,
- (iii) chloro benzene is subjected to hydrolysis,
- (iv) ethyl chloride is treated with aqueous KOH,
- (v) methyl bromide is treated with sodium in the presence of dry ether,
- (vi) methylchloride is treated with KCN