

DEHRADUN PUBLIC SCHOOL
ASSIGNMENT (2023-24)
SUBJECT- CHEMISTRY (043)
CLASS - XI

UNIT I: SOME BASIC CONCEPTS OF CHEMISTRY

MULTIPLE CHOICE QUESTIONS:

- Q1.** A compound has 20% of Mg, 26.66% S and 53.33% O, the empirical formula of compound is (Mg = 24u, S = 32u, O = 16u):
a. MgSO₃ b. MgSO₄ c. MgSO₂ d. MgSO₅
- Q2.** 25cm³ of oxalic acid completely neutralized 0.064 g of NaOH. Molarity of oxalic acid solution is:
a. 0.064 b. 0.045 c. 0.015 d. 0.032
- Q3.** Formation of CO and CO₂ illustrates the law of _____
a. Law of conservation of mass b. Law of Reciprocal proportion
c. Law of Constant Proportion d. Law of Multiple Proportion

In the following questions, a statement of assertion followed by a 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 correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

Q4. Assertion: The empirical mass of ethane is half of molecular mass.

Reason: The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

Q5. Assertion: Combustion of 16 g of methane gives 18 g of water.

Reason: In the combustion of methane, water is one of the products.

Subjective type questions:

- Q6.** Calculate the number of gram atoms present in the following masses:
a. 12.69 g of hydrogen.
- Q7.** Define the law of multiple proportions. Explain it with example.
- Q8.** 1.5 g of ethane on complete combustion gave 4.4 g of CO₂ and 2.7 g of H₂O. Show that the results are in accordance to the law of conservation of mass.
- Q9.** Calculate the molarity of pure water at room temperature if the density is 0.998 g/ml.
- Q10. Read the passage given below and answer the following questions:**
Concentrations of solution can be expressed in terms of mass percentage, volume percentage, mass/volume percentage. Molarity, molality and mole fractions are also used to express concentration of solution. Molality can be converted into molarity and vice-versa if density of solution is given. Mole fraction of solute can be converted into molality and vice-versa if we know molar mass of solvent. The following questions are multiple choice questions. Choose the most appropriate answer:
i. Find out number of H₂O molecules in 18 mL of H₂O [Molar mass= 18 g mol⁻¹, density of H₂O= 1g/mL]
ii. What do you mean by molality?
iii. Calculate the mass percent of calcium in calcium phosphate Ca₃(PO₄)₂
iv. The molarity of NaOH in the solution prepared by dissolving 4g in enough water to form 250 mL of solution is [Molar mass of NaOH = 40g/mol]

UNIT II: STRUCTURE OF ATOM

MULTIPLE CHOICE QUESTIONS:

- Q1.** The number of radial nodes for 3p orbital is _____.
a. 3 b. 4 c. 2 d. 1
- Q2.** Which of the following statements concerning the quantum numbers are correct?
a. Angular quantum number determines the three dimensional shape of the orbital.
b. The principal quantum number determines the orientation and energy of the orbital.
c. Magnetic quantum number determines the size of the orbital.

d. Spin quantum number of an electron determines the orientation of the spin of electron relative to the chosen axis.

Q3. Principal, Azimuthal and magnetic quantum numbers are respectively related to:

- a. Size, shape and orientation
b. Shape, size and orientation
c. Size, orientation and shape
d. None of the above

In the following questions, a statement of assertion(A) followed by a statement of reason(R) is given. Choose the correct answer out of the following choices.

- a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

Q4. Assertion: All isotopes of a given element show the same type of chemical behaviour

Reason: The chemical properties of an atom are controlled by the number of electrons in the atom.

Q5. Assertion: The mass of 1.09×10^{27} electrons is equal to 1 g.

Reason: The mass of 1 electron is 9.1×10^{-31} kg.

Subjective type questions:

Q6. What are the values of four quantum numbers for the $3d^2$ electrons.

Q7. What is the experimental evidence in support of the idea that electronic energies in an atom are quantized?

Q8. Table-tennis ball has a mass 10 g and a speed of 90 m/s. If speed can be measured within an accuracy of 4% what will be the uncertainty in speed and position?

Q9. Threshold frequency, ν_0 is the minimum frequency which a photon must possess to eject an electron from a metal. It is different for different metals. When a photon of frequency $1.0 \times 10^{15} \text{ s}^{-1}$ was allowed to hit a metal surface, an electron having 1.988×10^{19} J of kinetic energy was emitted. Calculate the threshold frequency of this metal. Show that an electron will not be emitted if a photon with a wavelength equal to 600 nm hits the metal surface.

Q10. Read the given passage and answer the questions that follow based on passage and related studied concepts.

Orbitals are region or space where there is maximum probability of finding electrons.

Qualitatively, these orbitals can be distinguished by their size, shape and orientation. An orbital of small size means there is more chance of finding the electron near the nucleus. Shape and orientation means the direction in which probability of finding electron is maximum. Atomic orbitals can be distinguished by quantum numbers. Each orbital is designated by three quantum numbers n , l and ml (magnetic quantum number) which defines energy, shape and orientation but these are not sufficient to explain spectra of multi-electrons atoms. Spin quantum number (m_s) determines the spin of electron. Spin angular momentum of electron has two orientations relative to chosen axis which are distinguished by spin quantum numbers m_s which can take values $+1/2$ and $-1/2$.

Value of 'l'	0	1	2	3	4
Notation for subshell	S	p	d	f	g

i. $n=2, l=1, n=4, l=0$ respectively represent:

ii. Name the d orbital which are axial.

iii. The pair of ions having same electronic configuration is _____.

iv. Write the electronic configuration for:

a. Cr

b. Cu

UNIT III: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

MULTIPLE CHOICE QUESTIONS:

Q1. Considering the elements F, Cl, O and N, the correct order of their chemical reactivity in terms of oxidizing property is:

- a. $F > Cl > O > N$
c. $Cl > F > O > N$

- b. $F > O > Cl > N$
d. $O > F > N > Cl$

- Q2. Which of the following has highest ionisation enthalpy?
a. O b. N c. P d. S
- Q3. Which of the following electronic configurations of an atom has the lowest ionisation enthalpy?
a. $1s^2 2s^2 2p^3$ b. $1s^2 2s^2 2p^6 3s^1$
c. $1s^2 2s^2 2p^6$ d. $1s^2 2s^2 2p^5$

In the following questions, a statement of assertion(A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

- a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

Q4. **Assertion:** Among 2nd period, $Li < B < Be < C < O < N < F < Ne$ is in the order of increasing ionization enthalpy.

Reason: Atomic size goes on increasing along a period from left to right.

Q5. **Assertion:** $B < Ga < Al < In < Tl$ is the increasing order in terms of atomic size of group 13.

Reason: Tl^+ is more stable than Tl^{3+} due to inert pair effect.

Subjective type questions:

- Q6. Predict the position of the element in the periodic table satisfying the electronic configuration $(n-1) d^1 ns^2$ for $n=4$.
- Q7. Na^+ has a higher value of ionization enthalpy than Ne, though both have the same electronic configuration.
- Q8. p-Block elements form acidic, basic and amphoteric oxides. Explain each property by giving two examples and also write the reactions of these oxides with water
- Q9. Name the element which has highest a. -ve, electron gain enthalpy. b. electro negativity. c. melting point
- Q10. **Read the passage given below and answer the following questions:**
Modern periodic table arranges the elements in the increasing order of atomic number. It has 18 groups and 7 periods. Atomic numbers are consecutive in a period and increases in the group in a pattern. Elements are divided into four blocks, s-block, p-block, d-block, and f-block based on their electronic configuration. 78% of elements are metals, about 20 elements are non-metals, and few elements like B, Si, Ge, As are metalloids. Metallic character increases down the group but decreases along the period from left to right. The physical and chemical properties vary periodically with their atomic numbers. Periodic trends are observed in atomic size, ionization enthalpies, electron gain enthalpies, electronegativity, and valence. Oxides of metals are basic, some are amphoteric. Non-metals form acidic oxides, some form neutral oxides. s-block elements are soft, highly reactive, do not show variable oxidation states. p-block elements are metals, non-metals as well as metalloids, show variable oxidation states, exist as solids, liquids, and gases. d-block elements are metals, form coloured ions, show variable oxidation states, have high melting and boiling points. Lanthanoids and actinoids are f-block elements, form coloured ions. All actinoids are radioactive.
- i. Name the elements which belong to the d-block but are not transition metals.
ii. What is the difference between oxidation states of p-block and d-block elements?
iii. Which group elements are most electropositive and why?
iv. a. What happens to reactivity down the group 17?
b. What type of compounds is formed by elements belonging to group 14 and third period?

UNIT IV: CHEMICAL BONDING AND MOLECULAR STRUCTURE

MULTIPLE CHOICE QUESTIONS:

- Q1. The bond angle in NF_3 (102.3°) is smaller than NH_3 (107.2°). This is because of
a. large size of F compared to H b. large size of N compared to F
c. opposite polarity of N in the two molecules d. small size of H compared to N
- Q2. The types of hybrid orbitals of nitrogen in ethyne, methane and ethane respectively are expected to be
a. sp, sp^3 and sp^2 b. sp, sp^2 and sp^3

c. sp, sp^2 and sp^3

d. sp, sp^2 and sp

Q3. Which of the following substances has a dipole moment more than zero?

a. Water

b. Methane

c. Carbon dioxide

d. Nitrogen

In the following questions, a statement of assertion (A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

- a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement, but reason is wrong statement.
d. Assertion is wrong statement, but reason is correct statement.

Q4. Assertion: Though the central atom of both NH_3 and H_2O molecules are sp^3 hybridised, yet H–N–H bond angle is greater than that of H–O–H.

Reason: This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.

Q5. Assertion: The dipole moment helps to predict whether a molecule is polar or non-polar.

Reason: The dipole moment helps to predict the geometry.

Subjective type questions:

Q6. What type of hybridization takes place in P in PCl_5 and S in SF_6 ?

Q7. How would the bond lengths vary in the following species? C_2, C_2^-, C_2^{2-} .

Q8. Explain why PCl_5 is trigonal bipyramidal whereas IF_5 is square pyramidal.

Q9. Elements X, Y and Z have 4, 5 and 7 valence electrons respectively.

- a. Write the molecular formula of the compounds formed by these elements individually with hydrogen.
b. Which of these compounds will have the highest dipole moment?

Q10. Read the passage given below and answer the following questions:

In order to explain the shapes of molecules adequately, Sidgwick and Powell in 1940 proposed a theory based on the repulsive interaction of the electron pairs in the valence shell of the atoms. Nyholm and Gillespie (1950) further developed and redefined the concept. The main postulates of this theory are as follows :

The number of valence shell electron pairs (bonded or non-bonded) present around the central atom decides the shape of the molecules. The shared electron pairs are called bond pairs and unshared or non-bonding electrons are called lone pairs. Electron pairs of valence shell repel one another because their electron clouds are negatively charged. These electron pairs arrange themselves in such a way so that there is minimum repulsion and maximum distance in between them. The valence shell is considered as a sphere in which the electron pairs are localised on the spherical surface at maximum distance from one another. A lone pair occupies more space than a bonding pair, since it lies closer to the central atom. This means that the repulsion between the different electron pairs follow the order :

Lone pair-lone pair > lone pair-bond pair > bond pair-bond pair

$(lp - lp) > (lp - bp) > (bp - bp)$

The following questions (i-iv) are multiple choice questions. Choose the most appropriate answer :

- i. What will be the net dipole moment of BF_3 ?
ii. Find out the bond pairs and lone pair around the central atom in PCl_3 .
iii. Why do the deviations occur from idealized shape of H_2O and NH_3 molecules?
iv. Write the two condition for hydrogen bonding.

UNIT VI: THERMODYNAMICS

MULTIPLE CHOICE QUESTIONS:

Q1. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

a. $q = 0, \Delta T \neq 0, w = 0$

b. $q \neq 0, \Delta T = 0, w = 0$

c. $q = 0, \Delta T = 0, w = 0$

d. $q = 0, \Delta T < 0, w \neq 0$

Q2. In an exothermic reaction, heat is evolved, and system loses heat to the surrounding. For such system

- a. q_p will be negative
 c. q_p will be positive

- b. $\Delta_r H$ will be negative
 d. $\Delta_r H$ will be positive

Q3. The enthalpy change in a reaction does not depend upon

- a. the state of reactions and products
 c. different intermediate steps in the reaction
- b. the nature of the reactants and products
 d. initial and final enthalpy of the reaction

In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

- a. Both assertion and reason are correct and reason is the correct explanation of assertion.
 b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
 c. Assertion is correct but reason is incorrect.
 d. Assertion is incorrect but reason is correct.

Q4. Assertion : Spontaneous process is an irreversible process and may be reversed by some external agency.

Reason: Decrease in enthalpy is a contributory factor for spontaneity.

Q5. Assertion : Combustion of all organic compounds is an exothermic reaction.

Reason: The enthalpies of all elements in their standard state are zero.

Subjective type questions:

Q6. Explain the Hess's law and its significance using suitable examples.

Q7. A reaction is found to endothermic and $\Delta S = +ve$. At what temperature (high or low) will reaction be spontaneous?

Q8. ΔH for the reaction $H-C\equiv N_{(g)} + 2H_{2(g)} \rightarrow CH_3 - C_{2(g)}$ is $-150 kJ$. Calculate bond energy of $C\equiv N$ bond if bond energy of $C-H$ bond is $414 kJ mol^{-1}$, bond energy of $C\equiv N$ is $293 kJ mol^{-1}$ and $H-H$ bond energy is $435 kJ mol^{-1}$.

Q9. Give an expression showing relationship between internal energy and enthalpy.

Q10. Read the given passage and answer the questions that follow:

Thermodynamics involve energy changes in chemical reactions and other processes. Internal energy is total energy stored in a substance. We can specify absolute value of volume but not the absolute value of internal energy. We can measure only change in internal energy (ΔU). Work done on the system is taken as positive and work done by the system is taken as negative. Heat (q) absorbed by the system is $+ve$ and heat given out by system is negative. $\Delta U = q + w$ according to first law of thermodynamics. ΔH (enthalpy change) is measured at constant pressure, ΔU is measured at constant volume. ΔH , ΔS (entropy change), ΔG (free energy change) and temperature help to decide spontaneity of the process.

i. What is ΔU in adiabatic process?

ii. If $701 J$ of heat is absorbed by the system and $394 J$ of work is done by the system. What is value of ΔU ?

iii. For an equilibrium $H_2O(l) \rightleftharpoons H_2O(g)$, What are sign of ΔG , ΔH and ΔS ?

iv. a. For $N_2O_4(g) \rightleftharpoons 2NO_2(g)$. What is relationship between ΔH and ΔU ?

b. What is $C_p - C_v$ equal to?

UNIT-VII EQUILIBRIUM

MULTIPLE CHOICE QUESTIONS:

Q1. Acidity of BF_3 can be explained on the basis of which of the following concepts?

- a. Arrhenius concept
 c. Lewis concept
- b. Bronsted Lowry concept
 d. Bronsted Lowry as well as Lewis concept

Q2. The solubility product of $AgCl$ in water is 1.5×10^{-10} . Its solubility in $0.01 M NaCl$ aqueous solution is:

- a. 1.5×10^{-8}
 b. 5×10^{-10}
 c. 5×10^{-7}
 d. 1×10^{-9}

Q3. Which of the following pairs constitutes a buffer ?

- a. $NaOH$ and HCl
 c. HCl and KCl
- b. HNO_3 and NH_4NO_3
 d. HNO_2 and $NaNO_2$

In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

- Both assertion and reason are correct and reason is the correct explanation of assertion.
- Both assertion and reason are correct but reason is not a correct explanation of the assertion.
- Assertion is correct but reason is incorrect.
- Assertion is incorrect but reason is correct.

Q4. Assertion: The vapour pressure of pure liquid has a fixed value at a particular temperature.

Reason: When equilibrium is reached, no more vapours are formed.

Q5. Assertion: A catalyst does not influence the value of the equilibrium constant.

Reason: Catalyst influences the rate of both forward and backward reaction equally.

Subjective type questions:

Q6. Arrange the following in increasing order of pH:

$\text{KNO}_3(\text{aq})$, $\text{CH}_3\text{COONa}(\text{aq})$, $\text{NH}_4\text{Cl}(\text{aq})$, $\text{C}_6\text{H}_5\text{COONH}_4(\text{aq})$

Q7. How can you predict the following stages of a reaction by comparing the value of K_c and Q_c ?

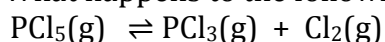
- Net reaction proceeds in the forward direction.
- Net reaction proceeds in the backward direction.
- No net reaction occurs.

Q8. On the basis of Le-Chatelier's principle explain how temperature and pressure can be adjusted to increase the yield of ammonia in the following reaction:



iv. For an equilibrium reaction, the rate constants for the forward and the backward direction are 2.38×10^{-4} and 8.15×10^{-5} respectively. Calculate the equilibrium constant for the reaction.

v. What happens to the following equilibrium:



If nitrogen gas is added to it (i) at constant volume (ii) at constant pressure?

Q9. Calculate the degree of dissociation of 0.5 M NH_3 at 25°C in a solution of $\text{pH}=12$.

18. For the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$, the partial pressures of N_2 and H_2 are 0.80 and 0.40 atmosphere respectively at equilibrium. The total pressure of the system is 2.80 atmospheres. What is K_p for the above reaction?

Q10. Read the following passage and answer the questions that follow:

Arrhenius acids give H^+ ion in aqueous solution whereas bases give OH^- in aqueous solution. Bronsted acids are proton donor whereas Bronsted bases are proton acceptors. Acids, on donating proton form conjugate base whereas bases form conjugate acid after accepting proton. Buffer solution is a solution whose pH does not change by adding small amount of H^+ or OH^- . The decrease in conc. of one of the ion by adding other ion as common ion is called common ion effect. Lewis acids are electron deficient or +vely charged. Lewis bases are electron rich or negatively charged. K_{sp} (solubility product) is product of molar concentration of ions raised to power number of ions per formula of the compound in sparingly soluble salt. Precipitation occurs only if ionic product exceeds solubility product. Solubility of salt decreases in presence of common ion. K_w is ionic product of water (1×10^{-14} at 298 K). K_w increases with increase in temperature. $\text{pH} = -\log [\text{H}_3\text{O}^+]$ where $[\text{H}_3\text{O}^+] = C\alpha$ in mono protic acid 'C' is molar conc, ' α ' is degree of ionisation. A salt is said to be hydrolysed if pH of solution changes. K_H is hydrolytic constant. pH of salts of strong acid and strong base is equal to 7. pH of other salts can be <7 or >7 . pH of buffer solution can be calculated with the help of Henderson equation.

i. The concentration of $[\text{H}_3\text{O}^+]$ is 4×10^{-4} . What is pH of solution? [$\log 4=0.6021$], $\log_{10}1=1$.

ii. K_b for NH_3 is 1.80×10^{-5} . What will be K_a ? [$K_w = 1 \times 10^{-14}$]

iii. Show a relationship between K_a , K_{a1} and K_{a2} .

iv. What are conjugate acids of NH_2^- and NH_3 ?

UNIT-VIII: REDOX REACTION

Q1. MULTIPLE CHOICE QUESTIONS:

Q1. Which of the following elements does not show disproportionation tendency?

- Cl
- Br
- F
- I

Q2. The oxidation number of Mn is maximum in:

- a. MnO_2 b. K_2MnO_4 c. MnO_4^{2-} d. KMnO_4 .

Q3. The oxidation number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$ is:

- a. -6 b. +6 c. +2 d. -2

In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

- a. Both assertion and reason are correct and reason is the correct explanation of assertion.
b. Both assertion and reason are correct but reason is not a correct explanation of the assertion.
c. Assertion is correct but reason is incorrect.
d. Assertion is incorrect but reason is correct.

Q4. Assertion (A): The reaction $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ is an example of redox reaction.

Reason(R): In this reaction HCl is reduced to Cl_2 whereas MnO_2 is oxidized to MnCl_2 .

Q5. Assertion(A): A substance which gets reduced can act as oxidising agent.

Reason(R): In the reaction, $3\text{ClO}^- \rightarrow \text{ClO}_3^- + 2\text{Cl}^-$, Cl atom is oxidized as well as reduced.

Subjective type questions:

Q6. The half cell reactions with their oxidation potentials are

$\text{Pb}_{(s)} \longrightarrow \text{Pb}^{2+}_{(aq)} + 2e^-$; $E^0_{\text{oxi.}} = +0.13\text{ V}$, $\text{Ag}_{(s)} \longrightarrow \text{Ag}^+_{(aq)} + e^-$; $E^0_{\text{oxi.}} = -0.80\text{ V}$. Write the cell reaction and calculate its EMF.

Q7. An iron rod is immersed in a solution containing 1.0 M NiSO_4 and 1.0 M ZnSO_4 . Predict giving reasons which of the following reactions is likely to be proceed?

- a. Fe reduces Zn^{2+} ions b. iron reduces Ni^{2+} ions. Given:

$E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{ V}$, $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.44\text{ V}$ and $E^0_{\text{Ni}^{2+}/\text{Ni}} = -0.76\text{ V}$

Q8. Write balanced chemical equation for the following reactions:

- a. Permanganate ion (MnO_4^-) reacts with sulphur dioxide gas in acidic medium to produce Mn^{2+} and hydrogen sulphate ion. (Balance by ion electron method).
b. Reaction of liquid hydrazine (N_2H_4) with chlorate ion (ClO_3^-) in basic medium produces nitric oxide gas and chloride ion in gaseous state (Balance by oxidation number method).

Q9. Predict the product of electrolysis in each of the following:

- a. An aqueous solution of NaCl by using platinum electrodes.
b. An aqueous solution of AgNO_3 by using silver electrodes.

Q10. Read the passage given below and answer the following questions :

Redox reactions are reactions in which oxidation and reduction takes place simultaneously. Oxidation–reduction reactions are complementary i.e., whenever any substance is oxidised another substance is always reduced at the same time and *vice-versa*. Oxidation numbers are assigned in accordance with the set of rules. Oxidation number and ion electron methods both are used in balancing ionic equations. Redox reactions are classified as combination, decomposition, displacement and disproportionation reactions. The concept of redox couple and electrode processes is basis of electrolysis and electrochemical cells.

- i. Give an example of a combination redox reaction.
ii. Are all decomposition reactions are redox reactions? Justify.
iii. Define oxidation and reduction in terms of oxidation number.
iv. Find oxidation state of Ni in $\text{Ni}(\text{CO})_4$ and Mn in KMnO_4 .

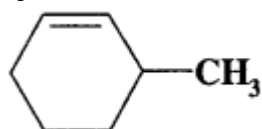
UNIT XII: ORGANIC CHEMISTRY

MULTIPLE CHOICE QUESTIONS:

Q1. Which of the following behaves both as a nucleophile and as an electrophile?

- a. $\text{CH}_3\text{C} \equiv \text{N}$ b. CH_3OH c. $\text{CH}_2 = \text{CHCH}_3$ d. CH_3NH

Q2. The I.U.P.A.C. name of



- a. 3-Methyl cyclohexene

- b. 1-methyl cyclohex-2-ene

- c. 6-methyl cyclohexened. d. 1-methyl cyclohex5-ene.
- Q3.** The most satisfactory method to separate mixture of sugar is:
a. Fractional crystallization b. Sublimation
c. Chromatography d. None of these

In the following questions, a statement of assertion followed by a 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 correct explanation for assertion.
b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c. Assertion is correct statement but reason is wrong statement.
d. Assertion is wrong statement but reason is correct statement.

Q4. Assertion(A): Pent-1-ene and pent-2-ene are position isomers.

Reason (R): Position isomers differ in the position of functional group or substituent.

Q5. Assertion (A): Energy of resonance hybrid is equal to the average of energies of all canonical forms.

Reason (R): Resonance hybrid can not be presented by a single structure.

Subjective type questions:

Q6. Explain how is the electronegativity of carbon atoms related to the state of hybridization in an organic compounds?

Q7. Why does SO_2 act as an electrophile?

Q8. Using curved – arrow notation, show the formation of reactive intermediates when the following covalent bond undergo heterolysis cleavage.

a. $\text{CH}_3 - \text{SCH}_3$, (b) $\text{CH}_3 - \text{CN}$

Q9. Ammonia produced when 0.75g of a substance was kjeldahlized, neutralized 30cm^3 of 0.25 N H_2SO_4 . Calculate the percentage of nitrogen in the compound.

Q10. Read the passage given below and answer the following questions:

Organic compounds are formed by covalent bonding. The nature of covalent bonding can described with the help of hybridisation, sp , sp^2 and sp^3 . The structure and reactivity depends upon type of bonds present in organic compounds. Organic compound can be represented by various structural formulae, Wedge and Dash formula is 3-D representation. Organic compounds can be classified on the basis of functional groups. Organic reactions mechanism are based on structure of substrate and the attacking reagent. The intermediate formed can be free radical, carbocation, carbanion or carbene. The attacking reagent can be electrophile or nucleophile. The inductive, electromeric, resonance and hyperconjugative effect may help in polarisation of covalent bond. Organic reactions may be regarded as substitution, addition, elimination and rearrangement, oxidation and reduction reaction. After the compound is obtained in pure state, qualitative analysis helps to detect elements present in organic compounds whereas quantitative analysis helps to find percentage of various elements. Dumas and Kjeldahl method help to determine percentage of nitrogen, Carius method for halogens and sulphur. Carbon and hydrogen are estimated by the amount of CO_2 and H_2O formed.

Phosphorus estimation is done by oxidising it to H_3PO_4 , sulphur to H_2SO_4 . The percentage of oxygen is determined by taking difference of 100 and percentage of all elements. Empirical formula gives simple ratios of elements where as molecular formula gives exact number of atoms of each element present in a compound.

i. Which element is estimated by Carius method?

ii. In the Dumas method, the nitrogen present in organic compound gets converted to. to.

iii. What is Empirical formula?

iv. In Dumas method for the estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm of Hg pressure. If the aqueous tension at 300 K is 25 mm of Hg, what is the percentage of nitrogen in the compound (approximately)?

UNIT XIII: HYDROCARBONS

MULTIPLE CHOICE QUESTIONS:

Q1. Pure methane can be prepared by
a. Soda lime decarboxylation

b. Kolbes electrolytic method

- c. Wurtz reaction
 d. Reduction with H₂
- Q2.** The catalyst used in Friedel – Crafts reaction is
 a. Aluminium Chloride
 b. Anhydrous Aluminium Chloride
 c. Ferric Chloride
 d. Copper
- Q3.** Which of the following can be used as the halide component of a Friedel craft reaction?
 a. Chlorobenzene
 b. Bromobenzene
 c. Chloroethene
 d. Isopropyl chloride

In the following questions, a statement of assertion(A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

- a. Assertion and reason both are correct statements and reason is correct explanation for assertion.
 b. Assertion and reason both are correct statements but reason is not correct explanation for assertion.
 c. Assertion is correct statement but reason is wrong statement.
 d. Assertion is wrong statement but reason is correct statement.
- Q4. Assertion(A) :** Boiling point of alkanes increases with increase in molecular weight.
Reason(R) : van der Waal's forces increase with increase in molecular weight.
- Q5. Assertion(A) :** All the hydrogen atoms in CH₂=C=CH₂ are attached to sp² hybridised carbon atom.
Reason(R) : Central carbon atoms in it is sp hybridized.

Subjective type questions:

- Q6.** Draw Newman and Sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?
- Q7.** Why do alkenes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions? Explain.
- Q8.** How will you convert the following:
 a. Benzene to hexachlorobenzene
 b. Ethene to Ethane-1,2-diol
 c. Propene to Propane
 d. Ethane to Chloroethane
- Q9.** Write short note on the following:
 a. Wurtz reaction
 b. Ozonolysis
 c. Decarboxylation
 d. Markovnikov Rule
 e. Friedel-Craft alkylation

Q10. Read the passage given below and answer the following questions:

Organic reactions can be classified into four main categories. Substitution reactions, addition reactions, elimination reactions and rearrangement reactions. Substitution reactions can be further classified into free radical, nucleophilic and electrophilic substitution reactions. Addition reactions can be nucleophilic as well as electrophilic addition reactions. Dehydration, dehydrohalogenation, dehalogenation are examples of elimination reactions. Conversion by ammonium cyanate to urea is an example of rearrangement reactions. Reactions are classified on the basis to nature of intermediate species formed. Mechanism of reaction is exact path followed by the reaction involving all steps showing intermediates and slowest steps of the reaction which is rate determining step. Oxidation, reduction, combustions reactions are also important in hydrocarbons

- i. An organic compound on treatment with Br₂ in CCl₄ gives. bromo derivative of an alkene. Name the compound.
- ii. Which alkene on ozonolysis gives CH₃CH₂CHO and CH₃COCH₃?
- iii What is meant by hybridisation?
- iv. Define
 a. Substitution reactions
 b. elimination reactions