Class XI Session 2024-25
Subject - Chemistry
Sample Question Paper - 7

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. The use of log tables and calculators is not allowed

Section A

1. A person is suffering with fever with a high temperature of 104 °F. What will be his body temperature in °C? **[1]**

   a) 32.38 °C b) 28 .10 °C

   c) 18.68 °C d) 40 °C

2. In an atom, the maximum number of electrons in an orbit / principal energy level n is **[1]**

   a) $2n^2$ b) 2n

   c) 2n-1 d) n^2

3. What is the change in the energy of system if 500 cal of heat energy are added to a system and system does 350 cal of work on the surroundings? **[1]**

   a) +850 cal b) -150 cal

   c) +150 cal d) -850 cal

4. Cathode rays or cathode ray particles are: **[1]**

   a) neutrons b) protons

   c) electrons d) muons

5. Suppose that 1.00 kJ of heat is transferred to 2.00 mol argon (at 298 K, 1 atm). What will the final temperature T_f be if the heat is transferred at constant pressure? **[1]**

   a) 301 K b) 335 K

   c) 322 K d) 376 K

6. An atom of an element contains 29 electrons and 35 neutrons. The number of protons are: **[1]**

a) 35

b) 32

c) 30

d) 29

7. Chlorine, bromine, and iodine when combined with oxygen, have oxidation numbers: **[1]**

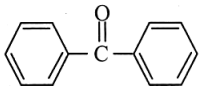
a) +1 or any positive number

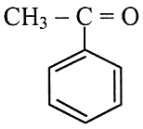
b) -1 or any negative number

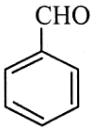
c) -2

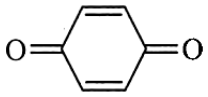
d) -1

8. The following compounds do not show ketoenol tautomerism, except: **[1]**

a) 

b) 

c) 

d) 

9. The number of alkynes possible with molecular formula C_5H_8 is: **[1]**

a) 5

b) 4

c) 2

d) 3

10. The correct order for the decrease in atomic radii is **[1]**

a) Li< Be< B< C

b) Li> Be> B> C

c) C< Li< Be< B

d) Be< B> C< Li

11. On the basis of thermochemical equations (A), (B) and (C), find out which of the algebraic relationships given in options (i) to (iv) is correct: **[1]**

A. C(graphite) + $O_2(g) \rightarrow CO_2(g)$; $\triangle_r H$ = x KJ mol^{-1}

B. C(graphite) + $\frac{1}{2}O_2(g) \rightarrow CO(g); \Delta_r H$ = y KJ mol^{-1}

C. $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g); \Delta_r H = zkJmol^{-1}$

a) x = y + z

b) y = 2z – x

c) z = x + y

d) x = y – z

12. The hydrocarbon which can react with sodium in liquid ammonia is_____. **[1]**

a) $CH_3CH{=}CHCH_3$

b) $CH_3CH_2C \equiv CH$

c) $CH_3CH_2CH_2C \equiv CCH_2CH_2CH_3$

d) $CH_3CH_2C \equiv CCH_2CH_3$

13. **Assertion (A):** Same number of electron pairs are present in resonance structures. **[1]**

Reason (R): Resonance structures differ in the location of electrons around the constituent atoms.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** The presence of Ag^+ enhances the solubility of alkenes in water. **[1]**

Reason (R): Alkenes are weakly polar in nature.

a) Both A and R are true and R is the correct

b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** Hydrogen atom has only one electron in its orbit. But it produces several spectral lines. **[1]**

Reason (R): There are many excited energy levels available.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Each side of a cube is measured to be 7.203 m. What is the volume of the cube to appropriate significant figure $373.7 m^3$. **[1]**

Reason (R): The mass of one mole of a substance in grams is called its average atomic mass.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. The pH of a sample of vinegar is 3.76. Calculate the concentration of hydrogen ion in it. **[2]**

18. i. How do the electronic configurations of the elements with Z = 107-109 differ from one another? **[2]**

ii. Rn (Z = 86) is the last noble gas discovered. Predict what will be the atomic number of the next noble gas to be discovered. Write its symbol.

19. What will be the mass of one ^{12}C atom in g? **[2]**

20. Hydrocarbon A (molecular formula is C_5H_8) gave a white precipitate with ammoniacal silver nitrate. Oxidation of A with hot alkaline $KMnO_4$ gave 2-methyl propanoic acid. What is the structural formula of A? **[2]**

OR

Write a short note on hydrogenation of unsaturated aliphatic hydrocarbons.

21. What kind of information about an electron in an atom is obtained from its wave function? **[2]**

Section C

22. On the basis of VSEPR theory, predict the shapes of the following **[3]**

i. NH_2^-

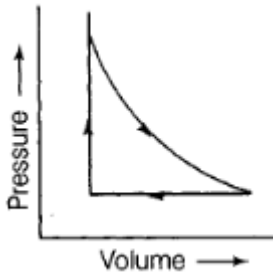
ii. O_3

23. **Answer:** **[3]**

(a) The fact that the enthalpy is a state function forms the basis of a very useful law. Name the law. **[1]**

(b) Two liters of an ideal gas at a pressure of 10 atm expands isothermally at 25 °C into a vacuum until its total volume is 10 liters. How much heat is absorbed and how much work is done in the expansion? **[1]**

(c) A sample of 1.0 mole of a monoatomic ideal gas is taken through a cyclic process of expansion and compression as shown in the figure. What will be the value of ΔH for the cycle as a whole? **[1]**



24. 1 mole of an ideal gas undergoes reversible isothermal expansion from an initial volume of V_1 to a final volume of 10 V_1 and does 10 kJ of work. The initial pressure was 1×10^7 Pa. **[3]**

i. Calculate V_1.

ii. If there were 2 moles of gas what must its temperature have been?

25. Consider the reactions : **[3]**

a. $6CO_2(g) + 6H_2O(I) \longrightarrow C_6H_{12}O_6(aq) + 6O_2(g)$

b. $O_3(g) + H_2O_2(I) \longrightarrow H_2O(I) + 2O_2(g)$

Why it is more appropriate to write these reactions as :

a. $6CO_2 + 12H_2O(I) \longrightarrow C_6H_{12}O_6(aq) + 6H_2O(I) + 6O_2(g)$

b. $O_3(g) + H_2O_2(I) \longrightarrow H_2O(I) + O_2(g) + O_2(g)$

Also suggest a technique to investigate the path of the above (a) and (b) redox reactions.

26. In a hydrogen atom, the energy of an electron in first Bohr's orbit is $E_n = -\frac{2\pi^2 me^4}{n^2h^2}$. **[3]**

What is the energy required for its excitation to Bohr's second orbit?

27. Describe the theory associated with the radius of an atom as it: **[3]**

a. gains an electron

b. loses an electron

28. i. Calculate the gram molecular mass of sugar having molecular formula $C_{12}H_{22}O_{11}$. **[3]**

ii. Calculate

a. The mass of 0.5 g molecule of sugar and

b. Gram molecule of sugar in 547.2 g.

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

IUPAC (International Union of Pure and Applied Chemistry) system of nomenclature. Common names are useful and in many cases indispensable, particularly when the alternative systematic names are lengthy and complicated. A systematic name of an organic compound is generally derived by identifying the parent hydrocarbon and the functional group(s) attached to it. By using prefixes and suffixes, the parent name can be modified to obtain the actual name. In a branched-chain compound, small chains of carbon atoms are attached at one or more carbon atoms of the parent chain. The small carbon chains (branches) are called alkyl groups. An alkyl group is derived from a saturated hydrocarbon by removing a hydrogen atom from carbon. Abbreviations are used for some alkyl groups. For example, methyl is abbreviated as Me, ethyl as Et, propyl as Pr and butyl as Bu.

i. Draw the structure of 3-Ethyl-4,4-dimethylheptane. (1)

ii. How is the numbering in branched chain hydrocarbon done? (1)

iii. Derive the structure of 2-Chlorohexane. (2)

OR

Why CH_4 after becoming-CH_3 called a methyl group? (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The ionic character of metallic halides tends toward covalent nature as per Fajan's rule. Such covalent halides behave as non-metal in their higher oxidation states. The property to hydrolyse to give oxy-acids of the element

and corresponding hydro halogen acid for most non-metallic elements proceeds exceptionally in the way, keeping oxidation number of element and halide sam in oxo-acids.

Non-polar halides are immiscible in water, as they do not show hydrolysis, but halides of some elements with empty d-orbital undergo hydrolysis. Stability of halides of the higher state is governed by the inert-pair effect.

i. How does halide undergo hydrolysis to give oxy-acids of underlined element PCl_3? (1)

ii. Out of NCl_3 and BCl_3 undergoes hydrolysis to form oxy-acids? Write the chemical reaction for the correct answer. (1)

iii. Out of $PbCl_4$, PbF_4, PbI_4 and $PbBr_4$ which one doesn't exist? (2)

OR

Non-Polar halides are immiscible in water. Why? (2)

Section E

31. **Attempt any five of the following:** **[5]**

(a) Why does the iodination of benzene is carried out in the presence of nitric acid or iodic acid? **[1]**

(b) Can a catalyst change the position of equilibrium in a reaction? **[1]**

(c) Why is benzene extraordinarily stable though it contains three double bonds? **[1]**

(d) Bring out the following conversion ethane to ethene. **[1]**

(e) Why are alkanes called paraffins? **[1]**

(f) Draw the New man's projection formula of the staggered form of 1,2-dichloroethane. **[1]**

(g) Give the IUPAC name of the lowest molecular weight alkane that contains a quaternary carbon. **[1]**

32. Reaction between N_2 and O_2 takes place as follows: **[5]**

$$2N_2(g) + O_3(g) \rightleftharpoons 2N_2O(g)$$

If a mixture of 0.482 mol of N_2 and 0.933 mol of O_2 is placed in a 10 L reaction vessel and allowed to form N_2O at a temperature for which $K_c = 2.0 \times 10^{-37}$ determines the composition of the equilibrium mixture.

OR

At 1127 K and 1 atmosphere pressure, a gaseous mixture of CO and CO_2 in equilibrium with solid carbon has 90.55% CO by mass.

$$C(s) + CO_2(g) \rightleftharpoons 2CO(g)$$

Calculate K_c for the reaction at the above temperature.

33. **Answer:** **[5]**

(a) i. What is the general molecular formula of saturated monohydric alcohols? **[2.5]**

ii. Write structural formulae for compounds named as- **[2.5]**

a. 1-Bromoheptane

b. 5-Bromoheptanoic acid

OR

i. What are electrophiles and nucleophiles? Explain with examples. **[2.5]**

ii. Derive the structure of 3 – Nitrocyclohexene. **[2.5]**

Solution

Section A

1.

(d) 40 °C

Explanation: 104°**F** − 32) × 5/9 = 40°**C**

2. **(a)** $2n^2$

Explanation: Since the maximum number of electrons in each orbital is 2, the maximum number of electrons in an entire quantum level is $2n^2$.

3.

(c) +150 cal

Explanation: According to the first law of thermodynamics,

ΔE = q + W = 500 + (-350) = +150 cal

4.

(c) electrons

Explanation: Cathode rays - In 1897, British physicist J. J. Thomson showed the rays were composed of a previously unknown negatively charged particle, which was later named the electron.

5.

(c) 322 K

Explanation: Argon is monoatomic, Here, $C_p = \frac{5}{2}R = \frac{5}{2} \times 8.314 JK^{-1}mol^{-1} = 20.79 JK^{-1}mol^{-1}$

As pressure is kept constant, $q_p = nC_p\Delta T$

$\Rightarrow 1000J = (2.00mol) \times \left(20.79JK^{-1}mol^{-1}\right) \times \Delta T$

$\Rightarrow \Delta T = 24.05K$

$\Rightarrow T_f = 298 + 24.05 = 322.05K$

6.

(d) 29

Explanation: In an atom no. of protons = no. of electrons i.e. P = E while this is not true in case of ions.

So the number of protons in the given atom is 29.

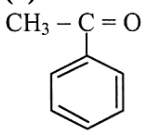
7. **(a)** +1 or any positive number

Explanation:

This is according to the rules of assigning oxidation numbers i.e., Chlorine, Bromine, Iodine have positive oxidation numbers when combined with oxygen, for example in oxoacids and oxoanions.

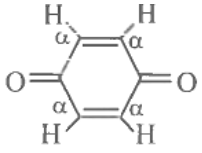
8.

(b)



Explanation:

For keto-enol tautomerism, a compound must have at least one acidic α-hydrogen. So acetophenone (A) shows tautomerism. Benzaldehyde (B) and benzophenone (C) do not show tautomerism due to lack of α-hydrogen. p-Benzoquinone (D) contains α-hydrogens but they are not acidic because they are present on a double bond. Therefore, it does not show keto-enol tautomerism.

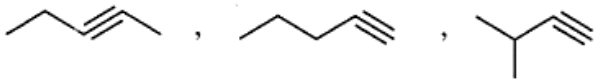


p-Benzoquinone

9.

(d) 3

Explanation:



10. **(a)** Li< Be< B< C

Explanation: In a period moving from left to right, the effective nuclear charge increases because the next electron fills in the same shell. So the atomic size decreases.

11. **(a)** x = y + z

Explanation: We have, C(graphite) + O_2(g) $\rightarrow$ CO_2(g); $\triangle_r H$ = x KJ mol $^{-1}$ ..... (1)

C(graphite) $+\frac{1}{2}O_2(g) \rightarrow CO(g); \Delta_r H = ykJmol^{-1}$ .... (2)

Subtacting (1) and (2), we get;

$CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$; $\triangle_r H$ = (x-y) kJmol^{-1}

$\therefore$ z = x - y $\Rightarrow$ x = y + z

12.

(b) $CH_3CH_2C \equiv CH$

Explanation: Terminal alkynes react with Na in the presence of liquid NH_3 to form higher alkynes. The alkyne contains acidic H at the end (i.e. the H bonded to C_1 of the chain). Therefore, it is easily replaced with highly electropositive metals such as Na in liquid ammonia, to form sodium alkaline ion which can react further in the presence of a suitable catalyst to yield higher alkynes/hydrocarbons.

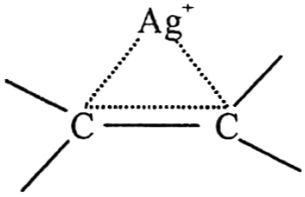
13. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: In resonance the structures differ only in location of electrons around the constituent atoms, that is why these have same number of electron pairs, and also unpaired electrons are same.

14.

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

Explanation: Ag^+ coordinates with the alkene by $p\pi - d\pi$ bonding giving an ion and the solubility increases.



15. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: A $\rightarrow$ Different lines correspond to different transitions.

B $\rightarrow$ Different transitions are due to different excited states available.

16.

(c) A is true but R is false.

Explanation: Side of a cube = 7.203m = $(7.203)^3$

= 373.714m^3

$\therefore$ Volume of a cube = 373.7m^3

The mass of one mole of a substance in grams is called its molar mass. The molar mass in grams is numerically equal to atomic/molecular/formula mass in u.

Section B

17. We know that, pH = -log[H^+] or log [H^+] = -pH = -3.76 = $\bar{4}.24$ Before taking antilog, add -1 in the characteristic (-3) and +1 in mantissa (0.76), i.e. (-3.76-1 +1 =$\bar{4}.24$)]

$\therefore [H^+] = Anti\log\ \bar{4}.24 = 1.738 \times 10^{-4}M = 1.74 \times 10^{-4}M$

Atomic	Electronic	Number	Group

18. i.

Number of element (Z)	configuration	of electrons in 6d orbital	Number
107	[Rn] $5s^{14}$ $6d^5$ $7s^2$	5	7
108	[Rn] $5s^{14}$ $6d^6$ $7s^2$	6	8
109	[Rn] $5s^{14}$ $6d^7$ $7s^2$	7	9

It is clear that these elements differ in the number of electrons in the 6d-subshell and group number in periodic table.

ii. 118, Uuo

19. Since,

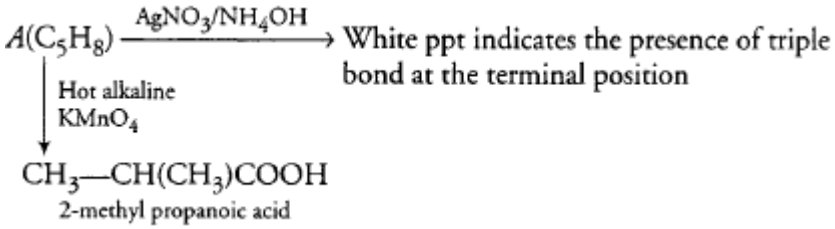
the number of atoms in 1 mol of ^{12}C atoms = 6.022×10^{23} atoms = Atomic mass of carbon - 12 in gms. = 12 g

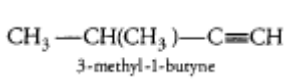
Thus, 6.0022×10^{23} atoms of ^{12}C have mass = 12 g

$\therefore$ 1 atom of ^{12}C will have mass = $\frac{12}{6.022 \times 10^{23}} g$

= 1.9927×10^{-23} g

20. White precipitate indicates that the triple bond is present at terminal position. The compound (A) is 3-methyl-1-butyne. It will oxidised in the presence of hot alkaline $KMnO_4$ to give 2-Methylpropanoic acid.



Therefore, the structural formula of A is 

OR

When unsaturated compounds, i.e. alkenes or alkynes, are treated with dihydrogen in the presence of finely divided catalysts (i.e. Pt, Pd or Ni), alkanes are obtained and the reaction is called hydrogenation reaction. As represented in the following reaction where ethene is converted into ethane.

eg $\underset{\text{Ethene}}{CH_2} = CH_2 + H_2 \xrightarrow{Pt\backslash Pd\backslash Ni} \underset{\text{Ethane}}{CH_3 - CH_3}$

21. The square of the amplitude of the electron wave, i.e, Ψ^2 at any point gives the probability of finding an electron at that point. since the region around the nucleus which represents the electron density at different points is called an orbital, hence the wave function for an electron in an atom is called orbital wave function.

Section C

22. i. Shape of NH_2^-

Number of valence electrons on central N atom = 5 + 1 (due to one unit negative charge) = 6 Number of atoms linked to it = 2

$\therefore$ Total number of electron pairs around

N = $\frac{6+2}{2}$ = 4 and number of bond pairs = 2 ion is of the type AB_2 E_2.

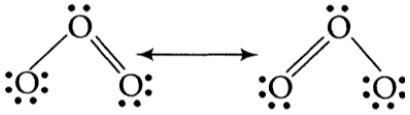
Hence, it has bent shape (V-shape).

ii. Shape of O_3

While predicting geometry of molecules containing the double (or multiple) bond is considered as one electron pair. e.g. in case of ozone, its two resonating structures are

Thus, the central O-atom is considered to have two bond pairs and one lone pair, i.e. it is of the type AB_2E.

Hence, it is a bent molecule. Thus, the two resonating structures will be

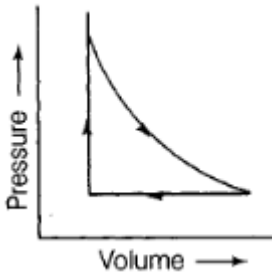


23. Answer:

(i) The name of the law is Hess's law of heat summation.

(ii) We have q = – w = p_{ex} (10 – 2) = 0(8) = 0 No work is done; no heat is absorbed.

(iii) According to the question, 1 mole of a mono atomic ideal gas is taken through a cyclic process of expansion and compression.



ΔH for a cyclic process is zero because enthalpy change is a state function.

24. According to the question, n = 1, Initial volume = V_1, final volume = 10 V_1, W = 10 kJ, p = 1 $\times 10^7$ Pa.

i. W = $-2.303nRT \log \frac{V_2}{V_1}$

$10 \times 10^3 \text{J} = -2.303 \times 1 \times 8.314 \times T \times \log \frac{10V_1}{V_1}$

$\Rightarrow$ T = 522.3 K

For initial conditions, $p_1V_1 = n_1RT$

$\Rightarrow \left(10^7\right) V_1 = 1 \times 8.314 \times 522.3$

$\Rightarrow V_1 = 4.342 \times 10^{-4} \text{m}^3$

$= 4.342 \times 10^2 \text{cm}^3$

= 434.2 cm^3

ii. If there were 2 moles of the gas, applying $p_1V_1 = n_1RT$, we get

$\left(10^7\right)\left(4.342 \times 10^{-4}\right) = 2 \times 8.314 \times T$

$\Rightarrow T = 261.1 \text{ K}$

25. It is believed that the photosynthesis reaction occurs in two steps. In the first step, H_2O decomposes to give H_2 and O_2 in the presence of chlorophyll and the H_2 produced reduces CO_2, to $C_6H_{12}O_6$ in the second step. During the second step, some H_2O molecules are also produced and therefore, the reaction occurs as:

a. i. $12H_2O\ (I) \longrightarrow 12H_2(g) + 6O_2\ (g)$

ii. $6CO_2(g) + 12H_2(g) \longrightarrow C_6H_{12}O_6\ (s) + 6H_2O(I)$

iii. $6CO_2(g) + 12H_2O(I) \longrightarrow C_6H_{12}O_6\ (s) + 6H_2O(I) + 6O_2(g)$

Therefore, it is more appropriate to write the reaction for photosynthesis as (III) because it means that 12 molecules of H_2O are used per molecule of carbohydrate and $6H_2O$ molecules are produced per molecule of carbohydrate during the process.

b. O_2 is written two times in the product which suggests that 0, is being obtained from the two reactants as:

$O_3\ (g) \longrightarrow O_2(g) + O\ (g)$

$$\frac{\mathrm{H_2O_2}(l)+\mathrm{O}(g)\longrightarrow \mathrm{H_2O}(l)+\mathrm{O_2(g)}}{\mathrm{O_3}(g)+\mathrm{H_2O_2}(l)\longrightarrow \mathrm{H_2O}(l)+\mathrm{O_2}(g)+\mathrm{O_2}(g)}$$

The path of the reaction can be studied by using H_2O^{18} in reaction (a) or by using H_2O^{18} or O_3^{18} in reaction (b).

26. The expression for the energy of hydrogen of an electron is:

$E_n = -\frac{2\pi^2 me^4}{n^2h^2}$

When n = 1, $E_1 = -\frac{2\pi^2 \text{me}^4}{(1)^2\text{h}^2} = -13.12 \times 10^5 \text{ J mol}^{-1}$

When n = 2, $E2 = --\frac{2\pi^2 \text{me}^4}{(2)^2\text{h}^2} = -\frac{13.12 \times 10^5}{4} \text{J mol}^{-1}$

$= -3.28 \times 10^5 \text{ J mol}^{-1}$

The energy required for the excitation is:

$\Delta E = E_2 - E_1 = (-3.28 \times 10^5) - (-13.12 \times 10^5) = 9.84 \times 10^5 \text{ J mol}^{-1}$

27. a. When an atom gains an electron, it forms an anion. The size of an anion is larger than that of the parent atom because the addition of one or more electrons results in increased repulsion among electrons and a decrease in effective nuclear charge. For example the ionic radius of fluoride ion (F^-) is 136 pm whereas the atomic radius of Fluorine (F) is only 64 pm.

    b. When an atom loses an electron, it forms a cation. A cation is smaller than its parent atom because it has lesser electrons while its nuclear charge remains the same. This implies that the valence electrons are more tightly held towards the nucleus thereby reducing the size. For example, the atomic radius of sodium (Na) is 186 pm and atomic radius of sodium ion (Na^+) = 95 pm.

28. i. Molecular mass of sugar ($C_{12}H_{22}O_{11}$) = 12 × atomic mass of C + 22 × atomic mass of H + 11 × atomic mass of O = 12 × 12 + 22 ×1 + 11× 16 = 342 g

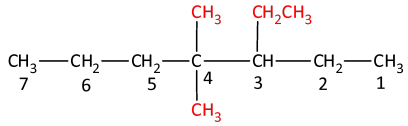
    ii. a. Since, 1 gram molecule of sugar = 342 g (Molecular Mass of Sugar,$C_{12}H_{22}O_{11}$=342 g)

    ∴ 0.5 gram molecule of sugar = 342× 0.5 = 171 g

    b. Since, 342 g of sugar = 1 gram molecule (Molecular Mass of sugar, $C_{12}H_{22}O_{11}$ =342 g)

    547.2 g of sugar = $\frac{1}{342} \times 547.2 = 1.6$ gram molecule

Section D

29. i. 

    ii. The numbering is done in such a way that the branched carbon atoms get the lowest possible numbers.

    iii. 'Hexane' indicates the presence of 6 carbon atoms in the chain. The functional group chloro is present at carbon 2. Hence, the structure of the compound is $CH_2CH_2CH_2CH_2CH(Cl)CH_3$.

    OR

    CH_4 after becoming-CH_3 called a methyl group because an alkyl group is named by substituting 'yl' for 'ane' in the corresponding alkane.

30. i. $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$

    ii. BCl_3 undergoes hydrolysis to form oxy-acids. The chemical reaction is as follows:

    $BCl_3 + 3H_2O \rightarrow H_3BO_3 + 3HCl$

    iii. PBI_4 doesn't exist because Pb^{4+} is strong oxidant, where as I^- is strong reductant.

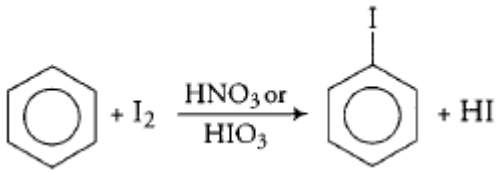
    OR

    The non-polar halides are immiscible in water because it doesn't show hydrolysis but halides of some element with empty d-orbital undergo hydrolysis.

Section E

31. Attempt any five of the following:

    (i) The iodination of benzene is usually brought about by refluxing benzene with iodine and conc. HNO_3 or HIO_3. HNO_3 or HIO_3 oxidises HI to I_2 and prevents the backward reaction to occur.



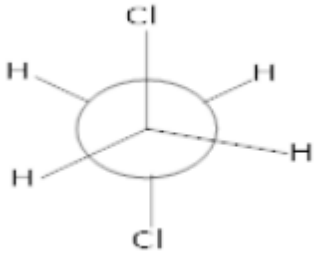
    (ii) A catalyst speeds up the forward and back reaction to the same extent. Because adding a catalyst doesn't affect the relative rates of the two reactions, a catalyst cannot change the position of equilibrium in a chemical reaction

    (iii) Due to resonance, benzene is extraordinarily stable.

    (iv) $\underset{\text{Ethane}}{CH_3CH_3} \xrightarrow[-HI]{I_2/HNO_3} \underset{\text{Ethyle iodide}}{CH_3CH_2I} \xrightarrow{KOH(alc.)} \underset{\text{Ethene}}{CH_2} = CH_2$

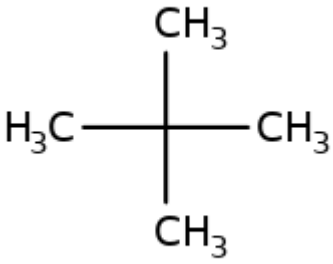
    (v) Paraffins means little affinity. Alkanes due to strong **C-C** and **C-H** bonds are relatively chemically inert.

(vi)New man's projection formula of staggered form of 1,2-dichloroethane:



(vii)IUPAC name of the lowest molecular weight alkane that contains a quaternary carbon is 2,2 -dimethyl propane.

Structure:



32. Let x moles of N_2(g) take part in the reaction. According to the equation, x/2 moles of O_{2-} (g) will react to form r moles of N_2O(g).

$2N_2(g) + O_2(g) \rightleftharpoons 2N_2O(g)$

Initial conc. (Mol/L) [N_2] = $\frac{0.482}{10}$ [O_{2-}] = $\frac{0.933}{10}$

At equilibrium point: $\frac{0.482-x}{10}$ $\frac{0.933-\frac{x}{2}}{10}$ $\frac{x}{10}$

The value of the equilibrium constant (2.0×10^{-37}) is extremely small. This means that only small amounts of reactants have reacted. Therefore, x is extremely small and can be omitted as far as the reactants are concerned.

Applying Law of Chemical Equilibrium $K_c = \frac{[N_2O(g)]^2}{[N_2(g)]^2[O_2(g)]^2}$

$2.0 \times 10^{-37} = \frac{\left(\frac{x}{10}\right)^2}{\left(\frac{0.482}{10}\right)^2 \times \left(\frac{0.933}{10}\right)} = \frac{0.01x^2}{2.1676 \times 10^{-4}}$

$x^2 = 43.352 \times 10^{-40}$ or $x = 6.6 \times 10^{-20}$

As x is extremely small, it can be neglected.

Thus, in the equilibrium mixture

Molar conc. of N_2 = 0.0482 mol L^{-1}

Molar conc. of O_2 = 0.0933 mol L^{-1}

Molar conc. of $N_2O = 0.1 \times x = 0.1 \times 6.6 \times 10^{-20}\ mol\ L^{-1}$

$= 6.6 \times 10^{-21}\ mol\ L^{-2}$

OR

Let the total mass of the gaseous mixture be 100g.

Mass of CO = 90.55g

And, mass of CO2 = (100 - 90.55) = 9.45g

Now, number of moles of CO,

$n_{CO} = \frac{90.55}{28}$ = 3.234 mol

Number of moles of CO2,

$n_{CO_2} = \frac{9.45}{44}$ = 0.215 mol

Partial pressure of CO,

$P_{CO} = \frac{n_{CO}}{n_{CO}+n_{CO_2}} \times P_{total}$

$= \frac{3.234}{3.234+0.215} \times 1$

= 0.938 atm

Partial pressure of CO2,

$p_{CO_2} = \frac{n_{CO_2}}{n_{co}+n_{CO_2}} \times p_{total}$

$= \frac{0.215}{3.234+0.215} \times 1$

= 0.062 atm

Therefore, Kp = $\frac{[CO]^2}{[CO_2]}$

$= \frac{(0.938)^2}{0.062}$

= 14.19

For the given reaction, Δn = 2 - 1 = 1

We know that

$K_p = K_c(RT)^{\Delta n}$

$\Rightarrow 14.19 = K_c(0.082 \times 1127)$

$\Rightarrow K_c = \frac{14.19}{0.082\times1127}$

= 0.154(approximately)

33. Answer:

(i) i. Monohydric alcohols are the compounds derived from an alkane by replacing one H by - OH group.

Example:

$\underset{\text{Methane}}{CH_4} \xrightarrow{replacing\ H\ with\ OH} \underset{\text{Methanol}}{CH_3 - OH}$

Therefore, the general molecular formula of saturated monohydric alcohols is $C_nH_{2n+1}OH$.

ii. i. Structural formula of 1-Bromoheptane:

CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2Br

ii. Structural formula of 5-Bromoheptanoic acid:

CH_3-CH_2-CH(Br)-CH_2-CH_2-CH_2-COOH

OR

i. **Electrophiles:** The name electrophiles means electron loving. Electrophiles are electron defficient. They may be positive ions or neutral molecules.

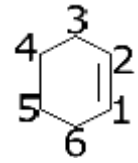
Ex: $H^+, Cl^+, Br^+, NO_2^+, R_3C^+, RN_2^+, AlCl_3, BF_3$

Nucleophiles: The name nucleophiles means 'nucleus loving' and indicates that it attacks the region of low electron density (positive centres) in a subtracts molecule. They are electron rich they may be negative ions or neutral molecules.

Ex: $Cl^-, Br^-, CN^-, OH^-, RCH_2^-, NH_3, RNH_2, H_2O, ROH$ etc.

ii. A six-membered ring containing a carbon – carbon double bond is called as cyclohexene.

Now giving numbers to the carbons:



Attach nitro group to 3rd carbon.

Hence the structure of 3 – Nitrocyclohexene is: