Class XI Session 2025-26
Subject - Chemistry
Sample Question Paper - 10

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. 0.2429 g sample of potassium is heated in oxygen, 0.440 g of a crystalline compound is obtained. What is the formula of this compound? **[1]**

   a) KO
   b) KO_3
   c) KO_2
   d) K_2O

2. Acid catalysed electrophilic addition reaction to carbon-carbon double bond proceeds in two steps. The first step involves the addition of an H^+ to double bond. Name the type of intermediate formed in the first step of the following addition reaction: **[1]**

   $H_3C - HC = CH_2 + H^+ \rightarrow ?$

   a) 1° Carbanion
   b) 1° Carbocation
   c) 2° Carbocation
   d) 2° Carbanion

3. For the isothermal reversible free expansion of an ideal gas from V_i, the initial volume to V_f, the final volume of the work done on the gas is: **[1]**

   a) w = $-nTln\left(\frac{V_f}{V_i}\right)$
   b) w = $-nRln\left(\frac{V_f}{V_i}\right)$
   c) w = $-nRTln\left(\frac{V_f}{V_i}\right)$
   d) w = $-RTln\left(\frac{V_f}{V_i}\right)$

4. To which block of elements in the periodic table $3d^{10}4s^2$ belongs? **[1]**

   a) f- Block
   b) d- Block
   c) s- Block
   d) p- Block

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

cal of work on the surroundings?

a) +150 cal
b) +850 cal
c) -150 cal
d) -850 cal

6. Find the energy of the photon which has a wavelength of 0.50 Å. (Hint: h = Planck's constant = 6.26×10^{-34}J). **[1]**

a) 3.98×10^{-15}J
b) 0.98×10^{-15}J
c) 1.98×10^{-15}J
d) 2.98×10^{-15}J

7. The oxidation number of $-\frac{1}{2}$ is assigned to an Oxygen atom in: **[1]**

a) When oxygen is bonded to fluorine
b) When oxygen is bonded to metals
c) Superoxides
d) Peroxides

8. In Carius method of estimation of halogen, 0.15 g of an organic compound gave 0.12 g of AgBr. Find out the percentage of bromine in the compound. **[1]**

a) 41.5%
b) 34.04%
c) $24\ \%$
d) $41.06\ \%$

9. Which product is obtained by passing ethanol vapours over heated alumina? **[1]**

a) C_2H_4
b) CH_4
c) C_2H_6
d) C_2H_2

10. Which of the following should be added in the compound for the detection of carbon and hydrogen? **[1]**

a) Zn dust
b) Activated charcoal
c) Cu(II) oxide
d) Cu(I) oxide

11. To vaporize 100.0 g carbon tetrachloride at its normal boiling point, 349.9 K, and P =1 atm, 19.5 kJ of heat is required. Calculate ΔH_{vap} for CCl_4? **[1]**

a) 23.0 kJ
b) 34.0 kJ
c) 42.0 kJ
d) 30.0 kJ

12. Saturated hydrocarbons contain **[1]**

a) double bonds
b) ionic bonds
c) triple bonds
d) single bonds

13. **Assertion (A):** The sp hybrid orbital contains more s character and hence it is closer to its nucleus. **[1]**
Reason (R): Hybridisation has no effect on the bond length and bond enthalpy in organic compounds.

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):** Benzene removes a butter stain from a table cloth. **[1]**
Reason (R): Butter has an affinity towards benzene.

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.

15. **Assertion (A):** Magnetic quantum number can have the value I = 0,..., (n - 1). **[1]**

Reason (R): Magnetic quantum number specifies the number of orbitals.

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):** S.I. unit of atomic mass and molecular mass is kg. **[1]**

Reason (R): It is equal to the mass of 6.023×10^{23} 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.

Section B

17. Calculates the formal charge on each atoms of **[2]**

i. Carbonate ion and

ii. SO_2 molecule

OR

Using valence bond theory, draw the molecular structures of OSF_4 and XeF_4 indicating the location of lone pair(s) of electrons and hybridization of central atoms.

18. Some processes are given below. What happens to the process if it is subjected to a change given in the brackets? **[2]**

i. Ice $\overset{melting point}{\rightleftharpoons}$ water (Pressure is increased)

ii. Dissolution of NaOH in water (Temperature is increased)

iii. $N_2(g) + O_2(g) \rightleftharpoons 2NO(g) - 180.7$ kJ (Pressure is increased and temperature is decreased.)

19. Arrange the following in increasing order of C - C bond length: **[2]**

C_2H_6, C_2H_4, C_2H_2

20. Under what conditions a water electrolyte can have high degree of ionization ? **[2]**

21. Write all structural isomers of molecular formula C_3H_6O **[2]**

Section C

22. N-pentane has a higher boiling point than neopentane but the melting point of neopentane is higher than that of n-pentane. **[3]**

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

(a) i. What is the mass of a proton? **[1]**

ii. What is the charge of a proton?

(b) Why electronic energy is negative? Comment on the spacing between the energy levels? **[1]**

(c) What happens to the position and momentum of an electron if a photon of a short wavelength hits the electron? **[1]**

24. Define the following: **[3]**

i. First law of thermodynamics

ii. Standard enthalpy of formation

25. What are the oxidation numbers of the underlined $\underline{C}H_3\underline{C}H_2OH$ element and how do you rationalise your results? **[3]**

26. Draw the resonance structures for the following compounds. Show the electron shift using curved arrow notation. **[3]**

i. C_6H_5OH

ii. $C_6H_5NO_2$

iii. $CH_3CH=CHCHO$

27. Give the relationship between ΔU and ΔH for gases. **[3]**

28. At 450 K, $K_p = 2.0 \times 10^{10}$/bar for the given reaction at equilibrium: **[3]**

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

What is K_c at this temperature?

Section D

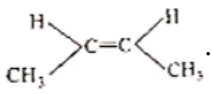
29. **Read the following text carefully and answer the questions that follow:** **[4]**

Hydrogenation of alkenes and alkynes takes place in presence of certain catalysts. In Sabatier Senderen's reaction, the addition of hydrogen takes place in the presence of Raney nickel catalyst. Platinum and Palladium can also be used as a catalyst in these reactions. These are the heterogeneous catalyst and used in a finely divided state. Experimentally, it is observed that less crowded alkenes adsorb H_2 with a faster rate. Controlled hydrogenation of alkyne in the presence of Lindlar's catalyst yields cis product i.e., 'cis' alkene. Thus, in the presence of Lindlar's catalyst, 'syn' addition takes place. The relative rate of hydrogenation follows the order:

$$—C\equiv C— > \rangle C=C\langle > \rangle C=O > C_6H_6$$

Non-terminal alkynes are reduced in the presence of Na or Li metal dissolved in liquid ammonia. In this reaction, anti-addition of hydrogen results into the trans-product.

i. Which type of alkenes adsorb H_2 with faster rate? (1)

ii. Out of $CH_3CH_2CH_2CH_3$ and  . What is the product (A) for the following given reaction? (1)

$$CH_3 - C \equiv C - CH_3 + H_2 \xrightarrow[\text{iling Quinoline}]{\text{Pd/CaCO}_3} (A)$$

iii. Powdered nickel is more effective than the grannular nickel. Why? (2)

OR

In non-terminal alkynes reaction what products are formed? (2)

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

The presence of a positive charge on the nucleus is due to the protons in the nucleus. The number of electrons in an atom is equal to the number of protons (atomic number, Z). The positive charge of the nucleus is due to protons, the mass of the nucleus, due to protons and neutrons. The composition of any atom is represented by using the normal element symbol (X) with super-script on the left-hand side as the atomic mass number (A) and subscript (Z) on the left-hand side as the atomic number. Isotopes are the chemical properties of atoms that are controlled by the number of electrons, which are determined by the number of protons in the nucleus. Isoba a different atomic mass number are known as Isotopes. A number of neutrons present in the nucleus hrs are atoms with the same mass number but a different atomic number. Atoms with identical atomic number butave very little effect on the chemical properties of an element.

i. What is the atomic number of an element whose mass number is 23 and contains 12 neutrons in its nucleus? What is the symbol of an element? (1)

ii. Why ^{1}H, ^{2}H, and ^{3}H are isotopes? (1)

iii. Give an isotone of C-13 atom. (2)

OR

The nucleus of an atom has 6 protons and 8 neutrons. What are its atomic number and mass number? What is this element 1? (2)

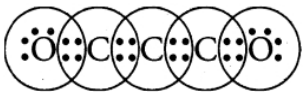
Section E

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

(a) How many nodal planes are present in $\pi(2p_x)$ and $\pi^*(2p_x)$ molecular orbitals? **[1]**

(b) Dipole moment is a scalar or a vector quantity? **[1]**

(c) Given is the electron dot structure for carbon suboxide, C_3O_2. Write its structural formula. **[1]**



(d) Draw the resonating structure of Nitrate ion. **[1]**

(e) How do you express the bond strength in terms of bond order? **[1]**

(f) If the electronic configuration of an element is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$, the four electrons involved in chemical bond formation will be **[1]**

(g) Group the following as linear and non-linear molecules: **[1]**

H_2O, HOCl, $BeCl_2$, Cl_2O

32. Discuss the drawbacks of Mendeleev's periodic table that led to its modification. **[5]**

OR

Which elements have the following electronic configurations? (Use only the periodic table.)

i. $1s^2, 2s^2, 2p^5$

ii. [Ar] $4s^2, 3d^{10}, 4p^1$

iii. [Xe] $6s^2$

iv. [Xe] $6s^2, 3d^1, 4f^7$

v. [Ar] $4s^1, 3d^{10}$ (exception to rules)

33. A mixture of oxalic acid and formic acid is heated with concentrated H_2SO_4. The gas evolved is collected and on treatment with KOH solution, the volume of solution decreases by $1/6^{th}$. Calculate the molar ratios of two acids in the original mixture. **[5]**

OR

i. How are 0.50 m $NaCO_3$ and 0.50 M $NaCO_3$ different?

ii. Calculate the amount of carbon dioxide that could be produced when

a. 1 mol of carbon is burnt in air

b. 1 mol of carbon is burnt in 16 g dioxygen

c. 2 mol of carbon is burnt in 16 g of dioxygen

Solution

Section A

1. **(c)** KO_2

   Explanation:

   Mass of K = 0.242 g, mass of compound = 0.440 g,

   mass of 0 = 0.440 - 0.242 = 0.198 g

   Relative molar ratio of K = $\frac{0.242}{39}$ = 0.0006,

   Relative molar ratio of O = $\frac{0.198}{16}$ = 0.012

   Simple ratio of K = 1

   Simple ratio of 0 = 2

   So, the formula is KO_2.

2. **(c)** 2° Carbocation

   Explanation:

   In this reaction, formation of secondary carbocation takes place by the addition of H^+ to terminal carbon of carbon-carbon double bond among the two possible carbon atoms. The more stable secondary carbocation formation will take place instead of primary carbocation.

3. **(c)** w = $-nRTln\left(\frac{V_f}{V_i}\right)$

   Explanation:

   w = $-nRTln\left(\frac{V_f}{V_i}\right)$

   This is work done by the system in an isothermal process where

   w is the work done

   n is the number of moles

   R is the universal gas constant

   T is the temperature in Kelvin scale

4. **(b)** d- Block

   Explanation:

   d-block element has the general outermost electronic configuration as $(n-1)d^{1-10}\ ns^{0-2}$.

5. **(a)** +150 cal

   Explanation:

   According to the first law of thermodynamics,

   ΔE = q + W = 500 + (-350) = +150 cal

6. **(a)** 3.98×10^{-15}J

   Explanation:

   Energy (E) of a photon having wavelength (λ) is given by the expression, $E = \frac{hc}{\lambda}$ where, h = Planck's constant = $6.626 \times 10^{-34} Js$

   c = velocity of light in vacuum = $3 \times 10^8 m/s$

   Wavelength $\lambda = 0.50A^\circ = 0.50 \times 10^{-10} m$

Substituting the values in the given expression of E as

$= \frac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{0.50 \times 10^{-10}} = 3.98 \times 10^{-15} J.$

7.

(c) Superoxides

Explanation:

In the superoxide ion, O_2^-, the oxygen has an oxidation number of $-\frac{1}{2}$. The stability of metal superoxides depends on the size and the electropositive character of the metal. The larger the metal and the more electropositive it is, the greater the stability of its superoxide.

8.

(b) 34.04%

Explanation:

Molar mass of AgBr = 108 + 80 = 188 g/mol

188 g AgBr contains 80 g bromine

0.12 g AgBr contains (80 × 0.12)/188 g bromine

Percentage of bromine $= \frac{(80 \times 0.12 \times 100)}{(188 \times 0.15)} = 34.04\%$

9. **(a)** C_2H_4

Explanation:

It is an example of dehydration of alcohols to give alkenes.

$$\underset{alcohol}{RCH_2 - CH_2OH} \xrightarrow[-H_2O]{Al_2O_3, 623K} \underset{alkene}{RCH = CH_2}$$

For example,

$$\underset{ethanol}{C_2H_5OH} \xrightarrow[-H_2O]{Al_2O_3, 623K} \underset{ethene}{CH_2 = CH_2}$$

Thus, when ethanol vapours are passed over heated alumina, the alcohol gets dehydrated to form ethene, as given above.

10.

(c) Cu(II) oxide

Explanation:

Carbon and hydrogen are detected by heating the compound with Cu(II) oxide. Carbon present in the compound is oxidised to carbon dioxide (tested with lime-water, which develop turbidity) and hydrogen to water (tested with anhydrous copper sulphate, which turns blue).

$$C + 2CuO \xrightarrow{\Delta} 2Cu + CO_2\uparrow,\ 2H + CuO \xrightarrow{\Delta} Cu + H_2O$$

$$CO_2 + Ca(OH)_2 \longrightarrow \underset{\text{White turbidity}}{CaCO_3\downarrow} + H_2O$$

11.

(d) 30.0 kJ

Explanation:

Number of moles of CCl_4 = $\frac{100}{154}$ = 0.6493 moles.

Heat required for 0.6493 moles = 19.5kJ

$\Rightarrow$ Heat required for 1.00 moles = $\frac{19.5}{0.6493}$ = 30.032kJ

12.

(d) single bonds

Explanation:

Saturated hydrocarbons are the compounds in which there is a single bond between the carbon atoms. They are also called alkanes and have the general formula C_nH_{2n+2}.

13.

(c) A is true but R is false.

Explanation:

Hybridisation influences the bond length and bond enthalpy (strength) in organic compounds. Thus, sp hybridised carbon atom having hybrid orbitals with 50% s character is more electronegative than sp^2 or sp^3 hybridised carbon atoms.

14.

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

Explanation:

Benzene is a non polar solvent. Butter is composed of organic compounds of low polarity. So it gets dissolved in benzene.

15.

(d) A is false but R is true.

Explanation:

Magnetic quantum number m_l can have values m_l = -l, -(l - 1),...0,...(l - 1), l(total 2l + 1 values). It gives the information about the number of orbitals and its orientation.

16.

(d) A is false but R is true.

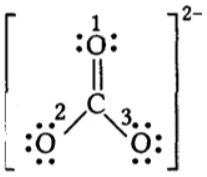
Explanation:

Atomic mass and molecular mass are the ratios and have no. units.

Mol. Mass = $\frac{\text{Wt. of one molecule of the substnace}}{1/12 \times \text{wt. of one atom of C-12}}$

Section B

17. i. Lewis structure of CO_3^{2-} ion is



The formal charge on

a. the carbon atom = V - L - $\frac{1}{2}$S

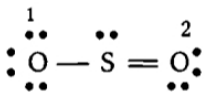
= 4 - 0 - $\frac{1}{2}$(8) = 0

b. the oxygen atom marked as (1) = V - L - $\frac{1}{2}$S

c. the oxygen atom marked as (2) and (3) = V - L - $\frac{1}{2}$S

= 6 - 6 - $\frac{1}{2}$ (2) = -1

ii. Lewis structure of SO_2 ion is



The formal charge on

a. the sulphur atom = V - L - $\frac{1}{2}$S

= 6 - 2 - $\frac{1}{2}$ (6) = +1

b. the oxygen atom marked as (1) = V - L - $\frac{1}{2}$S

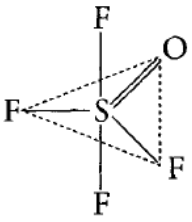
= 6 -6 - $\frac{1}{2}$ (2) = -1

c. the oxygen atom marked as (2) = V - L - $\frac{1}{2}$S

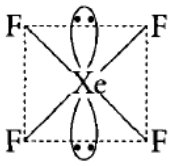
= 6 - 4 - $\frac{1}{2}$ (4) = 0

OR

The structures of OSF_4 and XeF_4 are shown below:

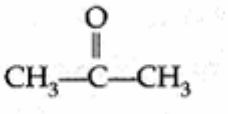


Trigonal bipyramidal
(sp^3d hybridisation)



Square planar
(sp^3d^2 hybridisation)

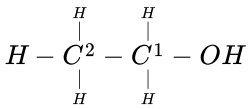
18. i. Equilibrium will shift in the forward direction, i.e. more of ice will melt.
    ii. Solubility will decrease because it is an exothermic process.
    iii. Pressure has no effect. Decrease of temperature will shift the equilibrium in the backward direction.
19. C_2H_2 (120 pm) < C_2H_4 (134 pm) < C_2H_6 (154 pm)
20. At a very low concentration a water electrolyte has high degree of ionization.
21. CH_3CH_2CHO



$CH_2{=}CH{-}CH_3$

Section C

22. The boiling point of hydrocarbons depends upon extent of van der waal's forces. Lesser the branching, greater the surface area and greater the van der waal's forces. Because of the presence of branches in neo-pentane the surface area and van der waal's forces of attraction are very weak in neopentane than in n-pentane. Therefore the b.p of neopentane is lower than that of n-pentane.
    But, melting point depends upon the packing of the molecules in the crystal lattice. Since neopentane are more symmetrical than n-pentane therefore, it packs much more closely in the crystal lattice than n-pentane and hence neopentane has much higher m.p than n-pentane.
23. Answer:
    (i) i. Mass of one mole proton = mass of 1 proton $\times$ 6.02 $\times$ 10^{23}
    = 1.67 $\times$ 10^{-24} $\times$ 6.02 $\times$ 10^{23} = 10.05 $\times$ 10^{-1} = 1.00 gm (approximately)
    ii. The charge of one proton = +1.602 $\times 10^{-19}$ C
    (ii) when that electron comes close to the nucleus ,the stability increases due to the loss of energy of electron and thus the energy of electron becomes less negative. That's why the electrons energy is taken as negative.The spacing between the energy levels decreases as we move outwards from the nucleus.
    (iii)If a photon of a short wavelength hits the electron then the uncertainty in position decreases but the uncertainty in velocity or momentum increases.
24. i. First law of thermodynamics: It states that energy can neither be created nor be destroyed. The energy of an isolated system is constant.
    $\Delta u = q + w$
    (It can be transferred from one body to another.)
    ii. It is defined as the amount of heat evolved or absorbed when one mole of the compound is from its constituting element in their standard states.
25. $\overset{x}{C_2}\overset{+1}{H_6}\overset{-2}{O}$
    2x + 6 (+1) + 1 (-2) = 0
    2x = - 4 or x = -2
    Therefore, the average oxidation number of C is -2.
    Let us consider the structure of ethanol CH_3CH_2OH



    Oxidation number of C_1 atom = 1 (+1) + 2 (+1) + x + 1 (-1) = 0
    [C_1 atom in CH_3CH_2OH is attached to one CH_3 group (oxidation number = + 1), two H atoms and one -OH group (oxidation

number = -1)]

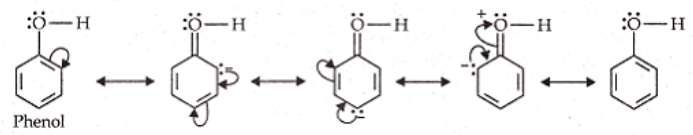
x = - 2

Oxidation number of C_2 atom = 3 (+1) + x + 1 (-1) = 0

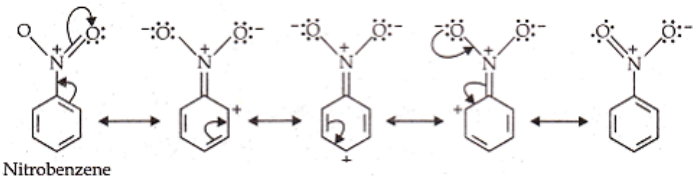
x = -2

[C_2 atom in CH_3CH_2OH is attached to three H-atoms and one -CH_2OH group (oxidation number = - 1)].

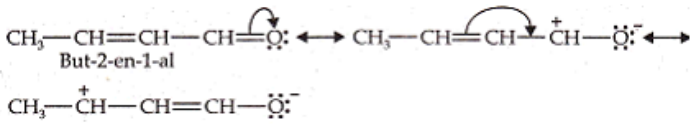
26. i. The resonance structure of phenol (C_6H_5OH):



ii. The resonance structure of nitrobenzene ($C_6H_5NO_2$)



iii. The resonance structure of but-2-en-1-al ($CH_3CH=CHCHO$).



27. Let V_A be the total volume of gaseous reactants,

V_B be the total volume of gaseous product.

Let n_A be the number of moles of the reactant,

n_B be the number of moles of the product,

At constant pressure and temperature,

$pV_A = n_ART$,

$pV_B = n_BRT$

$\Rightarrow pV_B - pV_A = (n_B - n_A)\ RT$

$\Rightarrow p\ \Delta V = (\Delta n)_g RT$

Here, $(\Delta n)_g = n_B - n_A$ is equal to the difference between the number of moles of gaseous products and gaseous reactants.

We know that,

$\Delta H = \Delta U + (\Delta n)_g RT$

Now, $\Delta H = q_p$(heat change under constant pressure),

$\Delta U = q_v$(heat change under constant volume).

Therefore, $q_p = q_v + (\Delta n)_g RT$

28. For the given reaction; $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

R = 0.083 L bar K^{-1} mol^{-1},

T = 450 K

$\triangle n_g$ = 2 - 3 = -1

$K_p = 2.0 \times 10^{10} bar^{-1}$

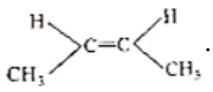
$K_c = \frac{K_p}{(RT)^{\Delta ng}} = K_p(RT)^{-\Delta ng}$

$K_c = (2.0 \times 10^{10} bar^{-1}) \times$ [(0.083L bar K^{-1} mol^{-1}) $\times$ (450 K)]$^{-(-1)}$

= 7.47×10^{11} mol^{-1} L = 7.47×10^{11} M^{-1}

Section D

29. i. Experimentally, it is observed that less crowded alkenes adsorb H_2 with the faster rate.

ii. The product (A) formed is  .

iii. Powdered nickel is more effective than the grannular nickel because the surface area of powdered nickel is maximum and Free valencies are large in number.

OR

In non-terminal alkynes reaction, anti-addition of hydrogen results into the trans-product.

30. i. Atomic number = No. of protons in the nucleus
= Mass no. – No. of neutrons
= 23 – 12 = 11
The element is sodium and its symbol is Na.

ii. Because atoms with identical atomic number but different atomic mass number are known as isotopes.

iii. Isotones are the atoms of different elements which have the same number of neutrons. N-14 is an isotone of a C-13 atom.

OR

Atomic number = 6; Mass No. = 6 + 8 = 14; Element is Carbon.

Section E

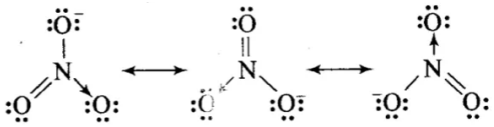
31. Attempt any five of the following:

(i) $\pi(2p_x)$ and $\pi^*(2p_x)$ have one and two nodes respectively.

(ii) Dipole moment is a vector quantity and the direction of dipole moment is from negative charge to positive charge.

(iii) O = C = C = C = O

(iv) Nitrate ion



(v) Bond strength is directly proportional to the bond order. Greater the bond order more is the bond strength.

(vi) The given electronic configuration shows that the element is vanadium (Z = 22). It belongs to d-block of the periodic table. In transition elements i.e. d-block elements, electrons of ns and (n - 1)d subshell take part in bond formation.

(vii) Only $BeCl_2$ is linear Cl-Be-Cl because, in all others, central atom O is surrounded by two lone pairs. Due to 1p-1p repulsion, molecules are non-linear.

32. The Demerits of Mendeleev periodic table that need improvement are discussed below:

i. It could not explain the position of hydrogen as it has resemblance with both alkali metals and halogen group elements.

ii. It failed to explain the position of isotopes as they have different atomic masses. For example, hydrogen isotopes with atomic masses 1,2 and 3 should be placed at three places. However, isotopes have not been given separate places in the periodic table because of their similar properties.

iii. The atomic mass of elements is not increases in regular manner which is basic property of his periodic table. For example, he placed cobalt before nickle but atomic mass of Co is more than Ni.

iv. In certain pair of elements law of atomic weight is not obeyed as he tried to place elements with similar properties together. For example Ar has atomic mass 39.9 but K has atomic mass 39 but Ar placed before K and iodine with lower atomic weight than that of tellurium (Group VI) was placed in Group VII along with fluorine, chlorine, bromine because of similarities in properties.

v. He failed to explain the cause of periodicity among elements.

OR

i. The outer electronic configuration of $1s^2$, $2s^2$, $2p^5$ is $2s^2$, $2p^5$. Hence this element is a p-block element and belongs to the second period and group 17 of the periodic table.Thus, the element is fluorine, F

ii. The outer electronic configuration of [Ar] $4s^2$, $3d^{10}$, $4p^1$ is $4s^2$ $4p^1$, hence it is a p-block element. It belongs to the fourth period and 13 group of the periodic table. Thus, the element is gallium, Ga.

iii. The outer electronic configuration of [Xe] $6s^2$ is $6s^2$, therefore, it is a s-block element and belongs to the sixth period and group 2 of the periodic table. Thus, the element is barium, Ba.

iv. In the electronic configuration [Xe] $6s^2$, $5d^1$, $4f^7$ the electrons are in 4f shell, therefore, it is a f-block element and belongs to the sixth period and third group of the periodic table. thud, the element is gadolinium, Gd.

v. The outer electronic configuration of [Ar] $4s^1$, $3d^{10}$ is $4s^1$, $3d^{10}$, therefore, it is a d-block element and belongs to the fourth period and group 11 of the periodic table.Thus, the element is copper, Cu.

33. Assume that the mixture of acids contains, number of moles of,
Oxalic acid = x moles &
Formic acid = y moles.

the two acids react stoichiometrically as under -

The two acids in the mixture when heated with conc. H_2SO_4 react according to the following equations.

$$\underset{\substack{| \\ \text{COOH} \\ \text{X mol}}}{\text{C}} \text{ - OOH} \xrightarrow{H_2SO_4/\text{heat}} \underset{\text{X mol}}{\text{CO}\,(g)} + \underset{\text{X mol}}{CO_2\,(g)} + CO_2\,(g) + H_2O\,(l)$$

$$\underset{\text{y mol}}{\text{HCOO H}} \xrightarrow{H_2SO_4/\text{heat}} \underset{\text{X mol}}{\text{CO}\,(g)} + H_2O\,(l)$$

Accodingly ,

Total moles of gaseous mixture = moles of CO + Moles of CO_2

[(x + y) mols + x mols] = (2x + y) mols.

Now, KOH absorbs only CO_2 (i.e. x moles of CO_2) and because of this, the volume of the solution decreases by $1/6^{th}$ of its original volume (as given).

Applying Avogadro's law of gaseous volumes (ie." Equal volumes of all gases under the same conditions of temperature and pressure contain an equal number of molecules ") it is mathematically inferred that,

$$\frac{\text{Moles of } CO_2}{\text{Moles of both gases}} = \frac{x}{(2x+y)} = \frac{1}{6}$$

therefore , 6x = 2x + y

or 4x = y

$\frac{y}{x} = 4$

The ratio y / x represents the molar ratio of Formic acid to oxalic acid, as per assumption above.

Thus,

The molar ratio of formic acid : oxalic acid, in the mixture is as 4 : 1

OR

i. 0.50 m Na_2CO_3 means that 0.50 moles of Na_2CO_3 are dissolved in 1000 g of water.

0.50 M Na_2CO_3 solution means that 0.50 moles of na2CO3 are dissolved in 1000 mL of solution.

ii. $C + O_2 \longrightarrow CO_2$

1 Mol of carbon reacts with 1 mole of oxygen to form 1 mole of CO_2.

a. 1 mol of CO_2 or 44 g of CO_2

b. since 16 g of dioxygen i.e. 0.5 mol of O_2 are present, it is a limiting reagent. 0.5 mol of O_2 will form 0.5 mol of CO_2 i.e. 22 g

c. 16 g or 0.5 mol O_2 is limiting reagent 0.5 mol of O_2 will form 0.5 mol of CO_2 i.e. 22 g