CBSE Class 11 Chemistry
## Sample Paper 03 (2019-20)

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

a. All questions are compulsory.

b. Section A: Q.no. 1 to 16 are very short answer questions (objective type) and carry 1 mark each.

c. Section B: Q.no. 17 to 23 are short answer questions and carry 2 marks each.

d. Section C: Q.no. 24 to 30 are long answer questions and carry 3 marks each.

e. Section D: Q.no. 31 to 33 are also long answer questions and carry 5 marks each.

f. There is no overall choice. However an internal choice has been provided in two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

g. Use log tables if necessary, use of calculators is not allowed.
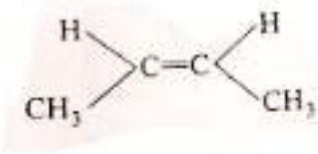
Section A

1. 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:

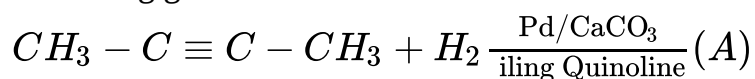 $$-C{\equiv}C- \: > \: {>}C{=}C{<} \: > \: {>}C{=}O \: > \: C_6H_6$$
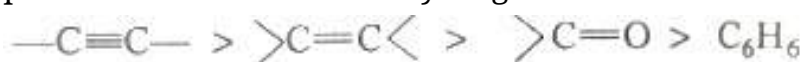
   Non-terminal alkynes are reduced in the presence of Na or Li metal dissolved in liquid ammonia. In this reaction, anti-addition of hydrogen results into the trans-product.
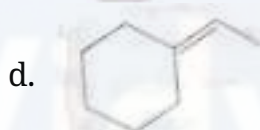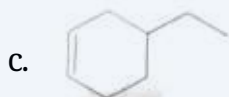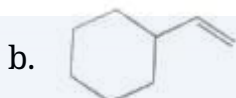
Answer the following questions:

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

  ii. Out of $CH_3CH_2CH_2CH_3$ and [structure: $\begin{smallmatrix}H\\CH_3\end{smallmatrix}>C=C<\begin{smallmatrix}H\\CH_3\end{smallmatrix}$] . What is the product (A) for the

  following given reaction?

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

  iii. In which of the following cases, the reaction is most exothermic?

a.

b.

c.

d.

  iv. Powdered nickel is more effective than the granular nickel. Why?

   v. In non-terminal alkynes reaction what products are formed?

2. We don't see a car moving as a wave on the road why?

3. The atomic radius of elements decreases along the period but Neon has highest size among III period element? Why?

4. Heat capacity (Cp) is an extensive property but specific heat (C) is an intensive property. What will be the relation between Cp and C for 1 mole of water?

5. Show with an example that CaO is a basic oxide.

6. Name the two major man-made sources of oxides of nitrogen to the atmosphere.

7. Which one of the given will most readily be dehydrated in acidic conditions?

a.

b.

c.

d.
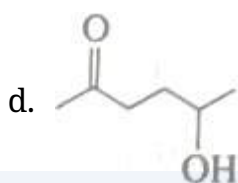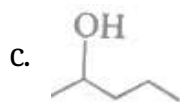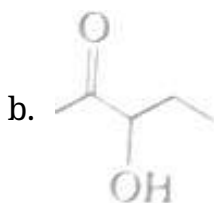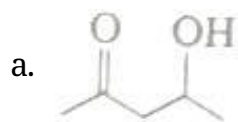
8. In the reaction $2H_2O_2 \rightarrow 2H_2O + O_2$

   a. Oxygen is reduced only

   b. Oxygen is oxidised only

   c. Oxygen is neither oxidised nor reduced

   d. Oxygen is oxidised as well as reduced

9. The colour of vapours formed on sublimation of iodine solid is
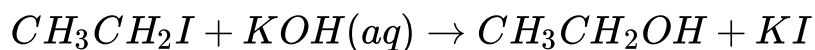
   a. Colourless

   b. Purple (violet)

   c. Yellow

   d. Orange

10. One of the following has application in electrode processes and cells

    a. half-reactions involving reduction

    b. the concept of redox reactions

c. the different oxidation states of the atom in the element

d. half-reactions involving oxidation

11. The following reaction is classified as:
$$CH_3CH_2I + KOH(aq) \rightarrow CH_3CH_2OH + KI$$

a. elimination

b. nucleophilic substitution

c. addition

d. electrophilic substitution

12. **Assertion:** Diborane forms two-three centred electron-pair bonds.
Reason: B_2H_6 does not have sufficient number of electrons to form normal covalent bonds.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

c. Assertion is CORRECT but, reason is INCORRECT.

d. Assertion is INCORRECT but, reason is CORRECT.

13. **Assertion:** The standard unit for expressing the mass of atoms is a.m.u.
Reason: a.m.u. stands for mass of 1 atom of carbon.

a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

c. Assertion is CORRECT but, reason is INCORRECT.

d. Assertion is INCORRECT but, reason is CORRECT.

14. **Assertion:** Oxidation state of hydrogen in H_2O is + 1 and in CaH_2 it is -1.

    Reason: CaH_2 is metal hydride and for hybrids, hydrogen is assigned the oxidation state of -1.

    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

    c. Assertion is CORRECT but, reason is INCORRECT.

    d. Assertion is INCORRECT but, reason is CORRECT.

15. **Assertion:** Trans-but -2-ene on reaction with Br gives meso-2, 3-dibromobutane.
    Reason: The reaction involves syn-addition of bromine.

    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

    c. Assertion is INCORRECT but, reason is CORRECT.

    d. Assertion is CORRECT but, the reason is INCORRECT.

16. **Assertion:** At low pressure, van der Waal's equation may be expressed as
    $pV = RT - \frac{a}{V}$.
    Reason: At low-pressure b can be neglected in comparison to V.

    a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

    b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.

c. Assertion is CORRECT but, reason is INCORRECT.

d. Assertion is INCORRECT but, reason is CORRECT.

Section B

17. Write the type of hybridisation involved in CH_4, C_2H_4 and C_2H_2.

18. Identify the oxidant and the reductant in the following reaction.

$N_2H_4 (g) + ClO\overline{3} (aq) \longrightarrow NO(g) + Cl^- (ag)$

19. What happens when magnesium reacts with

    i. CO_2

    ii. SO_2 gas?

20. Cyclobutane is less reactive than cyclopropane. Justify.

21. The value of K_c for the reaction $2A \rightleftharpoons B+C$ is 2×10^{-3}. At a given time, the composition of the reaction mixture is $[A] = [B] = [C] = 3 \times 10^{-4}$ M. In which direction the reaction will proceed?

OR

How is bond order related to the stability of a molecule?

22. Without using column chromatography, how will you separate a mixture of camphor and benzoic acid?

OR

The equilibrium constant for a reaction is 10. What will be the value of $\Delta G°$? R = $8.314JK^{-1}mol^{-1}$, T = 300 K.

23. The boiling point of alkanes shows a steady increase with an increase in molecular mass. Why?

Section C

24. i. Under what condition, the heat evolved or absorbed in a reaction is equal to its free energy change?
    ii. Calculate the entropy change for the following reversible process
       $\Delta G = \Delta H - T\Delta S$

25. Interpret the non-linear shape of H_2S molecule and non-planar shape of PCI_3 using valence shell electron pair repulsion (VSEPR) theory.

OR

The pH of 0.1 M solution of cyanic acid (HCNO) is 2.34. Calculate the ionization constant of the acid and its degree of ionization in the solution.

26. Calculate the oxidation number of sulphur, chromium, and nitrogen in H_2SO_5, $Cr2O_7^{2-}$ and N_3^-. Suggest the structure of these compounds. Count for the fallacy.

27. A mixture of CO and CO_2 is found to have a density of 1.50 gL^{-1} at 20°C and 740 mm pressure. Calculate the composition of the mixture.

28. Balance the following skeleton equation by the method of partial equations
    $KMnO_4 + H_2SO_4 + (COOH)_2 \longrightarrow K_2SO_4 + MnSO_4 + CO_2 + H_2O$

29. An element 'X' with atomic number 112 has been recently predicted. Its electronic configuration is : [Rn] $5f^{14}6d^{10}7s^2$. Predict

    i. its group
    ii. block in which this element would be placed
    iii. IUPAC name and symbol.

OR

The first (IE) and second (IER) ionization enthalpy: (KJ mol^{-1}) of three elements A, B and C are given below:

	A	B	C
IE_1	403	549	1142

IE$_2$	2640	1060	2080

Identify the element which is likely to be

  i. a non-metal

  ii. an alkali metal

  iii. an alkaline earth metal

30. What does the amount of BOD signify?

Section D

31. Calculate the oxidation number of the underlined element in

  i. $\underline{V}O_2^+$

  ii. $\underline{U}O_2^{2+}$

  iii. $Ba\underline{X}e6_6$

  iv. $K_4\underline{P}_2O_7$

  v. $K_2\underline{S}$

OR

  i. How can the production of dihydrogen, obtained from coal gasification, be increased?

  ii. Why does hydrogen occur in a diatomic form rather than in a monoatomic form under normal conditions?

32. Why is Wurtz reaction not preferred for the preparation of alkanes containing add number of carbon atoms? Illustrate your answer by taking one example.

OR

  i. How would you separate propene from propyne?

  ii. How would you carry out the following conversations?

    a. $H_3CCH_2CH{=}CH_2 \rightarrow H_3C\text{-}CH_2CH_2CH_2OH$

    b. $H_3C\ CH_2\text{-}CH{=}CH_2 \rightarrow H_3C\text{-}CH_2\text{-}CH(OH)CH_2OH$

    c. $H_3CC{=}CH \rightarrow H_3C\ COCH_3$

d. $Br_2CHCHBr_2 \rightarrow HC\equiv CH$

33. Threshold frequency, ν_0 is the minimum frequency that a photon must possess to eject an electron from a metal. It is different for different metals. When a photon of frequency 1.0×10^{15} 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.

OR

In a reaction

$A + B_2 \longrightarrow AB_2$

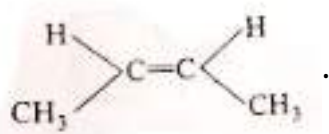Identify the limiting reagent if any in the, following reaction mixtures:

i. 300 atoms of A + 200 molecules of B
ii. 2 mol of A + 3 mol of B
iii. 100 atoms of A + 100 molecules of B
iv. 5 mol of A + 2.5 mol of B
v. 2.5 mol of A + 5 mol of B

Solution

Section A

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

    ii. The product (A) formed is .

    iii. The most exothermic reaction is .

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

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

2. According to de Broglie's relation, Wavelength, $\lambda = h/mv$.

    Since m and h are constant so $\lambda \propto \frac{1}{m}$

    Here, the mass of the car is very large, Therefore, its wavelength or wave character is negligible. Hence, we do not see a car moving like a wave.

3. The atomic radius increases as we move from group 17 to 18 because of inter-electronic repulsion. However, the atomic size of noble gases is expressed in terms of Van der walls radius as noble gases cannot form covalent bonds while other elements can form covalent bonds. And it is known fact that Van der walls radius is always greater than covalent radius.

    Hence, Neon has highest size among III period element.

4. We know that, Specific heat(C) of water is = 4.18 $Jg^{-1}K^{-1}$

    Now, Heat capacity(Cp) of water is = 18 $\times$ C

    = 18 $\times$ 4.18 JK^{-1}
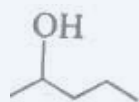
= 75.3 JK^{-1}

5. Being a basic oxide, Quick lime [CaO] combines with acidic oxides at high temperature:

Reactions:

$CaO + SiO_2 \rightarrow CaSiO_3$

$6CaO + P_4O_{10} \rightarrow 2Ca_3(PO_4)_2$
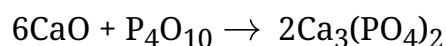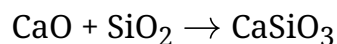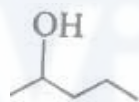
6. The two major man-made sources of oxides of nitrogen to the atmosphere are:

   i. Fossil fuel-based power plant

   ii. Automobiles

7. (c)

Explanation:

8. (d) Oxygen is oxidised as well as reduced

Explanation: This is a disproportionation reaction. (Disproportionation is a specific type of redox reaction in which an element from a reaction undergoes both oxidation and reduction to form two different products)

9. (b) Purple (violet)

Explanation: Purple (violet)

10. (b) the concept of redox reactions

Explanation: The concept of redox reaction is used in electrode processes and cells. Because in these processes an electrode loose or gain electrons, electrode with higher reduction potential undergo reduction, electrode potential is given a positive sign if oxidation occures at the electrode.

11. (b) nucleophilic substitution

Explanation: In this reaction we can observe that I- is replaced or substituted by a negatively charged ion -OH which is a nucleophile. So it is a nucleophilic substitution

reaction.

12. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

13. (c) Assertion is CORRECT but, reason is INCORRECT.

Explanation: Assertion is CORRECT but, reason is INCORRECT.

14. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

15. (d) Assertion is CORRECT but, the reason is INCORRECT.

**Explanation:** Assertion is CORRECT but, the reason is INCORRECT.

16. (a) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

Section B

17. Hybridisation = sigma bond + lone pair

If No. is 4 then sp^3, If No. is 3 then sp^2, If No. is 2 then sp

$CH_4 = Sp^3$ $C_2H_4 = Sp^2$ $C_2H_2 = Sp$
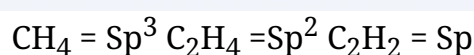
18. N2h4 is reductant (or, reducing agent)

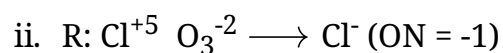$ClO\overline{3}$ is an oxidant (or, oxidising agent).

Explanation:

The following steps are taken into consideration in order to identify an Oxidant or reductant in an equation-

Step 1

Assign oxidation numbers for each atom in the given equation after writing out all redox couples in the reaction. So, in the given equation

  i. O: $N_2^{-2}H_4^{+1} \longrightarrow N^{+2}O^{-2}$

ii. R: $Cl^{+5} O_3^{-2} \longrightarrow Cl^-$ (ON = -1)
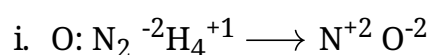
Step 2

Identify which reactant is being oxidised (the oxidation number increases when it reacts) and which reactant is being reduced (the oxidation number goes down.) Thus, we find that in the given reaction,

i. The oxidation number of N in N_2H_4 increases from (-2) to (+2), therefore, N_2H_4 is the reductant.

ii. The oxidation number of Cl in ClO_3^- decreases from (+5) to (-1), therefore, ClO_3^- is the oxidant.

Note that -

i. a reductant (or, reducing agent) reduces the other substances and loses electrons; therefore its oxidation state /number increases.

ii. an oxidant (or, oxidising agent) oxidises other substances and gains electrons; therefore its oxidation state/number decreases.

19. i. When magnesium reacts with CO_2; MgO is formed :

$$2Mg + CO_2 \xrightarrow{\Delta} 2MgO + C$$
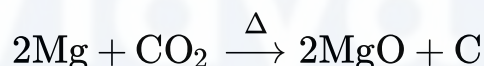
ii. When magnesium reacts with SO_2; MgO is formed:

$$2Mg + SO_2 \xrightarrow{\Delta} 2MgO + \frac{1}{8}S_8$$
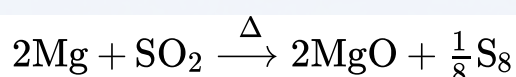
20. In cyclobutane molecule, the C-C-C bond angle is 90^0 while it is 60^0 in cyclopropane. Thus, the deviation from the tetrahedral bond angle (109^0 28') in cyclobutane is less than in cyclopropane. Therefore, cyclobutane has less bond strain as compared to cyclopropane and thus, cyclobutane is less reactive as compared to cyclopropane.

21. For the reaction, the reaction quotient, Q_c is

$$Q_c = \frac{[B][C]}{[A]^2}$$

As [A] = [B] = [C] = 3×10^{-4} M

$$Q_c = \frac{\left(3 \times 10^{-4}\right)\left(3 \times 10^{-4}\right)}{\left(3 \times 10^{-4}\right)^2} = 1$$

It is given that $K_c = 2 \times 10^{-3}$.

Hence $Q_c > K_c$, so the reaction will proceed in the reverse direction i.e. towards reactant A

OR

Bond order: - Number of bonds between two atoms is called bond order. More the bonds between atoms more will be the **Dissociation Energy &** more will be the stability.

Formula to find Bond order = $N_B - N_A / 2$

Bond order directly proportional to stability of molecules and dissociation energy and inversely proportional to bond length

where N_B = Number of the electron in bonding Molecular Orbits

N_A = Number of the electron in antibonding Molecular Orbits

22. Sublimation can not be used since both camphor and benzoic acid sublime on heating.
So, a chemical method is used to separate the mixture of camphor and benzoic acid. $NaHCO_3$ solution is mixed with the mixture of camphor and benzoic acid.
benzoic acid dissolves in the solution, leaving camphor behind.
The filtrate is cooled and then acidified with dil HCl to get benzoic acid.

OR

According to the question, equilibrium constant = K_c = 10, R = 8.314J K^{-1} mol^{-1}, T = 300 K.
We know that, $\Delta G^\circ = -2.303 RT \log K_c$
$\Delta G^\circ = -2.303 \times 8.314 \text{JK}^{-1}\text{mol}^{-1} \times 300\text{K} \times \log 10$
$\Rightarrow \Delta G^\circ =$ - 5744.14 J mol^{-1}.

23. With the increase in molecular weight or the molecular size of the molecule, the surface area of the molecule increases. Due to which the extent of the intermolecular

Vanderwall forces increases which causes the increase in the boiling point of alkanes.

Section C

24. i. $\Delta G = \Delta H - T\Delta S$

   When the reaction is carried out at

   0°K or $\Delta S = 0$

   $\Delta G = \Delta H$

   ii. $H_2O(s) \rightleftharpoons H_2O(l)$

   $\Delta_{fus} H = 6.0 \text{ kJ mol}^{-1}$

   $= 6000 \text{ J mol}^{-1}$

   $T_f = 0^oC = (0 + 273) = 273 \text{ K}$

   $\Delta_{fus}S = \dfrac{\Delta_{fus} H}{T_f} = \dfrac{6000 Jmol^{-1}}{273K} = 21.98 \text{ J K}^{-1} \text{ mol}^{-1}$

25. In H_2S, two bonded pairs and two lone pairs are present, i.e., sulphur is in sp^3 hybridized state. The angle is less than $109^o28'$ as contraction occurs due to the presence of lone pairs. Thus, H_2S has a V-shaped structure. In PCl_3, three bonded pairs and one lone pair are present, i.e., phosphorus is also in sp^3 hybridized state but it has pyramidal structure.

OR

$HCNO \rightleftharpoons H^+ + CNO^-$

pH = 2.34 means - log [H$^+$]= 2.34 or log [H$^+$] = -2.34.

Or,

$\log\left[H_3O^+\right] = -2.34 = \overline{3}.66$

$\left[H_3O^+\right] = \text{antilog } \overline{3}.66 = 4.571 \times 10^{-3}M$
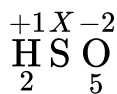
Or, $\left[H_3O^+\right] = C\hat{I}_\pm = 4.571 \times 10^{-3}M$

Degree of ionization constant, $\alpha = \dfrac{4.571 \times 10^{-3}}{0.1} = 4.571 \times 10^{-2}$

Now Ionization constant $= K_a = \dfrac{\left[H_3O^+\right]\left[CNO^-\right]}{\left[HCNO\right]} = \dfrac{4.571 \times 10^{-3} \times 4.571 \times 10^{-3}}{0.1}$

$= 2.089 \times 10^{-4}$

26. i. H_2SO_5,

By conventional method

$$\overset{+1}{H_2}\overset{X}{S}\overset{-2}{O_5}$$

$2(+1) + x + 5(-2) = 0$ or $x = +8$

This is not possible because S cannot have O.N. more than 6. The fallacy is overcomed if we calculate its O.N. from its structure as :

$$2 \times (+1) + \underset{\text{for S}}{X} + 2(-1) + \underset{\text{(for other O atom)}}{3 \times (-2)} = 0$$

$$\underset{\text{for H}}{2 \times (+1)}$$
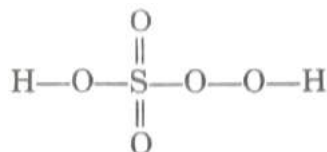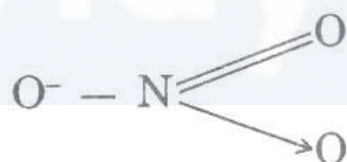
or $x = +6$

ii. $Cr_2O_7^{2-}$

$2x + 7(-2) = -2$

$2x = 12$

This is correct and there is no fallacy.

iii. N_3^-. By conventional method.

$x + 3(-2) = -1$ or $x = +5$

From the structure.

$$x + \underset{\text{(for O)}}{1(-1)} + \underset{\text{(for }=O)}{1(-2)} + \underset{\text{(for }\rightarrow O)}{1(-2)} = 0 \text{ or } x = +5$$

Hence there is no fallacy about O.N. of N in N_3^- as +5 whether we calculate by conventional method or by chemical bonding.

27. Given, $d = 1.50 \text{ gL}^{-1}$

$T = 20°C = 293 \text{ K}$

We know that,

$m = \dfrac{dRT}{p}$

$= \dfrac{1.50 \text{L}^{-1} \times 0.0821 \ L \ atm \ K^{-1} \text{mol}^{-1} \times 293 \ K}{(740/760) \text{atm}}$

$= 37.06$

Calculation of percentage composition:

Suppose mol % of CO in the mixture = x

Then, mol % of CO_2 in the mixture = (100 - x)

Average molecular mass = $\frac{x \times 28 + (100-x) \times 44}{100}$

$\therefore \frac{28x + 4400 - 44x}{100}$ = 37.06

$\Rightarrow 16x = 4400 - 3706$

$\Rightarrow 16x = 694$

$\Rightarrow x = \frac{694}{16}$

$\Rightarrow x = 43.38$

$\therefore$ Mol% of CO = 43.38 and Mol % of CO_2 = 100 - 43.38 = 56.62

28. The oxidation of oxalic acid, $(COOH)_2$, by potassium permanganate, $KMnO_4$ takes place in the following steps

 I. $KMnO_4$ is a strong oxidising agent reacts with dil. H_2SO_4 to produce nascent oxygen as given by chemical equation:
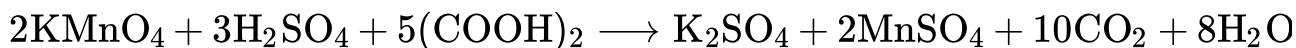 $KMnO_4 + H_2SO_4 \longrightarrow K_2SO_4 + MnSO_4 + 3H_2O + [O]$
  By balancing this skeleton equation by hit and trial method, we get
  $2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$....................(i)

 II. Oxalic acid is oxidised to CO_2 and H_2O by the nascent oxygen produced in equation (i). The balanced partial equation for this reaction is
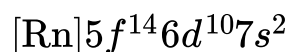 $(COOH)_2 + [O] \longrightarrow 2CO_2 + H_2O$.........................(ii)
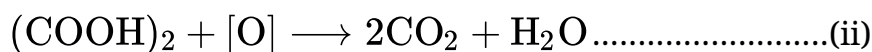
 III. Now, (i) + 5 [(ii)] , We get
  $2KMnO_4 + 3H_2SO_4 + 5(COOH)_2 \longrightarrow K_2SO_4 + 2MnSO_4 + 10CO_2 + 8H_2O$
  This represents the balanced chemical equation for the above reaction.

29. The configuration of the element is:
$[Rn]5f^{14}6d^{10}7s^2$

 i. It belongs to the 12th group.

 ii. It belongs to d block.

 iii. IUPAC name is: Ununbium; Symbol: Uub.

OR

i. C is non-metal

ii. A is alkali metal

iii. B is alkaline earth metal

30. The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water is called Biochemical Oxygen Demand (BOD). The amount of BOD in the water is a measure of the amount of organic material in the water, in terms of how much oxygen will be required to break it down biologically. Clean water would have a BOD value of less than 5 ppm whereas highly polluted water could have a BOD value of 17 ppm or more.

Section D

31. i. $\underline{V}O_2^+$: x + 2 (-2) = + 1 or x = +5

ii. $\underline{U}O_2^{2+}$: x + 2 (-2) = + 2 or x = +6

iii. $Ba\underline{X}e6_6$: +2(2) +x + 6(-2) or x = +8

iv. $K_4\underline{P}_2O_7$: 1 × 4 + 2x + 7 (-2) or x = +5

v. $K_2\underline{S}$: 1 × 2 + x or x = -2

OR

i. The process of producing a mixture of carbon monoxide and hydrogen from coal is called coal gasification. This mixture is also called synthesis gas or syngas.
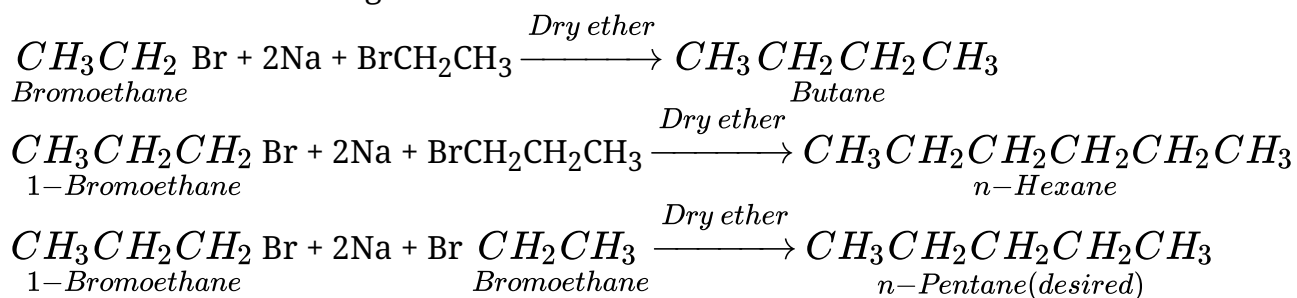
$$C \text{ (s)} + H_2O \text{ (g)} \xrightarrow{1270K} CO \text{ (g)} + H_2 \text{ (g)}$$
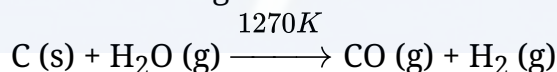
The production of hydrogen can be increased by reacting carbon monoxide of syngas with steam in the presence of iron chromate as a catalyst at 673K.

$$CO \text{ (g)} + \underset{\text{steam}}{H_2O(g)} \xrightarrow[673K]{FeCrO_4} CO_2 \text{ (g)} + H_2 \text{ (g)}$$
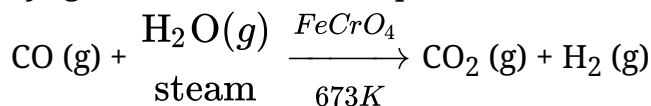
The CO_2 thus produced is removed by scrubbing with a solution of sodium arsenite.

ii. A hydrogen atom has only one electron in its valence shell ($1s^1$) and has only one electron less than the stable noble gas configuration of helium. Therefore, it shares its single electron with an electron of other H-atom to achieve the stable inert gas configuration of H_2. Therefore, it readily forms a diatomic molecule and exists as H, rather than monoatomic.

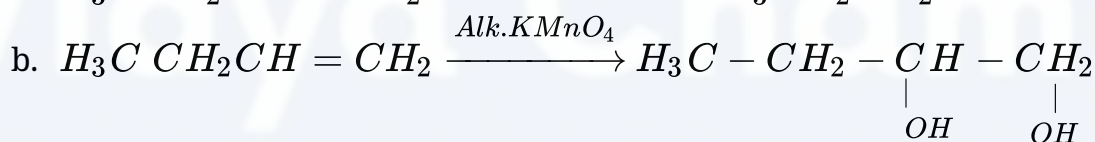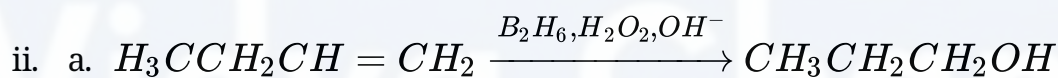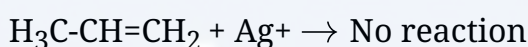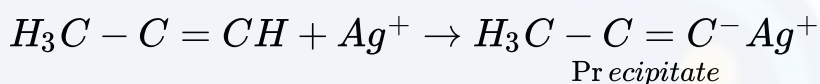32. For preparing alkanes containing od number of carbon atoms, a mixture of two alkyl halides has to be used. These two alkyl halides may react in three different ways producing a mixture of three alkanes instead of desired alkane. For example, Wurtz reaction between bromoethane and 1-bromopropane gives the following three alkanes instead of a single alkane of an odd number of C-atoms.

$$\underset{Bromoethane}{CH_3CH_2\,Br} + 2Na + BrCH_2CH_3 \xrightarrow{Dry\ ether} \underset{Butane}{CH_3\,CH_2\,CH_2\,CH_3}$$

$$\underset{1-Bromoethane}{CH_3CH_2CH_2\,Br} + 2Na + BrCH_2CH_2CH_3 \xrightarrow{Dry\ ether} \underset{n-Hexane}{CH_3CH_2CH_2CH_2CH_2CH_3}$$

$$\underset{1-Bromoethane}{CH_3CH_2CH_2\,Br} + 2Na + Br\ \underset{Bromoethane}{CH_2CH_3} \xrightarrow{Dry\ ether} \underset{n-Pentane(desired)}{CH_3CH_2CH_2CH_2CH_3}$$

OR

i. Pass the mixture through ammoniacal silver nitrate solution, propyne will precipitate out as silver propynide and propene will pass unchanged.

$$H_3C - C = CH + Ag^+ \rightarrow \underset{Pr\,ecipitate}{H_3C - C = C^- Ag^+}$$

$H_3C\text{-}CH=CH_2 + Ag^+ \rightarrow$ No reaction

ii. a. $H_3CCH_2CH = CH_2 \xrightarrow{B_2H_6,H_2O_2,OH^-} CH_3CH_2CH_2OH$

   b. $H_3C\ CH_2CH = CH_2 \xrightarrow{Alk.KMnO_4} H_3C - CH_2 - \underset{|\ OH}{CH} - \underset{|\ OH}{CH_2}$

   c. $H_3CCC = CH \xrightarrow[Hg^{2+}]{H_2SO_4} CH_3\ \underset{|\ OH}{C\ H} = CH_2 \xrightarrow{Re\,arrangement} CH_3\ \underset{||\ O}{C\ CH_3}$

   d. $Br_2CHCHBr_2 \xrightarrow{Zn} HC \equiv CH$
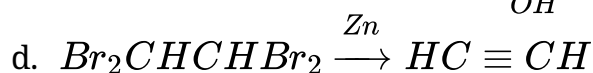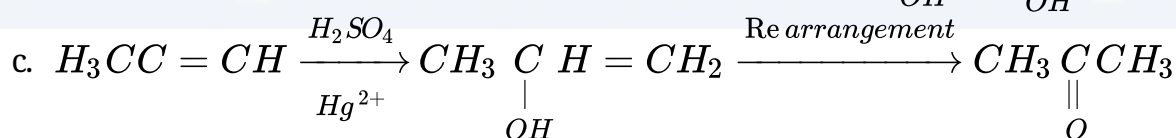
33. We know that, $h\nu = h\nu_0 + \text{K.E.}$

$\Rightarrow h\nu_0 = h\nu - \text{K.E.}$

$\Rightarrow \nu_0 = \nu - \dfrac{KE}{h}$ .....(i)

According to the question, $\nu = 1.0 \times 10^{15}\,s^{-1}$, K.E. = $1.988 \times 10^{-19} J, h = 6.626 \times 10^{-34} Js.$

From (i) we have,

$\nu_0 = 1.0 \times 10^{15}\,s^{-1} - \dfrac{1.988 \times 10^{-19}\,J}{6.626 \times 10^{-34}\,Js}$

$= \left(1.0 \times 10^{15} - 0.30 \times 10^{15}\right) s^{-1}$

$= 0.7 \times 10^{15} s^{-1} = 7 \times 10^{14} s^{-1}$

According to the question, $\lambda = 600 \text{nm} = 600 \times 10^{-9} \text{m} = 6.0 \times 10^{-7} \text{m}$

$\Rightarrow \nu = \frac{c}{\lambda} = \frac{3.0 \times 10^{8} m s^{-1}}{6.0 \times 10^{-7} m} = 5 \times 10^{14} s^{-1}$

We observe that, $\nu < \nu_0$,

Therefore, no electron will be emitted.

OR

According to the following,

1 mol of A reacted with 1 mole of B_2 and 1 atom of A reacts with 1 molecule of B_2.

i. B is limiting reagent because of 200 molecules of B_2 will react with 200 atoms of A and 100 atoms of A will be left in excess.

ii. A is limiting reagent because 2 moles of A will react with 2 mol of B and 1 mol of B will be left in excess.

iii. Both will react completely because it is a stoichiometric mixture. No limiting reagent.

iv. 2.5 mol of B will react with 2.5 mol of A and hence B is limiting reagent.

v. 2.5 mol of A will react with 2.5 mol of B. Hence A is limiting reagent.