CBSE Class 11 Chemistry

Sample Paper 06 (2019-20)

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

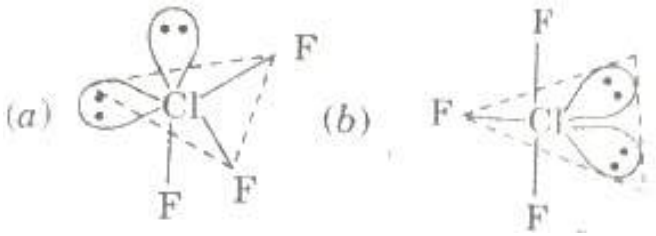
a. All questions are compulsory.
b. Section A: Q.no. 1 to 16 are very short answer questions (objective type) and carry 1 mark each.
c. Section B: Q.no. 17 to 23 are short answer questions and carry 2 marks each.
d. Section C: Q.no. 24 to 30 are long answer questions and carry 3 marks each.
e. Section 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. In order to explain the characteristic geometrical shapes of polyatomic molecules, Pauling introduced the concept of hybridisation. The orbitals undergoing hybridisation should have nearly the same energy. There are various type of hybridisations involving s, p and d-type of orbitals. The type of hybridisation gives the characteristic shape of the molecule or ion.

   Answer the following questions:

   i. The hybridised orbitals are always equivalent in _____ and _____.
   ii. Out of XeF_2 and SF_2 which molecule has the same shape as NO_2^+ ion?
   iii. Out of (a) and (b) given below which has correct placement of lone pairs and bond pairs.



iv. Out of XeF_4 and XeF_2 which molecule doesn't have the same type of hybridisation as P(Phosphorus) has in PF_5?

v. Which of the following moleucle /ion does not have same number of Ione pairs?

a. SF_4

b. PH_3

c. ClO_3^-

d. XeF_2

2. The mass of an electron is $9.1 \times 10\text{-}^{31}$ kg. If its KE(kinetic energy) is 3×10^{-25} J then calculate its velocity.

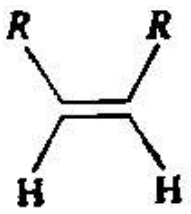
3. How do metals react in a period?

4. For the same increase in volume, why work is done is more if the gas is allowed to expand reversibly at a higher temperature?

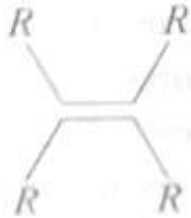
5. What happens when $CaCO_3$ is subjected to heat?

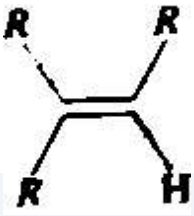
6. What are the principal chemical species present in the stratosphere?

7. Which of the following alkenes will react fastest with H_2 under catalytic hydrogenation conditions?

a. 

b. 

c. 

d. 

8. Which of the following is not an example of redox reaction?

   a. $2\mathrm{K} + \mathrm{F2} \rightarrow 2\mathrm{KF}$

   b. $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

   c. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

   d. $\mathrm{CuO} + H_2 \rightarrow \mathrm{Cu} + H_2O$

9. Which of the following statements about Hydrogen bond incorrect?

   a. In hydrogen bonding, H atom becomes partially negative and is attracted to the more positive N atom.

   b. In hydrogen bonding, H atom becomes partially positive and is attracted to the more negative N atom.

   c. In hydrogen bonding, H atom becomes partially positive and is attracted to the more negative O atom.

   d. In hydrogen bonding, H atom becomes partially positive and is attracted to the more negative F atom.

10. Which of the following halogens do not exhibit a positive oxidation number in their compounds?

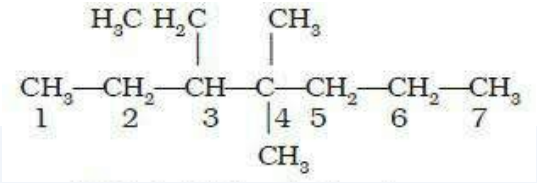
    a. I

    b. F

    c. Br

    d. Cl

11. Which of the following is the correct IUPAC name of the given compound?



    a. 4, 4-Dimethyl-3-ethylheptane

    b. 4, 4-Bis(methyl)-3-ethylheptane

    c. 3-Ethyl-4, 4-dimethylheptane

    d. 5-Ethyl-4, 4-dimethylheptane

12. **Assertion:** Boron has low electrical conductivity.
    Reason: At ordinary temperature boron behaves as metallic.

    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:** Graphite is in an element.
    Reason: Element is the pure form of a substance containing same kind of atoms.

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:** $PbCl_2$ is more stable than $PbCl_4$.
Reason: $PbCl_4$ is a powerful oxidising agent.

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:** Lactic acid shows geometrical isomerism.
Reason: It has C = C bond.

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.

16. **Assertion:** For a certain amount of gas, the product pV is always constant.
Reason: This is statement of Charle's law

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. Both assertion and reason are INCORRECT.

Section B

17. Which is more polar CO_2 or N_2O ? Give reason.

18. Calculate the oxidation number of Cr in $[Cr(H_2O)_6]^{3+}$ ion.

19. Explain the following:
(a) Why Cs is considered as the most electro positive element.
(b) Lithium cannot be used in making photoelectric cells.
(c) Lithium does not form alums.

20. Draw the structure of the following compounds all showing C and H atoms.
    a. 2-methyl -3-isopropyl heptane
    b. Dicyclopropyl methane.

21. The ionization constant of acetic acid is 1.74×10^{-5}. Calculate the degree of dissociation of acetic acid in its 0.05 M solution. Calculate the concentration of acetate ions in the solution and its pH.

OR

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

22. Why is sp hybrid orbital more electronegative than sp^2 or sp^3 hybridized orbitals?

OR

Increase in enthalpy of the surroundings is equal to decrease in enthalpy of the

system. Will the temperature of system and surroundings be the same when they are in thermal equilibrium?

23. When alkanes are heated, the C-C bonds rather than the C-H bonds break. Give reason.

Section C

24. 1 g of graphite is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atmospheric pressure according to the equation C (graphite) + O2(g) $\longrightarrow$ CO_2 (g).

    During the reaction, temperature rises from 298 K to 299 K. If the heat capacity of the bomb calorimeter is 20.7 kJ / K, what is the enthalpy change for the above reaction at 298 K and 1 atm?

25. What is the hybrid state of $BeCI_2$? What will be the change in the hyv\brid state of be in $BeCI_2$ in the solid-state?

    OR

    Calculate (a) ΔG^{Θ} and (b) the equilibrium constant for the formation of NO_2 from NO and O_2 at 298 K

    $NO(g) + 1/2\ O_2(g) \rightleftharpoons NO_2(g)$ where
    $\Delta_f G^{\Theta}(NO_2) = 52.0 kj/mol$, $\Delta_f G^{\Theta}(NO) = 87.0 kj/mol$,
    $\Delta_f G^{\Theta}(O_2) = 0\ kj/mol$,

26. Why does the following reaction occur?
    $\mathrm{XeO_6^{4-}}(aq) + 2\mathrm{F^-}(aq) + 6\mathrm{H^+}(aq) \longrightarrow \mathrm{xeO_3(g)} + \mathbf{F}_2(g) + 3\mathbf{H_2O}(l)$
    What conclusion about the compound Na4XeO6 (of which $\mathrm{XeO_6^{4-}}$ is a part) can be drawn from the reaction.

27. Sodium crystallizes in the cubic lattice and the edge of the unit cell is 430 pm. Calculate the number of atoms in a unit cell.

28. The mass of precious stones is expressed in terms of "carat". Given that 1 carat = 3.168 grain and 1 g = 15.4 grain, calculate the total mass of a ring in gram and kilogram which contains 0.500-carat diamond and 7.00 g gold.

29. What are Dobereiner's triads? Name two such triads.

OR

Predict the formula of the stable binary compounds that would be formed by the combination of the following pairs of elements:
(a) Lithium and oxygen
(b) Magnesium and nitrogen
(c) Aluminium and iodine
(d) Silicon and oxygen
(e) Phosphorous and fluorine
(f) Element 71 and fluorine

30. What is 'greenhouse effect'? How does it affects the global climate?

Section D

31. How do you account for the following observations?

    a. Though alkaline potassium permanganate and acidic potassium permanganate both are used as oxidants, yet in the manufacture of benzoic acid from toluene we use alcoholic potassium permanganate as an oxidant. Why? Write a balanced redox equation for the reaction.
    b. When concentrated sulphuric acid is added to an inorganic mixture containing chloride, we get colourless pungent-smelling gas HCl, but if the mixture contains bromide then we get red vapour of bromine. Why?

OR

i. Which Isotope of hydrogen
    a. does not contain neutron
    b. is radioactive?
ii. Which gaseous compound on treatment with dihydrogen compound produces methanol?
iii. Why is dihydrogen not prefered in balloons these days?
iv. Which of the following metals can be used for liberating hydrogen from dilute hydrochloric acid?

a. Zinc
b. Copper
c. Iron
d. Silver
e. Magnesium

v. Name the constituents of water gas.

32. Give the structures of A, B, C and D in the following reaction.

$$C + D \xleftarrow{Hot\ KMnO_4} \underset{(C_6H_{12})}{A} \xrightarrow[(ii)\ Zn,\ H_2O]{(i)\ O_3} \underset{Isomers\ of\ formula\ C_3H_6O}{B + C}$$

OR

i. Write structures of all the alkenes which on hydrogenation give 2-methyl butane.
ii. Out of benzene, m-dinitrobenzene and toluene which will undergo nitration most easily and why?

33. How many protons and neutrons are present in the following nuclei

i. $^{13}_{6}C$
ii. $^{16}_{8}O$
iii. $^{24}_{12}Mg$
iv. $^{56}_{26}Fe$
v. $^{88}_{38}Sr$

OR

A solution of glucose in water is labelled as 10% (w/w). The density of the solution is 1.20 g mL^{-1}.
Calculate i. molality, ii. molarity, and iii. mole fraction of each component in the solution.

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Solution

Section A

1. i. The hybridised orbitals are always equivalent in energy and shape.
   ii. XeF_2 molecule has the same shape as NO_2^+ ion.
   iii. Figure (b) shows the correct placement of lone pairs and bond pairs.
   iv. XeF_4 molecule doesn't have the same type of hybridisation as P(Phosphorus) has in PF_5.
   v. Option (d) XeF_2 is correct.

2. According to the question, mass of an electron = 9.1×10^{-31} kg, kinetic energy = 3×10^{-25} J.
   We know that, kinetic energy = $\mathrm{KE} = \frac{1}{2}mv^2$
   $\Rightarrow v = \left(\frac{2\mathrm{KE}}{m}\right)^{1/2}$
   $\Rightarrow v = \left(\frac{2\times3\times10^{-25}}{9.1\times10^{-31}}\right)^{1/2}$
   $\Rightarrow v = 8.12 \times 10^2 \mathrm{ms}^{-1}$

3. The reactivity of metals decreases as we move left to right in the periodic table as the tendency of an element to lose electrons decreases in going from left to right in a period because of greater nuclear charge.

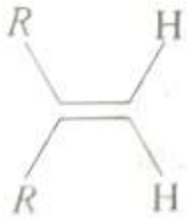
4. For isothermal reversible expansion,
   $W = -p_{\text{int}} \times \Delta V$.
   At higher temperatures, an internal pressure of the gas is more. So, the work done is more.
   Hence, for the same increase in volume, work done is more.

5. When $CaCO_3$ is heated, it decomposes to form quick lime and carbon dioxide.
   $CaCO_3 \overset{\Delta}{\rightleftharpoons} CaO + CO_2$

6. O_3, O_2, N_2 and some water vapour present in the stratosphere

7. (b)

Explanation:



8. (b) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Explanation:

The reaction is not redox because there is no oxidation or reduction of any element (i.e. no change in oxidation state/number).

Ba in $BaCl_2$ is at a +2 charge because it is in group 2. On the other side of the equation Ba in $BaSO_4$ is still +2. Cl_2 on the first side of the equation is -2 (as 2 chlorines) and Cl is -2 on the other side as there are 2 of them.

H on both sides are both +1 (but technically +2 as there are two of them).

SO_4 does not change oxidation number and always remains -2.

So, the reaction is not a redox reaction.

9. (a) In hydrogen bonding H atom becomes partially negative and is attracted to the more positive N atom.
Explanation: Hydrogen atom covalently bonded to highly electronegative atom such as N,O experience electrostatic field of another highly electronegative atom due to which a partial positive charge is developed on H atom.
10. (b) F

Explanation: Flourine is most electronegative element.

11. (c) 3-Ethyl-4, 4-dimethylheptane

    Explanation: In IUPAC name, functional groups are written in alphabetical order. Locant 3 is assigned to ethyl group and the two methyl groups are present on C-4. The longest C chain has 7 C atoms so the IUPAC name is 3-ethyl-4,4-dimethylheptane.

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

    Explanation: Assertion is CORRECT but, reason is INCORRECT.

13. (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.

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

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

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

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

16. (d) Both assertion and reason are INCORRECT.

    Explanation: Both assertion and reason are INCORRECT.

Section B

17. N_2O is more polar than CO_2

    This is because CO_2 is Linear and symmetrical (O=C=O). Its net dipole moment is Zero.

    N_2O is Linear but not symmetrical (N=N=O). It has a net dipole moment of $\sigma\ 116D$.

18. As H_2O is a neutral molecule,

    $\therefore$ O.N of H_2O = 0

    Let the oxidation number of Cr in $[Cr(H_2O)_6]^{3+}$ ion be x

    Write the oxidation number of Cr above its symbol and that of H_2O above its formula as

$[C_r^x(H_2^0O)_6]^{3+}$

Since, $[Cr(H_2O)_6]^{3+}$ is an ion,

the sum of the oxidation numbers must be

= + 3

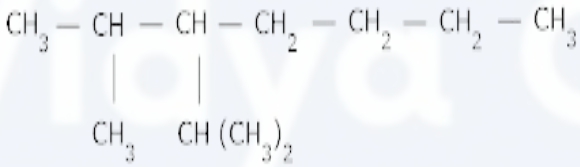
$\therefore$ [x + (6 $\times$ 0)] = +3

$\therefore$ x = + 3

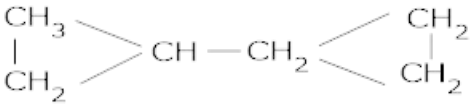
Thus the oxidation number of Cr in [$Cr(H_2O)_6$]$^{3+}$ is +3

19. (a) Cs has the largest size in alkali metals and thus it has lowest ionization energy. Therefore, Cs is considered as the most electropositive element.
(b) Lithium cannot be used in making photoelectric cells because out of all the alkali metals it has highest ionization energy and thus cannot emit electrons when exposed to light.
(c) Lithium does not form alums because of its small size.

20. a. The struture of 2-methyl -3-isopropyl heptane is:



b. The struture of Dicyclopropyl methane is:



21. For the given acid,

$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$

C	0	0(initially)
$C(1-\alpha)$	$C\alpha$	$C\alpha$ (At time t)

$$K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]} = \frac{[H^+]^2}{[CH_3COOH]}$$

$K_a = \frac{[CH_3COO^-][H^+]}{[CH_3COOH]} = \frac{[H^+]^2}{[CH_3COOH]}$

or $[H^+] = \sqrt{K_a[CH_3COOH]} = \sqrt{(1.74 \times 10^{-5})(5 \times 10^{-2})} = 9.33 \times 10^{-4} M$

$[CH_3COO^-] = [H^+] = 9.33 \times 10^{-4} M$

$[CH_3COO^-] = [H^+] = C\alpha$

Therefore, Degree of dissociation, $\alpha = \frac{[H^+]}{C} = \frac{9.33 \times 10^{-4}}{0.05} = 1.86 \times 10^{-2}$

Now, $pH = -\log(9.33 \times 10^{-4})$= 4 - 0.9699 = 4 - 0.97 = 3.03

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. The greater the s - character of the hybrid orbital's, the greater is the electronegativity.
A carbon atom having an sp hybrid orbital with 50% s – the character is more electronegative than that possessing sp^2 or sp^3 hybridized orbital's.

OR

Increase in enthalpy of the surroundings is equal to decrease in the enthalpy of the system.
If the system is in thermal equilibrium with the surroundings, then the temperature of the surroundings is same as that of the system.

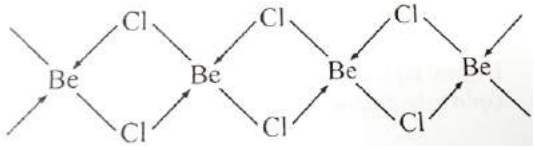
23. The C-H bond is stronger than C-C bond. When alkanes are heated, the C-C bonds

rather than the C-H bonds breaks because the C-C bond has a lower bond energy than the C-H bond.

Section C

24. Suppose q is the quantity of heat from the reaction mixture and C_v is the heat capacity of the calorimeter, then the quantity of heat absorbed by the calorimeter.
$q = Cv \times \Delta T$
Quantity of heat from the reaction will have the same magnitude but opposite sign because the heat lost by the system (reaction mixture) is equal to the heat gained by the calorimeter.
$q = - C_v \times \Delta T = - 20.7\ kJ/K \times (299 - 298)\ K$
$= - 20.7\ kJ$
(Here, the negative sign indicates the exothermic nature of the reaction). Thus, ΔU for the combustion of the 1g of graphite = $- 20.7\ kJ\ K^{-1}$
For combustion of 1 mol of graphite,
$= \frac{12.0g\ mol^{-1} \times (-20.7kJ)}{1g}$
$= - 2.48 \times 10^2\ kJ\ mol^{-1}$
Since $\Delta n_g = 0$
$\Delta H = \Delta U = - 2.48 \times 10^2\ kJ\ mol^{-1}$

25. In the vapor state, $BeCI_2$ exists as a linear molecule, CI - Be - CI, i.e., Be is in the hybridized state. In the solid-state, it has a polymeric structure. Each Be atom is linked with 4 CI atoms, two by covalent bonds and two by coordinate bonds.



Thus, be atom is in a sp^3 hybridized state. Two empty orbitals and two half-filled orbitals, i.e., in all four orbitals undergo hybridization.

OR

Step I. Calculation of ΔG^{Θ}

$\Delta G^{\Theta} = \Delta_f G^{\Theta}(NO_2) - [\Delta_f G^{\Theta}(1/2O_2)]$

= 52.0 - (87 + 0) = -35 kJ mol^{-1}

Step II. Calculation of K_c

$\Delta G^{\Theta} = -2.303\ RT\ \log K_c$

$\log K_c = -\frac{\Delta G^{\Theta}}{2.303RT} = -\frac{(-35\times10^3 J\ mol^{-1})^3}{2.303\times(8.314kJ\ mol^{-1})\times(298K)} = 6.134$

K_c = antilog 6.314 $= 1.36 \times 10^6$

26. $\overset{+8}{\mathrm{Xe}}\mathrm{O}_6^{4-}(aq) + 2\overset{-1}{\mathrm{F}}^-(aq) + 6\mathrm{H}^+(aq) \rightarrow\rightarrow \overset{+6}{\mathrm{Xe}}\mathrm{O}_3(s) + \overset{0}{\mathrm{F}}_2(g) + 3\mathrm{H}_2\mathrm{O}(l)$

O.N. of Xe decreases from +8 (in $\overset{+8}{\mathrm{Xe}}\mathrm{O}_6^{4-}$) to +6 (in XeO_2) and that of F increases from-1 (in F-) to 0 (in F,). Therefore, XeO_6^{4-} is reduced while F^- is oxidised. The reaction occurs because of $\mathrm{Na}_4\mathrm{XeO}_6$ (or XeO_6^{4-}) is a stronger oxidizing agent than F_2

27. Given, Atomic mass of Na, (M) = 23.0 amu

Density of sodium,d = 0.9623 g cm^{-3} ; Edge length (a) =430 × 10^{-10} cm.

$N_A = 6.022 \times 10^{23} mol^{-1}$

By applying density formula, we have

$d = \frac{Z\times M}{a^3\times N_A}$

$\Rightarrow 0.9623 = \frac{Z\times 23}{(430\times10^{-10})^3\times6.022\times10^{23}}$

$\Rightarrow Z = \frac{(0.9623\ g/cm^3)(430\ \times10^{-10}\ cm)^3(6.022\times10^{23}\ mol^{-1})}{(23\ g/mol)}$

Hence, Z = 2

28. Mass of diamond in ring, m_1 = 0.500 carat (Given)

Also, 1 carat = 30.168 grain and 1 g = 15.4 grain (Given)

Mass of 1 carat diamond = 3.168 grains

Mass of 0.500 carat diamond = (0.500 × 3.168) grains

Now, Mass of diamond in gram $= \left(\frac{0.500 \times 3.168}{15.4}\right)$ = 0.10 g

Now, Mass of gold in ring, m_2 = 7.00 g (Given)

The total mass of the ring = m_1 + m_2 = 0.10 g + 7.00 g = 7.10 g$= 7.10\text{g} \times \frac{1\text{kg}}{1000\text{g}}$ = 0.0071 kg.

29. Dobereiner arranged certain elements with similar properties in groups of three in such a way that the atomic weight of the middle element was nearly the same as the average atomic weights of the first and third elements.
For example:

Triad	lithium	sodium	potassium
Atomic mass:	7	23	39

Atomic mass of Na = $\frac{39+7}{2} = 23$

Chlorine	Bromine	Iodine
35.5	80	127

Atomic mass of Br = $\frac{127+35.5}{2} = 81.25$

OR

(a) Li_2O (Lithium oxide)

(b) Mg_3N_2 (Magnesium nitride)

(c) AlI_3 (Aluminium iodide)

(d) SiO_2 (Silicon dioxide)

(e) PCl_5 (Phosphorous pentafluoride)

(f) For Z = 71, the compound formed will be LuF_3 {the element is Lutenium (Lu) with electronic configuration = [Xe] $4f^{14}$ $5d^1$ $6s^2$}

30. The 'greenhouse effect' is the warming of climate that results when the atmosphere traps heat radiating from Earth toward space. Gases that contribute to the greenhouse effect are carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, and water

vapour.

The much increase in the greenhouse gases raises the temperature of the earth's atmosphere which, if not checked, may eventually result in the melting of polar ice caps and consequently may submerge the coastal landmass. Also, many human activities are producing chemicals, which are responsible for the depletion of the ozone layer in the stratosphere, leading to the formation of the ozone hole.

Section D

31. a. In manufacture of benzoic acid from toluene, alcoholic potassium permanganate is used because of the following reasons ,

    i. the cost of adding acid or a base is avoided, because in neutral medium OH^- are produced in the reaction itself. Thus,the process becomes cost-effective.

    ii. $KMnO_4$ and alcohol, both being polar, are homogeneous to each other.

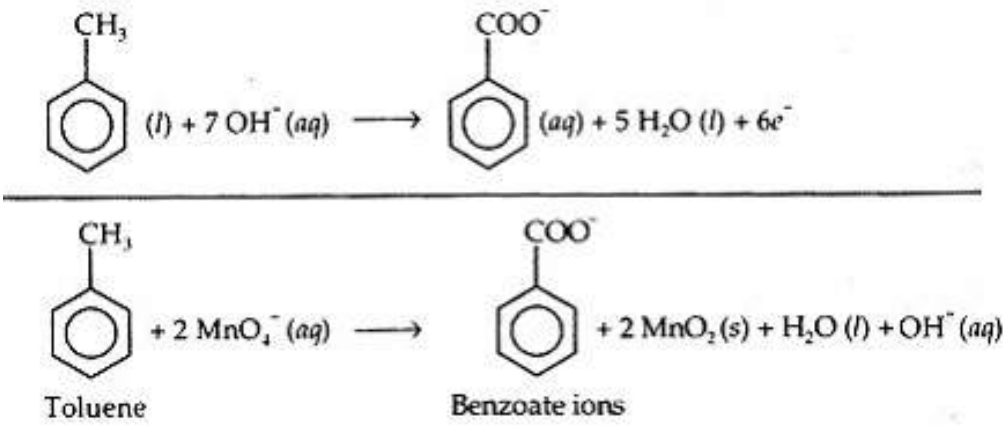
    Toluene and alcohol are also miscible with each other forming a homogeneous solution .

    Thus the reaction mixture becomes homogeneous.

    iii. Further, kinetically reactions proceed at a faster rate in homogeneous medium. Hence in presence of alcohol, $KMnO_4$ and toluene can react at a faster rate. making the process still more economical.

    The balanced redox reaction in neutral medium is given below:

    $\mathrm{MnO_4^-}(aq) + 2\mathrm{H_2O}(l) + 3e^- \longrightarrow \mathrm{MnO_2}(s) + 4\mathrm{OH^-}(aq) 1 \times 2$



b.

- When Conc. H_2SO_4 is added to an inorganic mixture containing chloride, a

pungent-smelling gas HCl is produced because a stronger acid displaces a weaker acid from its salt.

$$\underset{\text{Stronger acid}}{2NaCl + 2H_2SO_4} \longrightarrow 2NaHSO_4 + \underset{\text{Weaker acid}}{2HCl}$$

$$HCl + H_2SO_4 \not\longrightarrow Cl_2 + SO_2 + 2H_2O$$

- Since HCl is a very weak reducing agent, it can not reduce H_2SO_4 to SO_2 and hence HCl is not oxidized to Cl_2 .
  However, when the mixture contains bromide ion, the initially produced HBr being a strong reducing agent than HCl , it reduces H_2SO_4 to SO_2 and is itself oxidized to produce red vapour of Br_2 .
  The reaction takes place in following two steps:
  $2NaBr + 2H_2SO_4 \longrightarrow 2NaHSO_4 + 2HBr$
  $2HBr + H_2SO_4 \longrightarrow Br_2 + SO_2 + 2H_2O$

OR

i.
   a. Protium
   b. Tritium

ii. Carbon monoxide

iii. Because it is combustible in nature.

iv. (a), (c) and (d)

v. Carbon monoxide and hydrogen

32. (B) and(C) are CH_3CH_2CHO (propanal) and CH_3COCH_3 (propanone).

$$\underset{(B)}{CH_3CH_2CHO} + \underset{(C)}{CH_3COCH_3} \xleftarrow{Ozonolysis} \underset{(A)}{CH_3CH_2CH = \overset{CH_3}{\overset{|}{C}} - CH_3}$$

$$\underset{(A)}{CH_3CH_2CH = \overset{CH_3}{\overset{|}{C}} - CH_3} \xrightarrow{Hot\ KMnO_4} \underset{(D)}{CH_3CH_2COOH} + \underset{(C)}{CH_3 - \overset{CH_3}{\overset{|}{C}} = O}$$

OR

i. The product is

$$\overset{1}{C}H_3 - \underset{\underset{2-Methylbutane}{}}{\overset{2}{\underset{\underset{CH_3}{|}}{C}}H} - \overset{3}{C}H_2 - \overset{4}{C}H_3$$

The different alkenes which given the product on hydrogenation are given ahead:

$$CH_3 - \underset{\underset{2-Methylbut-1-ene}{}}{\underset{\underset{CH_3}{|}}{C}H} - CH - CH_2 \; CH_3 - \underset{\underset{2-Methylbut-2-ene}{}}{\underset{\underset{CH_3}{|}}{C}H} = CH - CH_2$$

$$CH_2 = \underset{\underset{2-Methylbut-1-ene}{}}{\underset{\underset{CH_3}{|}}{C}H} - CH - CH_2$$

ii. CH_3 group is an electron releasing group while -NO_2 group is an electron-withdrawing group. Therefore, the electron density will be more in toluene than in benzene and the electron density in m-dinitrobenzene will be less than in benzene. Therefore, the ease of nitration decreases in the order:
Toluene > benzene > m-dinitrobenzene.

33. i. $^{13}_{6}$C Atomic no. (Z) = 6 Mass no. (A) = 13
No. of protons (p) = 6 No. of neutrons (n) = 13 - 6 = 7

ii. $^{16}_{8}$O Atomic no. (Z) = 8 Mass no. (A) = 8
No. of protons (p) = 8 No. of neutrons (n) = 16 - 8 = 8

iii. $^{24}_{12}$Mg Atomic no. (Z) = 12 Mass no. (A) = 24
No. of protons (p) = 12 No. of neutrons (n) = 24- 12 = 12

iv. $^{56}_{26}$Fe Atomic no. (Z) = 26 Mass no. (A) = 56
No. of protons (p) = 26 No. of neutrons (n) = 56 - 26 = 30

v. $^{88}_{38}$Sr Atomic no. (Z) = 38 Mass no. (A) = 88
No. of protons (p) = 38 No. of neutrons (n) = 50

OR

10 % (w/w) solution of glucose means that 10 g of glucose is present in 100 g of solution or in 90 g of water.

i. Calculation of molality

Mass of glucose = 10 g

Mole of glucose = $\frac{10}{180}$ = 0.0556

(Molar mass of glucose = 180)

Mass of water = 90 g

$\therefore$ Molality = $\frac{\text{Moles of glucose}}{\text{Mass of water}} \times 1000$

= $\frac{0.0556}{90} \times 1000$ = 0.618 m.

ii. Calculation of molarity

moles of glucose = 0.0556

Volume of solutions = $\frac{\text{Mass}}{\text{Density}}$

= $\frac{100}{1.20}$ = 83.3 mL

Molarity = $\frac{\text{Moles of glucose}}{\text{Vol. of solution}} \times 1000$

= $\frac{0.0556}{83.3} \times 1000$ = 0.667 M

iii. Calculation of mole fraction of components

Moes of glucose = 0.0556

Moles of water = $\frac{90}{18}$ = 5.0

Total moles = 5.0 + 0.0556 = 5.0556

Mole fraction of glucose = $\frac{0.0556}{5.0556}$ = 0.011

Mole fraction of water = $\frac{5.0}{5.0556}$ = 0.989