Revision Unit 1

1) What is the percentage of carbon, by mass, in octane?

   Mass of carbon / total mass of octane

   (96/114) X 100 = 84.2%

2) What is the empirical formula for a compound containing 38.8% carbon, 16.2% hydrogen and 45.1% nitrogen?
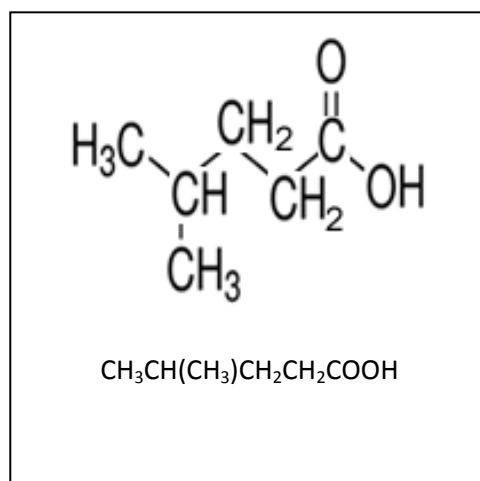 CH_5N

3) A compound was analysed and found to contain, 20.6% of oxygen, 15.5% carbon, 18.1% nitrogen and 45.8% chlorine, by mass. If its molar mass is 232.4 g/mol find its molecular formula
   $O_3C_3N_3Cl_3$

4) Draw the structural and semi-structural formulae of
   a) 2,3-dibromohex-3-ene

$CH_3CHBrCBrCHCH_2CH_3$
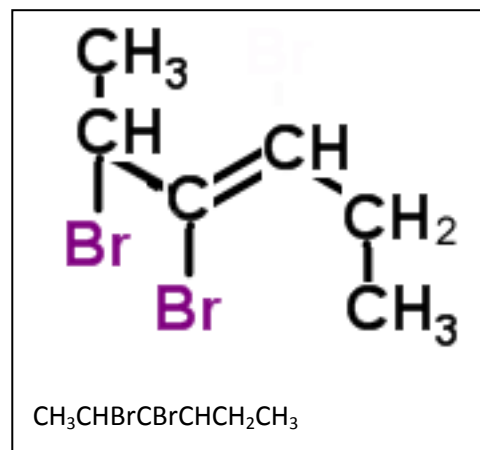
   b) 4-methylpentanoic acid

$CH_3CH(CH_3)CH_2CH_2COOH$

5) An atom "A" with atomic number 12 and an atom "B" with atomic number 17 react.
   a) What is the type of bond formed between them. Ionic
   b) What is the formula of the compound that is formed between A and B? AB_2
   c) Describe the properties of this compound.
      Brittle
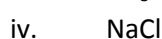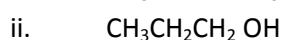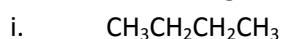   High melting temperature
      Conducts electricity in the molten state.
6) Complete the table below.

Molecular formula	Intra-molecular bonding	Inter –molecular bonding
CH_4	Polar covalent	Dispersion forces
CO_2	Polar covalent	Dispersion forces
Cl_2	Pure covalent	Dispersion forces
CH_3CH_2OH	Polar covalent	Dispersion forces + H-bonding

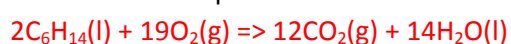7) Place the following in order of increasing melting temperature. Give a reason
   i. $CH_3CH_2CH_2CH_3$
   ii. $CH_3CH_2CH_2\ OH$
   iii. CH_3OH
   iv.   NaCl

   $CH_3CH_2CH_2CH_3$, CH_3OH, $CH_3CH_2CH_2\ OH$, NaCl ⟶ highest melting temperature
8) Write the formula for:
   a) sodium carbonate Na_2CO_3
   b) ammonium phosphate $(NH_4)_3PO_4$
   c) aluminium sulphate $Al_2(SO_4)_3$
9) Write balanced chemical equations for the following reactions.
   a) Combustion of liquid hexane
      $2C_6H_{14}(l) + 19O_2(g) => 12CO_2(g) + 14H_2O(l)$
   b) Aluminium metal reacts with oxygen gas
      $4Al(s) + 3O_2(g) => 2Al_2O_3(s)$
   c) Copper metal reacts with sulphuric acid to produce an ionic compound and hydrogen gas.
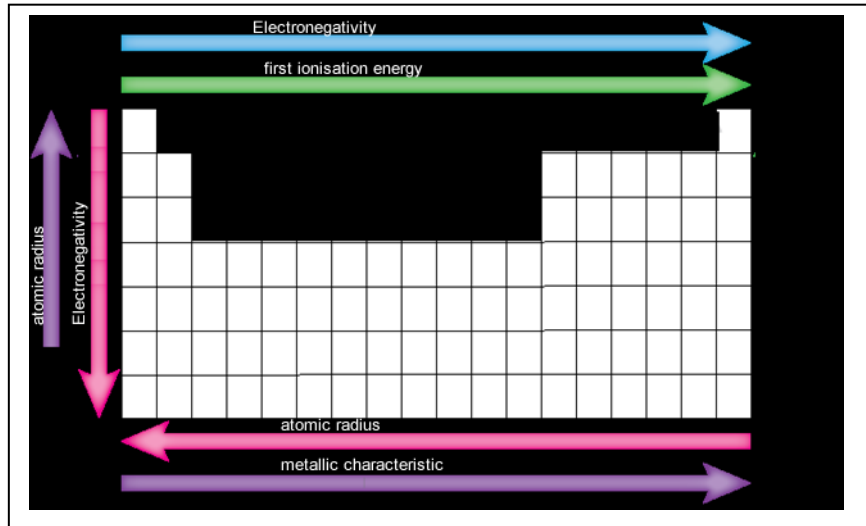 $Cu(s) + H_2SO_4(aq) => CuSO_4(aq) + H_2(g)$
10) What trends could be represented by the coloured arrows? Select the colour that best describes the following characteristics.
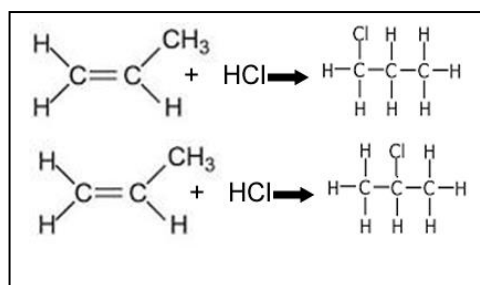   a) Electronegativity _____
    b) First ionisation energy _____
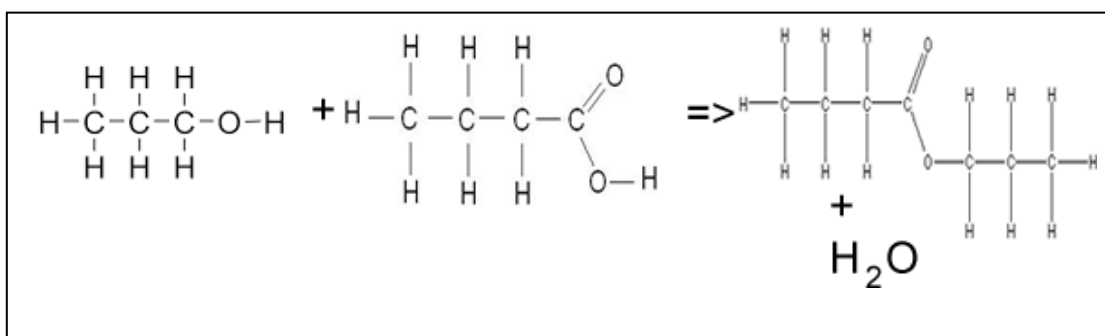   c) Atomic radius _____
    d) Metallic character _____
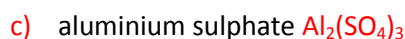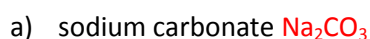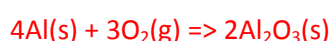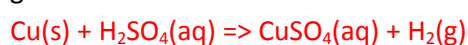
11) Using structural formulae write balanced chemical equations for:

    a.   The addition reaction between gaseous propene and HCl gas.

    b.   The condensation reaction between propanol and butanoic acid.

       -intra-molecular bonding in each sample.
       Pure covalent in both samples

       -inter-molecular bonding in each sample.
       Dispersion forces in both samples.

  b. Which has the highest melting temperature? Explain why
       Iodine because it is a bigger molecule than bromine, hence the dispersion forces are greater.