(b)   Calculate the mass of calcium metal which reacted with copper (II) nitrate
       solution. (Relative atomic mass of Ca = 40)   (2 marks)

(c)   The resulting mixture in (a) above was filtered and aqueous sodium hydroxide
       added to the filtrate dropwise until in excess. What observations were made?
                                                                             (1 mark)

(d)   (i)   Starting with calcium oxide, describe how a solid sample of calcium
              carbonate can be prepared.   (3 marks)

       (ii)   Name **one** use of calcium carbonate.   (1 mark)

5   (a)   Other than their location in the atom, name **two** other differences between an
            electron and a proton.   (2 marks)

     (b)   The table below gives the number of electrons, protons and neutrons in particles
            A, B, C, D, E, F and **G**.

Particle	Protons	Electrons	Neutrons
A	6	6	6
B	10	10	12
C	12	10	12
D	6	6	8
E	13	10	14
F	17	17	18
G	8	10	8

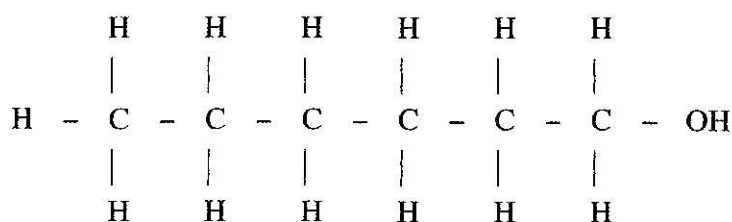   (i)   Which particle is likely to be a halogen?   (1 mark)

       (ii)   What is the mass number of **E**?   (1 mark)

       (iii) Write the formula of the compound formed when **E** combines with **G**.
                                                                             (1 mark)

       (iv)   Name the type of bond formed in (iii) above.
                                                                             (1 mark)

       (v)   How does the radii of **C** and **E** compare? Give a reason. (2 marks)

       (vi)   Draw a dot (.) and cross (x) diagram for the compound formed between
              A and **F**.   (1 mark)

       (vii) Why would particle **B** not react with particle **D**?   (1 mark)

6 (a) Study the flow chart below and answer the questions that follow.
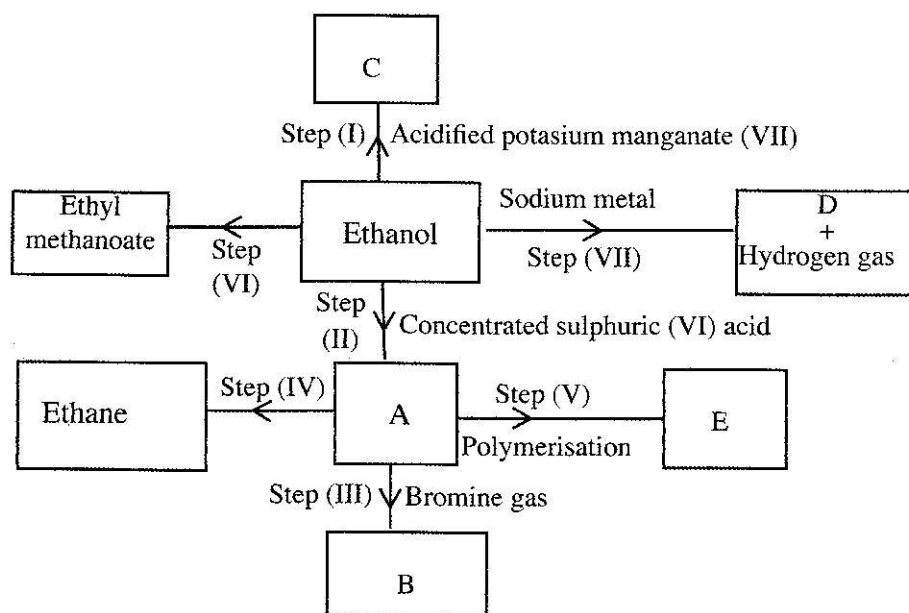
(i) I What observation will be made in Step I? (1 mark)

II Describe a chemical test that can be carried out to show the identity of compound **C**. (2 marks)

(ii) Give the names of the following: (2 marks)

I **E** ....

II Substance **D** ....

(iii) Give the formula of substance **B**. (1 mark)

(iv) Name the type of reaction that occurs in: (1 mark)

I Step (II) ....

II Step (IV) ....

(v) Give the reagent and conditions necessary for Step (VI). (2 marks)

Reagent: ....

Conditions ....

(b) (i) Name the following structure.

$$H - C - C - C - C - C - C - OH$$

with H atoms above and below each C (six carbons), each with H top and bottom:

H   H   H   H   H   H
| | | | | |
H – C – C – C – C – C – C – OH
| | | | | |
H   H   H   H   H   H

(1 mark)

....

(ii) Draw the structure of an isomer of pentene. (1 mark)

7 (a) What is meant by molar heat of combustion? (1 mark)

(b) State the Hess's Law. (1 mark)

(c) Use the following standard enthalpies of combustion of graphite, hydrogen and enthalpy of formation of propane.

ΔH^θ_C (Graphite) $= -393kJ\ mol^{-1}$

ΔH^θ_C ($H_2(g)$) $= -286kJ\ mol^{-1}$

ΔH^θ_f ($C_3H_8(g)$) $= -104kJ\ mol^{-1}$

(i) Write the equation for the formation of propane. (1 mark)

(ii) Draw an energy cycle diagram that links the heat of formation of propane with its heat of combustion and the heats of combustion of graphite and hydrogen. (3 marks)

(iii) Calculate the standard heat of combustion of propane. (2 marks)

(d) Other than the enthalpy of combustion, state **one** factor which should be considered when choosing a fuel. (1 mark)

(e) The molar enthalpies of neutralization for dilute hydrochloric acid and dilute nitric (V) acid are −57.2kJ/mol while that of ethanoic acid is −55.2kJ/mol. Explain this observation. (2 marks)