Answer all the questions in the spaces provided.

1. A form one teacher cut small pieces of sodium and performed different experiments. In each of the experiments below, state the observations and write an equation of the reaction. I. A piece of sodium metal is burnt in excess air.

Observation (1mk)

Equation (1mk)

II. Product in (I)above is added to water.

Observation (1mk)

Equation (1mk)

III. Heated sodium is lowered into a gas jar of chlorine.

Observation (1mk)

Equation (1mk)

IV. A small piece of sodium is put in cold water in a beaker and resulting solution is tested with litmus paper. Observation (1mk)

Equation (1mk)

b) Define the term ionization energy. (1mk)

c) Study the following ionization energy values and answer the questions that follow.

Ionization	Ionization Energy(kj/mole
$Na_{(g)} \rightarrow Na^{+}_{(g)} + e$	500
$Na^{+}_{(g} \rightarrow Na^{2+}_{(g)} + e$	4600
$Na^{2+}_{(g)} \rightarrow Na^{3+}_{(g)} + e$	6900
$Mg_{(g)} \rightarrow Mg^{+}_{(g)} + e$	740
$Mg^{+}_{(g)} \rightarrow Mg^{2+}_{(g)} + e$	4500
$Mg^{2+}_{(g)} \rightarrow Mg^{3+}_{(g)} + e$	7700
$Mg^{3+}_{(g)} \rightarrow Mg^{4+}_{(g)} + e$	10500

i) What do the values of energies of ionization suggest about the

I. first electron removed from a sodium atom. (1 ½ mk)

II. First two electrons removed from a magnesium atom.(1½mk)

ii) Calculate the energy change in the process $Mg_{(g)} \rightarrow Mg_{(g)}^{3+} + 3e$ (1mk)

2. a) Study the information in the table below and answer the questions that follow.

Number of Carbon atoms per molecule	Relative molecular mass of hydrocarbon
2	28
3	42
4	56

i) Write the general formula of the Hydrocarbons in the table (1mk)

ii) Predict the relative mass of the Hydrocarbon with 5 carbon atoms. (1mk)

iii) Determine the molecular formula of the Hydrocarbon in (ii) above and draw the structural

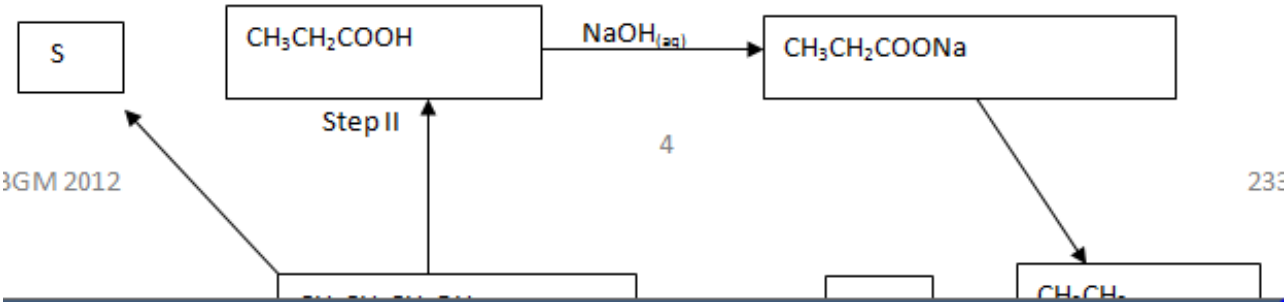
formula. Molecular formula (1mk)

_____ _____
_____ _____

Structural formula (1mk)

_____ _____
_____ _____
_____ _____
_____ _____

2 (b) The scheme below shows some reactions starting with Propanol. Study it and answer the questions that follow.



CH_3COOH

Drops of

Conc.H_2SO_4

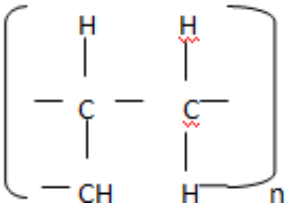
Heat

Step I

Limited Cl_2 and uv light.

Step IV

Step III



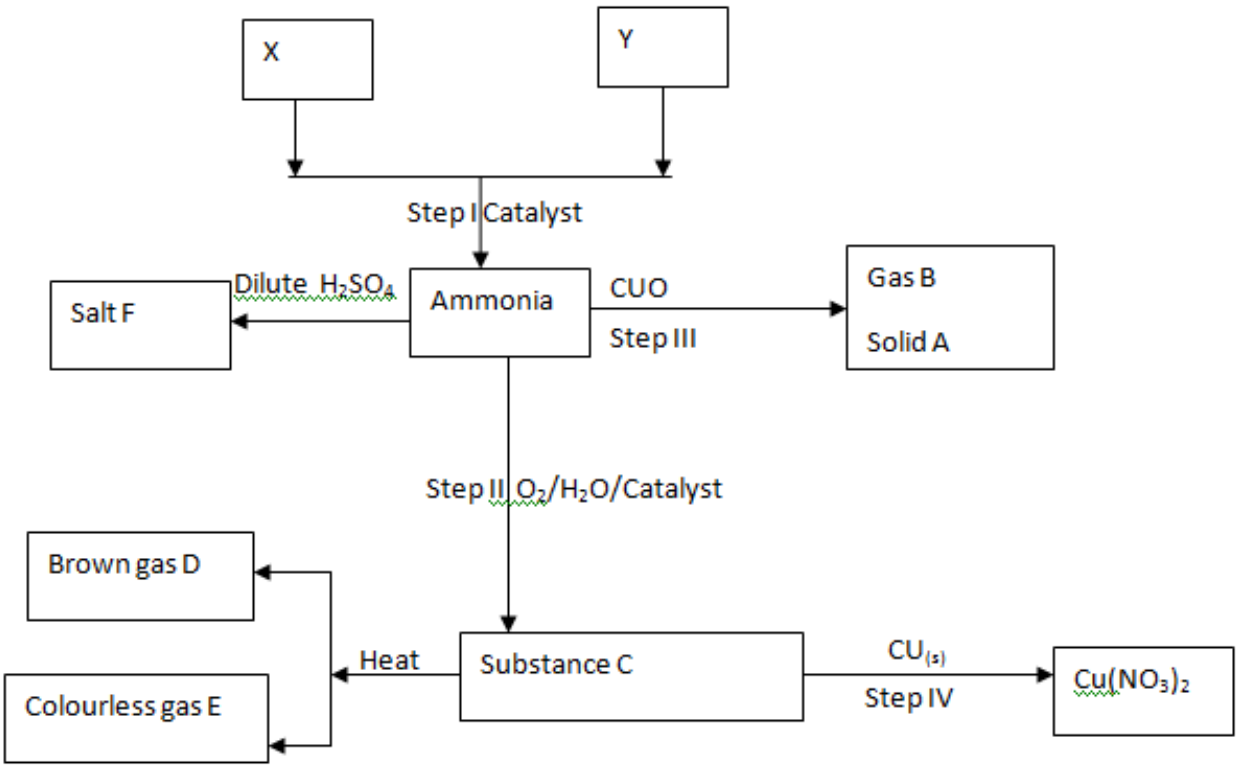
iii) Name the type of reaction, reagent and conditions in the reactions in step I and step IV.

Step	Type of reaction	Reagent	Condition
I			
IV			

iv) Name two chemical tests that can be used to differentiate propanol from propanoic acid.

Propanol	Propanoic acid
i)	
ii)	

3. Study the scheme below and answer the questions that follow.



a) Identify X and Y and give their sources.

X_____ _(1mk)
Source_____ ___
_____ ___
Y_____ _____
Source_____ ____
_____ ___(1mk)

b) Identify the catalyst used in step I (1mk)

c) Name the substances (2mks) A_____

B_____

C_____

D_____

d) Write chemical equations that shows

i) The formation of substance C (2mks)

ii) The reaction between substance C and copper metal. (2mks)

e) Describe a chemical test for gas E. (1mk)

f) i) State one economic use of substance (1mk)

ii) Name the optimum conditions for the production of ammonia gas. (1mk)

4. a) In a class experiment 5.0g of ethanol CH_3CH_2OH, were completely burnt and all the heat evolved was used to heat 500cm^3 of water from 20^0c to 80^0c. Given that the specific heat capacity of water =4.2kj/kg/k, density of water =1cm^{-3}, c=12, O=16.0 and H=1.0

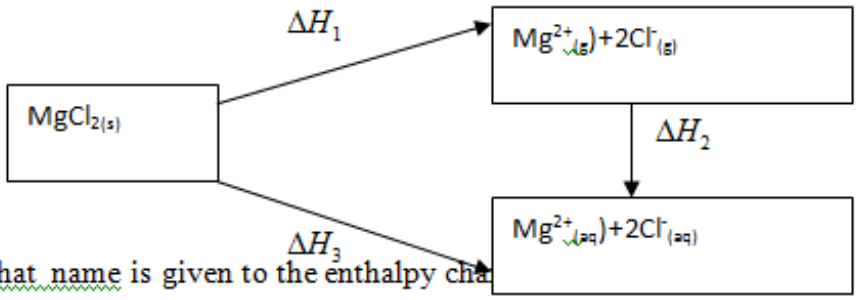
i) Write a balanced equation to show the reaction that takes place when ethanol burns. (1mk)

ii) Calculate the heat energy.

I. absorbed by the water. (1mk)

II. given out when one mole of ethanol was burned completely. (2mks)

b) Use the information in the energy cycle diagram below to answer the questions that follow.



i) What name is given to the enthalpy cha

I. ΔH_2 _____ (1mk)

II. ΔH_3 _____ (1mk)

ii) Given the ΔH_1 =2489kj and ΔH_2 =-2659kj, calculate the value of ΔH_3 .

_____ _____

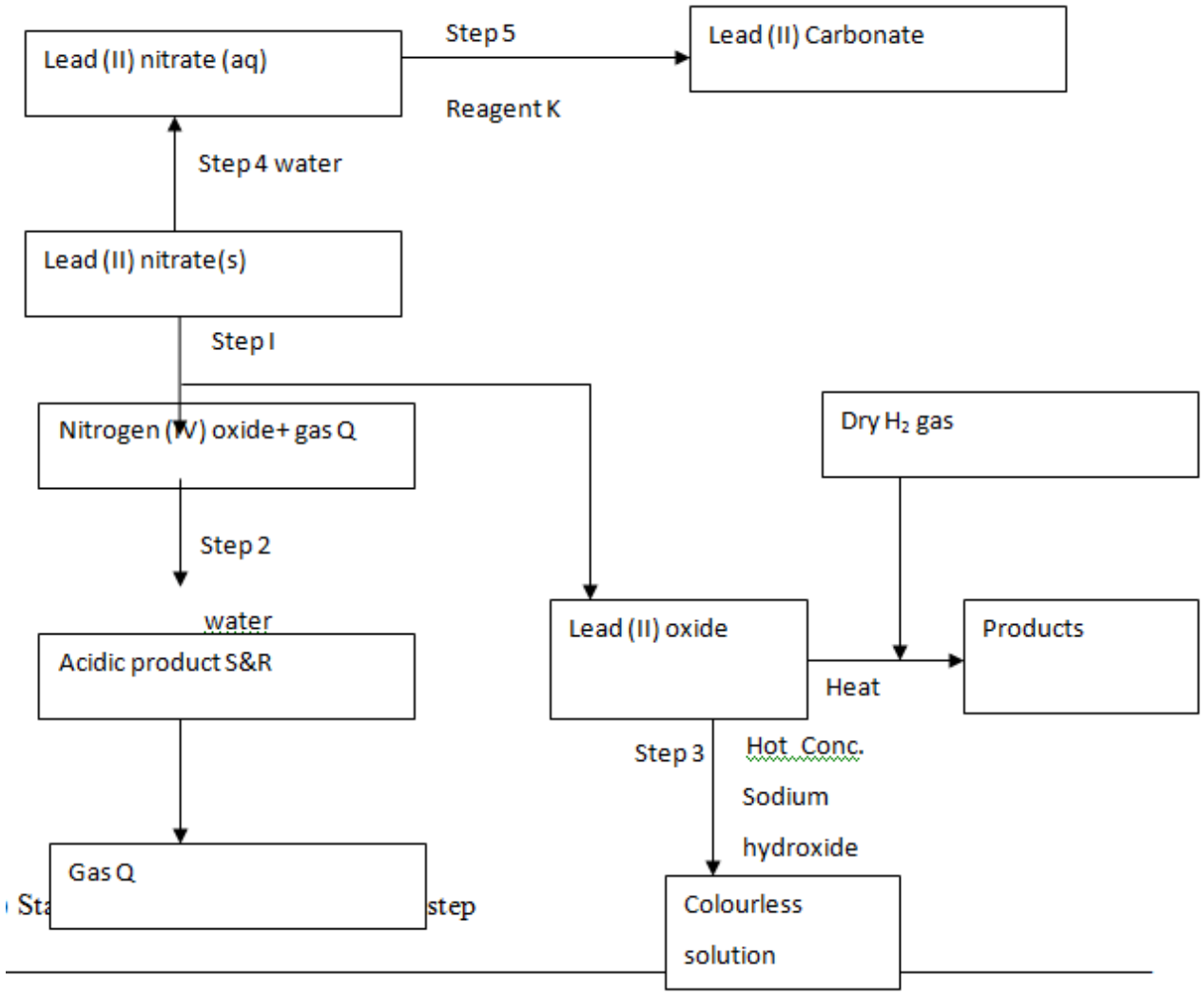
_____ _____

c) Using the information and answer in b (ii) above draw the energy level diagram for dissolving magnesium chloride. _____

_____ _____

_____

5. The diagram below shows some reactions starting with Lead(II) nitrate solid. Study it and answer the questions that follow.



_____ _(1mk)

ii) Identify

I. Reagent K. (1mk)

_____ _____
_____ _____

II. Gas Q

_____(1m

k)

III. Acidic products S and R. (2mks)

_____ _____
_____ _____

iii) Write

I. The formula of the complex ion formed in step 3. (1mk)

_____ _____

II. The equation for the reaction in step 5. (1mk)

b) i) The reaction between lead (II) nitrate and concentrated sulphuric acid starts but stops immediately. Explain with the help of an equation. (2mks)

ii) Name one reagent that can be reacted with concentrated sulphuric acid to produce nitric

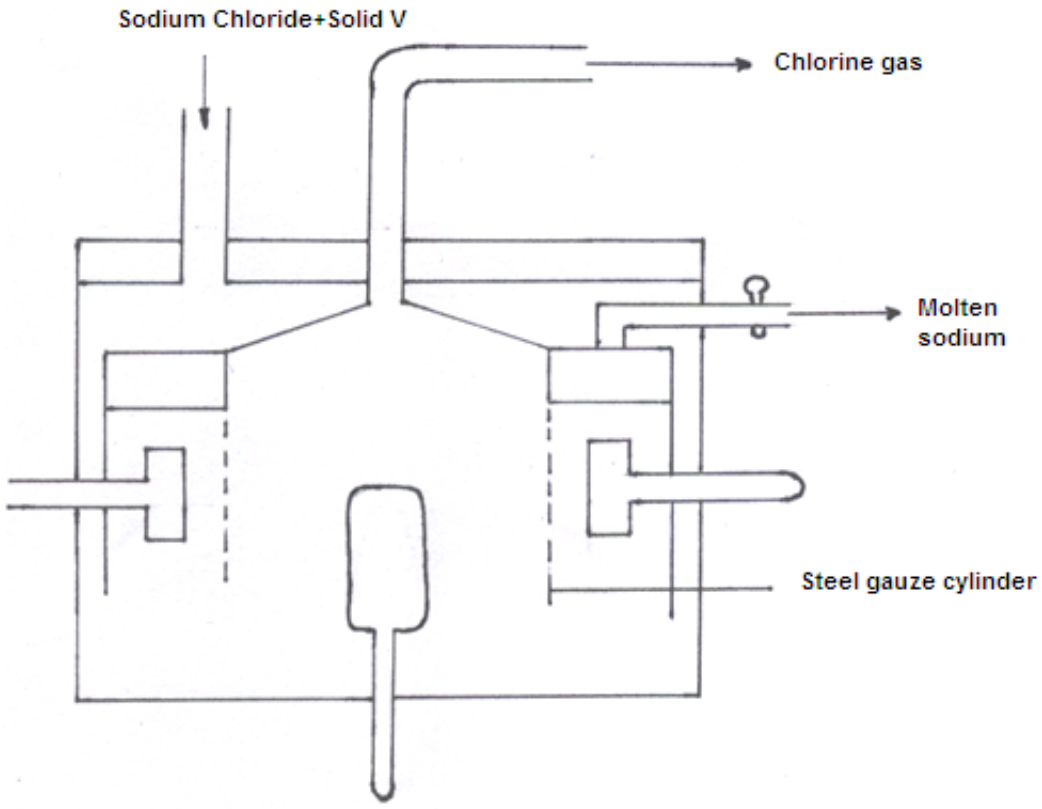
(v) acid. (1mk)

c) Write the formula of the ion formed in each of the reactions described below.

i) Excess ammonia is added to solution containing copper (II) ions. (1mk)

ii) Excess sodium hydroxide solution is added to a solution containing aluminium ions. (1mk)

6. The diagram below is the down cell for the extraction of sodium metal. Use it to answer the questions that follow.



a) In which state is sodium chloride and how is it maintained in the state. (2mks)

b) Name solid V and state its use.

Name_____(½ mk)
Use_____(½ mk)

c) Give a reason why the anode is made of graphite and not steel. (1mk)
_____
_____
_____

d) Write equations for reactions that take place at

Anode_____(½ mk)
Cathode_____(½ mk)

e) State the main impurity in the sodium collected and state how it is removed.

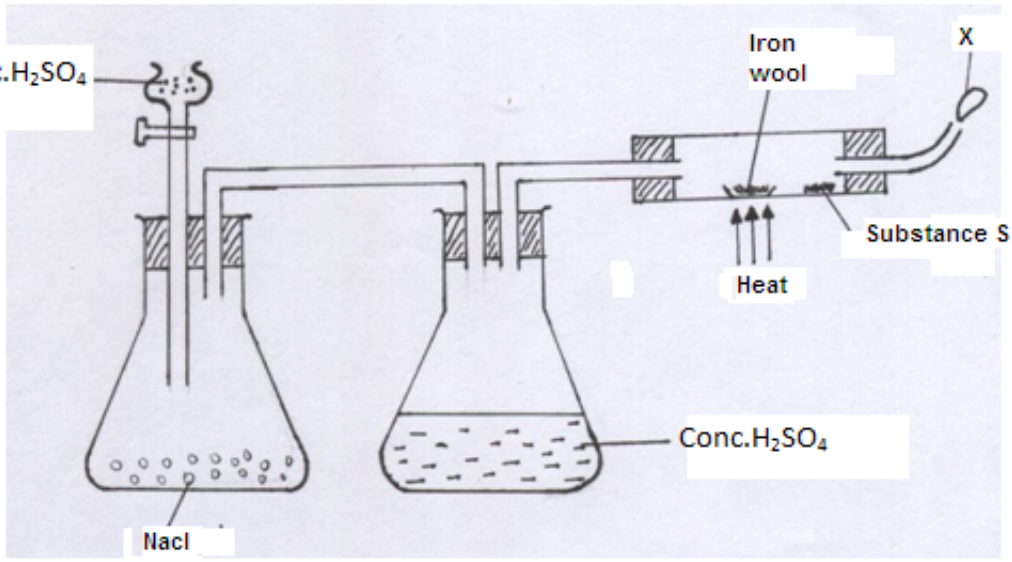
Impurity_____1mk)

How

removed_____
_____(1mk)

g) State any two uses of sodium metal. (2mks)
_____
_____

7. a) The set up below represents the arrangement used to prepare substance S by passing a stream of dry hydrogen chloride gas over heated iron wool.



i) Correct the mistake in the set up above (1mk)
_____
_____

ii) Give the chemical equations for the reaction.

I. that involves formation of substance

S_____ (1mk)

II. at point X_____ (1mk)
_____

iii) What precautions would you take when carrying out this experiment. Give reasons precaution
I_____(½ mk)
Reason_____ _____ (½ mk)

Precaution 2_____
_____ _____ (½ mk)

Reason_____
_____
_____(½ mk)

b) 300cm3 of hydrogen chloride gas were passed over 7.0g of heated iron wool until there was no further change. The reaction vessel then was allowed to cool to room temperature. i) Determine the mass of iron that remained at the end of the experiment.(Molar gas volume at r.t.p=24000cm3, Fe=56)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

ii) Determine the volume of 2M sulphuric acid that would be required to react with excess iron that remained in the above experiment, b(i) above.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____