FORM FOUR CLUSTER KCSE MODEL1

CHEMISTRY PAPER 1 QUESTIONS

1. The atomic number of an element X is 11 and that of element Y is 8

    a) Write down the possible formula of a compound formed between X and Y. (1mark)
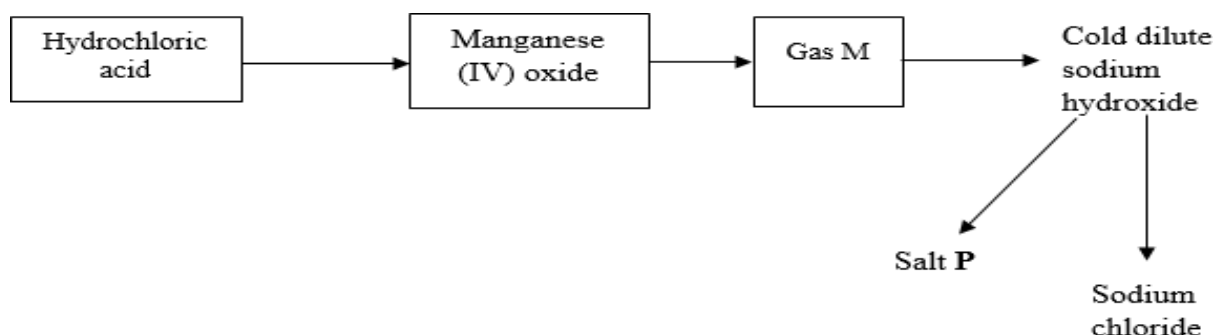   ....

    b) Draw a dot (•) and cross (X) diagram to show the bonding in the compound formed in (a) above. ....
    ....
    ....

2. Study the flow scheme below and answer the questions that follow.

    a) State the condition necessary for the gas M to be formed.

    ....
    ....

    b) What compounds form when hot concentrated sodium hydroxide is used instead of the cold dilute sodium hydroxide.
    ....
    ....
    ....
    c) Explain what happens to coloured petals when dropped into a solution of salt P in water.
    ....
    ....

3. When dry ammonia gas is passed over hot lead (II) oxide a grey residue remains in the combustion tube.

    a) Write the equation for the reaction which takes place inside the combustion tube. (1mark)
    ....
    ....

    b) If 30g of lead (II) oxide were reacted with excess ammonia, determine the volumes of ammonia gas used. (Pb= 207, O=16, molar gas volume at R.T.P =24dm3)
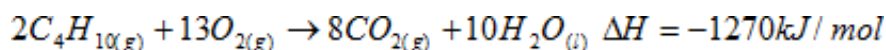
    ....
    ....
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4. a) Butane burns in oxygen according to the equation below:

$$2C_4H_{10(g)} + 13O_{2(g)} \rightarrow 8CO_{2(g)} + 10H_2O_{(l)} \quad \Delta H = -1270 kJ/mol$$
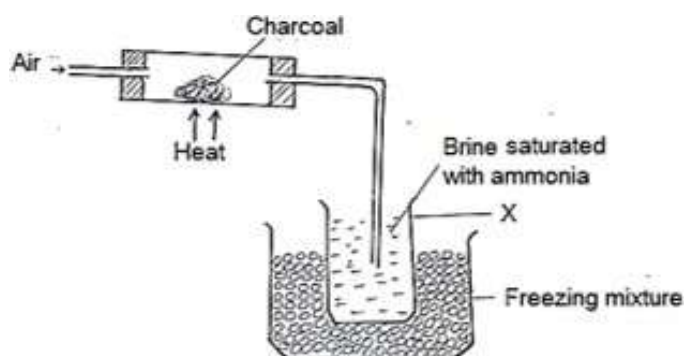
In the axis labelled below, draw an energy level diagram for the above reaction
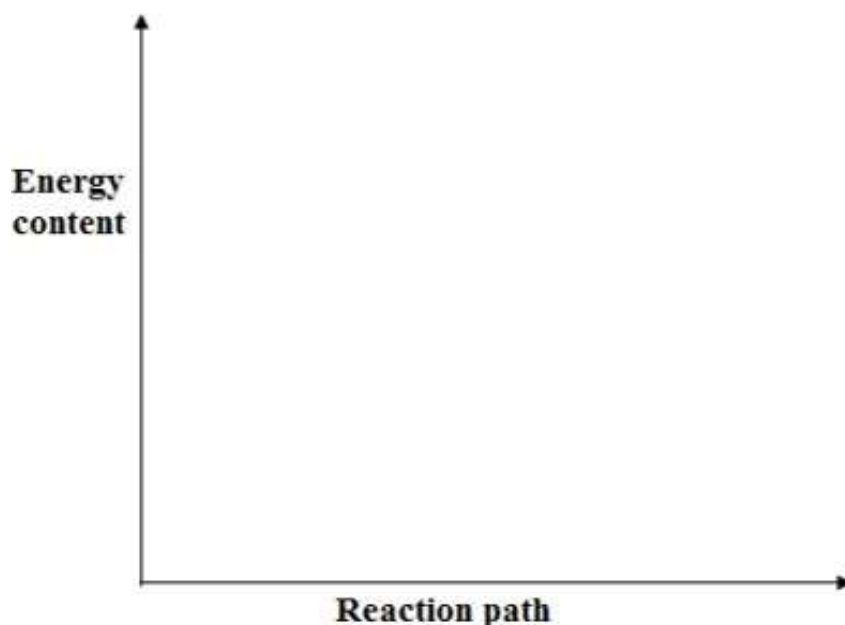
b) Draw the structure of two isomers of a compound with a molecular formula . 94 Br HC
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5. Study the diagram below and use it to answer the questions that follow.

i) Write chemical equations, for the reactions taking place in the apparatus labelled X.
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ii) Two salts are formed at the end of the reaction. State the method used to separate the two salts. ....
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6. During the extraction of sodium chloride in the Down's cell, calcium chloride is added

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) State why it's necessary to add calcium chloride.

....
....

b) Briefly explain how the calcium is separated from sodium in the down's cell.
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....

7. a) Name the following processes i) When anhydrous calcium chloride was left in an open beaker overnight a solution was formed.
....
....

ii) When sodium carbonate decahydrate crystals are left in an open beaker for some days it turned into powder. ....
....

b) Calculate the oxidation state of Sulphur in sodium thiosulphate ($Na_2S_2O_3$)
....
....

8. The data given below was obtained when a metal Q was completely burned in air. Letter Q is not the actual symbol of the element. (O =16; Q=56)
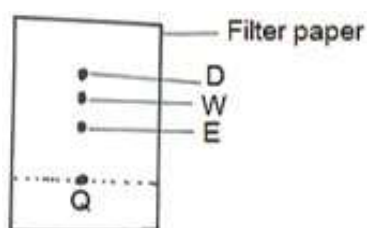
Mass of crucible +lid +metal =5.272g

Mass of empty crucible +lid =5.16g

Mass of empty crucible +lid+metal oxide = 5.320

Determine the empirical formular of the metal oxide.

9. The chromatogram below shows the constituents of a leaf extract after an organic solvent was used to separate them.

a) State one property that makes it possible for the separation to occur in this method.
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....

b) Describe how you can obtain a pure sample of pigment D.

....
....
....
....

10. he grid below represents part of the periodic table. Study it and answer the questions that follow. (The letters are not the actual symbols of the elements).

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a) Which letter represents the element that is least reactive?

....
....

b) What type of bond is formed when B and E react? Explain your answer.

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c) What name is given to the group of elements to which C and F belongs.

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11. The scheme below shows the reactions of propanol. Study it and answer the questions that follow.
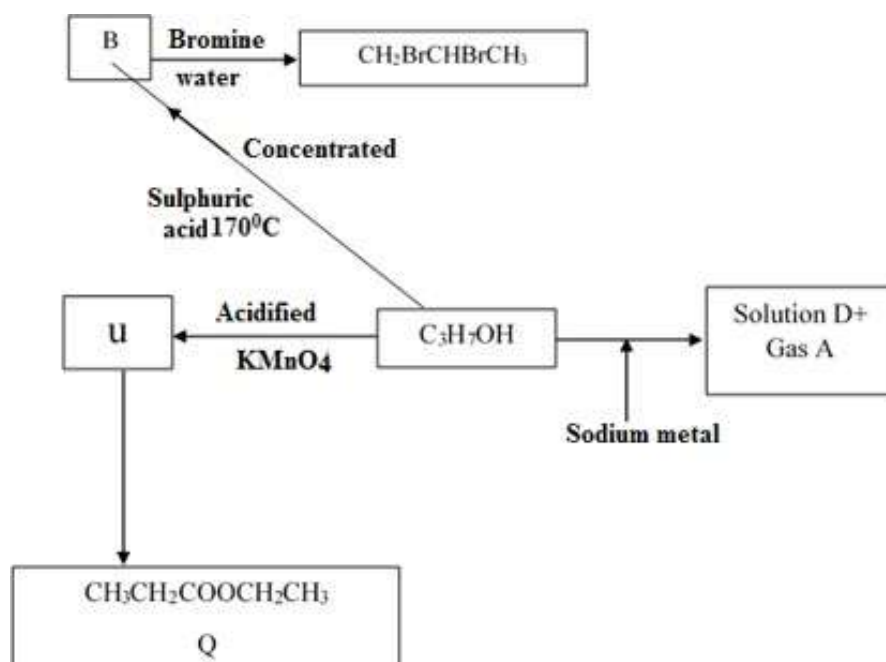
i) What reagent and condition is required to convert substance U to substance Q.

Reagent...

Condition...

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ii) Name solution D and gas A.

Solution D…………………………………………

Gas A……………………………………………

iii) Name the type of reaction which occurs to convert substance B to CH2Br CHBr CH3

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……………………………………………………………………………………………

12. Bismuth chloride undergoes hydrolysis in water resulting in the equilibrium below.

$$BiCl_{3\,(aq)} + H_2O_{(l)} \rightleftharpoons BiOCl_{(s)} + 2HCl_{(aq)}$$
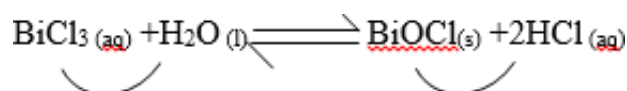
a) Giving a reason, state what would be observed if concentrated hydrochloric acid is added dropwise to a solution of Bismuth chloride.
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b) What is meant by the term dynamic equilibrium?

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13. During the electrolysis of aqueous copper (II) sulphate using copper electrodes a current of 0.3A was passed through the cell for 6 hours. a) Write ionic equation for the reaction that took place at the cathode.

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……………………………………………………………………………………………

b) Determine the change in mass of the anode which occurred as a result of the electrolysis. (IF=96500; Cu =63.5)

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14. The diagram below shows a set-up of apparatus used to prepare oxygen gas and pass it over a burning candle. The experiment was allowed to run for several minutes.

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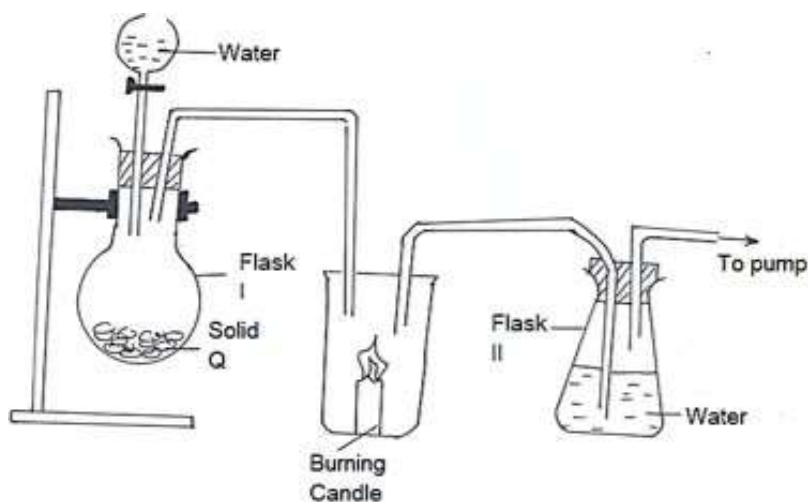
i) Identify solid Q.

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ii) The PH of the solution in flask II was found to be less than 7. Explain

....
....

iii) Write the equation for the reaction that forms oxygen in the step-up.

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15. When 2.0g of zinc powder were added to 75cm3 of 0.15M copper (II) chloride initially at 230C, the temperature of the mixture rose to 350C. Calculate the molar enthalpy of displacement of copper (II) ions from the above information. (Cu =64, Zn=65, Cl=35.5, assume density of solution 1.0g/cm3, specific heat =4.2j/g/0C.)

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....
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16. Element L has atomic number 12 while Aluminium has 13. Both elements conduct an electric current.

a) Explain why the electrical conductivity of L is less than that of Aluminium.
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....

b) Other than electrical conductivity state one factor that makes Aluminium a better material for the overhead cables in electricity transmission.
....
....

c) Aluminium oxide can react with both hydrochloric acid and sodium hydroxide. What name is given to such an oxide? Give another example.
....
....

17. The following table shows the PH values of M N O and P.

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Solution	M	N	O	P
PH	3	7	9	13

i) Which solution is likely to be that of iron (II) Chloride.

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....

ii) Which solution has the highest hydroxide ions concentration? Explain

....
....

18. The set-up below was used by a student to pass dry ammonia gas over heated zinc oxide.
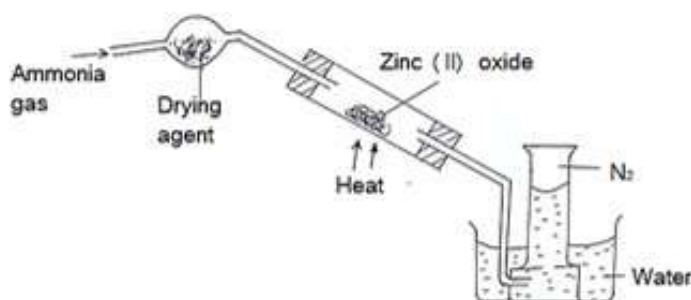
a) Name a suitable drying agent for the ammonia gas.

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b) State the observations made in the combustion tube.

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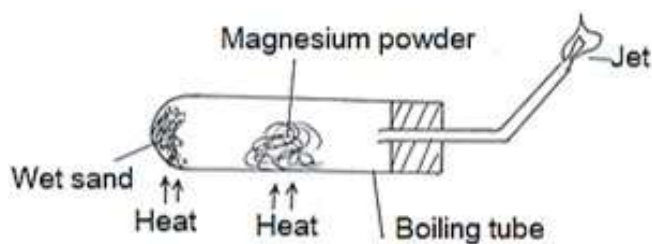c) Explain the observations stated in 18 (b) above.

19. 2.63g of a solution of sodium chloride at 300C was reacted with excess silver nitrate solution. After filtering, washing and drying, 2.1525g of silver chloride was obtained. Determine the solubility of sodium chloride at 300c (Na =23, Cl= 35.5; Ag =108).
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20. a) Fossil fuels are commonly used as sources of energy. Hydrogen gas is also a source of energy. State and explain why hydrogen is a more attractive fuel than the fossil fuels.

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21. Study the diagram below and answer the questions that follow.

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State the observations that are made inside the boiling tube as the experiment progresses.
....
....

22. The flow chart below shows how sulphuric (VI) acid is manufactured in a large scale. Study it and answer the questions that follow.
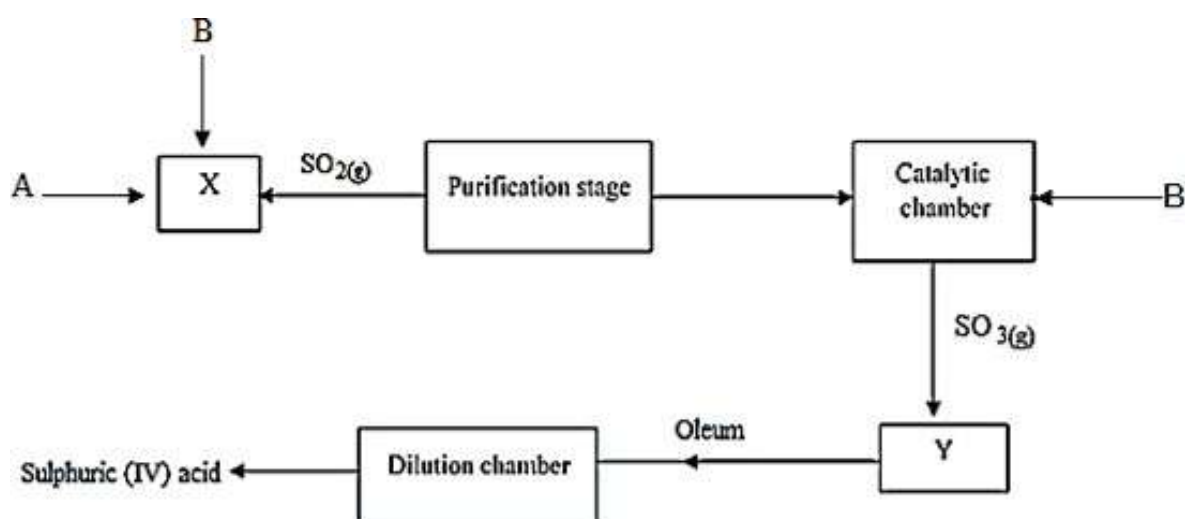
a) Name the raw materials A and B.

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....

b) Giving a reason, name the catalyst that is used in this process.
....
....
....
....

c) Why is it important to remove impurities at the purification chamber?
....
....

23. . Below is a set-up of apparatus used to determine the proportion of air used when copper powder is heated in a fixed volume of air? The air was passed slowly and repeatedly from syringe G over hot excess copper powder to syringe M.

Study the set-up answer the questions that follow.

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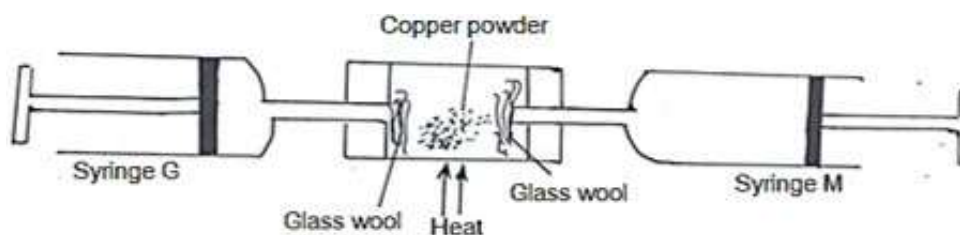
a) What is the purpose of glass wool?

....
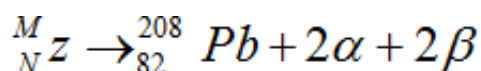...

b) If copper powder is replaced by magnesium powder the percentage of the part of air used is higher than expected. Explain
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....
....
....

24. i) Complete the following nuclear equation by finding the values for M and N.

$$^{M}_{N}Z \rightarrow ^{208}_{82}Pb + 2\alpha + 2\beta$$

M----------------

N----------------

ii) Element Z has initial mass of 80g. After 5years the remaining mass is 5g. What is the half-life if Z? ....
....
....

25. 150cm3 of unknown gas Q diffuses through a hole in 8 seconds 160cm3 of oxygen diffuses through the same hole in 4 seconds.

Determine the molecular mass of the unknown gas Q. (O= 16).

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26. . During the extraction of zinc metal, the ore is crushed into powder and mixed with water and oil. Air is also blown through the mixture.

i) What name is given to the process described above?
....
....

ii) The hull of a ship is made using Iron and blocks of zinc to prevent rusting. How does zinc prevent the rusting of iron?
....
....

iii) Explain the process named in 26(a) above occurs.

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....
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27. Study the energy level diagram below and answer the questions that follow

$Mg^{2+}{}_{(g)} + 2Cl^-{}_{(g)}$

P

Q

Energy (kJ)

$Mg^{2+}{}_{(g)} + 2Cl^-{}_{(aq)}$

$MgCl_2$

M

N

$Mg^{2+}{}_{(aq)} + 2Cl^{-1}{}_{(aq)}$

Reaction path
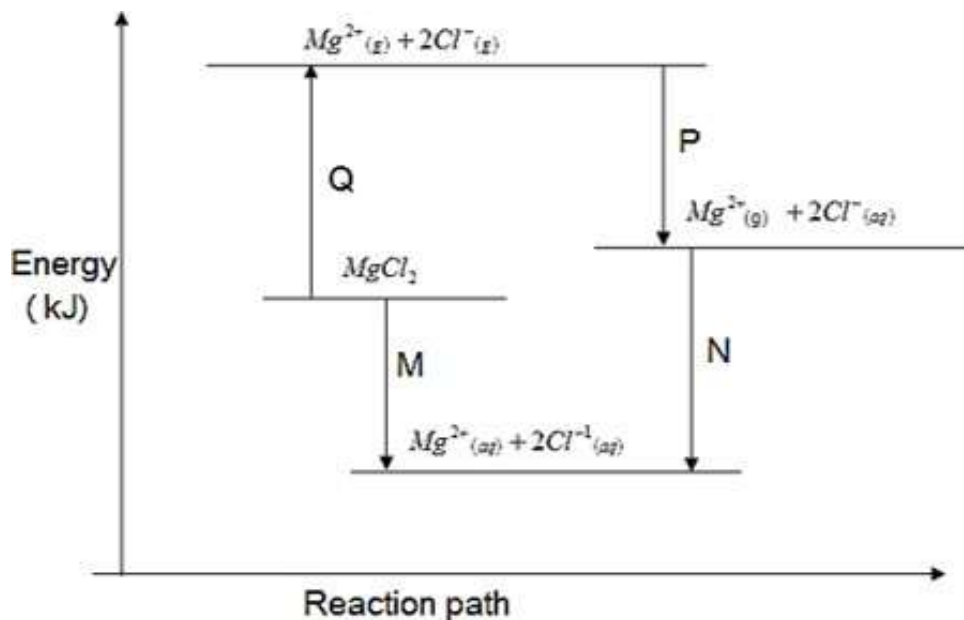
Suppose the lattice energy for magnesium chloride is -2493Kj/mol; hydration energy for Mg^{2+} and Cl⁻ ions is -1891Kj/mol and -840kJmol- respectively. i) Determine the heat of solution for magnesium chloride.

....
....
....
....

ii) Which letters M, N, P and Q represents hydration energy for magnesium chloride?

....
....
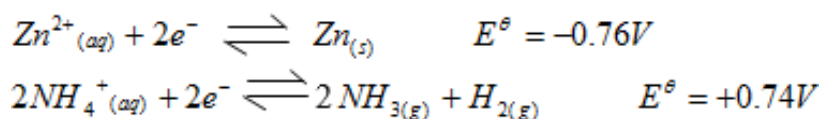..

28. . A dry cell is used as a source of electric current.

a) State the role of manganese (IV) oxide mixed with carbon

....

b) Given the following electrode potentials, calculate the e.m.f of a dry cell.

$$Zn^{2+}{}_{(aq)} + 2e^- \rightleftharpoons Zn_{(s)} \qquad E^\theta = -0.76V$$
$$2NH_4^+{}_{(aq)} + 2e^- \rightleftharpoons 2NH_{3(g)} + H_{2(g)} \qquad E^\theta = +0.74V$$

....
....

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c) Write down the cell representation (cell notation) for the reaction in (b) above.

....
....

29. The table below gives some properties of three substances A, B and C. Study it and answer the questions that follow.

Substance	Melting point ^0C	Solubility in water	Electrical conductivity	
			Solid	molten.
A	1062	Insoluble	Conducts	Conduct
B	113	Insoluble	Does not	Does not
C	402	Sparingly soluble	Does not	Conducts

a) Suggest the type of structure in A and C.

A………………………………………………………..

C…………………………………………………………..

b) Explain why a substance conducts electric current when in molten state and not in solid state.
....
....
....

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