FORM 4 CHEM LUNCH HOUR   12/2/20
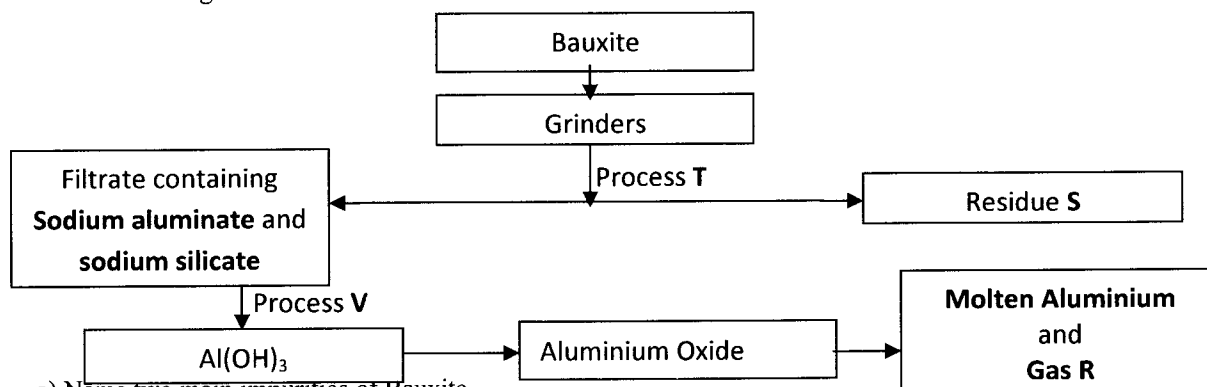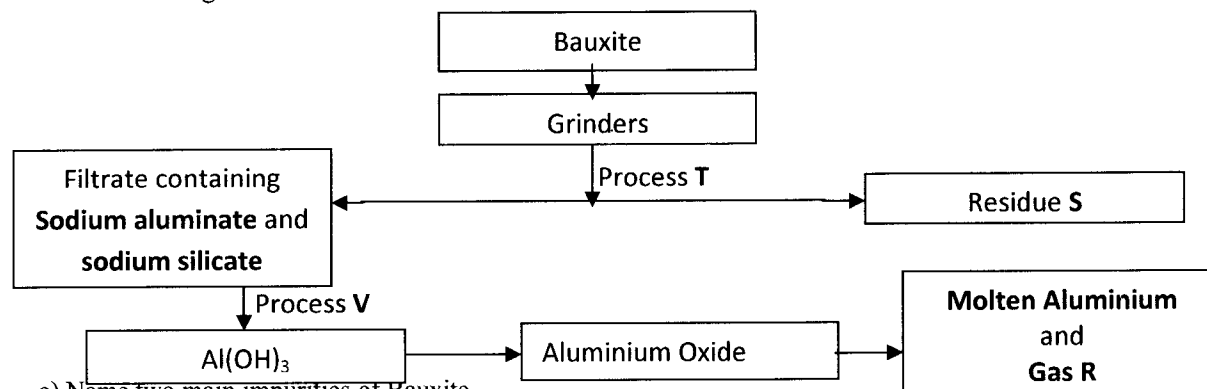
1. The following flow chart is an illustration of the extraction of aluminium from an ores.

```
                    ┌─────────────────┐
                    │     Bauxite     │
                    └─────────────────┘
                             │
                    ┌─────────────────┐
                    │    Grinders     │
                    └─────────────────┘
                             │ Process T
┌──────────────────────┐                    ┌─────────────────┐
│ Filtrate containing  │ ◄──────────────────►│    Residue S    │
│ Sodium aluminate and │                    └─────────────────┘
│   sodium silicate    │
└──────────────────────┘
             │ Process V                      ┌─────────────────┐
    ┌──────────────┐     ┌──────────────────┐ │ Molten Aluminium│
    │   Al(OH)₃    │ ──► │ Aluminium Oxide  │►│      and        │
    └──────────────┘     └──────────────────┘ │     Gas R       │
                                              └─────────────────┘
```

a) Name two main impurities of Bauxite.

b) Bauxite is ground to powder and pre-heated to temperatures of about 160°C. The resultant powdered ore is then subjected to process **T**. Describe the process **T**.   (2mks)

c) The melting point of aluminium oxide is very high. Explain what is done to make the process cost effective.
d) In the electrolysis stage, the graphite electrode used at the anode is periodically replaced. Explain why it is necessary to regularly replace the graphite anode.   (1mk)

e) Write down the ionic half equations at the electrodes

f) Name
I. Residue **S**..   (1mk)

II. Gas **R**...   (1mk)

1.Given that $P=27.5L-15\sqrt{L}$, find L when P=110

2. Two variables x and y are connected by an equation of the form $y=ax^n$ where a and n are constants. If y=80 when x=2, and y=52 when x=3. Find the values of a and n to 2sf

3. ABC is an isosceles triangle with AB=AC and its perimeter is 64cm. the latitude from A to BC is 24cm. find the lengths of AC and BC

1. A circle passes through the points A, B and C, with AB as a diameter of the circle. If the diameter is 20cm longer than the chord BC and chord AC =$20\sqrt{3}$cm long. Calculate angle BAC

2. A number is chosen at random from the numbers 2, 3, 4,…………, 30. Find the probability that it is either a multiple of 3 or a factor of 20.

3. A quantity f varies partly as t and partly as the square root of t. when t=4, f=22 and when t=9 and f=42. Write the equation connecting f and t

1. Solve for x and y in the questions given by:
   $5^x \times 5^{2y} = 25$ and $3^{2x} \times 3^y = \sqrt[3]{81}$
2. Solve for x in $(\log x)2 = \frac{\log x^5 + 3}{2}$
3. Solve for x in; $3 - log_{10}x^2 = \left(\frac{1}{logx^{10}}\right)^2$

NYABURURU GIRLS FORM 4 LUNCH HOUR 3/02/2020

The transformation T and S are defined as follows:

$\qquad$ T = reflection on the line y = x

$\qquad$ S = positive quarter turn about the origin

The points A (3, 7), B (3, 4) and C(-1, 4) are the vertices of triangle ABC whose image under T is triangle $A^1B^1C^1$

a) On the grid provided, draw triangle ABC and its image $A^1B^1C^1$ under transformation T. (3 marks)

b) State the coordinates of $A^1B^1C^1$ (1 mark)

c) Draw triangle $A^{11}B^{11}C^{11}$ the image of $A^1B^1C^1$ under transformation S. (2 marks)

d) State the coordinates of $A^{11}B^{11}C^{11}$ (1 mark)

e) Find a single matrix transformation that maps ABC onto $A^{11}B^{11}C^{11}$ (3 marks)

NYABURURU GIRLS FORM 4 LUNCH HOUR 4/02/2020 .

The table below shoes the marks scored by forty form 4 students in a mathematical test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	4	5	7	10	6	3	2	1

a) Using an assumed mean score of 55, calculate the mean of the data. (3marks)

b)Calculate the lower quartile. (2marks)

NYABURURU GIRLS FORM 4 LUNCH HOUR 6/02/2020 .

A triangle whose area is 6.5cm² is mapped onto a triangle whose area is 13cm² by a matrix $\begin{pmatrix} x+4 & 6 \\ 5 & x \end{pmatrix}$.Find the possible values of χ. (4 marks)

Triangle A'B'C' is the image of triangle ABC under a transformation matrix $T = \begin{pmatrix} 1 & 3 \\ 2 & 2 \end{pmatrix}$

If the area of triangle A'B'C'D' is $25.6cm^2$, find the area of the object. (3 marks)

F41. (a) State Graham's law of diffusion

(b) $30cm^3$ of hydrogen chloride gas diffuses through a porous pot in 20seconds. How long would it take $42cm^3$ of sulphur (IV) oxide gas to diffuse through the same pot under the same conditions   (H =1   Cl = 35.5   S = 32   O =16)
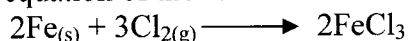
2. a) State **Boyles law**

 b) Sketch a graph that represents Charles' law

 c) A gas occupied a volume of $250cm^3$ at -23°C and 1 atmosphere. Determine its volume at 127°C when pressure is kept constant.

3. When excess dilute hydrochloric acid was added to sodium sulphite, $960cm^3$ of sulphur (IV) Oxide gas was produced. Calculate the mass of sodium sulphate that was used.
          (Molar gas volume = $24000cm^3$ and Molar mass of sulphite = 126g)
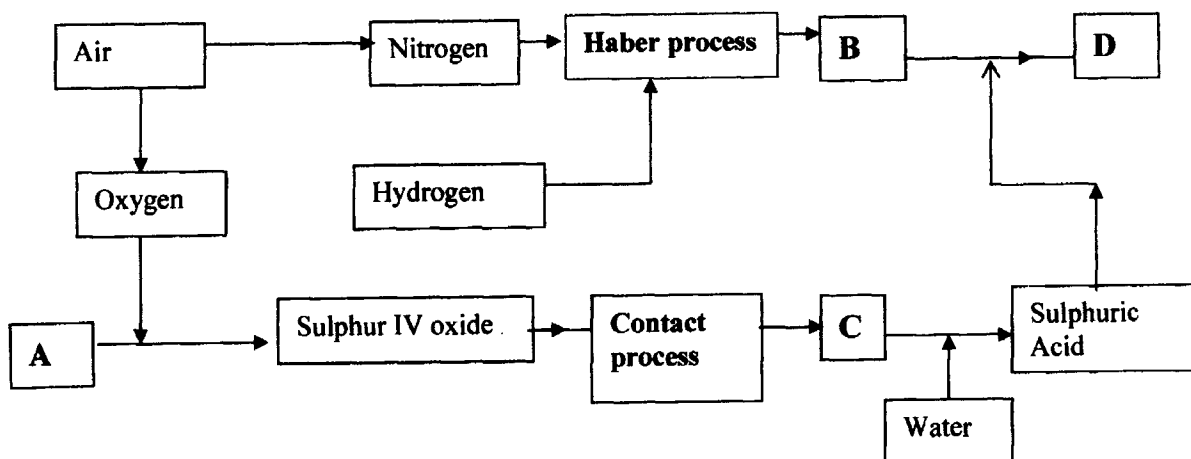
4. The equation of the formation of iron (III) chloride is
          $2Fe_{(s)} + 3Cl_{2(g)} \longrightarrow 2FeCl_3$
 Calculate the volume of chlorine which will react with iron to form 0.5g of Iron (III) chloride.
          (Fe = 56   Cl=35.5). Molar gas volume at 298K = $24dm^3$)

5. The flow chart below illustrates two industrial processes, **Haber** process and the **Contact** process:

(a) (i) Give the name of the process by which air is seperated into oxygen and nitrogen
          (ii) Apart from oxygen and nitrogen gases produced from process **(a)(i)** Name
                one other gas produced
 (b) Name the substances represented by the letters **A, B, C** and **E**
 (c) Name the catalysts used in:
                (i) Haber Process
                (ii) Contact Process
 (d) Explain the role of the catalysts in both the Haber and the Contact processes
 (e) Write a chemical equation for the formation of compound **B**
 (f) Calculate the percentage by mass of the nitrogen present in compound **D**
 (g) Give **one** major use of compound **E**

6. a) Define the term solubility of a substance.

b) The table below shows the solubilities of two salts **L** and **M** at different temperatures.

Temperature (^{o}C)	Type of salt	10	20	30	40	50
Solubility g/100g of water	L	11.0	14.0	20.1	28.0	36.0
	M	15.0	17.0	19.0	21.2	25.0

(i) Name the method that can be used to separate the two salts.

(ii) Plot on the same axes a graph of solubilities of **L** and **M** against temperature

(iii) From the graph, determine:

      I. The temperatures at which solubilities are equal

      II. The solubility at the temperature mentioned above

(iv) If the relative formula mass of **M** is 132, determine the concentration of

      M in moles per litre in (**iii**) II above.

      v) A solution contains 38g of **L** and 22g of **M** at 50°C. Calculate the total mass of crystals obtained in cooling this solution to 30°C.

7. a) Define:

      (i) A saturated solution.

      (ii) Solubility of a solute.

      b) In an experiment to determine solubility of sodium chloride, 10.0 cm^3 of a saturated solution of sodium chloride weighing 10.70g were placed in a volumetric flask and diluted to a total of 500 cm^3. 25.0 cm^3 of the diluted solution of sodium chloride reacted completely with 24.0 cm^3 of 0.1M silver nitrate solution. The equation for the reaction is

$$AgNO_3{(aq)} + NaCl{(aq)} \longrightarrow AgCl{(s)} + NaNO_3{(aq)}$$

      I. Calculate;

      (i) Moles of silver nitrate in 24.0 cm^3 of solution.

      (ii) Moles of NaCl in 25.0 cm^3 of solution.

      (iii) Moles of NaCl in 500 cm^3 of solution.

      (iv) Mass of NaCl in 10.0 cm^3 of saturated sodium chloride (Na = 23, Cl = 35.5)

      (v) Mass of water in 10.0cm^3 of saturated solution.

      (vi) The solubility of NaCl in g/100g of waters.

8. Describe how you would prepare a dry sample of crystals of potassium sulphate starting with 100cm^3 of 1M sulphuric (VI) acid.

9. The table shows solubility of potassium chlorate **V**

| Temp (^{o}C)	45°C	80°
Solubility	39	63

      (a) Calculate the mass of solute and solvent in 90g of the saturated solution of the salt at 45°C

      (b) A solution of the salt in 100g water contains 63g at 95°C. At what temperature will the solution start forming crystals when cooled

10. Two samples of hard water **C** and **D** were boiled. When tested with drops of soap, sample **D** formed lather easily while **C** did not:-

      (a) Name the possible salt that caused hardness in sample **D**

      (b) Explain how distillation can remove hardness in sample **C**

      (c) Give **one** advantage of hard water
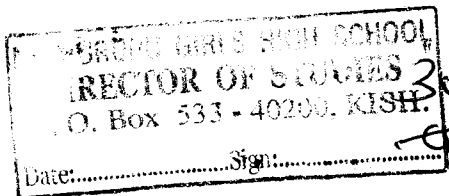
1 (A) You are provided with:

Solution **Q1**, acidified potassium manganate (VII)

Solution **Q2** made by dissolving 19.6g of $FeSO_4.(NH_4)_2 SO_4.6H_2O$ in $200cm^3$ of water and the solution diluted to $250cm^3$.
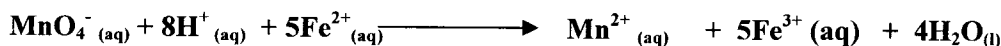
You are required to determine the concentration of solution **Q1** in moles per litre.

PROCEDURE

Fill the burette with solution **Q1**. Using clean pipette filler put $25cm^3$ of solution **Q2** into a clean dry 250ml conical flask. Titrate solution **Q2** with solution **Q1** from the burette until the permanent pink colour appears. Repeat the experiment two more times and record your results in the table below.

Titration	I	II	III
Final burette reading(cm^3)			
Initial burette reading(cm^3)	0.0	17.4	20.0
Volume of solution **Q1** used(cm^3)	17.4		

(a) Complete the table above (2mks)

(b) Determine the average volume of solution **Q1** used (1mk)

(c) Determine the concentration of **Q2** in moles per litre (K=39, Mn=55, O=16, S=32, N=14, H=1)(2mks)

(d) Determine the number of moles of **Q2** used (2mks)

(e) Given the following ionic equation, determine the number of moles of **Q1** used (2mks)

$$MnO_4^-{}_{(aq)} + 8H^+{}_{(aq)} + 5Fe^{2+}{}_{(aq)} \longrightarrow Mn^{2+}{}_{(aq)} + 5Fe^{3+} (aq) + 4H_2O_{(l)}$$
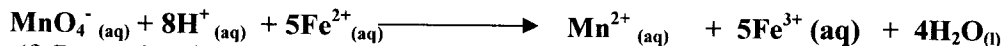
(f) Determine the concentration of **Q1** in moles per litre (2mks)

CHEM FORM 4 LUNCH HOUR   26/2/20

1. a) Define half-life   (1mk)

b) If 1g of Caesium – 137 decays to $^1/_{32}$ in 100 days. What is the half-life of Caesium- 137?

2.Define an acid.   (1mk)
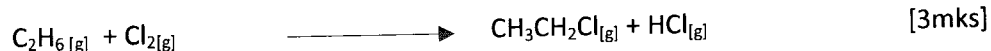
b) Given the equation below;

$$RNH_2 + H_2O \rightleftharpoons RNH_3^+ + OH^-$$

Identify the substance that acts as an acid in the backward reaction.   (1mks)

3.   Given the following bond energies in KJmole^{-1}

Bond	Energy [KJmole^{-1}]
C –C	348
C – H	414
Cl -Cl	243
C -Cl	432
H – Cl	340

[a]   Determine the enthalpy charge in the following reaction

$$C_2H_{6\,[g]} + Cl_{2[g]} \longrightarrow CH_3CH_2Cl_{[g]} + HCl_{[g]}$$ [3mks]
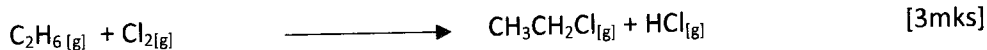
[b]   state whether the reaction was exothermic or endothermic

1. Study the flow chart below and answer the questions that follow

Brown gas **B**

SOLID **A** —— Heat —————⟨ Solid **K**   Yellow when hot / White when cold —— Dilute $HNO_{3(aq)}$ ——▶ Colourless solution **M**

Colourless gas **C**
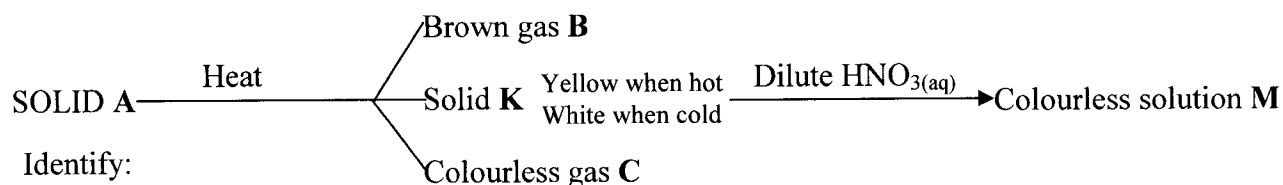
Identify:
i) Gases **C** and **B**
ii) Ions likely to be presented in solid **A**

2. In an experiment the following solids were provided to form three students; $Ca(NO_3)_{2(s)}$, $NaH_2PO_{4(s)}$; $Mg(OH)Cl_{(s)}$ and $Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$. They were then told to dissolve the given solids in differently in 20ml of water.
(a) Classify the given salts accordingly
(b) (i) Explain the process which takes place when $FeCl_3$ is dissolved in water
    (ii) A student placed a moist litmus paper on the product in **(i)** above. State and explain the observation made.

3. In the preparation of magnesium carbonate, magnesium was burnt in air and a **product** collected. Dilute sulphuric acid was then added and the mixture filtered and cooled. Sodium carbonate was added to the **filtrate** and the contents filtered. The residue was then washed and dried to give a white powder.
(a) Give the name of the **product**
(b) Write the chemical equation for the formation of the **product**
(c) (i) Name the filtrate collected after sodium carbonate was added.
  (ii) Write down the chemical formula of the white powder
(d) Write a chemical equation for the reaction between product in **(a)** and the acid
(e) Write an ionic equation to show the formation of the white powder.
(f) Write an equation to show what happens when the white powder is strongly heated.
(g) Identify the ions present in the filtrate after addition of sodium carbonate.
(h) What is the name given to the reaction that takes place when sodium carbonate was added to the filtrate?
(i) Explain the observations made when crystals of sodium carbonate decahydrate are left exposed to the atmosphere for two days

4. 6.4g of a mixture of sodium carbonate and sodium chloride was dissolved in water to make 50cm^3 solution. 25cm^3 of the solution was neutralized by 40cm^3 of 0.1M $HCl_{(aq)}$. What is the percentage of sodium chloride in the solid mixture?

5 (a) What is meant by the term solubility of salts?
(b) Calculate the solubility of salt given that 15g of the salt can saturate 25cm^3 of water
(c) The table below gives the solubility of salt **X** in grams per 100g of water at different temperatures

Temp ^{o}C	10	20	30	40	50	60	70	80	90	100
Solubility	5.0	7.5	10.5	14.0	18.5	24.0	30.0	38.0	46.0	50.1

(i) Plot a solubility curve of solubility in g/100g water (y- axis) versus temp (^{o}C)
(ii) What is meant by the points plotted in (i) above?
(iii) From your graph determine the solubility of salt **X** at the following temperatures
    I.   44°C
    II.   62°C
(iv) What mass of crystals will be formed if the solution was cooled from 62°C to 44°C?

1. Below is a diagram of set-up of apparatus that is used to investigate the effect of electric current on a binary electrolyte, lead (II) bromide.

Switch

Bulb

B ___ ___ A

Cruscible

Molten lead (II) bromide

Heat

Source; Longhorn secondary chemistry F2
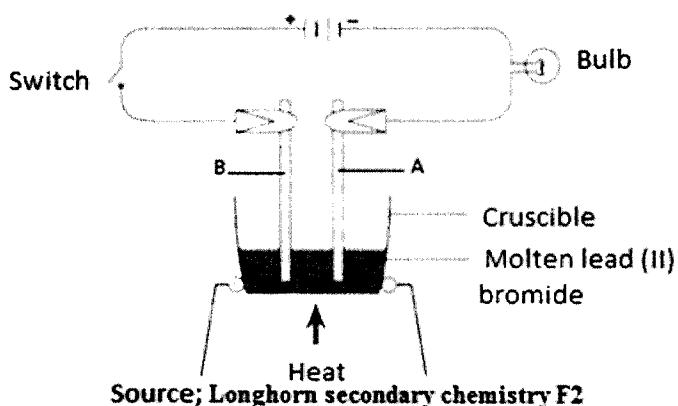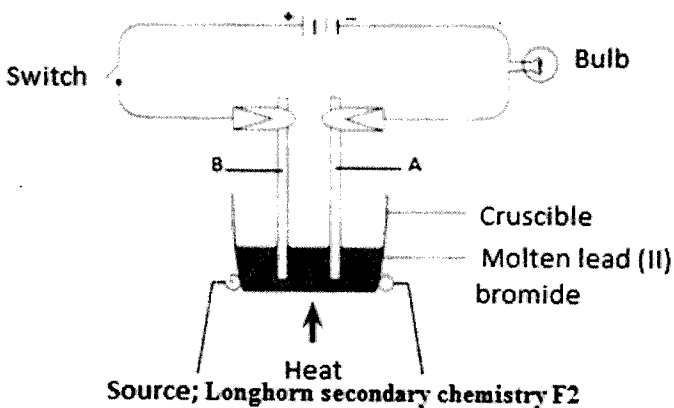
i) Explain what is meant by a 'binary electrolyte.
ii) During the experiment, brown vapour was seen around electrode B. Explain this observation.
iii) State the function of heat in the above experiment.

1. The table below gives the solubilities of hydrated copper (II) sulphate in mol/ dm^3 at different temperature

Temperature (^{0}C)	Solubilities mol/dm^3
20	8x10^{-2}
40	12 x 10^{-2}
60	16x10^{-2}
80	22x10^{-2}
100	30x10^{-2}

a) i) On a graph paper plot a graph of solubility of copper (II) sulphate (Vertical Axis) against temperatures   (3mks)

ii) From the graph, determine the mass of copper (II) sulphate deposited when the solution is cooled from 70^{0}C to 40^{0}C. (Molar mass of hydrated copper (II) Sulphate is 250g.) (2mks)

b) In an experiment to determine the solubility of sodium chloride, 5.0 cm^3 of a saturated solution of the sodium chloride, 5.0 cm^3 of a saturated solution of the sodium chloride solution weighing 5.35g were placed in a volumetric flask and diluted to a total volume of 250cm. 25 cm^3 of the dilute solution of sodium chloride completely reacted with 24.1 cm^3 of 0.1m silver nitrate solution

$$AgNO_3 \text{ (aq)} + NaCl_{(s)} \rightarrow AgCl_{(s)} + NaNO_3 \text{ (aq)}$$
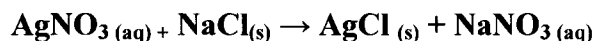
Calculate
     i) Moles of silver nitrate in 24.1cm^3 of the solution.   (1mk)
     ii) Moles of sodium chloride in 25.0cm^3 of solution.   (1mk)
     iii) Moles of sodium chloride in 250 cm^3 of saturated sodium chloride.   (1mk)
     iv) Mass of water in 5.0 cm^3 of saturated sodium chloride.   (1mk)
     v) Mass of water in 5.0cm^3 of saturated solution of sodium chloride.   (1mk)
     vi) Solubility of sodium chloride in g/100g water   (2mks)

2. a) At 25^{0}C, 50g of potassium nitrate were added to 100g of water to make a saturated solution. What is meant by saturated solution?   (2mks)
b) The table below gives the solubilities of potassium nitrate of different temperatures.

Temperature (^{0}C)	12	20	28	36	44	52
Solubility in /100 water	22	31	42	55	70	90

i) Plot a graph of the solubility of potassium nitrate (Vertical axis) against temperature.
ii) Use the graph
 a) Determine the solubility of potassium nitrate at 15°C.   (1mk)
 b) Determine the mass of nitrate that remained undissolved given that 80g of potassium nitrate were added to 100 cm^3 of water and warmed to 40°C.   (2mks)

3. In an experiment 30cm^3 of 1.0M sulphuric acid were reacted with 30cm^3 of 1.0M sodium hydroxide.
(a) Write an equation for the reaction that took place   (1 mk)
(b) State the observation made when both blue and red litmus papers were dropped with the mixture   (1 mk)
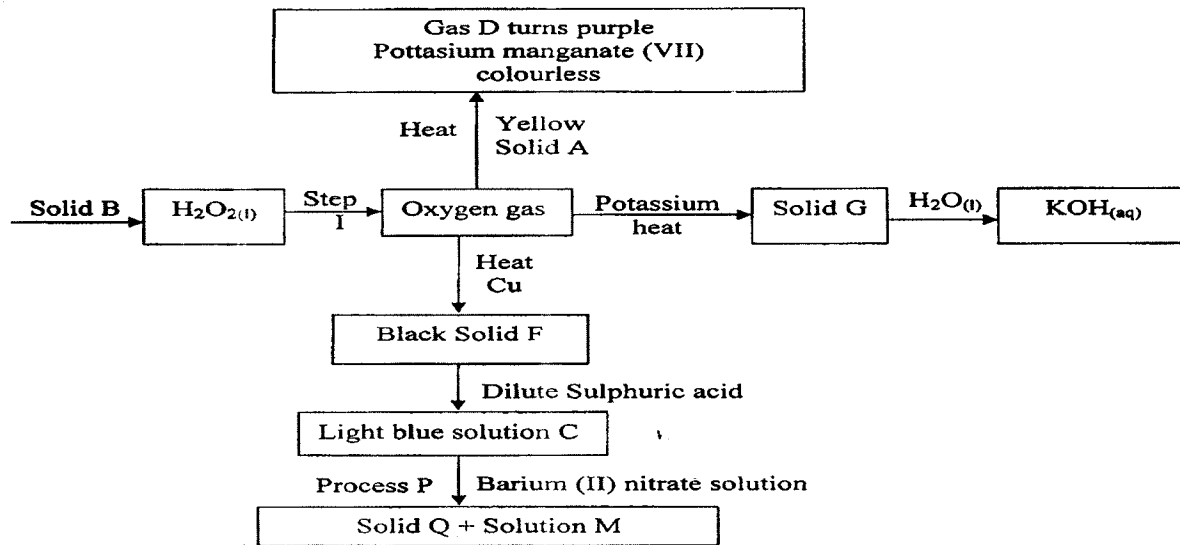(c) Give a reason for your answer in (b) above   (1 mk)

4. When excess chlorine gas is bubbled through dilute sodium hydroxide solution the resulting solution act as a bleaching agent.
a) Write an equation for the reaction between chlorine gas and sodium hydroxide solution
b) Explain how the resulting solution acts as a bleaching agent   (2mks)

1. The flow chart below represents preparation and properties of oxygen gas. Study it and wer the question that follow.

```
                    ┌─────────────────────────────────┐
                    │      Gas D turns purple          │
                    │  Pottasium manganate (VII)       │
                    │        colourless                │
                    └─────────────────────────────────┘
                                 ▲
                          Heat │ Yellow
                               │ Solid A
                               │
Solid B    ┌──────────┐ Step  ┌────────────┐ Potassium  ┌─────────┐ H2O(l) ┌──────────┐
─────────► │ H2O2(l)  │──────►│ Oxygen gas │───────────►│ Solid G │───────►│ KOH(aq)  │
           └──────────┘   I    └────────────┘  heat       └─────────┘        └──────────┘
                                 │ Heat
                                 │ Cu
                                 ▼
                          ┌──────────────┐
                          │ Black Solid F │
                          └──────────────┘
                                 │ Dilute Sulphuric acid
                                 ▼
                    ┌─────────────────────┐
                    │ Light blue solution C │
                    └─────────────────────┘
                  Process P │ Barium (II) nitrate solution
                            ▼
                    ┌─────────────────────┐
                    │ Solid Q + Solution M │
                    └─────────────────────┘
```

a) Identify the following substances   (4mks)
    i   Solid A
    ii.   Gas D.
    iii   Solid Q.
    iv   Solution M.

b) Write a chemical equation for the reaction in step I.   (1mk)

c) Write chemical equation for the formation of the following compound.   (3mks)
    i.   Solid G.
    ii.   Gas D.
    iii.   Light blue solution C.
    iv. State the confirmatory test for oxygen gas.   (1mk)
    v.   Write the ionic equation for reaction taking place in process P.   (1mk)
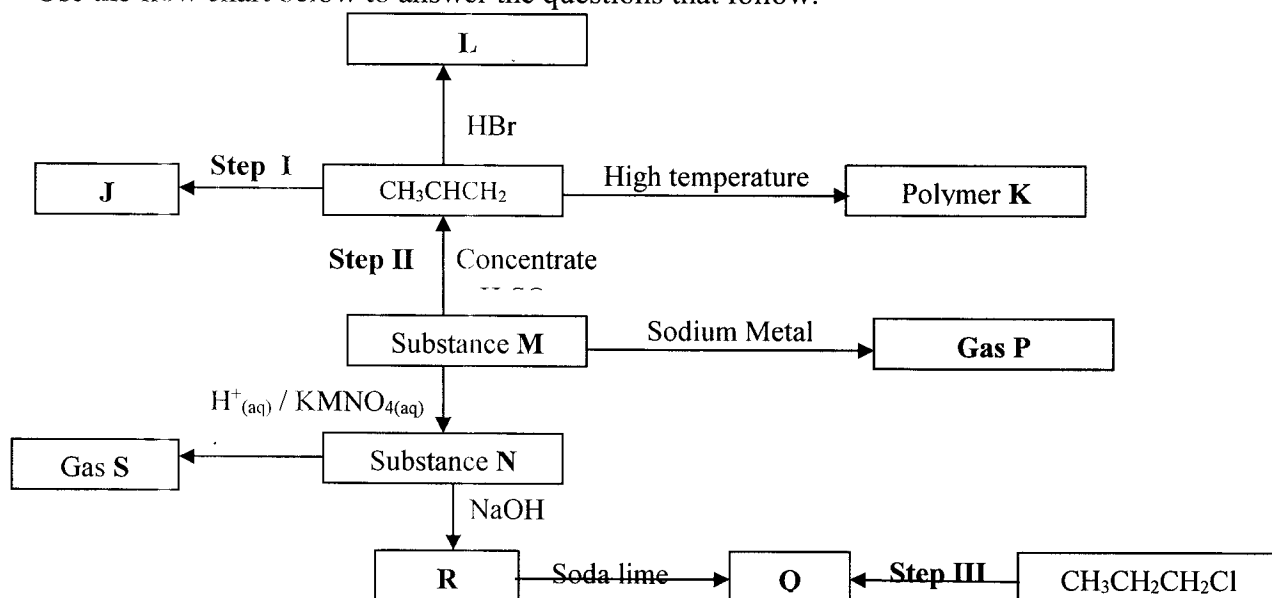   vi.   State one use of oxygen.   (1mk)

2. The following table gives information on four elements by letters **W, X, Y** and **Z.**

(a) Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Electron Arrangement	Atomic radius (mm)	Ionic radius (mm)
W	2.8.2	0.136	0.065
X	2.8.7	0.099	0.181
Y	2.8.8.1	0.203	0.133
Z	2.8.8.2	0.174	0.099

    (i)   Which **two** elements have similar properties? Explain.   (2mks)
    (ii)   What is the most likely formula of the oxide of **X**.   (1mk)
    (iii)   Which element is a non-metal? Explain.   (2mks)
    (iv)   Explain the difference in the atomic radii of **Y** and **Z**.   (1mk)

3. (a) Name the following compounds $(CH_3)_3 C\ CH_2\ CH_2\ CH_3$

Use the flow chart below to answer the questions that follow:-

```
                          ┌─────────────┐
                          │      L      │
                          └─────────────┘
                                 ▲
                                 │ HBr
                                 │
┌─────────┐   Step I   ┌──────────────────┐  High temperature  ┌──────────────┐
│    J    │◄───────────│    CH3CHCH2      │───────────────────►│  Polymer K   │
└─────────┘            └──────────────────┘                    └──────────────┘
                       Step II │ Concentrate
                               │
                               ▼
                       ┌──────────────────┐   Sodium Metal   ┌──────────────┐
                       │   Substance M    │─────────────────►│    Gas P     │
                       └──────────────────┘                  └──────────────┘
     H+(aq) / KMNO4(aq)         │
┌─────────┐                     ▼
│  Gas S  │◄──────────┌──────────────────┐
└─────────┘           │   Substance N    │
                      └──────────────────┘
                               │ NaOH
                               ▼
┌─────────┐  Soda lime  ┌──────────┐  Step III  ┌──────────────────┐
│    R    │────────────►│    O     │◄───────────│   CH3CH2CH2Cl    │
└─────────┘             └──────────┘            └──────────────────┘
```

(b) (i) Name the following :-

I. Gas **S** ....

II. Gas **P** ....

III. **J** ....

(ii) Name the processes involved in the following steps:Step I, Step II and Step III

(iii) Write a chemical equation for the complete combustion of substance **M**

(iv) Name the condition and reagent in step III

(v) Calculate the mass of salt **R** that would be formed by using 21.9 tonnes of **N** when it reacts with excess sodium hydroxide (C= 12.0 H= 1.0 Na = 23)

(vi) Draw the structure of polymer **K** and state **one** use of the above polymer

(c) (i) Name the class to which the following cleansing agents belong:-

i) $R - COO^-Na^+$

(ii) $R \longrightarrow$ (benzene ring with O) $O\text{-}SO_3\,Na$
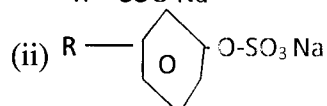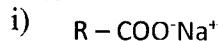
II. Which cleaning agent above is not environmental friendly? Explain

4. Campers GAZ cylinder contains about $1.12dm^3$ of butane measured at $0°$ and 1atm. Given that 25% of heat is lost, what is the maximum volume of water at room temperature which can be boiled to $100°C$ in order to make some coffee?

$$C_4H_{10(g)} + 6\,½\,O_{2(g)} \longrightarrow 4CO_{2(g)} + 5H_2O_{(l)};\ \Delta H^0 = -3,000KJmol^{-1}$$
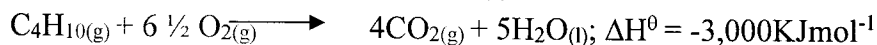
(Specific heat capacity of water = 4.2J $g^{-1}C^{-0c}$, density of water $1gcm^{-3}$ Molar gas volume 22.41 at s.t.p)

5. An aqueous solution containing anhydrous sodium carbonate was prepared by dissolving 19.6g of the salt in $250cm^3$ of distilled. Calculate the volume of **2M** of magnesium chloride solution required to precipitate all the carbonate ions in the solution.(Na=23, C= 12; O = 16; Mg = 24; Cl =35.5)

6. 0.84g of aluminium reacted completely with chlorine gas. Calculate the volume of chlorine gas used (Molar gas volume is $24dm^3$, Al = 27)
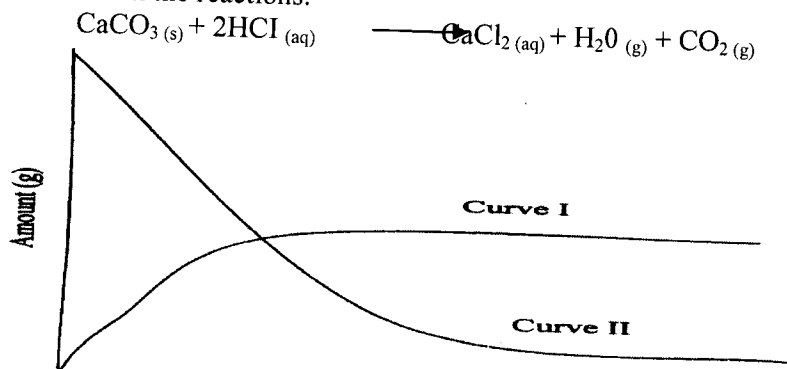
Form 4 lunch hour 26/6/19

1. The graph below shows the amount of calcium carbonate and calcium chloride varying with time in the reactions:

$$CaCO_{3\ (s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2\ (aq)} + H_2O_{(g)} + CO_{2\ (g)}$$
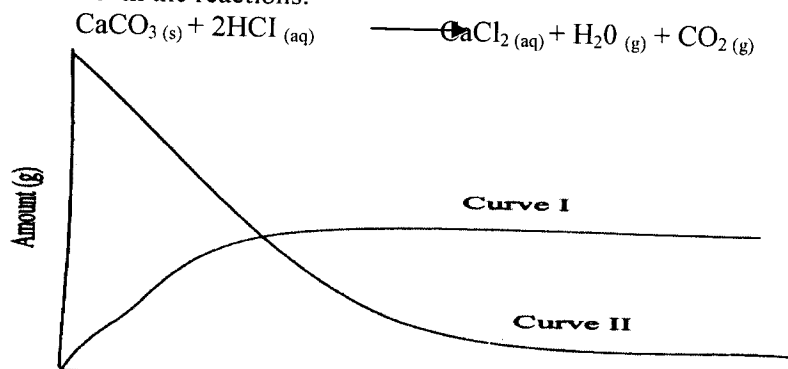
Curve I

Curve II

(a) Which curve shows the amount of calcium chloride varying with time?   (1mk)
(b) Explain why the two curves become horizontal after a given period of time.   (1mk)
(c) Sketch on the graph how curve II would appear if the experiment was repeated using a more dilute hydrochloric acid solution
                                                                                    (1mk)

2. An equilibrium is established between CrO_4 and H^+ ions as shown below:

$$2CrO_4^{2-}{}_{(aq)} + 2H^+{}_{(aq)} \rightleftharpoons Cr_2O_{7(aq)}^{2-} + H_2O_{(l)}$$
   (Yellow)   (Orange)

3. State and explain and explain the observation made when aqueous sodium hydroxide is added to the equilibrium mixture

4. define the term dynamic equilibrium

FORM 4 LUNCH HOUR CHEMISTR 22/01/2020

1. An organic compound with the formula $C_4 H_{10} O$ reacts with potassium metal to give hydrogen gas and white solid
   a) Write the structural formula of the compound   (1mk)
   b) To which homologous series does the compound belong? (1mk)
   c) Write the equation for the reaction between the compound and potassium metal (1mk)
2. (a) Write the structural formula of:
   (i) Methanol
   (ii)Methanoic acid   (1mark)
   (b) (i) Name the product formed when methanol reacts with methanoic acid
   (ii) State one condition necessary for the reaction in (c) (i) above to take place (1mk

1. Calculate the simplest and molecular formula of a compound using the following data: 1.9g of a certain compound when burnt in oxygen gives 1.1g carbon dioxide and 3.2g sulphur dioxide. 200cm³ of the compound has a mass of 0.68g at s.t.p.

2. The structures below represent two cleansing agents, A and B.

A B

$R - COO^- Na^+$ R

  $OSO_3^- Na^+$
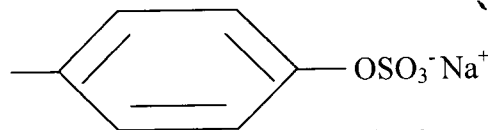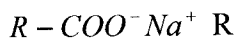
a) Which cleansing agent would be suitable for washing in water with dissolved magnesium sulphate? Give a reason

b) Give one disadvantage of cleansing agent B

3. A certain Polymer has the following structure
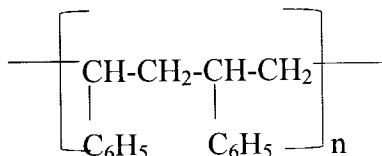
a) Name the type of polymerization exhibited by the structure above.

b) Draw the structure of the monomer.

c) If the molecular mass of the polymer is 20800. What is the value of n? (C=12,H=1)

4. You are given solid **T** which is suspected to be zinc sulphite. Using the following reagents, write a step by step procedure of conclusively identifying the solid.

- Distilled water
- Sodium hydroxide solution
- Ammonium hydroxide solution
- Barium (II) nitrate
- Dilute nitric (V) acid
- Blue and red litmus papers

5. You are provided with solution P, 0.5M Hydrochloric acid. Solution Z, sodium hydroxide solution, phenolphthalein indicator. You are required to standardize a dilute solution Z with solution P.

PROCEDURE

- Using a pipette and a pipette filter place 25cm³ of solution Z into a 250ml conical flask.
- Add 4 drops of phenolphthalein indicator.
- Fill the burette with solution P and titrate it against solution Z. Record your results in the table. Repeat the titration two or more times and complete the table.

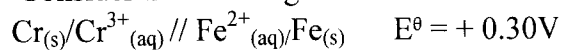| Titration number	1	2	3
Final burette reading (cm³)		45.4	21.5
Initial burette reading(cm³)	0.0		
Volume of solution P used (cm³)	21.5		

Calculate

a) Complete the table above

b) Average volume of solution P used.

c) The number of moles of Hydrochloric acid that reacted with 25cm³ of solution Z.

d) Write the equation for the reaction that occurred in the conical flask

e) The number of moles of Sodium hydroxide in 25cm³ of solution Z

f) The Molarity of Sodium hydroxide in solution Z.

1.   The diagram below shows an electrochemical cell:
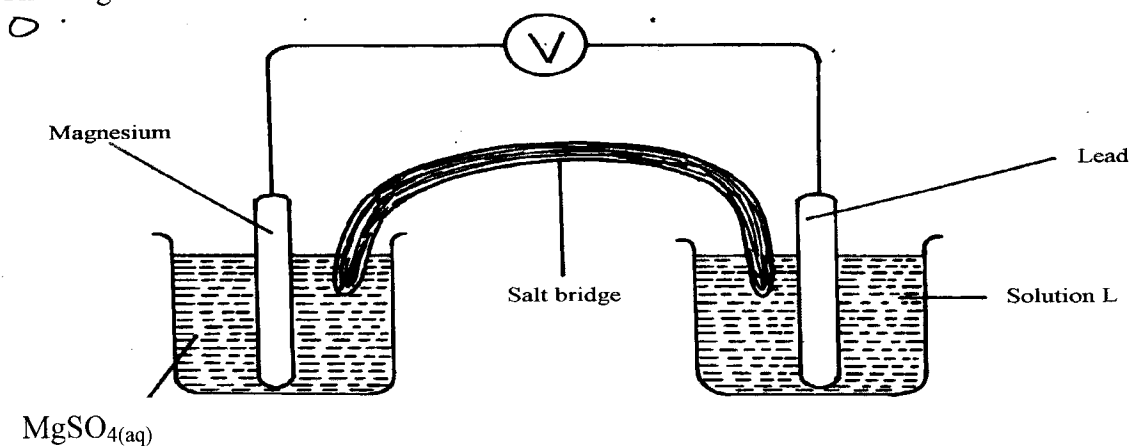

MgSO$_{4(aq)}$
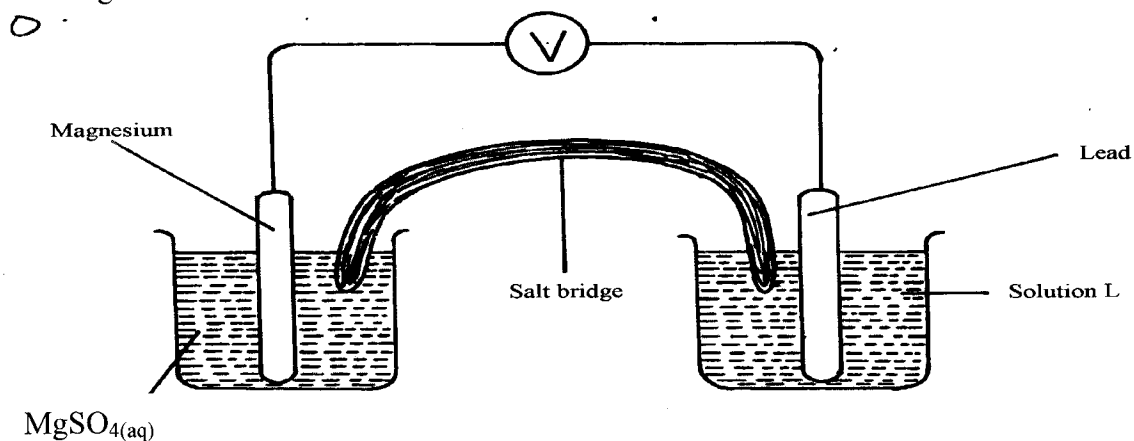
a) Write the cell representation of the above cell
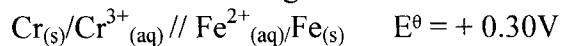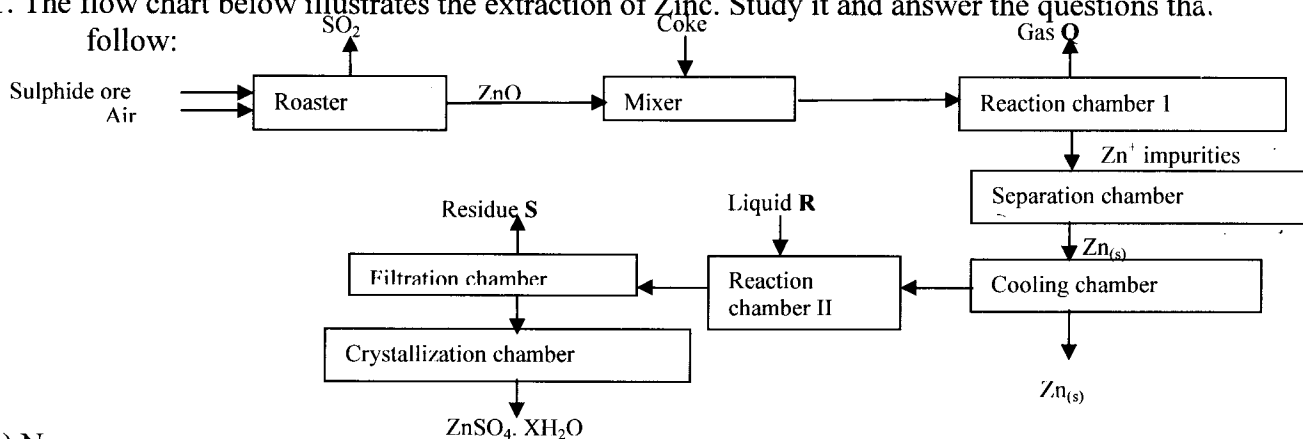
2.   Consider the cell diagram below

Cr$_{(s)}$/Cr$^{3+}_{(aq)}$ // Fe$^{2+}_{(aq)}$/Fe$_{(s)}$ E$^{\theta}$ = + 0.30V

i) Write the overall cell reaction for the above electrochemical cell

ii)state 2 functions of a salt bridge

1. The flow chart below illustrates the extraction of Zinc. Study it and answer the questions that follow:

a) Name:-
   i) Gas **Q**   ii) Liquid **R**   iii) Residues

b) Name the sulphide ore used
c) Before the ore is roasted, it is first concentrated;
   i) Explain why it is necessary to concentrate the ore
   ii) Explain briefly the process of concentrating the ore
d) Write an equation for the reaction that takes place in the:-
   i) Roaster   ii) Reaction chamber

(e) (i) Name **one** major impurity present in the sulphide ore used
(ii) Write an equation to show how the impurity in **(e)(i)** above is removed
 f) Given that the sulphide ore contains only 45% Zinc sulphide by mass, calculate :
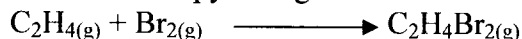(i) The mass in grams of Zinc sulphide that would be obtained from 250kg of the ore.
(ii) The volume of Sulphur (IV) oxide that would be obtained from the mass of sulphide ore at room temperature and pressure (Zn = 65.4, S = 32.0, O= 16.0, I mole of gas=24dm^3 at r.t.p)

2. Study the table below and answer the questions that follow

Bond type	bond energy kJmol^{-1}
C-C	346
C = C	610
C-H	413
C-Br	280
Br-Br	193

a) Calculate the enthalpy change for the following reaction
$$C_2H_{4(g)} + Br_{2(g)} \longrightarrow C_2H_4Br_{2(g)}$$
b) Name the type of reaction that took place in **(a)** above

3. Bond energies for some bonds are tabulated below:-

BOND	BOND ENERGY KJ/mol
H – H	436
C = C	610
C- H	410
C - C	345

Use the bond energies to estimate the enthalpy for the reaction
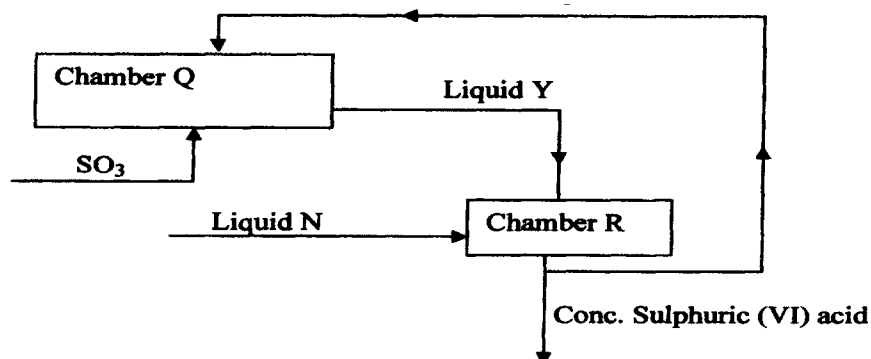$$C_2H_{4(g)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$$
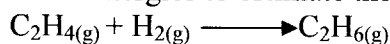
4. (a) The scheme below shows some reactions starting with magnesium oxide. Study it and answer the questions that follow:-
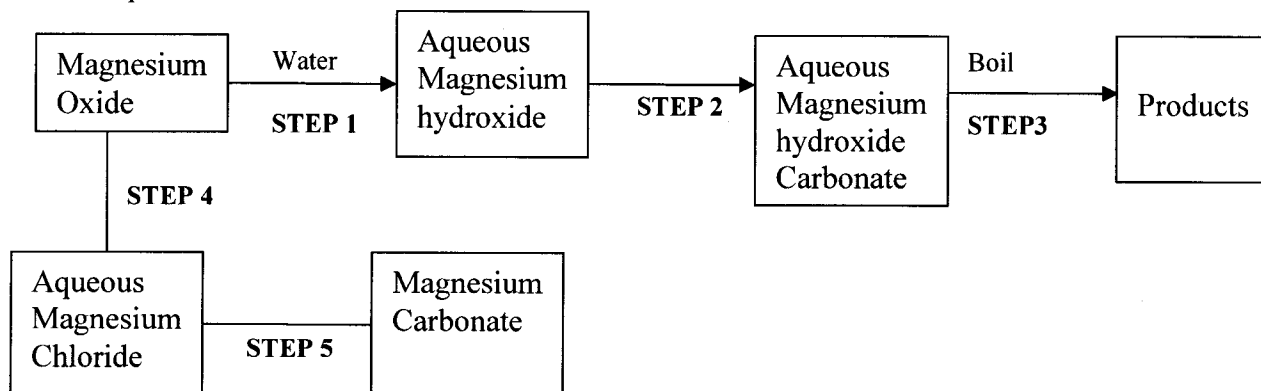
(i) Name the reagents used in **steps 2 and 4**

(ii) Write an equation for the reaction in **step 3**

(iii) Describe how a solid sample of anhydrous magnesium carbonate is obtained in **step 5**

5. Below is part of a flow diagram for the contact process:

(a) Name :

    I. Liquid **Y**   II. Liquid **N**

(b) Write the equation for the reaction taking place in;

    I. Chamber **Q**   II. Chamber **R**

6. When Carbon (IV) oxide is passed through lime water, a white precipitate is formed but when excess Carbon (IV) Oxide is passed, the white precipitate disappears;

(a) Explain why the white precipitate disappears

(b) Give an equation for the reaction that takes place in (a) above

FORM 1   PEER DISCUSSIONS QUESTIONS
THURSDAY, MARCH 05, 2020

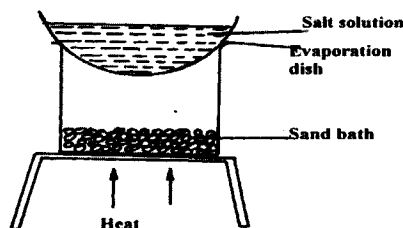1. A mixture of kerosene and water was shaken and left to separate as shown in the diagram below:

A

B
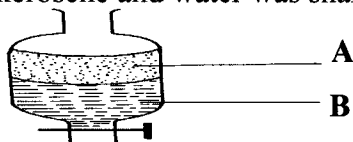
State the identity of;

(i) A ……………………………………….. (ii) B ………………………………………

2. (a) State **two** differences between luminous flame and non-luminous flame

(b) A form 1 student carried out the separation as shown in the set-up below:-

Salt solution

Evaporation dish

Sand bath

Heat

(i) Identify the method above

(ii) Give **one** of its disadvantages

(iii) Name a mixture which can be separated by the set-up above

3. What is meant by melting point and boiling point of a substance?

4. Give **two** reasons why a luminous flame is not used for heating purposes

5. The table below shows liquids that are miscible and those that are immiscible

Liquid	L₃	L₄
L₁	Miscible	Miscible
L₂	Miscible	Immiscible

Use the information given in the table to answer that questions that follow;

i) Name the method that can be used to separate L_1 and L_2 from a mixture of the two

ii) Describe how a mixture of L_2 and L_4 can be separated

6. A student left some crushed fruit mixture with water for some days. He found the mixture had fermented. He concluded that the mixture was contaminated with water and ethanol with boiling point of $100^{\circ}C$ and $78^{\circ}C$ respectively. The set-up of apparatus below are used to separate the mixture.

Thermometer

B

Apparatus W

A

Conical flask

Mixture
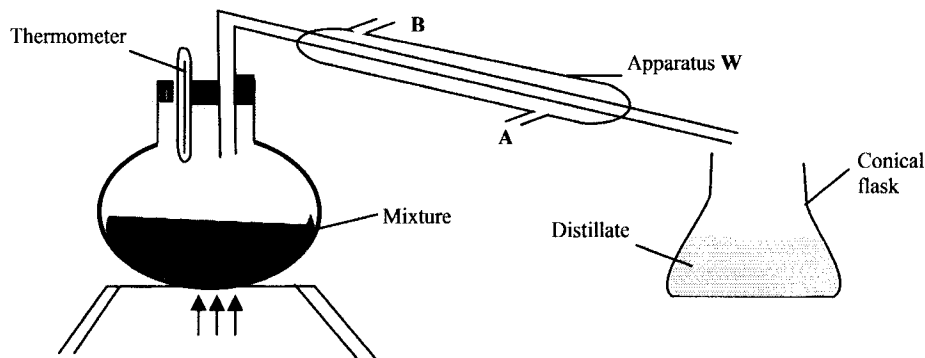
Distillate

i) Name the piece of apparatus labelled **W**

ii) What is the purpose of the thermometer in the set-up?

iii) At which end of the apparatus **W** should tap water be connected?

iv) Which liquid was collected as the first distillate? Explain

v) What is the name given to the above method of separating mixture?

vi) State **two** applications of the above method of separating mixtures

vii) What properties of the mixture make it possible for the component to be separated by the above methods?

FORM 2   PEER DISCUSSIONS QUESTIONS

1. Substance **Q** has a melting point of $15^{\circ}C$ and boiling point of $70^{\circ}C$.
(a) On the same axes, draw the melting point and boiling point graph for **Q** and the room temperature

Time (minutes)
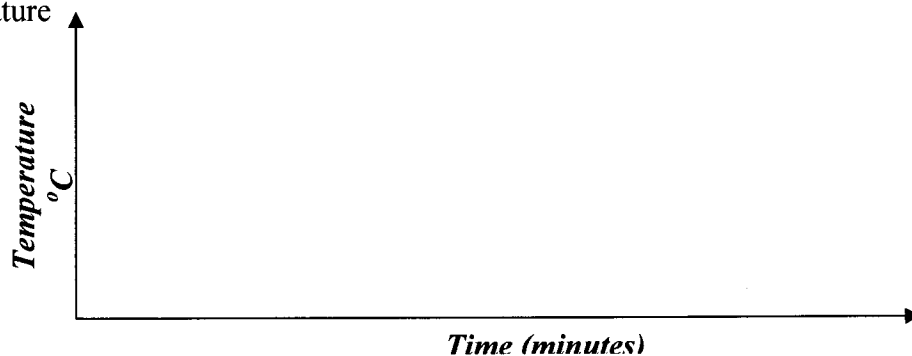
(b) State the physical state of substance **Q** at room temperature

2. Study the information below and answer the following questions. A mixture contains three solids **A, B**, and **C**. The solubility of these solids in different liquids is as shown below:-

Solid	Water	Alcohol	Ether
A	Soluble	Insoluble	Insoluble
B	Insoluble	Soluble	Very soluble
C	Soluble	Soluble	Insoluble

Explain how you will obtain sample **C** from the mixture

3. Below is a list of oxides. MgO, N_2O, K_2O, CaO ans Al_2O_3. Select:-
a) A neutral oxide.
b) A highly water soluble basic oxide.
c) An oxide which can react with both sodium hydroxide solution and dilute hydrochloric acid.

4. Hydrogen can be prepared by reacting zinc with dilute hydrochloric acid.
a) Write an equation for the reaction.
b) Name an appropriate drying agent for hydrogen gas.
c) Explain why copper metal cannot be used to prepare hydrogen gas.
d) Hydrogen burns in oxygen to form an oxide.
(i) Write an equation for the reaction.
(ii) State **two** precautions that must be taken before the combustion begins and at the end of the combustion.
e) Give **two** uses of hydrogen gas.
f) When zinc is heated to redness in a current of steam, hydrogen gas is obtained. Write an equation for the reaction.
g) Element **Q** reacts with dilute acids but not with cold water. Element **R** does not react with dilute acids. Elements **S** displaces element **P** from its oxide. **P** reacts with cold water. Arrange the four elements in order of their reactivity, starting with the most reactive.
h) Explain how hydrogen is used in the manufacture of margarine.

5. (a) What is rust?
(b) Give **two** methods that can be used to prevent rusting
(c) Name **two** substances which speeds up the rusting process

1. The grid below shows a part of the periodic table. The letters do not represent the actual symbols. Use it to answer the questions that follow:-

C								T
	K					U		
X	Y		M			O	W	
J								Z

(a) How do the atomic radius of element **X** and **Y** compare

(b) (i) Using crosses (**X**) to represent electrons, draw the atomic structure of element **Q**

    (ii) State the period and the group to which element **Q** belong

(c) (i) The ionic configuration of element **G** is 2.8 **G** forms an ion of the type **G^{-1}**.
        Indicate on the grid, the position of element **G**.

    (ii) To which chemical family does element **G** belong?

    (iii) State **one** use of element **U**

    (iv) What is the nature of the compound formed between **K** and **U**?

2. Study the information in the table below and answer the questions that follow:
    (The letters do not represent the actual symbols of the elements)

Element	Electronic configuration	Ionization energy KJmol^{-1}
P	2:1	519
Q	2:8:1	494
R	2:8:8:1	418

(i) What is meant by ionization energy?

(ii) Element **R** has the lowest ionization energy. Explain

(iii) When a piece of element **Q** is placed on water it melts and a hissing sound is produced as it moves on the water surface. Explain these observations

(iv) Write the equation for the reaction between element **Q** and water

3. 88 cm^3 of gas K diffuse through a small hole in 40 seconds while 50cm^3 of hydrogen gas diffuse through the same hole under the same conditions in 5 seconds. Calculate the RMM of the gas K   (3mks)

4. 200 cm^3 ammonia gas are burnt in 300 cm^3 of oxygen gas (excess). 200 cm^3 of nitrogen (II) oxides and 300 cm^3 steam were formed. 50 cm^3 of oxygen was left unused. Deduce the equation for this reaction.   (3mks)

5. Nitrogen gas occupies a volume of 200 cm^3 at 25^{0}C. What will be the temperature of nitrogen if it occupied a volume of 300 cm^3?   (2mks)

6. 200 cm^3 of gas "P" at s.t.p was cooled and the volume contracted to 160 cm^3. Calculate the new temperature of the gas in ^{0}C if the pressure is kept constant.   (2mks)

7. Form three students found that a mass of nitrogen gas occupies 330 cm^3 at 280^{0}C and 760 mm Hg pressure. At what temperature will the volume of the gas be 190cm^3 and the pressure 800 mm Hg?   (2mks)