Name ………………………………………………Index No………………………………….

Candidates signature ……………………………… Date…………………………………………….

233/3

CHEMISTRY

Paper 2 ¼

(Practical)

2 ¼ hours

KCSE TOP PREDICTION MASTER CYCLE 5

Instructions to candidates.

a) Write your name and index number in the spaces provided above.
b) Answer all questions in the spaces provided in the question paper.
c) Mathematical tables (KNEC) and silent electronic calculators may be used.
d) All workings must be clearly shown where necessary.
e) Candidates should answer the questions in English.

For examiners use only.

Question	Maximum score	Candidate's score
1	22	
2	10	
3	8	
Total score	40	

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1. (a). You are provided with

(i). 0.3g of metal F.

(ii). 100cm^3 of 1.0M hydrochloric acid solution labelled as solution G.

(iii). 120cm^3 of 0.1M sodium hydroxide solution, labelled as solution H.

(iv). Screened methyl orange indicators solution.

You are required to determine the Relative Atomic Mass of metal F.

Procedure

(a). Using a burette, measure 50.0cm^3 of solution G into a clean 250ml beaker.

(b). Add the WHOLE AMOUNT of F provided into the beaker containing 50.0cm^3 of solution G and stir well with a glass rod until ALL the solid metal reacts completely.

(c). Transfer the mixture left in the beaker after the reaction into a 250ml Volumetric flask. Rinse the beaker as well as the glass rod with distilled water and transfer ALL the rinsings into the volumetric flask. Make up the volume of the solution in the volumetric flask up to the calibration mark with distilled water, cover the flask with a stopper, shake well and label as solution Q.

(d). Fill a clean burette with solution Q.

(e). Pipette 25.0cm^3 of solution H into a 250ml conical flask, add 3 drops of screened methyl orange indicator solution and titrate against solution Q from the burette.

A change in colour of the mixture from <u>green</u> to <u>pink</u> marks the end point of titration.

Record your results in table 1.

(f). Repeat the titration TWO more times to complete table I.

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Table I

Titration	1	2	3
Final burette reading, cm^3			
Initial burette reading, cm^3			
Volume of solution Q used, cm^3			

(4 marks)

Average volume of Q used, cm^3 …………………………………………….. *(1 mark)*

(g). Calculate:

(i). Calculate the number of moles of HCl in $50.0cm^3$ of solution G. *(1 mark)*

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(ii). Determine the number of moles of NaOH in $25.0cm^3$ of solution H. *(1 mark)*

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(iii). Determine the number of moles of HCl in the average volume of solution Q useD in the titration. *(1 mark)*

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(iv). Calculate the moles of HCl left unreacted after the reaction between F and solution G. *(1 mark)*

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(vi). Determine the moles of HCl that reacted with metal F.   *(1 mark)*

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(vi). Given that metal F forms a divalent cation, determine the moles of metal F that reacted with
hydrochloric acid.   *(1 mark)*

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(vii). Determine the Relative Atomic mass of metal F.   *(1 mark)*

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1(b). You are provided with
(i). 2.00g of solid K.
(ii). A thermometer
(iii). Distilled water
(iv). Boiling tube
(v). Hot water bath.

You are required to determine the temperatures at which solutions of known concentrations of compound K
becomes saturated and plot solubility curve.

Procedure.

(a). Transfer the whole amount of solid K supplied to you into clean dry boiling tube.

(b). Using a burette, add 5.0cm^3 of distilled water into the boiling tube with solid K
 (c) Put the boiling tubeinto a beaker of hot water bath and warm the boiling tube, while continuously stirring
the content with thermometer, until the crystals of K dissolve/disappear
(DO NOT BREAK THE THERMOMETER)

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(d). Remove the boiling tube from the hot water bath and allow the content to cool slowly while stirring with the thermometer. Not the temperature at which crystals
FIRST form/reappear and record this temperature in Table 2.

(e). Add a further $2.00cm^3$ of distilled water from the burette into the boiling tube containing the mixture and repeat steps (c) and   (d) above. Continue this way until the volume of water added to boiling tube is $5.00cm^3$.
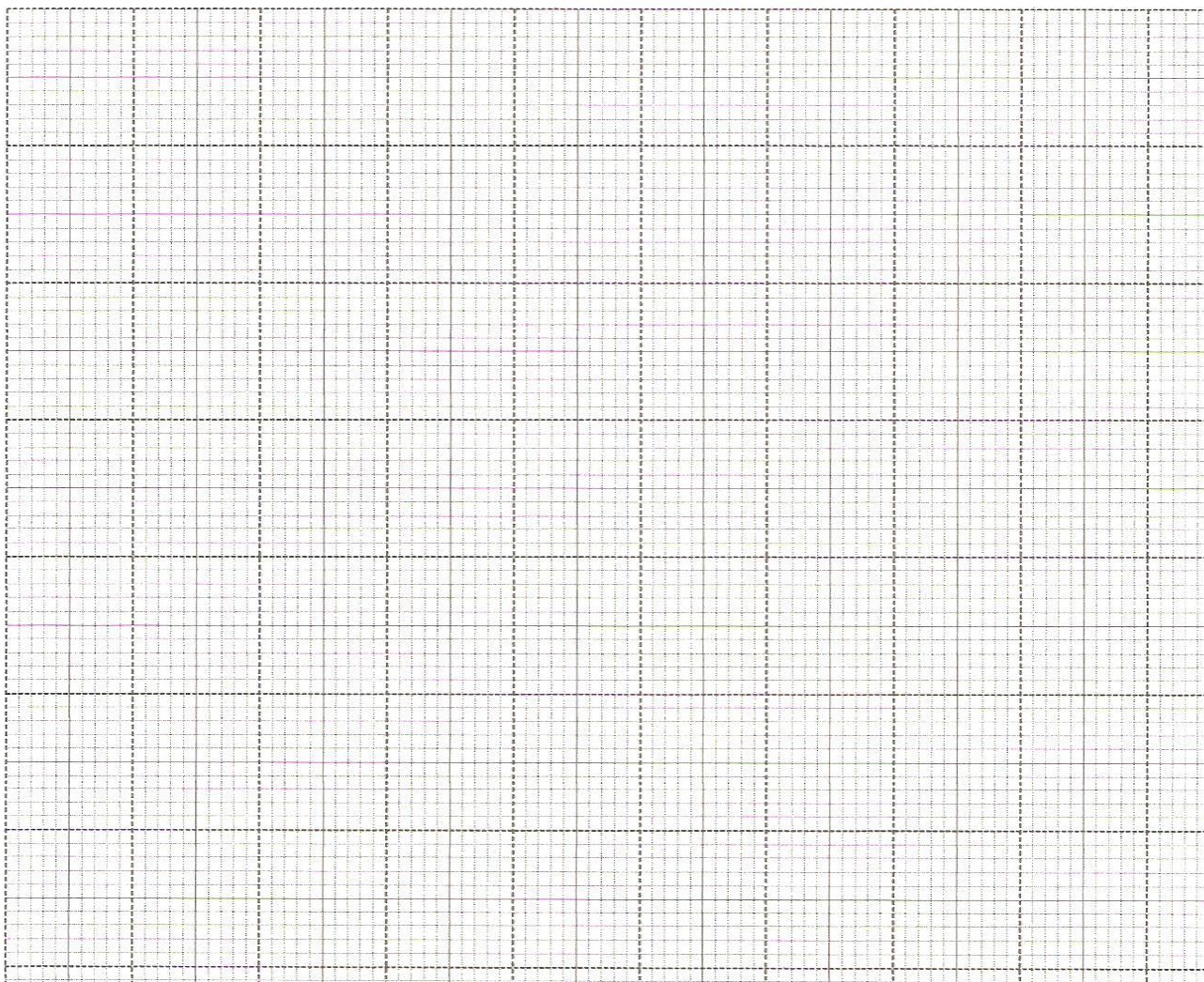
(f). Complete Table 2 by calculating the solubility of compound K in water at different temperatures.

Total volume of water added (cm^3)	Temperature at which crystals first appear (^{o}c)	Solubility of compound K in water (g/100g water)
5.00		
7.00		
9.00		
11.00		
13.00		
15.00		

(6 marks)

(g). On the grid provided plot a graph of solubility of compound K (vertical axis) against temperature.
(3 marks)

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(h). From your graph determines the solubility of K in water at 25.0°c.   (*1 mark*)

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2. You are provided with $10cm^3$ of solution R containing <u>TWO</u> cations and <u>ONE</u> anions carry out the tests below and record your observations and inferences in the spaces provided.

(a). Add $20cm^3$ of 2M sodium hydroxide to all of solution R provided. Shake well. Filter the mixture into a

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conical flask. Retain both the filtrate and residue.

Observation	Inference
(¹/₂ mark)	*(¹/₂ mark)*

(b). To about 2cm^3 of the filtrate, add 1cm^3 of 2cm^3 of 2M nitric acid. Retain the mixture.

Observation   *(¹/2 mark)*

Divide the mixture in (b) above into TWO portions

(i). To the FIRST portion, add aqueous sodium hydroxide solution drop wise until in excess.

Observation	Inference
(1 mark)	*(1 mark)*

(ii). To the SECOND portion, add 2M aqueous ammonia solution DROPWISE until in excess.

Observation	Inference

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(1 mark)	*(1 mark)*

(c). To about 2cm^3 of the filtrate, add 3 drops of 2M hydrochloric acid

Observation	Inference
($^1/_2$ mark)	*($^1/_2$ mark)*

(d). To about 2cm^3 of the filtrate, add about 1cm^3 of acidified Barium chloride solution

Observation	Inference
($^1/_2$ mark)	*(1 mark)*

(e). To the RESIDUE add about 5cm^3 of dilute nitric acid and filter into a clean test tube. To about 2cm^3 of this filtrate add 2M aqueous. Ammonia solution dropwise until in excess and filter into clean test tube.

Observation	Inference

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(1 mark)	*(1 mark)*

3. You are provided with solid Z.

Carry out tests below. Write your observations and inferences in the spaces provided.

(a). Scoop a little of solid Z (using a clean spatula and burn it in a |Bunsen burner flame.

Observation	Inference
(1 mark)	*(1 mark)*

(b). To the remaining portion, add about 6m^3 of distilled water and shake. Divide the mixture into two portions

Observation	Inference
(1 mark)	*(1 mark)*

(c). To the second portion, add the whole of sodium carbonate provided.

Observation	Inference

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(1 mark)	*(1 mark)*

(d). To a little amount of Z, add sodium carbonate.

Observation	Inference
(1 mark)	*(1 mark)*

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