**Part B Written task – Investigation Analytical Chemistry /30**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write balanced **ionic** equations and give a detailed description of the observations you would expect to make for any reactions that occur in the following situations.

If no reaction occurs, write "no reaction".

1. A solution of silver nitrate is added to a solution of ammonium chloride. (4 marks)

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Observations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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(b) Dilute hydrochloric acid is added to solid copper (II) carbonate. (4 marks)

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Observations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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(c) Dilute hydrobromic acid is added to a solution of potassium sulfide. (4 marks)

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Observations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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(d) Dilute ethanoic acid is added to solid nickel (II) oxide. (4 marks)

Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Observations: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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2. When dilute sulfuric acid is added to substance A (a solid), there is a vigorous effervescence and the gas explodes when ignited in air. When the remaining solution is evaporated, white crystals remain. A confused student is told that these crystals are either magnesium oxide, zinc sulfate, copper sulfate or calcium oxide.

(a) What are the crystals? (1 mark)

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(b) Identify substance A (1 mark)

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(c) Write an ionic equation to show the reaction of A with dilute sulfuric acid. (2 marks)

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3. The equation below represents the reaction between solid iron (Fe) and hypochlorous acid (HCℓO).

6 HCℓO(aq) + 6 H+(aq) + 2 Fe(s) ® 3 Cℓ2(g) + 6 H2O(ℓ) + 2 Fe3+(aq)

A piece of iron was placed in a solution of 1.53 mol L-1 hypochlorous acid. The reaction was allowed

to go to completion, that is all the solid iron had reacted and 1.48 L of Cℓ2 was produced at STP.

(a) Calculate the volume of HCℓO that would have been required for the reaction to take place. (3 marks)

(b) Calculate the mass of the piece of iron that was reacted with the hypochlorous acid. (2 marks)

4. Phosphoric acid can be prepared by reaction of sulfuric acid with "phosphate rock" according to the

equation:

Ca5(PO4)3OH + 5 H2SO4 à 3 H3PO4 + 5 CaSO4 + H2O

(a) If 2.5 kg of “phosphate rock” was reacted with excess sulfuric acid, calculate the mass of phosphoric

acid produced. (5 marks)

**End of Assessment**