This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1 (a) boxes completed to show stirrer / glass rod (1)
    watchglass / evaporating dish (1) [2]

    (b) to speed up the reaction (1) [1]

    (c) correct answer 4.2 g (2)
        if incorrect, evidence of 17.8 – 13.6 (1) [2]

    (d) (i) solid / lead oxide visible / remaining (1)
        **do not allow:** mention of precipitate [1]

        (ii) filtration (1) [1]

        (iii) excess (1)
            **allow:** residue [1]

    (e) Any **two** from:
        evaporation / steam (1)
        solid / crystals formed (1)
        breakdown / decomposition of solid (1) [2]

2 (a) smooth curve missing anomalous point (1) [1]

    (b) composition of mixture
        double volume / 100 cm³ of hydrogen peroxide (1)
        more than 1 g of manganese(IV) oxide / powdered (1) [2]
        **ignore:** references to water
        **note:** double the concentration is valid for (2)

        **explanation**
        double volume of gas (1)
        faster reaction (1) [2]

    (c) catalyst / increase the rate of the reaction (1) [1]

    (d) sketch graph less steep than original for Experiment 1 (1)
        to same level (1) [2]

3 (a) (i) chromatography (1) [1]

    (ii) to prevent loss / evaporation of solvent (1) [1]

    (b) when the solvent is near the top of the paper / before the solvent reaches the top of the paper (1) [1]
(c)  
   (i)  4 (1)  
   (ii) yes, one artificial dye (1)  
        at same height / matches (1) (2)

4  
   (a)  table of results for Experiment 1  
        initial volume completed correctly (1)  
        0 or 24.4  
        all readings to 1 decimal place (1) (2)

(b)  table of results for Experiment 2  
        final volume completed correctly (1)  
        6.1  
        difference correct (1) (2)

(c)  
   (i)  neutralisation (1)  
        allow: acid-base (1)
   (ii)  as an indicator / to show end point (1) (1)

(d)  water to remove the solution A of acid (1)  
        acid B to remove traces of water (1) (2)

(e)  
   (i)  Experiment 1  
        ecf from readings (1) (1)
   (ii)  any correct comparison (1) (1)
   (iii) solution B more concentrated / stronger (1) or converse  
        less volume was needed (1) (2)

(f)  half value from table result for experiment 2 (1)  
        cm$^3$ (1) (2)

(g)  advantage: easy to use / quick / convenient (1)  
        disadvantage: not accurate owtte (1) (2)

(h)  same volume of each solution (1)  
        add suitable reactant (1)  
        expected observation (1)  
        comparison (1) (4)
        note: e.g. 10 cm$^3$ of each acid (1), add strip of magnesium / named carbonate (1)  
        effervescence (1), more rapid bubbles means stronger acid (1)
5 (c) no reaction / no change / no precipitate (1) [1]

(d) white (1) precipitate (1) [2]

(e) transition metal present (1)
   allow: iron
   water / hydrated (1) [2]

(f) hydrated (1) iron (1) (II) (1) (sulfate) [3]

6 (a) (i) gas syringe / inverted measuring cylinder in trough of water (1)
   labelled (1) [2]

   (ii) limewater (1)
   milky (1) [2]

   (b) measured volume of water (1)
   in named weighed container (1)
   evaporate to dryness (1)
   reweigh / measure mass of solid (1)
   conclusion: e.g. double the mass of residue if 500 cm$^3$ water used to check mass in
   1000 cm$^3$ (1) max [4]