

Mark Scheme (Results) January 2011

GCE

GCE Chemistry (6CH07/01)

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Question Number	Acceptable Answers	Reject	Mark
1 (a) (i)	Sodium hydroxide (solution) / NaOH(aq) / NaOH Potassium hydroxide (solution) / KOH(aq) / KOH Allow calcium hydroxide (solution) / Ca(OH) ₂ (aq) / Ca(OH) ₂	Alkali Aqueous ammonia Ammonium hydroxide	1

Question Number	Acceptable Answers	Reject	Mark
1 (a) (ii)	Observation: White precipitate (or ppt or ppte) Allow white solid / suspension (1) Inference: any two valid ions gain both marks Sulfate or sulfate(VI) or sulphate or sulphate(VI) or SO ₄ ²⁻ (1) Carbonate or CO ₃ ²⁻ (1) Allow hydrogensulfate / hydrogensulfate(VI) / hydrogensulphate / hydrogensulphate(VI) / HSO ₄ ⁻ Allow hydrogencarbonate / HCO ₃ ⁻ If a formula is used charge must be correct Ignore 'barium'	(solution) goes cloudy Incorrect oxidation number if used hydrogensulfite (or hydrogensulfate(IV))	3

Question Number	Acceptable Answers	Reject	Mark
1 (a) (iii)	(Gas evolved) was pungent / acrid or turned (orange) potassium dichromate / dichromate(VI) / K ₂ Cr ₂ O ₇ green / blue Allow dichromate (etc) ions / Cr ₂ O ₇ ²⁻ or decolorized potassium manganate(VII) / permanganate (allow potassium manganate) / KMnO ₄ Allow manganate(VII) (etc) ions / MnO ₄ ⁻ Allow turns blue litmus red	Steamy fumes Was acidic / sulfur dioxide / SO ₂ Incorrect oxidation number if used	1

Question Number	Acceptable Answers	Reject	Mark
1 (a) (iv)	With HCl(g) (allow HCl) / conc HCl on a glass rod or stopper or open bottle (1) White fumes / smoke (1) Observation mark not stand alone but award for a near miss (e.g. 'add (conc.) HCl(aq)') No TE on a forbidden test (indicators / smell)	Add conc HCl Steamy / misty	2

Question Number	Acceptable Answers	Reject	Mark
1 (b) (i)	Calcium (ion) or Ca^{2+} (ion)	Ca / Ca^+	1

Question Number	Acceptable Answers	Reject	Mark
1 (b) (ii)	Pink Allow red or purple		1

Question Number	Acceptable Answers	Reject	Mark
1 (b) (iii)	Nitrogen dioxide or or nitrogen(IV) oxide or NO_2 Allow dinitrogen tetroxide or N_2O_4	Incorrect oxidation number if used	1

Question Number	Acceptable Answers	Reject	Mark
1 (b) (iv)	Oxygen or O_2	0	1

Question Number	Acceptable Answers	Reject	Mark
1 (b) (v)	Nitrate or nitrate(V) or NO_3^-	Incorrect oxidation number if used Incorrect / no charge	1

Question Number	Acceptable Answers	Reject	Mark
1 (b) (vi)	$\text{Ca}(\text{NO}_3)_2$ (1) H_2O (1) or $\text{Ca}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ (2) If this formula is correct, ignore incorrect formula / charge in 1(b)(v) TE on a name or correct formula from 1(b)(v)	Name H_2O with no attempt at a compound formula	2

Question Number	Acceptable Answers	Reject	Mark
2 (a)	<p>Test Add PCl_5 or phosphorus pentachloride or phosphorus(V) chloride (1) Ignore heat</p> <p>Result Steamy or misty fumes or fumes which turn litmus or UI red (1) Allow white fumes</p> <p>OR</p> <p>Test Add sodium (1)</p> <p>Result Effervescence / gas which pops with a lighted splint (1)</p> <p>OR</p> <p>Test Add named carboxylic acid and sulfuric / hydrochloric acid (1)</p> <p>Result Sweet / pear drops / glue smell (1)</p> <p>Observation marks not stand alone</p> <p>Allow oxidizing agents (max 1)</p> <p>Test Add acidified (potassium) dichromate / dichromate(VI)</p> <p>Result orange to / turns green/blue</p> <p>OR</p> <p>Test Add acidified (potassium) manganate(VII) or permanganate Allow acidified potassium manganate</p> <p>Result Purple to / turns colourless or decolorized</p>	<p>PCl_3 PCl_5 solution</p> <p>White smoke HCl observed</p>	2

Question Number	Acceptable Answers	Reject	Mark
2 (b)	<p>Elimination (1) Allow dehydration</p> <p>Test Bromine (water /organic solvent) (1) Result (Orange or red-brown or brown or yellow to) /turns colourless or decolorized (1) Ignore clear</p> <p>Test Acidified potassium manganate (VII) or permanganate (1) Allow acidified potassium manganate Result (Purple to) /turns colourless or decolorized (1)</p> <p>Test Alkaline potassium manganate (VII) or permanganate (1) Allow acidified potassium manganate Result (Purple to) brown (ppt) or turns green (1)</p>		3

Question Number	Acceptable Answers	Reject	Mark
3 (a) (i)	Gas syringe (2) (cylinder & plunger reasonably distinct) or Collection over water (1) graduated collection vessel (1) Max (1) if gaps in apparatus or if delivery tube goes straight through the walls of trough and collection vessel		2

Question Number	Acceptable Answers	Reject	Mark
3 (b) (i)	5 points correctly plotted (1) 8 or 9 points correctly plotted (2) Smooth best fit line (1)		3

Question Number	Acceptable Answers	Reject	Mark
3 (b) (ii)	29.0/20 (= 1.45) = 1.5 (1) cm^3s^{-1} or cm^3/s (1) (2 SF only)		2

Question Number	Acceptable Answers	Reject	Mark
3 (b) (iii)	Initial rate faster / higher / line steeper (1) Final gas volume the same (1)		2

Question Number	Acceptable Answers	Reject	Mark
3 (b) (iv)	Amount of H_2O_2 & therefore volume / amount of O_2 remains the same (1) (both points needed) Greater surface area (of MnO_2) (1) Results in more (frequent) collisions (between H_2O_2 molecules & MnO_2) (1)	No consequential marking 'smaller pieces' or fine powder (for greater surface area)	3

Question Number	Acceptable Answers	Reject	Mark
3 (c)	Weigh (1) filter (1) dry (1) and re-weigh (1) the catalyst Allow evaporation of H_2O_2 / H_2O for filter mark Repeat experiment using fresh H_2O_2 (1) Rate is the same / similar (1)	Just 'mass constant'	4

Question Number	Acceptable Answers	Reject	Mark
4 (a)	Burette or pipette Allow volumetric flask	Measuring cylinder	1

Question Number	Acceptable Answers	Reject	Mark
4 (b)	Bromine volatile or low boiling point or evaporates easily Or To ensure that the bromine does not evaporate		1

Question Number	Acceptable Answers	Reject	Mark
4 (c)	Reaction is exothermic or gives off heat (allow reaction is vigorous)	Reaction is fast	1

Question Number	Acceptable Answers	Reject	Mark
4 (d)	Round or pear-shaped flask with some attempt at a vertical condenser (1) Correct vertical condenser (1) Working reflux apparatus (heat, correct water flow, no stopper, no gaps, apparatus not one piece) (1) Ignore use of a Bunsen burner Fully correct distillation (1) max		3

Question Number	Acceptable Answers	Reject	Mark
4 (e)	Product / bromoethane is volatile or has a low boiling point or evaporates easily Allow To prevent evaporation of the bromoethane Or Bromoethane boils at 38.4 (°C) Or To ensure bromoethane is liquid		1

Question Number	Acceptable Answers	Reject	Mark
4 (f) (i)	Neutralize the (phosphoric) acid / bromine Allow react with or remove the acid / bromine		1

Question Number	Acceptable Answers	Reject	Mark
4 (f) (ii)	Drying agent or to remove water	Dehydration	1

Question Number	Acceptable Answers	Reject	Mark
4 (g)	From: 35, 36, 37 or 38 (°C) To: 39, 40, 41 or 42 (°C)	Fractions of degrees	1

Question Number	Acceptable Answers	Reject	Mark
4 (h) (i)	$10 \times 0.789/46 (=0.17152) = 0.172$ (ignore sf except 1 sf)	incorrect rounding	1

Question Number	Acceptable Answers	Reject	Mark
4 (h) (ii)	$0.17152 \times 109 = 18.6959 = 18.7$ (g) $0.172 \times 109 = 18.748 = 18.7$ (g) $0.17 \times 109 = 18.53 = 18.5$ (g) ECF on 4 (h)(i) Allow use of 108.9 (from periodic table) If M_r values transposed in 4hi) and 4hii) (mass = 3.33 g) penalise once (ignore sf except 1 sf)		1

Question Number	Acceptable Answers	Reject	Mark
4 (h) (iii)	$100 \times 13.3/18.7 = 71.123 = 71.1$ (%) $100 \times 13.3/18.5 = 71.8919 = 71.9$ (%) Or using moles: Moles of C_2H_5Br formed = $13.3/109 = 0.12202$ Yield = $100 \times 0.12202 / 0.17152 = 71.123 = 71.1$ (%) Final answer = 71.1% if all values in calculator ECF on 4 (h)(ii) (ignore sf except 1 sf)	Yield > 100 %	1

Question Number	Acceptable Answers	Reject	Mark
4 (h) (iv)	Bromine is in excess or All the ethanol is used up	Ethanol limiting reagent	1

Question Number	Acceptable Answers	Reject	Mark
4 (h)(v)	Transfer losses or handling losses or specific examples of these (e.g. some product remains in the aqueous layer during separation or in the flask during distillation. Reaction incomplete or Side / competing reactions	Just 'lost' Handling errors Evaporation Equilibrium <u>Named</u> other products of this reaction formed (i.e. phosphoric acid or water) Waste products	1

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