Question	Skill	Indicative material	Mark	Total
1(a)(i)	PDO	*Results table:* records initial burette readings, final burette reading and volume of ***Q*** added with correct headings and units in titration table. all burette readings for accurate titre in titration table recorded to nearest 0.05 cm^3 MMO *Titration Results: 22.50 cm^3* accuracy for the average titre (of consistent readings) within 0.20 cm^3 of teacher's average value scores 2 marks for the average titre (of consistent readings) within 0.30 cm^3 of teacher's average value scores 1 mark concordance at least two titre values are within 0.20 cm^3 (using uncorrected titres)	 1 1 2 1	**[5]**
1(a)(ii)	MMO	appropriate average volume of **P** in 2 d.p. from closest titre values (titre should be identified either in the table by a tick or in calculation)	1	**[1]**
1(b)(i)	ACE	No. of moles of **P** = 22.50/1000 x 0.2 = 0.00450 mol 1 mole of **P** reacts with 1 mole of HC*l* No. of moles of HC*l* = 0.00450 mol	 1	**[1]**
(ii)	ACE	No. of moles of HC*l* = 0.00456/0.025 x 0.25 (*Allow e.c.f.)* = 0.0450 mol	 1	**[1]**
1(c)(i)	ACE	No. of moles of HC*l* that has reacted with MgO = (0.1 x 1 mol/dm^3) – 0.0450 = 0.055 mol (*Allow e.c.f.)* 1 mole of MgO reacts with 2 moles of HC*l* No. of moles of MgO = 0.055/2 = 0.0275 mol	 1 1	**[2]**
(ii)	ACE PDO	Mass of MgO = 0.0275 x (24+16) (*Allow e.c.f.)* = 1.10 g (with unit)	 1	**[1]**

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1(c)(iii)	ACE	Percentage purity = 1.10/1.2 (*Allow e.c.f.)* = 91.7%	 1	**[1]**
(d)	P	Impurities in magnesium oxide does not react with acid.	1	**[1]**
(e)	ACE	Water dilutes aqueous sodium hydroxide, lower concentration of sodium hydroxide. Higher volume of aqueous sodium hydroxide required to neutralize acid.	1 1	**[2]**

Total: 15

Question	Skill	Indicative material	Mark	Total
2(a)	MMO	Effervescence. Gas evolved produces white precipitate in limewater. Gas is CO_2	1 1 1	**[3]**
2(b)	MMO	No observable change. Gas evolved on warming, turns damp red litmus blue. Gas is NH_3	1 1 1	**[3]**
2(c)	MMO	White precipitate formed and then dissolves / no ppt /no observable change effervescence on addition of nitric acid	1 1	**[2]**
2(d)	MMO	White precipitate formed Precipitate insoluble in HNO_3	1 1	**[2]**
2(e)	ACE	NH_4^+/ammonium – When X is warmed with NaOH(aq) in (b), ammonia gas is produced CO_3^{2-}/carbonate – When HCl (aq) added to X in (a), CO_2 produced SO_4^{2-}/sulfate – white precipitate formed with $Ba(NO_3)_2$ in (d), insoluble in HNO_3 Na^+/K^+/sodium/potassium - the carbonate is soluble 1m each Alternative: identify NH_4^+, CO_3^{2-}, SO_4^{2-} 1m 1m each for each supporting evidence		**[4]**

Total: 14

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Question	Skill	Indicative material	Mark	Total
3(a)	P	Stopwatch Gas syringe/burette	1 1	**[2]**
3(b)	PDO	Appropriate scale with correctly labelled axis Correctly plot all the point. Draw a best fit line	1 1 1	**[3]**
3(c)	ACE	Mass of oxygen = 0.05/24 x 32 = 0.0667 g	 1	**[1]**
3(d)	ACE	First 50s: $34 \pm 1/50 = 0.68 \pm 0.2$ cm^3/s Second 50s: $(48-34 \pm 1)/50 = 0.28 \pm 0.2$ cm^3/s No unit –1m working required (qn says calculate)	1 1	**[2]**
3(e)	P	Measure the mass/mass loss/change in mass of hydrogen peroxide (1m) at regular time intervals (1m)	2	**[2]**
3(f)	P	The change in mass is too small to be measured accurately. / Some oxygen has dissolved in solution / increased temperature as reaction is exothermic, faster rate of reaction.	1	**[1]**
				Total: 11
				Question paper total: [40]

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