

2024 Sec 4 Prelim Chemistry P3 Mark Scheme

Question	Skill	Indicative material	Mark	Total
1(a)(i)	PDO	<i>Results table:</i> records initial burette readings, final burette reading and volume of Q added with correct headings and units in titration table.	1	[5]
		all burette readings for accurate titre in titration table recorded to nearest 0.05 cm ³	1	
	MMO	<i>Titration Results: 22.50 cm³</i> 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	2	
		concordance at least two titre values are within 0.20 cm ³ (using uncorrected titres)	1	
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 = $22.50/1000 \times 0.2$ = 0.00450 mol 1 mole of P reacts with 1 mole of HCl No. of moles of HCl = 0.00450 mol	1	[1]
(ii)	ACE	No. of moles of HCl = $0.00456/0.025 \times 0.25$ (Allow e.c.f.) = 0.0450 mol	1	[1]
1(c)(i)	ACE	No. of moles of HCl that has reacted with MgO = $(0.1 \times 1 \text{ mol/dm}^3) - 0.0450$ = 0.055 mol (Allow e.c.f.) 1 mole of MgO reacts with 2 moles of HCl No. of moles of MgO = $0.055/2$ = 0.0275 mol	1	[2]
			1	
(ii)	ACE PDO	Mass of MgO = $0.0275 \times (24+16)$ (Allow e.c.f.) = 1.10 g (with unit)	1	[1]

1(c)(iii)	ACE	Percentage purity = 1.10/1.2 (<i>Allow e.c.f.</i>) = 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

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 = $0.05/24 \times 32$ = 0.0667 g	1	[1]
3(d)	ACE	First 50s: $34 \pm 1/50 = 0.68 \pm 0.2 \text{ cm}^3/\text{s}$ Second 50s: $(48-34 \pm 1)/50 = 0.28 \pm 0.2 \text{ cm}^3/\text{s}$ 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]				