Separate Science (Chemistry) Unit 3 Quantitative chemistry – mark scheme

Foundation

Question number	Description	Marks	Page number
4.3.1 Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations			
4	(Mixed multiple choice questions), reading value form a graph, extrapolation of graph calculation, describing mistakes in a gradient calculation and example of doing the correct calculation, calculating Ar of an unknown element in a compound and then using periodic table to name element	16	2
4.3.3 Yield and atom economy of chemical reactions			
6	Calculating atom economy, calculating 38% of 40kg, calculating Mr of a compound, calculating percentage yield (4.4.3 explain why aluminium is extracted from aluminium oxide by electrolysis rather than reduction)	11	4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	B		1	AO2 5.1.2.1
04.2	calcium oxide **or** CaO carbon dioxide **or** CO_2	either order	1 1	AO1 5.1.1.1 5.3.1.3
04.3	decomposition		1	AO1 5.3.1.3
04.4	endothermic		1	AO1 5.5.1.1
04.5	32 (g)	allow 31–33 (g)	1	AO2 5.3.1.3
04.6	 $\frac{32}{5.2} \times 24$ 148 (g) **or** uses graph eg 12 dm^3 gives 74 (g) (1) (then factors up so that 24 dm^3 gives) 148 (g) (1)	an answer of 148 (g) scores **2** marks allow ecf from question **04.5** allow a range 143–153 (g) allow a range 143–153 (g)	 1 1	AO3 5.3.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7		mark mistakes and calculation independently		AO3 5.3.1.3
	(mistakes) increase in mass = 3 (not 4)	allow mistakes in either order	1	
	inserted numbers inversely into formula	allow numbers wrong way round	1	
	(calculation)	an answer of 250 scores the **2** calculation marks	1	
	gradient $= \frac{750}{3}$	allow $\frac{1000}{4}$		
	250 (cm^3 per g)	if no calculation marks awarded	1	
		allow $\frac{750}{3}$ **or** 187.5 **or** $\frac{3}{750}$ **or** 0.004 for **1** mark		
04.8		an answer of 24 scores the **3** calculation marks		AO2 5.3.1.2 5.3.1.3 5.1.1.5
	3 × 16 or 48		1	
	(48) + 12 or 60	allow their mass of oxygen + 12	1	
	84 − (60) **or** 24	allow 84 − their mass of carbonate	1	
	magnesium **or** Mg	magnesium **or** Mg without working scores this mark	1	
Total			**16**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$\frac{184}{(232 + 6)} \times 100$ = 77 (%)	an answer of 77 (%) scores **2** marks an answer of 78.63247863 (%) correctly rounded to at least 2 significant figures scores **1** mark allow 77.31092437 (%) correctly rounded to at least 2 significant figures	1 1	AO2 4.3.3.2
06.2	$\frac{38}{100} \times 40$ = 15 (kg)	an answer of 15 (kg) scores **2** marks allow 15.2 (kg)	1 1	AO2 4.4.1.3
06.3	(2 x 27) + (3 x 16) = 102	an answer of 102 scores **2** marks ignore units	1 1	AO2 4.3.1.2
06.4	$\frac{28.4}{31.8} \times 100$ = 89.3081761 (%) = 89.3 (%)	an answer of 89.3 (%) scores **3** marks allow 89.3081761(%) correctly rounded to at least 2 significant figures allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses the masses in the question	1 1 1	AO2 4.3.3.1

06.5	aluminium is more reactive than carbon (so) carbon cannot displace aluminium **or** (so) carbon cannot reduce aluminium oxide	allow aluminium is above carbon in the reactivity series allow (so) carbon cannot replace aluminium allow (so) carbon cannot remove oxygen from aluminium oxide allow (so) carbon will not react with aluminium oxide	1 1	AO1 4.4.1.1 4.4.1.2 4.4.1.3 4.4.3.3
Total			**11**	