Electrolysis of aqueous solutions (required practical)

Q1. (2019)

05.4	any **two** from: • concentration / volume of solution was different • impurities in solution • error in timing • copper falls off (electrode) • copper removed when drying electrode • electrode not dry (when weighed) • voltage / current was different	 allow copper at bottom of beaker ignore power supply ignore recorded mass inaccurately	2	AO3 5.4.3.4

Q2. (2019)

05.5		an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps		AO2 5.4.3.4
	reading of mass at stated time	allow tolerance of ± ½ small square eg at 30 minutes value is 5.4 (mg)	1	
	factor from time to 24 hours	eg 5.4 × 48 $(= \frac{24 \text{ hours}}{30 \text{ minutes}})$ allow correct calculation using incorrectly read value for mass at time quoted	1	
	correct evaluation	eg = 259 (mg)	1	
	alternative approach:			
	calculates the gradient (1)	eg (1.8÷10) = 0.18		
	gradient × time in minutes in 24 hours (1)	eg 0.18 × 24 × 60 **or** eg 0.18 × 1440 allow correct use of incorrectly determined gradient		
	correct evaluation (1)	eg = 259 (mg)		

Q3. (2021)

05.1	reduction	ignore electrolysis	1	AO2
	(as H^+ ions) gain electrons		1	AO1 5.4.1.4 5.4.3.1 5.4.3.4 RPA 9

Q4. (2021)

05.2	$2Cl^- \rightarrow Cl_2 + 2e^-$	allow $2Cl^- - 2e^- \rightarrow Cl_2$ ignore state symbols allow **1** mark for $Cl_2 + e^-$ allow **1** mark for $-e^-$ (on lhs) **and** Cl_2 (on rhs)	2	AO2 5.4.1.4 5.4.3.1 5.4.3.4 RPA9

Q5. (2021)

05.3	water molecules		1	AO1 5.4.1.4
	break down to produce OH^- ions	allow dissociate to produce OH^- ions	1	5.4.3.1 5.4.3.4 5.4.3.5
	(which are) attracted to the positive electrode		1	RPA9
	(where OH^- ions are) oxidised **or** (where OH^- ions) lose electrons	ignore discharged ignore oxygen is produced as no halide is present	1	

Q6. (2022)

A)

02.1	K_2SO_4		1	AO2 5.1.1.1 5.4.3.4 RPA9

B)

02.2	(volume of hydrogen) 30 (cm^3) **and** (volume of oxygen) 15 (cm^3)		1	AO2 5.4.3.4 RPA9

C)

02.3	(because) the ratio of volume of hydrogen : oxygen is 2 : 1 (and this is the) **same** as the ratio of hydrogen (atoms) : oxygen (atoms) in (formula of) H_2O **OR** (because) the ratio of volume of hydrogen : oxygen is **not** 2 : 1 (1) (and this is) **different** to the ratio of hydrogen (atoms) : oxygen (atoms) in (formula of) H_2O (1)	**must** relate to the volumes given in question **02.2**	1 1	AO3 5.4.3.4 RPA9

D)

02.4	9 ± 3 cm^3		1	AO2 5.3.1.4

Q7. (2023)

05.3	carbon / graphite	allow platinum / gold / silver	1	AO3 5.4.3.1 5.4.3.4 RPA9

Q8. (2023)

05.5	water (molecules) break down to produce (equal numbers of) H^+ and OH^- (ions)		1	AO3
	(so) the hydrogen / H^+ ions are attracted to the negative electrode (where) hydrogen ions are discharged / reduced		1	AO1
	(because) hydrogen is less reactive than sodium		1	AO3
	(so there is) a decrease in (the relative number of) hydrogen / H^+ ions **or** (so there is) an increase in the relative number of hydroxide / OH^- ions		1	AO3 5.4.2.4 5.4.3.1 5.4.3.4 5.4.3.5 RPA9