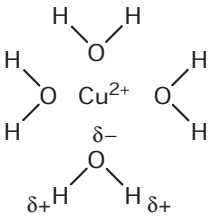
Answers to From Minerals to Elements End of Unit Test

Q	Answer with marks	Marking suggestions
1(a)	Solution goes brown (1); as bromine is produced (1)	
1(b) (i)	–1 (1)	
1(b) (ii)	0 (1)	
1(c) (i)	Loss of electrons (1)	
1(c) (ii)	$2Br^- \rightarrow Br_2 + 2e^-$ (1)	Allow $2Br^- - 2e^- \rightarrow Br_2$
1(d) (i)	Electrolysis (1); of brine/seawater/named chloride solution (1)	Score separately
1(d) (ii)	$2Br^-(aq) + Cl_2(g) \rightarrow Br_2(aq) + 2Cl^-(aq)$ (1) for reagents correct (1) for products correct and equation balanced (1) for state symbols if equation balanced	
1(e) (i)	A white (1); precipitate (1)	
1(e) (ii)	$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ (1) for formation of AgCl (even if not an ionic equation or spectator ions shown and not cancelled) (1) for correct ionic equation (1) for state symbols if equation balanced	
1(f)	Protective clothing *or words to that effect* (1); prevent breathing of vapour *or words to that effect* (1)	
1(g)	Answer is $18/160 = 0.11(3)\ mol\ dm^{-3}$ (1) for using correct M_r of Br_2 (160) (1) for multiplying by ten ($100\ cm^3$ to $1\ dm^3$) (1) for final answer (with *error carried forward*) with correct units and 2 or 3 significant figures	
1(h)	Photography, medicines, etc (1)	

Q	Answer with marks	Marking suggestions
2(a) (i)	It separates the mineral from unwanted material (1)	
2(a) (ii)	Roasting/heating (1); in air/oxygen (1)	
2(a) (iii)	1. Large amounts of waste/tailings ponds, etc (1) 2. Sulphur *dioxide* emissions (1)	
2(b) (i)	*d* block/transition metals/elements (1)	
2(b) (ii)	Step 5 (1)	
2(c)	SiO_2 has giant/network structure (1); CO_2 has (small) molecules/ molecular structure (1); covalent bonds (between atoms in giant structure) make SiO_2 hard/solid (1); weak/intermolecular forces between molecules make CO_2 a gas (1) (1) mark for diagrams or further description of either structure	

Q	Answer with marks	Marking suggestions
3(a)	$...2p^63s^23p^63d^{10}4s^1$ (1) $...2p^63s^23p^63d^9$ (1) $...2p^63s^23p^4$ (1)	Allow $3d^94s^2$, $4s^13d^{10}$,etc
3(b)	Funnel, connected by clearly sealed joint to... (1); a flask with a side-arm (1); labels: pump and filter paper (1)	
3(c) (i)	$\overset{+2\ -2}{CuS} + 1.5\overset{0}{O_2} \rightarrow \overset{+2\ -2}{CuO} + \overset{+4\ -2}{SO_2}$ (1) each, except only one mark for both copper oxidation states	Max (3) if signs follow numbers
3(c) (ii)	Equation 3.2 (1) NH_4^+ (1) proton donor (1)	

3(d) (i)	Add an indicator (1); do several titrations (1); and *one* from (1): proceed drop by drop near end-point; do a rough titration first; use a white tile	
3(d) (ii)	21.3/25 (2); Answer (0.852 mol dm^{-3}) (1) including 3sf and units; *allow error carried forward*	Allow (1) for correct calculation of moles of HCl or correct expression for concentration of ammonia.
3(e)	Three-dimensional array of spheres (1); alternate spheres labelled Cu^{2+} and S^{2-} (1)	
3(f)	 Positive copper (not necessarily 2+) surrounded by at least three water molecules (2); structure of water molecule clearly shown with δ^- on at least one oxygen (1)	Allow labelled blobs for water molecules for first mark