1(a)(i)	$Sr(HCO_3)_2 \rightarrow SrCO_3 + CO_2 + H_2O$
1(a)(ii)	**M1**: radius of cation / M^{2+} increases **OR** charge density of cation / M^{2+} decreases **M2**: less polarisation / less distortion of the anion / carbonate ion
1(b)	**M1**: least soluble CaF_2 < SrF_2 < BaF_2 most soluble **M2**: ΔH_{latt} and ΔH_{hyd} both become less exothermic / less negative **M3**: ΔH_{hyd} changes less / becomes less exothermic by a smaller extent **OR** ΔH_{latt} changes more / becomes less exothermic by a larger extent **M4**: ΔH_{sol} becomes more exothermic / more negative
1(c)(i)	enthalpy change when one mole of gaseous ions dissolve in water to form a solution
1(c)(ii)	**M1**: ionic radii **AND** ionic charge **M2**: (ionic) radii increase / charge density decreases **AND** ΔH_{hyd} decreases/less exothermic **AND** less attraction between water molecules and (gaseous) ions **OR** as ionic charge increases / charge density increases **AND** ΔH_{hyd} increases/more exothermic **AND** more attraction between water molecules and (gaseous) ions
1(d)	**M1**: use of –2957 / –1926 / –505 **AND** 2 × (–505) **M2**: correct signs and evaluation ΔH_{sol} of $MgF_2(s)$ = –1926 + (2 × –505) – (–2957) = (+)21 kJ mol^{-1}
1(e)(i)	**M1:** $K_{sp} = [Hg_2^{2+}] [F^-]^2$ **M2:** units = $mol^3\ dm^{-9}$
1(e)(ii)	$K_{sp} = 2^2 \times (9.20 \times 10^{-3})^3$ = **3.11×10^{-6}** min 2sf

1(a)	$Mg(NO_3)_2 \rightarrow MgO + 2NO_2 + ½O_2$ **OR** $2Mg(NO_3)_2 \rightarrow 2MgO + 4NO_2 + O_2$
1(b)	**M1:** $Mg(NO_3)_2$ / magnesium nitrate **AND** magnesium ion / Mg^{2+} **AND** is smaller / has higher charge density **M2:** nitrate ion / anion is more distorted / polarised
1(c)(i)	magnesium sulfate and water / $MgSO_4$ and H_2O
1(c)(ii)	**M1:** magnesium sulfate / **A** has a more exothermic ΔH_{latt} and ΔH_{hyd} **M2:** difference in ΔH_{hyd} is greater **M3:** magnesium sulfate / **A** has a more exothermic ΔH_{sol}

2(a)	**M1:** (solubility) decreases down the group **M2:** ΔH_{latt} and ΔH_{hyd} decrease / become less exothermic / less negative **M3:** ΔH_{hyd} decreases / changes more **/** dominant factor / becomes less exothermic by a larger extent **OR** ΔH_{latt} decreases / changes less / changes slower **M4:** ΔH_{sol} becomes less exothermic / less negative **OR** ΔH_{sol} becomes (more) endothermic / (more) positive
2(b)(i)	$Ag_2CrO_4(s) \rightleftharpoons 2Ag^+(aq) + CrO_4^{2-}(aq)$
2(b)(ii)	**M1:** $K_{sp} = [Ag^+]^2 [CrO_4^{2-}]$ **M2:** $\sqrt[3]{(1.12 \times 10^{-12} \div 4)} = 6.54 \times 10^{-5}$ **M3:** $[Ag^+] = 2 \times 6.54 \times 10^{-5} = 1.31 \times 10^{-4}$ (mol dm^{-3}) min 2sf

2(c)(i)	$K_a = 10^{-6.49} = 3.236 \times 10^{-7}$ $[H^+]^2 = 8.08984 \times 10^{-9}$ **M1:** $[H^+] = 8.99 \times 10^{-5}$ **M2:** $pH = -\log(8.99 \times 10^{-5}) = 4.05$ min 2sf
2(c)(ii)	conjugate acid H_2CrO_4 **AND** conjugate base CrO_4^{2-}
2(d)(i)	(the energy change / released when) one mole of gaseous atoms become 1^- ions / gain one mole of electrons
2(d)(ii)	due to repulsion between negative ion and incoming / gained electron
2(d)(iii)	$2Ag^+(g)$ $S^{2-}(g)$ → $Ag_2S(s)$
2(d)(iv)	**M1:** selection of correct six numbers only: –33, 731, 279, –200, 532, –2677 **M2:** use of × 2 as only multiplier with Ag **M3:** correct signs and evaluation of data $-33 = 2\Delta H_{at} + (2 \times 731) + 279 + (-200) + 532 + (-2677)$ $2\Delta H_{at} = 571$ (kJ mol $^{-1}$) $\Delta H_{at} = +285.5$ (kJ mol $^{-1}$)
2(e)	Ag_2S smaller / less negative / less exothermic lattice neergy **AND** larger ionic radius (of cation)