

3(a)(i)	two species that differ by one proton / H^+
3(a)(ii)	$H_2PO_4^-$ AND PO_4^{3-}
3(b)(i)	M1: $[H^+] = 2.51 \times 10^{-4}$ M2: $[CH_3CH_2COOH] = 4.67 \times 10^{-3}$
3(b)(ii)	3.98×10^{-11}
3(b)(iii)	$[HC\dot{I}] = 2.51 \times 10^{-4}$
3(b)(iv)	M1: top box ticked AND weaker acid M2: alkyl group is electron donating M3: O–H bond strengthened / anion is destabilised
3(c)(i)	NaOH AND $CH_3CH_2COOH + OH^- \rightarrow CH_3CH_2COO^- + H_2O$
3(c)(ii)	H_2SO_4 AND conjugate base of CH_3CH_2COOH is not present
3(d)(i)	3.69×10^{-5}
3(d)(ii)	M1: $K_{sp} = [Mn^{2+}][OH^-]^2$ M2: units = $mol^3 dm^{-9}$
3(d)(iii)	2.0×10^{-13}

1(a)(i)	2.12 g
1(a)(ii)	M1 add a (small) volume of (distilled) water (to the small beaker) AND dissolve the solid / $AgNO_3$ (s) M2 Transfer the solution and washings (using a funnel) AND into a 250 cm^3 volumetric flask. M3 Make up to the (calibration) mark / line with <u>distilled</u> water. AND then invert the (stoppered) flask (several times)
1(b)(i)	(20(.0) cm^3) pipette.
1(b)(ii)	barium (ions) could react with chromate (ions).
1(b)(iii)	Potassium chromate(VI) / $K_2CrO_4(aq)$ is an irritant / corrosive
1(c)(i)	They are (the only ones that are) concordant.
1(c)(ii)	$\frac{2 \times 0.05}{20.60} \times 100 = 0.48(54\%)$ Correct working must be shown.
1(d)(i)	$20.65 \times 0.05 / 1000 = 0.00103(25)$
1(d)(ii)	$= ((d)(i) / 2) \times (250 / 20)$ $= (d)(i) \times 6.25$

1(d)(iii)	M1 $M_r = 1.58 / (d)(ii)$ M2 $x = (M1 - 208.3) / 18$ AND x must be an integer. Some working must be shown.
1(e)	Heat to drive off water of crystallisation. M1 Apparatus 1 Bunsen burner. 2 Crucible (supported by pipeclay triangle) M2 Measurements 1 Measure mass of crucible (+ lid) (empty). 2 Measure mass crucible (+ lid) + solid before heating 3 Measure mass of crucible (+ lid) + residue (after heating.) M3 Key step in method • Description of heat to constant mass. OR Produce a suitable precipitate using a viable reaction. M1 Apparatus and method • Chooses suitable reagent. • Filter the precipitate. • Wash and (allow to) dry M2 Measurements • Measure mass of hydrated barium chloride used. • Measure mass of precipitate. M3 Key step in method • Description of dry to constant mass.