Rewarding Learning

ADVANCED
General Certificate of Education
2024

Chemistry

Assessment Unit A2 3

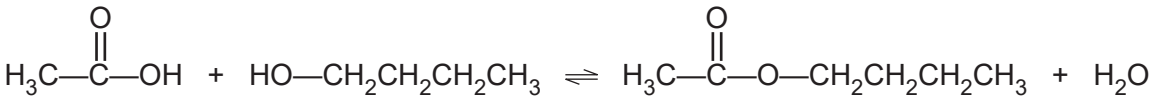
assessing

Further Practical Chemistry
Practical Booklet B (Theory)

[ACH32]

FRIDAY 21 JUNE, MORNING

MARK SCHEME

				AVAILABLE MARKS
1	(a)	(i)	addition is exothermic [1] dissipate the heat [1] [2]	
		(ii)	ethanoic acid would freeze/form a solid [1]	
		(iii)	reflux [1]	
		(iv)	anti-bumping granules [1]	
		(v)	transfer to a separating funnel and allow to settle [1] open the tap/run off the lower layer [1] open the tap/run off the upper layer into a clean, dry beaker [1] [3]	
	(b)	(i)	no more bubbles/no more effervescence [1]	
		(ii)	place in beaker or conical flask [1] add a spatula measure of a drying agent, e.g. anhydrous calcium chloride [1] shake/swirl [1] repeat until liquid changes to clear [1] filter/decant to remove drying agent [1] [5]	
		(iii)	distillation [1]	
		(iv)	boiling point not sharp/boiling point over a range/boiling point increases [1]	
	(c)	(i)	 [2]	
		(ii)	mass of ethanoic acid = 15 × 1.05 = 15.75 g moles of ethanoic acid = $\frac{15.75}{60}$ = 0.2625 [2]	
		(iii)	mass of butan-1-ol = 30 × 0.81 = 24.3 g moles of butan-1-ol = $\frac{24.3}{74}$ = 0.3284 [2]	
		(iv)	react in a 1 : 1 ratio [1] moles of butan-1-ol > moles of ethanoic acid [1] [2]	
		(v)	theoretical yield of product = 0.2625 moles theoretical yield of product = 0.2625 × 116 = 30.45 g percentage yield = $\frac{12.2}{30.45}$ ×100 = 40 % [3]	27

					AVAILABLE MARKS
2	**(a)**	**(i)**	$Co^{2+} + 2OH^- \longrightarrow Co(OH)_2$	[1]	
		(ii)	$[Co(NH_3)_6]^{2+}$	[1]	
		(iii)	changes to brown	[1]	
		(iv)	cobalt(II) chloride	[1]	
	(b)	**(i)**	it is reversible	[1]	
		(ii)	$[Co(H_2O)_6]^{2+} + 4Cl^- \rightleftharpoons [CoCl_4]^{2-} + 6H_2O$	[2]	
		(iii)	co-ordination number changes from 6 to 4 [1] shape changes from octahedral to tetrahedral [1]	[2]	
	(c)	**(i)**	green to blue	[1]	
		(ii)	$[Ni(H_2NCH_2CH_2NH_2)_3]^{2+}$	[1]	
		(iii)	$[Ni(H_2NCH_2CH_2NH_2)_3]^{2+} + edta^{4-} \longrightarrow [Ni(edta)]^{2-} + 3H_2NCH_2CH_2NH_2$	[2]	13
3	**(a)**	**(i)**	(the solution is) neutral	[1]	
		(ii)	red litmus paper changes to blue and blue litmus would remain blue	[1]	
	(b)		nitrogen [1] ethanol [1]	[2]	
	(c)		ammonia [1] sodium ethanoate [1]	[2]	
	(d)		ethanoic acid [1] ammonium chloride [1]	[2]	8

				AVAILABLE MARKS
4	(a)	(i)	both ions are negatively charged and will repel each other [1]	
		(ii)	catalyst [1]	
	(b)	(i)	colourless to brown [1]	
		(ii)	sodium thiosulfate reacts with the iodine produced [1] $2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + 2I^-$ [1] [2]	
		(iii)	colourless to blue-black [1]	
	(c)	(i)	moles = 5×10^{-3} mass = $5 \times 10^{-3} \times 248 = 1.24$ g [2]	
		(ii)	weigh 1.24 g of solid in a beaker [1] dissolve solid in a small volume of deionised water [1] transfer the solution to a 250 cm^3 volumetric flask with washings [1] make up to the mark with deionised water until the bottom of the meniscus is on the mark [1] stopper the flask and invert to mix [1] max [4]	12
			Total	**60**