Organic Synthesis - Mark Scheme

Q1.

Question number	Answer	Mark
	D it avoids the decomposition of the organic molecule when it distils	1

Q2.

Question number	Answer	Additional guidance	Marks
(a)	An answer that makes reference to the following points: (1)	Accept displayed/skeletal formulae	8
	• react iodoethane with **aqueous** hydroxide ions	Accept aqueous sodium hydroxide/ potassium hydroxide	
	• $C_2H_5I + OH^- \rightarrow C_2H_5OH + I^-$ (1)	$C_2H_5I + NaOH \rightarrow C_2H_5OH + NaI$	
	• oxidation of C_2H_5OH with acidified dichromate(VI) under **distillation** conditions (1)	Accept reference to sodium/ potassium dichromate(VI)	
	• $C_2H_5OH + [O] \rightarrow CH_3CHO + H_2O$ (1)		
	• react iodoethane with magnesium (in **ethoxyethane**) (1)		
	• $C_2H_5I + Mg \rightarrow C_2H_5MgI$ (1)		
	• reaction of ethylmagnesium iodide with ethanal to form butan-2-ol (1)		
	• $C_2H_5MgI + CH_3CHO + H_2O \rightarrow C_2H_5CH(OH)CH_3 + Mg(OH)I$ (1)	Allow this to be shown as two separate equations	

Question number	Answer		Additional guidance	Marks
(b)(i)	• calculation of number of moles of butan-2-ol	(1)	Example of calculation: n=(1.850 ÷ 74 =) 0.025 (mol)	4
	• calculation of number of moles of carbon dioxide and water	(1)	$n(CO_2) = 4 \times 0.025 = 0.100$ (mol) and $n(H_2O) = 5 \times 0.025 = 0.125$ (mol)	
	• calculation of carbon dioxide mass/mass increase of solid X	(1)	$m(CO_2) = 0.100 \times 44 = 4.40$ (g)	
	• calculation of mass of water/mass increase of solid Y	(1)	$m(H_2O) = 0.125 \times 18 = 2.25$ (g)	

Question number	Answer		Additional guidance	Marks
(b)(ii)	Prediction: • suitable example by name or formula.	(1)	Allow structural /displayed / skeletal formula. Any molecule with the molecular formula $C_4H_{10}O$	2
	Reason: • the same molecular formula as butan-2-ol / is an isomer of butan-2-ol.	(1)	Do not award just '$C_4H_{10}O$'	

Q3.

Question number	Answer	Mark
	A 3	1