Question number				Answer	Notes	Marks
1	a			organic compounds flammable OR decreases chance of fire OR less vapour/gas escapes	Ignore references to breaking boiling tube / beaker/escape of mercury / need to hold boiling tube / being burned by flame / loss of heat Ignore liquid escapes Accept stops/prevents vapour escaping Reject references to reactions inside the beaker	1
1	b	i	M1 M2	all five points correct	to nearest gridline Deduct 1 mark for each error If points not visible, assume they are under the line	2
			M3	straight line of best fit	Must be drawn with a ruler Does not need to be extrapolated Line should go through any two correctly plotted points	1
		ii		correct qualitative relationship	eg boiling point increases as relative formula mass increases / positive correlation Accept statement "wrong" way round Reject mass in place of relative formula mass Reject temperature in place of boiling point Reject (directly) proportional	1
		iii		117 (ºC) ±1º	CQ on candidate graph	1
		iv		E		1
					Total	**7**

Question number	Answer	Accept	Reject	Marks
2 (a)	**Any two from:** **M1** both forward and backwards reactions are occurring **M2** amounts/concentrations of reactants and products stay the same/pressure (of gas mixture) stays the same **M3** rate of forward reaction = rate of backwards reaction	masses for amounts	are the same	2
(b) (i)	**M1** increase **M2** (forward) reaction is exothermic/gives out heat **M2** dep on **M1** **IGNORE** references to le Chatelier's principle and to reaction tries to decrease the temperature/equilibrium shifts to right	reverse reaction is endothermic	equilibrium shifts to left	1 1
(b) ii)	**M1** increase **M2** fewer moles/molecules (of gas) on right (hand side) **M2** dep on **M1** **IGNORE** references to le Chatelier's principle and to reaction tries to decrease the pressure/equilibrium shifts to right	more molecules on left (hand side)	equilibrium shifts to left	1 1

(c) (i)	$2CH_3OH + O_2 \rightarrow 2H_2CO + 2H_2O$ **M1** formulae **M2** balancing **M2** dep on **M1** **IGNORE** catalyst if on <u>both</u> sides or above arrow **IGNORE** state symbols	multiples and halves		2
(ii)	**M1** – a substance that increases the rate of a reaction **IGNORE** alters the rate and any reference to enzymes **M2** and is chemically unchanged (at the end of the reaction) **IGNORE** references to takes no part in the reaction	mass does not change without being used up		1 1
(iii)	**M1** provides an alternative reaction path(way)/route/mechanism **M2** (alternative path has a) lower activation energy [Activation energy can be described, e.g. the minimum energy needed (by colliding particles) for reaction to occur] **MAX 1** if any mention of particles gaining energy	**M1** molecules adsorb on/stick to the catalyst **M2** weakens the bonds in the reactant molecules		1 1
(d)	$2CH_3OH + 3O_2 \rightarrow 2CO_2 + 4H_2O$ **M1** all formulae correct **M2** balanced **M2** dep on **M1** **IGNORE** state symbols	multiples and halves correct equation for methanal for one mark		2
			Total	**14**