

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	<u>reverse</u> 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)	$2\text{CH}_3\text{OH} + \text{O}_2 \rightarrow 2\text{H}_2\text{CO} + 2\text{H}_2\text{O}$ 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
	(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
(d)		$2\text{CH}_3\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 4\text{H}_2\text{O}$ 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

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1 a	reference to line/curve/temperature /graph/it AND not reached minimum / not constant / not level /not horizontal /still falling /decreasing/changing	Ignore reference to correlation Ignore has not reached zero / x-axis Ignore does not become	1
b	(better) insulator (than glass) OR poor conductor (of heat)	Accept equivalents such as prevents heat from entering / keeps out heat better Allow stops heat escaping / traps heat Reject references to keeping temperature constant Ignore references to breaking glass	1
c	i effervescence / fizzing / bubbles OR colourless solution/liquid formed	Accept carbon dioxide <u>gas</u> Accept gas given off/evolved/formed Ignore identity of gas Accept solid disappears/dissolves Ignore hissing and other sounds	1
	ii Neutralisation endothermic	Accept acid-base / acid-alkali M1 and M2 independent Accept answers in either order Do not penalise contradictions such as exothermic and endothermic – this answer is worth 1 mark	1 1

Question number	Answer	Notes	Marks
1 d i	product formulae or names / products (word) above reactants	Horizontal line not needed Ignore formula errors and one or two missing product(s) Ignore curves and intermediates	1
	ii (approximately) vertical line between reactants and products / between two levels AND labelled ΔH / energy change / heat change / enthalpy change	Ignore arrowheads on vertical line Ignore sign of ΔH Mark can be awarded for exothermic reaction Accept 2310 or any other number in place of ΔH	1