

Multiple Choice Answers

Q17: A

Q19: C

Multiple Choice Answers

Q18: C

Multiple Choice Answers

Q19: A

Q20: B

4(a)	M1 energy level of products below energy level of reactants M2 label of $\text{SO}_2(\text{g}) + 4\text{HF}(\text{g})$ on product line M3 upward arrow labelled E_a from energy level of reactants to the highest point of the curve M4 one downward arrow labelled ΔH AND energy change starting from energy level of reactants and finishing at energy level of products
4(b)	M1 $= (4 \times \text{S-F}) + (4 \times \text{O-H}) = (4 \times 330) + (4 \times 460) = 3160$ M2 bond energy of products $- 3160 = -54$ $= 3160 - (-54) = 3214$ M3 $(2 \times \text{S=O}) + (4 \times \text{H-F}) = 3214$ therefore $2 \times \text{S=O} = 3214 - (4 \times 570) = 934$ M4 $\text{S=O} = 934 \div 2 = 467$
4(c)	increased temperature: M1 (position of) equilibrium moves to left hand side M2 reaction is exothermic increased pressure: M3 (position of) equilibrium moves to left hand side M4 less (gaseous) moles on left hand side M5 no change / catalyst does not affect position of equilibrium
4(d)	M1 kinetic energy of particles decreases M2 frequency of collisions between particles decreases M3 lower percentage/proportion/fraction of collisions / particles have energy greater than / equal to activation energy

Multiple Choice Answers

Q16: B

Multiple Choice Answers

Q16: D

5(a)	M1 concentration is no longer changing M2 rates of forward reaction and of the reverse reaction are equal
5(b)(i)	M1 rate decreases M2 yield of methanol decreases
5(b)(ii)	no change(1) increases (1)
5(b)(iii)	exothermic
5(b)(iv)	M1 copper M2 transition element
5(c)(i)	any 2 from: - same or similar chemical properties or reactions (same) general formula (consecutive members) differ by CH_2 - same functional group - physical properties OR example of a physical property e.g. melting point / boiling point / volatility vary in predictable manner or show trends or gradually change
5(c)(ii)	$\text{C}_5\text{H}_{12}\text{O}$
5(d)(i)	M1 displayed formula of ester linkage, i.e. $\text{H or C} - \overset{\text{O}}{\overset{\parallel}{\text{C}}} - \text{O} - \text{C}$ M2 completely correct displayed formula of methyl ethanoate or ethyl methanoate i.e. $\begin{array}{c} \text{H} & \text{O} & \text{H} \\ & \parallel & \\ \text{H} - \text{C} & - \text{C} - \text{O} - & \text{C} - \text{H} \\ & & \\ \text{H} & & \text{H} \end{array}$ OR $\begin{array}{c} \text{O} & \text{H} & \text{H} \\ \parallel & & \\ \text{H} - \text{C} & - \text{O} - & \text{C} - \text{C} - \text{H} \\ & & & \\ & & \text{H} & \text{H} \end{array}$
5(d)(ii)	M1 butan-1-ol M2 ethanoic acid

5(e)	M1 C 64.87 / 12 H 13.51 / 1 O 21.62 / 16 OR 5.41 13.51 1.35 M2 C ₄ H ₁₀ O
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Multiple Choice Answers

Q20: D