

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Mark Schemes

Q1.

- (a) Amount / number / proportion / percentage / fraction / moles of molecules / particles

Penalise an incorrect qualification of the number eg NOT number of molecules with E greater than E_a .

Not 'atoms'.

1

- (b) There are no molecules / particles with zero energy

OR

All of the molecules / particles are moving / have some energy

Not 'atoms'.

The answer should relate the energy to the molecules.

1

- (c) **C** (The most probable energy)

1

- (d) **M1** The peak of the new curve is displaced to the right and lower than the original

M2 All of the following needed

- The new curve starts at the origin and should begin to separate from the original almost immediately
- and the new curve only crosses the original curve once
- and the total area under the new curve is approximately the same as the original
- and an attempt has been made to draw the new curve correctly towards the axis above the original curve but not to touch the original curve

2

- (e) None / no effect / stays the same

1

[6]

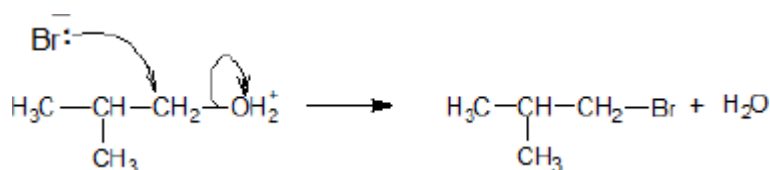
Q2.

- (a) (i) **M1** double-headed curly arrow from the lone pair of the bromide ion to the C atom of the CH_2

Penalise additional arrows.

M2 double-headed arrow from the bond to the O atom

As follows



2

- (ii) **M1** nucleophilic substitution

M1 both words needed (allow phonetic spelling).

M2 1-bromo(-2-)methylpropane

M2 Require correct spelling in the name but ignore any hyphens or commas.

2

- (b) **M1** hydrolysis

*For **M1** give credit for 'hydration' on this occasion only.*

M2 $\text{C}\equiv\text{N}$ with absorption range 2220–2260 (cm^{-1})

*Credit 1 mark from **M2** and **M3** for identifying $\text{C}\equiv\text{N}$ **and** either $\text{O}-\text{H}$ (acids) **or** $\text{C}=\text{O}$ **or** $\text{C}-\text{O}$ without reference to wavenumbers or with incorrect wavenumbers.*

M3 $\text{O}-\text{H}$ (acids) with absorption range 2500–3000 (cm^{-1})

OR

$\text{C}=\text{O}$ with absorption range 1680–1750 (cm^{-1})

OR

$\text{C}-\text{O}$ with absorption range 1000–1300 (cm^{-1})

*Apply the list principle to **M3***

3

- (c) (i) **M1** Yield / product **OR** ester increases / goes up / gets more

M2 (By Le Chatelier's principle) the position of equilibrium is driven / shifts / moves to the right / L to R / in the forward direction / to the product(s)

M3 – requires a correct statement in **M2**

(The position of equilibrium moves)

to oppose the increased concentration of ethanol

to oppose the increased moles of ethanol

to lower the concentration of ethanol

to oppose the change and decrease the ethanol

*If no reference to **M1**, marks **M2** and **M3** can still score BUT if **M1** is incorrect CE=0*

*If there is reference to 'pressure' award **M1** ONLY.*

3

(ii) **M1**

Catalysts provide an alternative route / pathway / mechanism

OR

surface adsorption / surface reaction occurs

*For **M1**, not simply 'provides a surface' as the only statement.*

***M1** may be scored by reference to a specific example.*

M2

that has a lower / reduced activation energy

OR

lowers / reduces the activation energy

*Penalise **M2** for reference to an increase in the energy of the molecules.*

*For **M2**, the student may use a definition of activation energy without referring to the term.*

*Reference to an increase in successful collisions in unit time alone is not sufficient for **M2** since it does not explain why this has occurred.*

2

[12]