

Name of the Student: _____

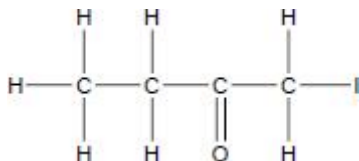
Max. Marks : 21 Marks

Time : 21 Minutes

Mark Schemes

Q1.

(a)



Apply list principle for more than one structure given

M1

1-iodobutan-2-one

Allow 1-iodo-2-butanone

M2

$$\frac{\text{Rate}}{[\text{CH}_3\text{CH}_2\text{COCH}_3][\text{H}^+]} = k$$

Rearranged expression Or with numbers

M1

$$k = 4.(04) \times 10^{-5} \text{ or } 0.00004(04)$$

If upside down = $24752 \text{ mol dm}^{-3} \text{ s}$ If multiply = $5.20 \times 10^{-4} \text{ mol}^3 \text{ dm}^{-9} \text{ s}^{-1}$

M2

$$\text{mol}^{-1} \text{ dm}^3 \text{ s}^{-1}$$

M3

$$(c) \quad 3.6(25) \times 10^{-5} (\text{mol dm}^{-3} \text{ s}^{-1})$$

Allow 3.59×10^{-5} to 3.63×10^{-5}

1

(d) Brown colour removed

Goes colourless

Allow (orange) brown to colourless

Allow purple to colourless

1

(e) As T increases rate ($1/t$) increases OR time for completion decreases

M1

Exponentially

OR

By a greater/ increasing factor

Or rate increases more and more as temp increases ie description of

exponential increase

M2

Many more particles have $E \geq E_a$

NOT just higher collision frequency

NOT just more successful collisions

M3

(f) Time = $\frac{1}{0.03} = 33 \text{ s}$

1

(g) $\ln(1.55 \times 10^{-5} / 1.70 \times 10^{-4}) = \frac{E_a}{R} \left(\frac{1}{333} - \frac{1}{303} \right)$
Insertion of correct values

M1

$-2.39 = \frac{E_a}{R} (-2.97 \times 10^{-4})$
Evaluate LHS and fraction on RHS

M2

$\frac{2.39 \times 8.31}{2.97 \times 10^{-4}} = E_a$
Re-arrange for E_a

M3

66937

Evaluate

M4

66.9 kJ mol⁻¹

convert to kJ mol⁻¹

M5

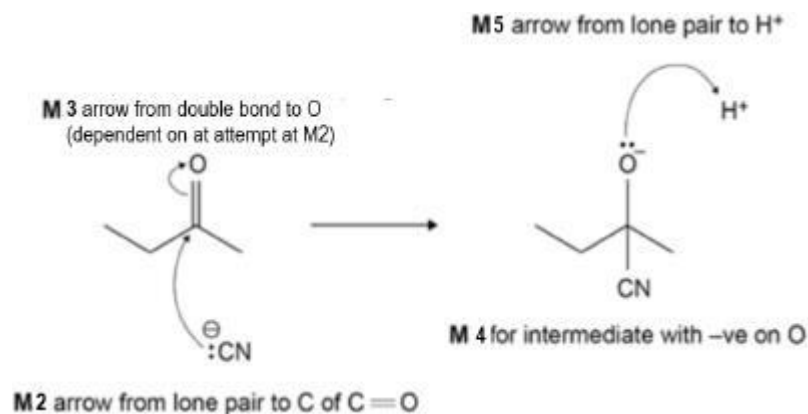
If only k_1 and k_2 reversed this gives a negative answer for E_a Lose M1 and M5

If AE in M2 allow ECF

Allow ECF from M4 to M5 for a correct unit conversion

Allow range 66.3 – 67.1

(h) Nucleophilic Addition



M1M2M3M4M5

ALLOW negative charge anywhere on cyanide

But attacking lone pair must be on C

Do not award M3 without attempt of M2
Allow M2 for attack to a positive carbon following breaking of C=O
Penalise covalent KCN in M2
M3 ignore partial charges unless wrong
Penalise M3 for incorrect connection between CN and C
NB Allow fully displayed or other structural formulae

[21]