Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Rate Equations

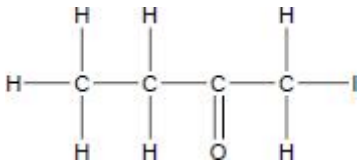
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Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

(a)



Apply list principle for more than one structure given

M1

1-iodobutan-2-one

Allow 1-iodo-2-butanone

M2

(b) $\frac{\text{Rate}}{[CH_3CH_2COCH_3][H^+]} = k$

Rearranged expression Or with numbers

M1

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

If upside down = 24752 mol dm^{-3} s
If multiply = 5.20 × 10^{-4} mol^3 dm^{-9} s$^-$

M2

mol^{-1} dm^3 s^{-1}

M3

(c) 3.6(25) × 10^{-5} (mol dm^{-3} 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

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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 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

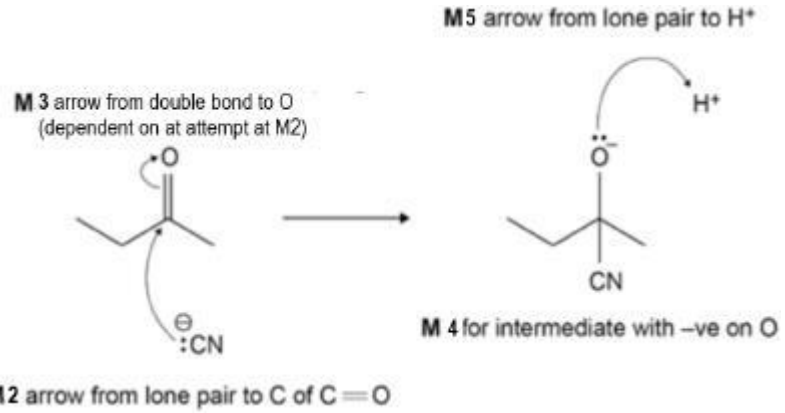
If only k_1 *and* k_2 *reversed this gives a negative answer for* E_a *Lose M1 and M5*

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

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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]

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