

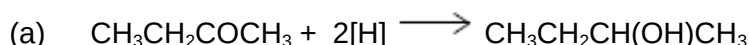
Name of the Student: _____

Max. Marks :19 Marks

Time :19 Minutes

Mark Schemes

Q1.



1

- (b) This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question.

All stages are covered and the explanation of each stage is generally correct and virtually complete.

Answer is communicated coherently and shows a logical progression from stage 1 to stage 2 then stage 3.

Level 3
5 – 6 marks

All stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies OR two stages are covered and the explanations are generally correct and virtually complete.

Answer is mainly coherent and shows progression from stage 1 to stage 3.

Level 2
3 – 4 marks

Two stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies, OR only one stage is covered but the explanation is generally correct and virtually complete.

Answer includes isolated statements but these are not presented in a logical order or show confused reasoning.

Level 1
1 – 2 marks

Insufficient correct chemistry to gain a mark.

Level 0
0 marks

Indicative Chemistry content

Stage 1: Formation of product

- Nucleophilic attack
- Planar carbonyl group
- H^- attacks from either side (stated or drawn)

Stage 2: Nature of product

- Product of step 1 shown
- This exists in two chiral forms (stated or drawn)
- Equal amounts of each enantiomer / racemic mixture formed

Stage 3: Optical activity

- Optical isomers / enantiomers rotate the plane of polarised light equally in
- With a racemic / equal mixture the effects cancel

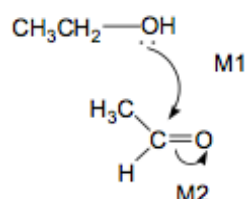
Q2.

- (a) (i) Nucleophilic addition

Any extra loses the mark

Allow minor spelling errors e.g. nucleophyllic

1



(ii)

M1 for arrow from lone pair on oxygen in ethanol to C of C=O (or to space half way between O and C)

M2 for arrow from C=O bond to oxygen in ethanal

Do not allow M2 as first step without nucleophilic attack, but can allow M1 for attack on C⁺ produced

+ rather than δ⁺ on C=O loses M2

Ignore any further steps

Mark independently

1

1

- (b) (i) Equal mixture of enantiomers/optical isomers OWTTE

1

- (ii) (Non-superimposable) mirror images

Ignore rotates light in opposite directions

Ignore stereoisomers

1

- (c) (i) Ethanal 0.33

1

Ethanol 4.16

Allow 4.2 for ethanol

1

$$K_c = \frac{[\text{acetal}][H_2O]}{[CH_3CHO][CH_3CH_2OH]^2} \text{ or with names}$$

$$\frac{(0.37/0.31)(0.65/0.31)}{(0.58/0.31)(3.76/0.31)^2} \text{ OR } \frac{(0.37)(0.65)}{(0.58)(3.76)^2} \times 0.31$$

(ii)

Ignore slips in acetal structure or formula C₆H₁₄O₂

If K_c wrong, allow M4 only for units conseq to their K_c

If volume omitted (gives 2.93 × 10⁻²) may only score M1 and M4

If volume used = 310 cm³ allow M2 then award M3 for 9.08 – 9.23 only and M4 for mol⁻¹ cm³ only

Treat error in converting 310 cm³ to dm³ as AE

M1

M2

$$9.1 \times 10^{-3}$$

Allow range 9.08 × 10⁻³ – 9.23 × 10⁻³

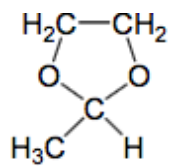
M3

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

Not moles⁻¹dm³

M4

(d)



1

[12]