Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1

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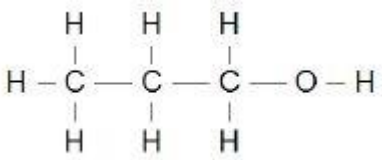
Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a)



Must be displayed **1**

(b) Nucleophilic substitution **1**

Excess NH_3

Ignore aqueous, alcoholic, conc, dil, temp, heat, pressure **1**

(c) Amount of $CH_3CH_2CH_2Br$ 25.2/122.9 (=0.205) (mol) **M1**

Amount of $CH_3CH_2CH_2NH_2$ M1 × 0.75 (= 0.154) (mol) **M2**

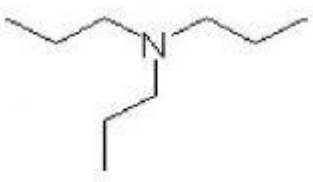
Mass $CH_3CH_2CH_2NH_2$ M2 × 59.0 = 9.07g Must be 3sf **M3**

If either Mr incorrect or used incorrectly then only award 1 mark for 75% yield calculation
(ignore rounding to 123 for $CH_3CH_2CH_2Br$)

OR
Max mass amine = M1 × 59.0 (= 12.1) (g)
Actual mass = M2 × 0.75 = 9.07g Must be 3sf

Allow 9.09 but if 9.08 check for AE
18.9 scores 1 for 75%

(d)



Must be skeletal

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Ignore lone pair

1

tertiary amine or 3° amine (only award if a tertiary amine shown)

1

(e) NaOH/ ethanol or KOH / ethanol (both required)

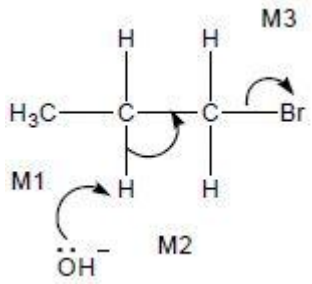
***NOT** aqueous*

Ignore heat, temp, conc., dil,

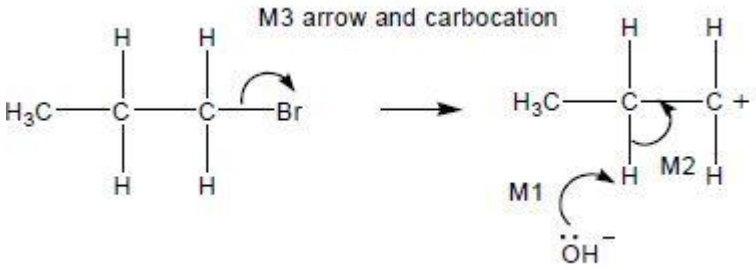
Accept alcoholic for ethanol

1

(f) (Basic) Elimination



Also credit E1 mechanism



1

M1 arrow from <u>lone pair on O</u> of hydroxide to correct H (or to space mid way between hydroxide O and H)

M2 arrow from C-H bond to C-C bond following attack by OH^- on the correct H

M3 arrow from C-Br bond to Br

If nucleophilic substitution shown then allow M3 only in mechanism

If wrong haloalkane used then Max 2 for mechanism

M3 curly arrow for loss of Br^- & structure of carbocation

M1 arrow from <u>lone pair on O</u> of hydroxide to H (or to space mid way between hydroxide O and H) (same as E2)

M2 arrow from C-H bond to C-C bond (same as E2)

3

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Q2.

(a) 7–10.2

any range (i.e. 2 values) within this range

1

(b) $K_a = \frac{[H^+][X^-]}{[HX]}$

ALLOW H_3O^+ for H^+ and A for X
IGNORE $[H^+]^2/[HX]$
must be square brackets
IGNORE state symbols

1

(c) Amount NaOH = $(24.0 \times 0.100)/1000 = 2.40 \times 10^{-3}$ mol

(= amount HX)

Conc HX = $2.40 \times 10^{-3}/0.025 = 0.0960$ mol dm^{-3}

ecf for M1/0.025

(d) ($K_a = 2.62 \times 10^{-5} = [H^+]^2/0.0960$)

$[H^+] = \sqrt{(2.62 \times 10^{-5} \times 0.0960)}$ (= 1.59×10^{-3} mol dm^{-3})

ecf from part (c) $[H^+] = \sqrt{(2.62 \times 10^{-5} \times$ ans to part (c))
From alternative data
$[H^+] = \sqrt{(2.62 \times 10^{-5} \times 0.600)}$ (= 3.96×10^{-3} mol dm^{-3})

(pH = –log 1.59×10^{-3} =) 2.80 (must be 2 or more dp)

1

pH = 2.40 (must be 2 or more dp)
M2 dependent on a calculation of $[H^+]$

1

(e) (pH at half-neutralisation = pK_a)

= –log $2.62 \times 10^{-5} = 4.58$ (must be 2 or more dp)

ALLOW 1dp if already penalised in part (d)

1

(f) Both points plotted correctly and line touches both points

ecf from (d) and (e) within 1 small square

1

<u>Line steeper at start</u> then levels (to show buffering)

Mark independently

1

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