Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Organic Synthesis

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

In each section

- If wrong or no reagent given, no marks for any observations;
- Penalise incomplete reagent or incorrect formula – but mark observations
- Mark each observation independently
- Allow *no reaction* for no change / no observable reaction in all three parts, but not *none* or *nothing*
- Q says **one test**. If two tests are given, score zero

(a)

	$K_2Cr_2O_7$ / H^+	$KMnO_4$ / H^+	Lucas test ($ZnCl_2$ / HCl)
R Primary alcohol	(Orange) goes green Penalise wrong starting colour	(purple) goes colourless / decolourises allow goes brown	No cloudiness
S Tertiary alcohol	no change / no observable reaction	no change / no observable reaction	Rapid cloudiness

1

1

1

Allow acidified potassium manganate and acidified potassium dichromate without oxidation numbers

(b)

	Na_2CO_3 / $NaHCO_3$ named carbonate	metal eg Mg	named indicator

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PCl_5 *PCl_3*

$SOCl_2$

Named alcohol + HCl / H_2SO_4

1

T ester	no change / no observable reaction	no change / no observable reaction	no effect

no change / no observable reaction

1

U Acid	Effervescence or (CO_2) gas formed	Effervescence or (H_2) gas formed	acid colour

Fumes / (HCl) gas formed

Sweet smell

1

(c)

	Fehling's / Benedict's	Tollens' / $[Ag(NH_3)_2]^+$	$K_2Cr_2O_7$/ H^+

I_2 / NaOH

1

V Ketone	no change / no observable reaction	no change / no observable reaction	no change / no observable reaction

Yellow ppt

1

W aldehyde	Red ppt	Silver mirror	(Orange) goes green Penalise wrong starting colour

no change / no observable reaction

1

[9]

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Q2.

(a) Hydrogen bond(ing)

Allow H bonding.

Penalise mention of any other type of bond.

1

(b) (i) Ammonia is a nucleophile

Allow ammonia has a lone pair.

1

Benzene repels nucleophiles

Allow (benzene) attracts / reacts with electrophiles.

***OR** benzene repels electron rich species or lone pairs.*

***OR** C–Cl bond is short / strong / weakly polar.*

1

(ii) H_2 / Ni **OR** H_2 / Pt **OR** Sn / HCl **OR** Fe / HCl

Ignore dil / conc of HCl.

Ignore the term 'catalyst'.

Allow H_2SO_4 with Sn and Fe but not conc.

Ignore NaOH following correct answer.

Not $NaBH_4$ nor $LiAlH_4$.

1

(iii) conc HNO_3

conc H_2SO_4

1

If either or both conc missed can score 1 for both acids.

1

$HNO_3 + 2H_2SO_4 \longrightarrow NO_2^+ + H_3O^+ + 2HSO_4^-$

OR using two equations

$HNO_3 + H_2SO_4 \longrightarrow H_2NO_3^+ + HSO_4^-$

$H_2NO_3^+ \longrightarrow H_2O + NO_2^+$

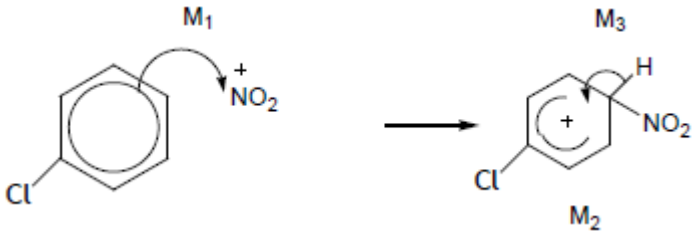
Allow 1:1 equation.

$HNO_3 + H_2SO_4 \longrightarrow NO_2^+ + H_2O + HSO_4^-$.

1

(iv) Electrophilic substitution

1



OR

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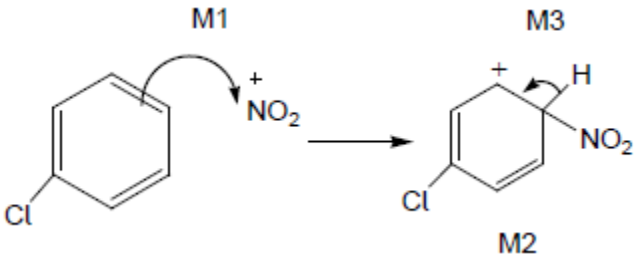

- *Ignore position or absence of Cl in M1 but must be in correct position for M2.*
- *M1 arrow from within hexagon to N or <u>+ on N</u>.*
- *Allow NO_2^+ in mechanism.*
- *Bond to NO_2 must be to N for structure mark M2.*
- *Gap in horseshoe must be centered around correct carbon (C1).*
- *+ in intermediate not too close to C1 (allow on or "below" a line from C2 to C6).*
- *M3 arrow into hexagon unless Kekule.*
- *Allow M3 arrow independent of M2 structure.*
- *Ignore base removing H in M3.*
- *+ on H in intermediate loses M2 not M3.*

3

[11]

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