AQA A-Level Chemistry

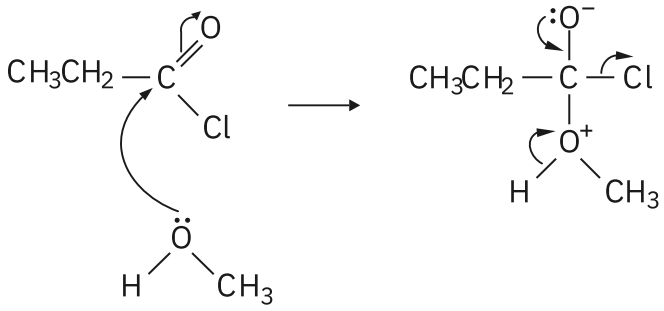
Aromatic chemistry mark scheme · goes with “Aromatic chemistry” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Aromatic chemistry · 8 questions

Q1 · June 2023 · Paper 2 · Q3 · [12 marks]

(a)



M1 Structures of reactant species

M2 Arrow from lp on O to C

M3 Arrow from C=O bond to O

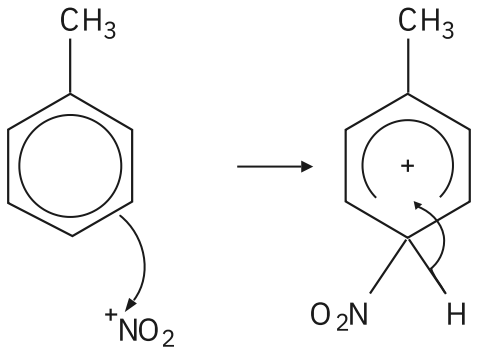
M4 3 curly arrows and lp on intermediate

Allow full marks for candidates who draw a second intermediate formed after formation of C=O and loss of Cl^- then loss of H^+

Ignore any attempt to show the final products

[4 marks]

(b)



M1 Structures of reactant species including + on N of $+NO_2$

M2 Arrow from ring (inside hexagon) to N or + on N

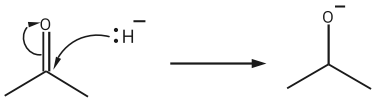
M3 Arrow from C-H bond into hexagon

M4 Electrophilic substitution

Apply list principle

[4 marks]

(c)



M1 Arrow from lp on hydride to C

M2 Arrow from C=O to O

M3 Intermediate structure / Allow displayed or abbreviated structures

Ignore any attempt to show further steps if correct Penalise further incorrect steps

M4 Nucleophilic addition

Apply list principle

[4 marks]

Q2 · June 2024 · Paper 2 · Q10 · [12 marks]

(a) M1 Benzene is more stable than cyclohexatriene

M2 The enthalpy of hydrogenation of benzene is (152 kJ mol^{-1}) less/less exothermic

M3 Due to the delocalisation of electrons in benzene

M4 Both are planar/hexagonal

M5 Benzene has equal C-C bond lengths or regular hexagon whereas Cyclohexa-1,3,5-triene has bonds of different/varied length or the hexagon is distorted/irregular

M4 and M5 could be shown in a clear diagram

[5 marks]

(b) M1 Concentrated nitric acid AND concentrated sulfuric acid/conc. HNO_3 AND conc. H_2SO_4

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

OR

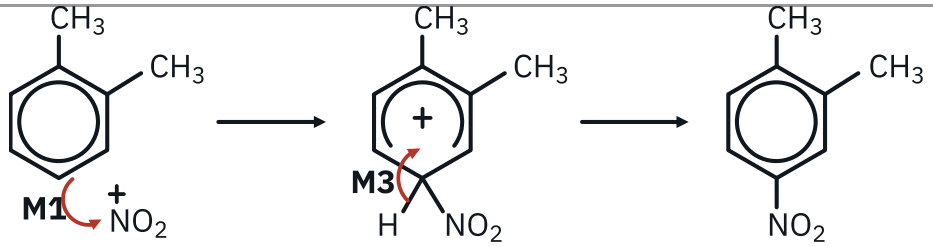
$HNO_3 + H_2SO_4 \rightarrow H_2NO_3^+ + HSO_4^-$ then $H_2NO_3^+ \rightarrow NO_2^+ + H_2O$

OR

$HNO_3 + H_2SO_4 \rightarrow H_2O + NO_2^+ + HSO_4^-$

[2 marks]

(c)



M2 – structure

M1 Positive must be on N and arrow from inside hexagon to N or + on N

M2 Structure showing horseshoe and positive charge.

- Horseshoe centred on C1 but must not extend beyond C2 and C6
- + in intermediate not too close to C1 (allow on or "above" a line from C2 to C6)

M3 Arrow from C-H bond back into hexagon

[3 marks]

(d) Sn/HCl

Allow H_2 with Pt/Ni

Allow HCl with Fe

Ignore references to NaOH used after Sn/HCl BUT penalise if NaOH used at the same time as Sn/HCl

[1 mark]

(e) Manufacture of dyes/(cationic) surfactants/fabric softener

Allow to make hair/fabric conditioner

[1 mark]

Q3 · June 2022 · Paper 3 · Q30 · [1 mark]

Answer: **B**

hydrolysis

Q4 · June 2017 · Paper 3 · Q33 · [1 mark]

Answer: **B**

Q5 · June 2018 · Paper 3 · Q23 · [1 mark]

Answer: **A**

Q6 · June 2019 · Paper 3 · Q20 · [1 mark]

Answer: **B**

Q7 · June 2019 · Paper 3 · Q26 · [1 mark]

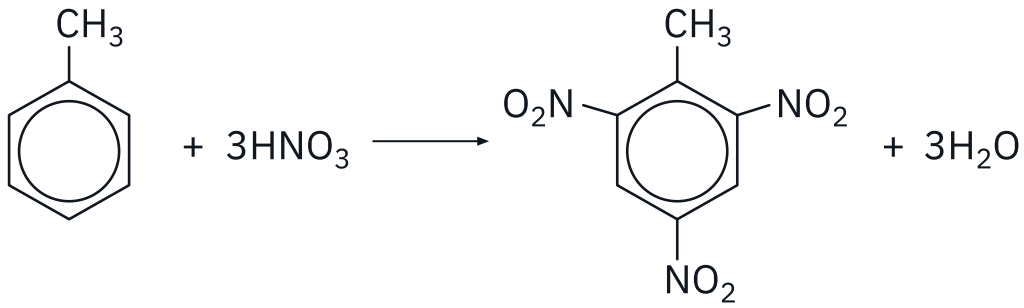
Answer: **C**

Q8 · June 2025 · Paper 2 · Q5 · [11 marks]

05.1

M1 for structure of TNT

M2 for the rest of the equation



[2 marks]

05.2

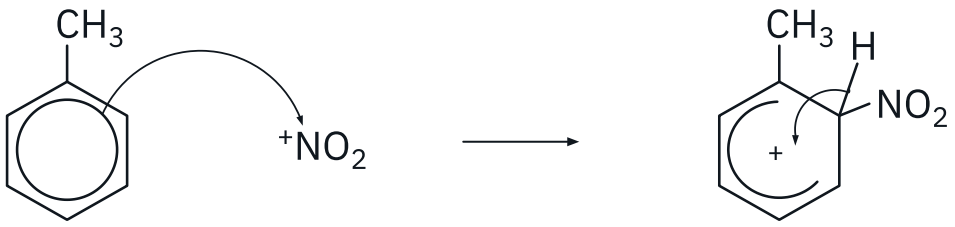
Answers	Additional comments/Guidelines
M1 Mass 1050 cm^3 methyl benzene = 1050 × 0.867 = 910.35 g	
M2 n $C_6H_5CH_3$ = $\frac{(M1)}{(92)}$	M2 n $C_6H_5CH_3$ = $\frac{(910.35)}{(92)}$ = 9.895 mol
M3 n $C_6H_2CH_3(NO_2)_3$ = M2 × 0.425	M3 n $C_6H_2CH_3(NO_2)_3$ = 9.895 × 0.425 = 4.205 mol
M4 Mass TNT = M3 × 227 = 955 g (3sf) allow 954.6 to 2 or more sf	M4 Mass TNT = 4.205 × 227 = 955 g (3sf) allow 954.6 or more sf

[4 marks]

05.3

M1 $HNO_3 + 2H_2SO_4 \rightarrow O_2N^+ + 2HSO_4^- + H_3O^+$

M2 Electrophile



M3 Positive must be on N and arrow from inside hexagon to

N or + on N

M4 Intermediate structure with horseshoe not beyond C2–C6

M5 Arrow from C–H bond back into the hexagon

$M1\ HNO_3 + H_2SO_4 \rightarrow O_2N^+ + HSO_4^- + H_2O$

OR via two equations

[5 marks]

Source: AQA A-Level Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.

Stuck on any of these? One-to-one online A-Level chemistry tuition with Joe White, an experienced examiner: whiteboardchemistry.com/tuition