Phenol Summary Map

Cambridge International A Level Chemistry · Topic 32 Phenol

1 A weak acid

32.2.2(a), (b)

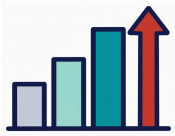
- NaOH(aq): sodium phenoxide + H_2O
- Na(s): sodium phenoxide + **H_2**
- No CO_2 from carbonates
- Phenol dissolves in alkali



2 Relative acidity

32.2.3, 32.2.4

- **Ethanol < water < phenol**
- Phenoxide charge spreads into the ring
- A more stable anion
- Ethoxide: alkyl pushes electrons on

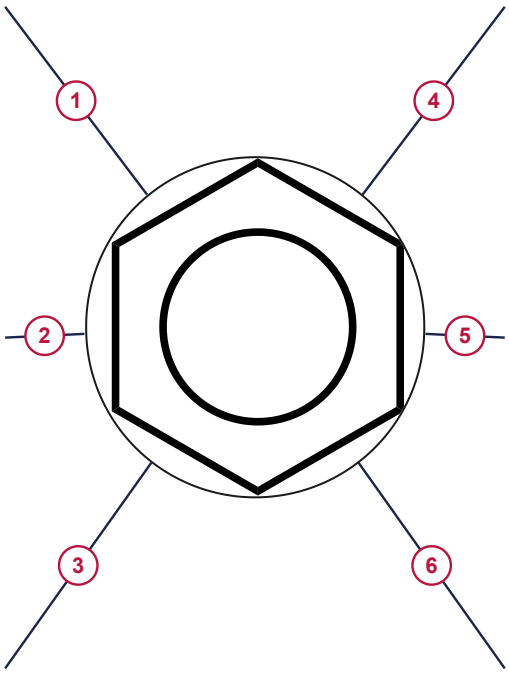


3 Bromination

32.2.2(e)

- Br_2(aq), no catalyst
- Orange to colourless
- **White precipitate**
- 2,4,6-tribromophenol + 3HBr

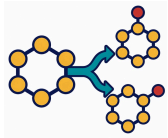




4 Nitration

32.2.2(d)

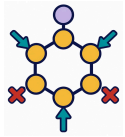
- **Dilute** HNO_3(aq)
- Room temperature
- 2-nitrophenol
- 4-nitrophenol



5 Milder conditions

32.2.5, 32.2.6

- O lone pair joins the π-system
- **Higher electron density**
- Stronger attraction for electrophiles
- OH directs to **2, 4 and 6**



6 Other phenols

32.2.7

- Naphthol has OH on an arene
- Same reactions as phenol
- Reacts with NaOH
- Reacts with Br_2(aq)



Phenol against benzene

the same reaction, different conditions

Reaction	Benzene	Phenol
Bromination	Br_2, $AlBr_3$	Br_2(aq), no catalyst
Product	Bromobenzene	2,4,6-tribromophenol
Nitration	Conc HNO_3, conc H_2SO_4, 25–60 °C	Dilute HNO_3, room temperature
Product	Nitrobenzene	2- and 4-nitrophenol

Worked examples

Moles

- 0.940 g phenol: 0.0100 mol
- 0.100 mol dm^{-3} NaOH
- **100 cm^3**

Yield

- 0.940 g phenol
- 0.695 g 4-nitrophenol
- **50%**

Bromination

- 0.940 g: 0.0100 mol
- Mr of product 331
- **3.31 g**

Forming phenol from a diazonium salt, and azo dyes, are taught with Topic 34.

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