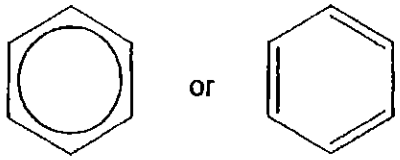
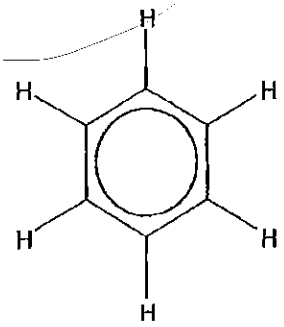
1 (a) structure. [2]

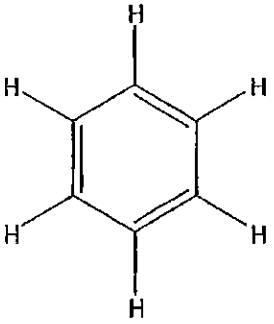


or

✓

accept





empirical formula: CH ✓ **NOT** C_6H_6 or $(CH)_6$

(b) HNO_3 ✓ [2]
H_2SO_4 ✓
accept words or formulae
NOT <u>dilute</u> acids – penalise dilute ONCE only; so dil H_2SO_4 + dil HNO_3 gets (1)
NOT correct words with wrong formula eg nitric acid HNO_2
NOT wrong words with correct formula eg nitrous acid, HNO_3
ignore state symbols
mark any wrong answers and subtract from correct answers to min of 0

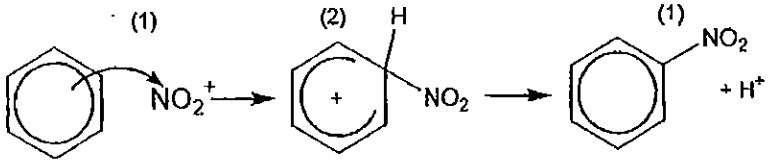
(c) (i) NO_2^+ ✓ [1]
NOT NO^{2+}

(ii) $HNO_3 + H^+ \rightleftharpoons H_2O + NO_2^+$ ✓ [1]
$HNO_3^+ \rightleftharpoons H_2O + NO_2^+$
or
$HNO_3 + 2H^+ \rightleftharpoons H_3O^+ + NO_2^+$
or
$2\,H_2SO_4 + HNO_3 \rightleftharpoons H_3O^+ + 2HSO_4^- + NO_2^+$
or
$HNO_3 + H_2SO_4 \rightleftharpoons NO_2^+ + HSO_4^- + H_2O$

equation must balance; $\rightleftharpoons$ not essential

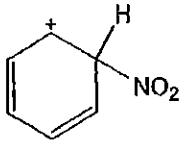
NOT $HNO_3 \rightleftharpoons NO_2^+ + HO^-$

(iii) electrophilic attack by NO_2^+ ✓ [4]
correct structure of cationic intermediate ✓ ✓
correct structure of product **and** H^+ ✓
(Kekulé structures accepted)
e g



arrow required, doesn't matter where it comes from but must be in **correct direction**

be careful with position of horseshoe and of +



both products required or $PhNO_2$ and arrow for loss of H^+
NOT H_2SO_4 as product unless HSO_4^- given as base to remove H^+

(d) M_r C_6H_6 = 78 ✓ [4]
M_r $C_6H_5NO_2$ = 123 ✓

all correct working ✓
allow e.c.f from wrong M_r
e g

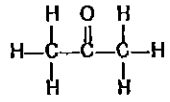
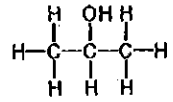
moles $C_6H_6 = \frac{10}{78} = 0.128$

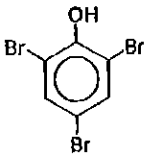
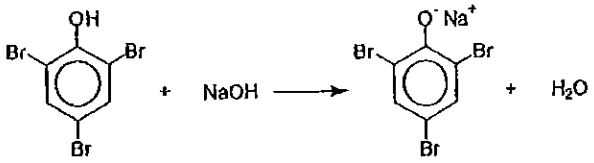
100% yield = 0.128 x 123 = 15.77g

%yield = $\frac{13.3}{15.77}$ x 100 = **84.3%** ✓ (answer) must have 3 sig figs

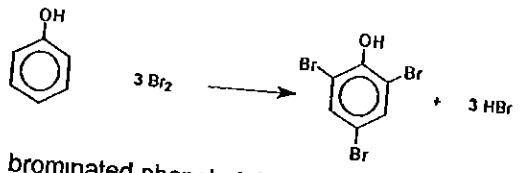
accept any answer in the range 84.2 → 84.5 as 'correct'
Correct answer on its own = 4 marks

Total = 14

Qu.	Expected answers:	Marks
1 (a)	propanone ✓  ✓	[2]
(b) (i)	propan-2-ol ✓  ✓	[2]
(ii)	$NaBH_4$ ✓	[1]
(iii)	$C_3H_6O + 2[H] \longrightarrow C_3H_8O$ / C_3H_7OH ✓	[1]
(c)	2,4-dinitrophenylhydrazine ✓ yellow / orange/red … crystals /solid / ppt. etc ✓ (re)crystallise / purify ✓ measure melting point/m.p. (of product) ✓ compare with known compounds ✓ **ANY 4 out of 5**	max [4]
		[Total: 10]

Qu.	Expected answers:	Marks
2 (a) (i)	$C_6H_6 + Br_2 \longrightarrow C_6H_5Br + HBr$ organic product ✓ rest of the equation also correct ✓	[2]
(ii)	$FeBr_3$ / $AlBr_3$ / iron(III)bromide / aluminium bromide	[1]
(b) (i)	 ✓✓	[2]
(ii)	 organic product ✓(allow ecf from (i) but must be a ring with OH) rest of the equation also correct ✓	[2]
(iii)	(benzene) ring is activated ✓ lone pair on oxygen is delocalised / interacts with the π electrons ✓ more (π) electron density (around ring) ✓ attracts bromine / electrophiles more / polarises Br_2 molecule more ✓ *ANY* 3 marks from 4	max [3]
(iv)	antiseptics / disinfectants	[1]
		[Total: 11]

(b) (i)



brominated phenol ✓ 2,4,6 substituted ✓
balancing ✓

(ii)

phenoxide ✓
balancing ✓

[3]

(c) any general use that contains phenols - eg
antiseptics / disinfectants /dyes / plastics /pharmaceuticals / pesticides/explosives ✓ **[2]**

[1]

[Total: 11]