F324 TEST 1 MS

1. Discussion of the π-bonding

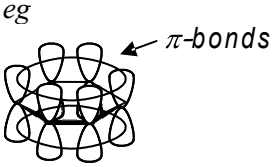
p-orbitals overlap **(1)**

above and below the ring **(1)**

(to form) π-bonds / orbitals **(1)**

any of the first three marks are available from a labelled diagram

eg



(π-bonds / electrons) are <u>delocalised</u> **(1)**

***4** marks*

Other valid points – any two of:

- ring is planar /
- C-C bonds are equal length / have intermediate length/strength between C=C and C-C /
- σ-bonds are between C-C and/or C-H
- bond angles are 120° 6

MAX 2** out of **4** marks **(1)(1)

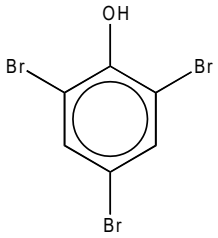
Quality of written communication

two or more sentences with correct spelling, punctuation and grammar 1

[7]

2. (i) $C_6H_5NO_2$ **(1)** 1

(ii)



1

[2]

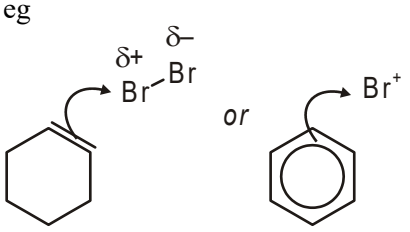
3. (a) (i) **bromine as**

an electrophile accepts an electron pair **(1)**
***NOT** a lone pair*

bromine is polarised/has + charge (centre)/dipole on Br-Br/Br^+ shown in diagram **(1)**

appropriate diagram showning a curly arrow from a double/ π bond to the $Br^{\delta+}$/Br^+ **(1)**

eg



3

(ii) **comparison of reactivity of cyclohexene and benzene**
benzene is (more) stable / more energy required **(1)**

benzene (π) electrons are delocalised **(1)**

benzene has lower electron/- charge density **(1)**

so bromine is less polarised /attracted to it /
benzene is less susceptible to electrophiles **(1)**

ora for cyclohexene 4

quality of written communication mark for any **two** of the the terms:

delocalised/localised, π-electrons/bonds/system, electron density, dative covalent, activation/stabilisation energy, halogen carrier, heterlytic fission, addition/substitution, polarity used appropriately **(1)** 1

(b) (i) iodobenzene because

Br is more electronegative than I **(1) ora**

so the I atom will be positive /δ^+ /the electrophile **(1)** 2

(ii) $C_6H_6 + IBr \rightarrow C_6H_5I + HBr$ **(1)**
or ecf giving $C_6H_5Br + HI$ 1

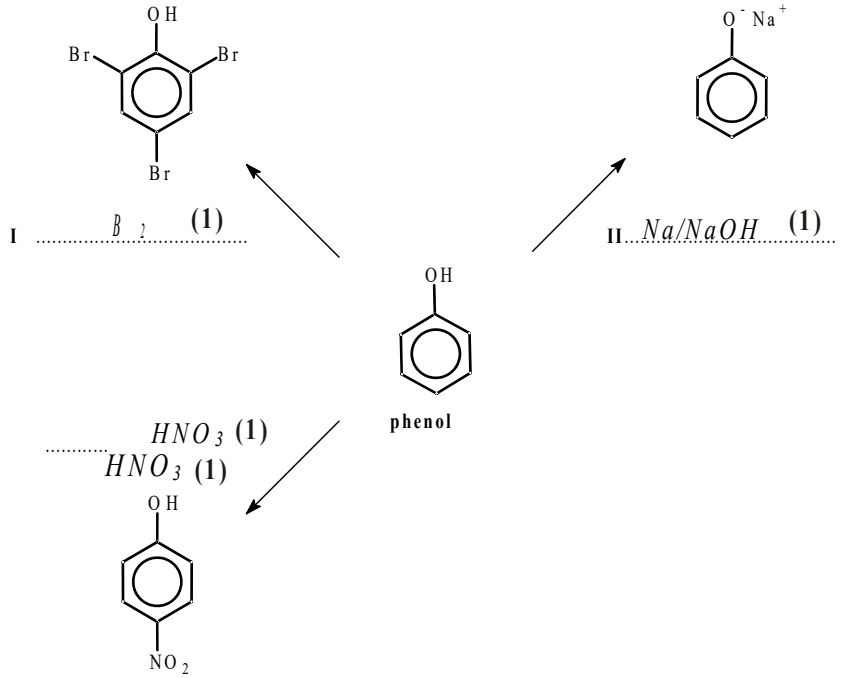
[11]

4. (conc) H_2SO_4 **(1)**
(conc) HNO_3 **(1)**
equation – e.g.: $C_6H_6 + HNO_3 \rightarrow C_6H_5NO_2 + H_2O$ **(1)**
intermediate – name or unambiguous structure **(1)**
4 marks

Quality of Written Communication mark for a well organised answer with the two stages clearly distinguished and sequenced **(1)**
1 mark 8

[5]

5.



(do not allow a halogen carrier with the bromine)

(do not penalise use of a nitrating mixture)

3
[3]