

F324 Module 1: HW4

1. Coloured organic compounds also include azo dyes.

Describe how an azo dye can be made from phenylamine. Show the structure of the azo dye and the organic intermediate in your answer.

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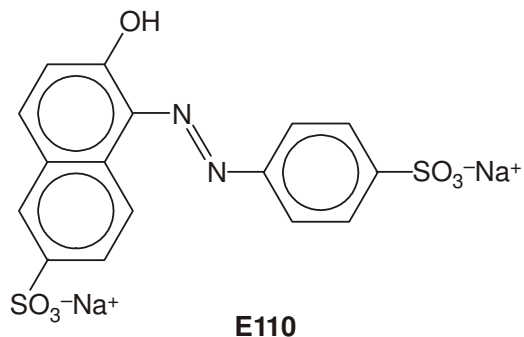
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[Total 6 marks]

- (b) The structure of E110 is shown below.



- (i) On the structure above, draw a circle around the functional group that identifies this molecule as an azo dye.
- (ii) Deduce how many carbon and hydrogen atoms are in a molecule of E110.
..... carbon atoms and hydrogen atoms.
- (c) The solubility of E110 in water can be improved by converting the phenolic -OH group into a charged -O^- group.
Suggest a suitable reagent that will convert the -OH group in E110 into an -O^- group.

[1]

[2]

[1]

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- (d) In the boxes below, draw the structures of a phenol and an amine that could be used to make E110 by the method in part (a).

Assume that the SO_3^-Na^+ groups do not change during the process.

phenol		amine
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[2]

[Total 13 marks]

3. The method below can be used to make phenylamine from nitrobenzene in the laboratory.

3.69 g of nitrobenzene and 8 g of tin (an excess) were placed into a flask. The flask was fitted with a reflux condenser. Concentrated hydrochloric acid was then added dropwise to the flask.

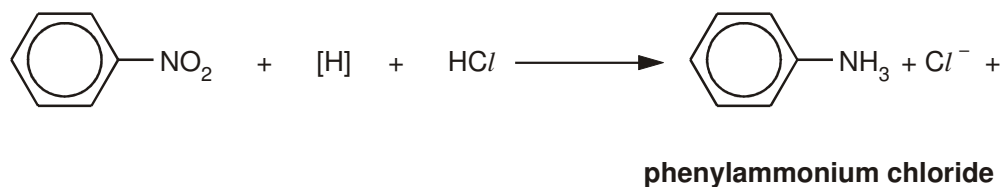
The mixture was heated for 30 minutes to complete the reaction.

Once the mixture had cooled, concentrated sodium hydroxide solution was added until the mixture was alkaline.

Purification gave a 72.1% yield of phenylamine.

- (a) Reaction of nitrobenzene with the tin and hydrochloric acid produces phenylammonium chloride as the organic product.

- (i) Complete the equation for this reaction.



[2]

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- (ii) State what the symbol [H] in the equation represents.

.....

[1]

- (b) When the sodium hydroxide was added, the phenylammonium chloride was converted to phenylamine.

Write an equation for this reaction.

[2]

- (c) Calculate the mass of phenylamine that was produced from the 3.69 g of nitrobenzene in this experiment. Give your answer to three significant figures.

M_r : nitrobenzene, 123; phenylamine, 93.1

mass of phenylamine = g

[4]

[Total 9 marks]