

- 7 (a) State the relative acidities of bromoethanoic acid, BrCH_2COOH , chloroethanoic acid, ClCH_2COOH , ethanoic acid, CH_3COOH and ethanol, $\text{CH}_3\text{CH}_2\text{OH}$.

Explain your answer.

.....

most acidic least acidic

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.....

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.....

.....

[4]

- (b) Fig. 7.1 shows the reaction of methylbenzene and ethanedioic acid with KMnO_4 .

Predict the major carbon-containing product for each of these reactions.

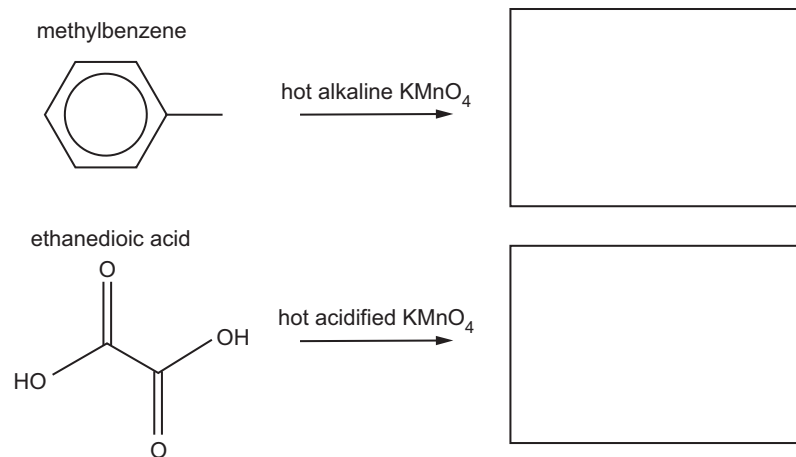
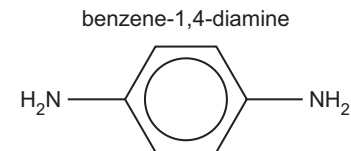


Fig. 7.1

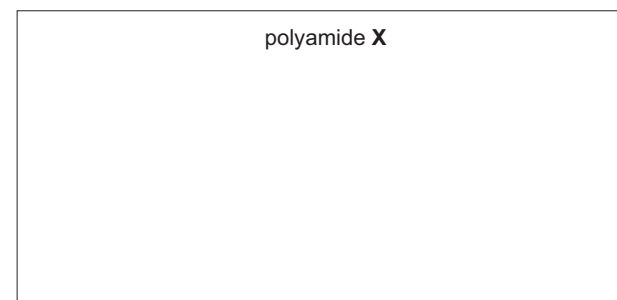
[2]

- (c) Polyamide **X** can be synthesised from ethanedioic acid and benzene-1,4-diamine.



- (i) Draw the repeat unit of polyamide **X** in the box.

The new functional group formed should be shown displayed.

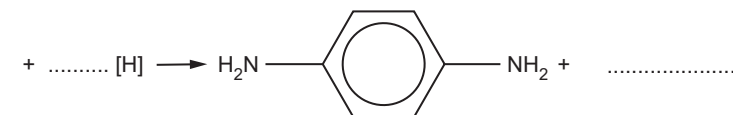


[2]

- (ii) Benzene-1,4-diamine can be formed by reduction of 1,4-dinitrobenzene.

Complete the equation for this reduction.

[H] represents one atom of hydrogen from a reducing agent.



[1]

(d) Fig. 7.2 shows the two-step synthesis of the azo compound **W**.

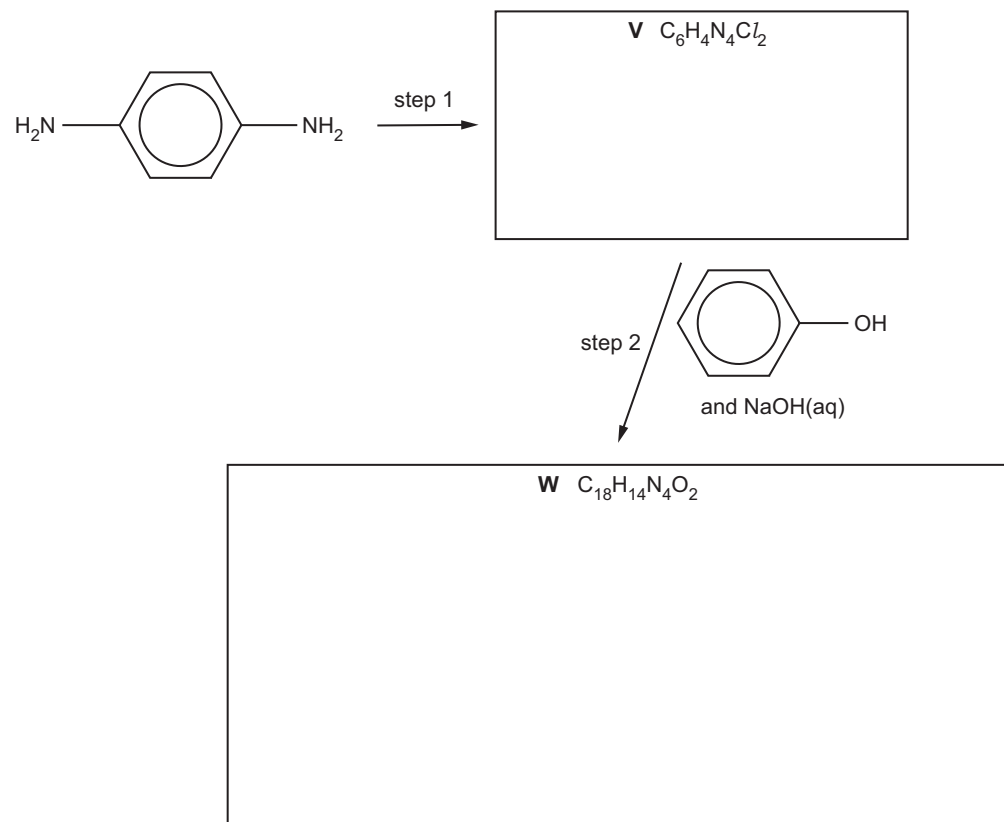


Fig. 7.2

(i) Suggest structures for compounds **V** and **W** and draw them in the boxes in Fig. 7.2. [2]

(ii) Give the reagents and conditions for step 1.

..... [1]

[Total: 12]