

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

Explain your answer.

.....

most acidic ..... least acidic

.....

.....

.....

.....

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.....

.....

[4]

- (b) Fig. 7.1 shows the reaction of methylbenzene and ethanedioic acid with  $\text{KMnO}_4$ .

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

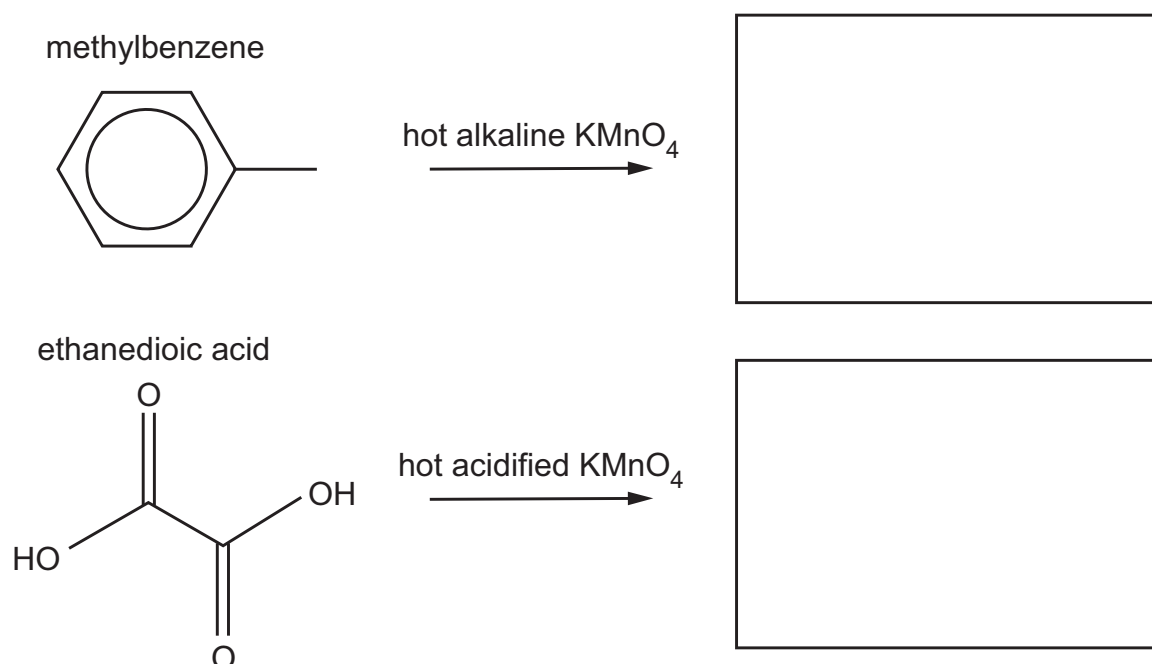
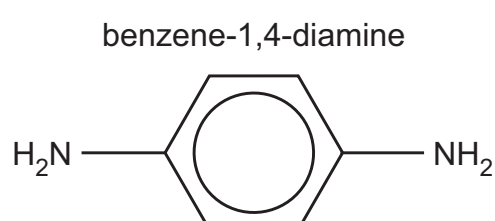


Fig. 7.1

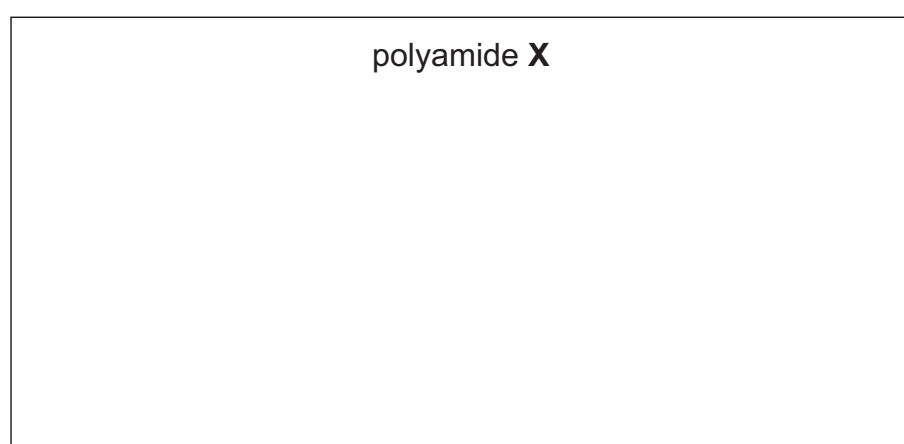
[2]

- (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.

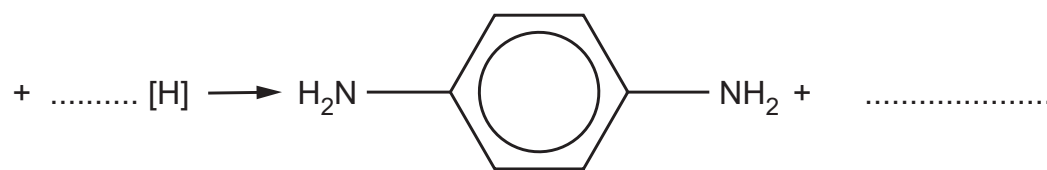


[2]

- (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**.

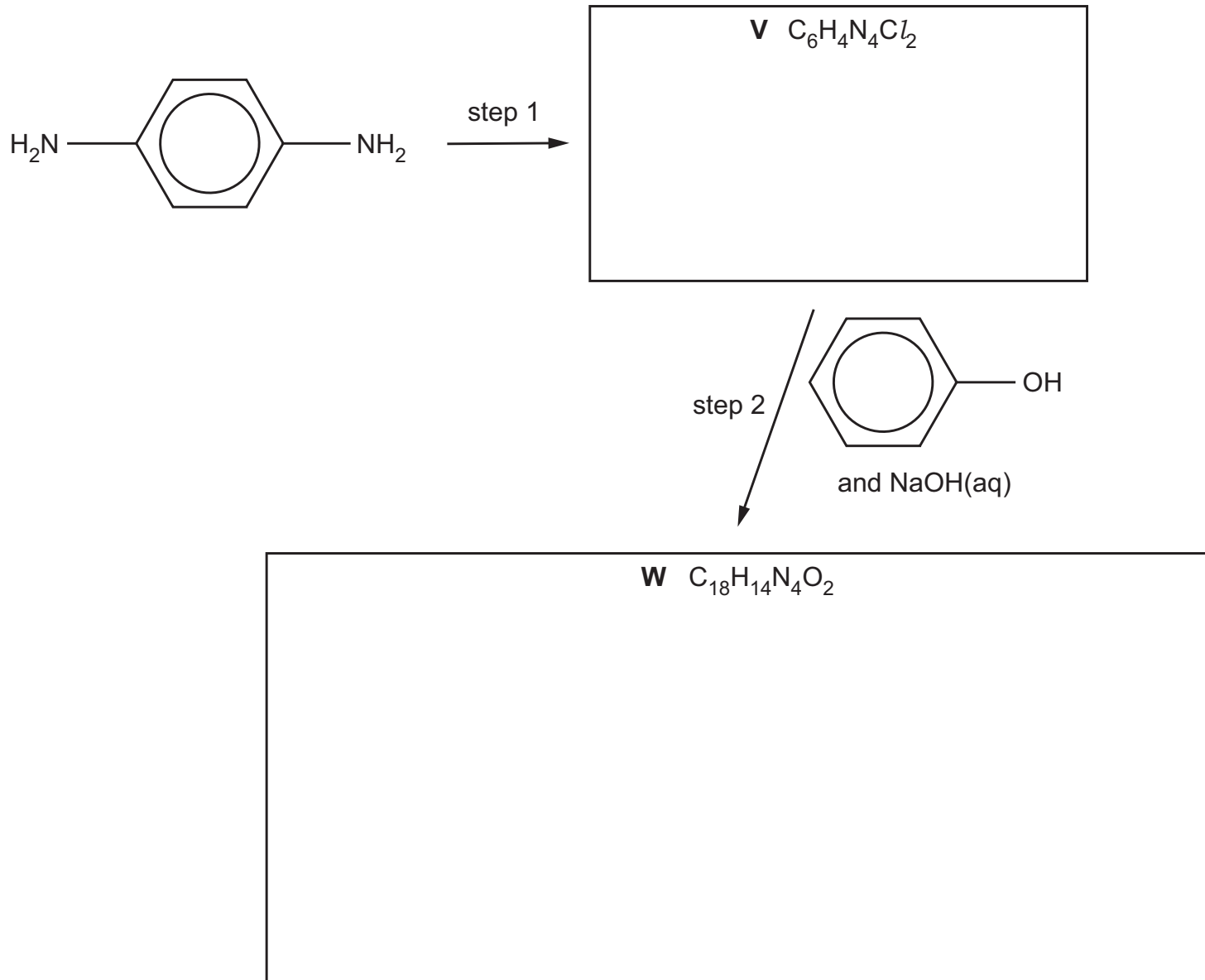


Fig. 7.2

- (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]