Section C

Answer **all** the questions in the spaces provided.

9 Iron is extracted from iron ore in the blast furnace, as shown in Fig. 9.1 below.

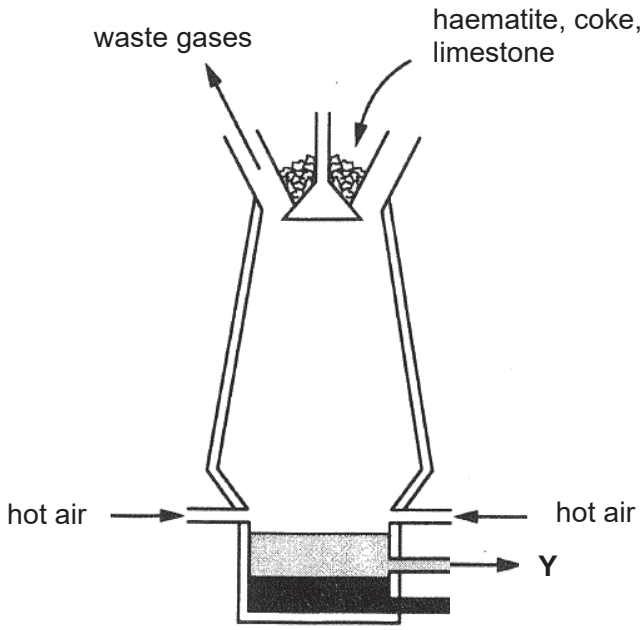

Fig. 9.1

(a) In the furnace, the coke is converted to carbon monoxide. A redox reaction then takes place between iron(III) oxide in haematite and carbon monoxide to produce iron and carbon dioxide.

(i) Write a balanced chemical equation for the reaction between iron(III) oxide and carbon monoxide.

…….. [1]

(ii) Explain why the reaction in **(i)** is a redox reaction.

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…….. [2]

(iii) Identify the reducing agent in reaction **(a)(i)**.

…….. [1]

(b) Pure iron from the blast furnace is frequently mixed with other elements to form alloys. Give one example of this alloy, and explain why it is preferred to pure iron.

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(c) Identify substance **Y**, and explain how it is formed. Include the relevant chemical equation(s) in your answer.

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10 Magnesium nitrate is commonly used as a dehydrating agent; it is also present in some fertilisers.

A student prepared a sample of magnesium nitrate by adding magnesium oxide to 200 cm^3 of nitric acid of an unknown concentration. The equation is shown below:

$$2HNO_3\ (aq) + MgO\ (s) \rightarrow Mg(NO_3)_2\ (aq) + H_2O\ (l)$$

In this particular reaction, 7.4 g of magnesium nitrate was collected at the end of the reaction.

(a) Given that the nitric acid reacted completely, calculate the moles of nitric acid that reacted and hence its concentration in mol/dm^3.

[3]

(b) Outline an experimental procedure to describe how pure crystals of zinc nitrate may be prepared using a similar method as above. State clearly the reagents that you use.

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…….. [6]

(c) Explain why sodium nitrate cannot be prepared with the method in **(b)**.

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End of Paper