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Centre Number

Section I – Part B (continued)

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Student Number

**Marks**

**Question 22** (6 marks)

Justify the procedure you used to prepare an ester in a school laboratory. Include relevant chemical equations in your answer.

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**Question 23** (4 marks)

A household cleaning agent contains a weak base of general formula NaX. 1.00 g of this compound was dissolved in 100.0 mL of water. A 20.0 mL sample of the solution was titrated with 0.1000 mol L<sup>-1</sup> hydrochloric acid and required 24.4 mL of the acid for neutralisation.

(a) What is the Brønsted–Lowry definition of a base? **1**

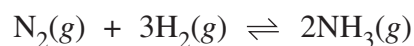
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(b) What is the molar mass of this base? **3**

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**Question 24** (6 marks)

In the early twentieth century, Fritz Haber developed a method for producing ammonia, as shown by the equation:



- (a) Ammonia is used as a cleaning agent. State ONE other use of ammonia. **1**

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- (b) Explain the effect of liquefying the ammonia on the yield of the reaction. **2**

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- (c) Explain why it is essential to monitor the temperature and pressure inside the reaction vessel. **3**

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