

## Chemistry

## Section I – Part B (continued)

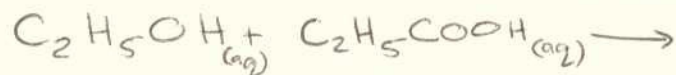
Marks

## Question 22 (6 marks)

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

6

To prepare an ester a <sup>a reflux procedure was used</sup> flask was placed in a water bath heated by a bunsen burner. This flask was connected to a condenser. The alcohol and the ester or a carboxylic acid were placed in the flask prior to heating. This was so that the volatile reactants were not in direct contact with the flame and heat. The flask was connected to a condenser which stopped the release of the volatile products and reactants and to keep them at boiling point. The reactants of the ester were placed in the flask prior to heating. For example ethanol and propanoic acid to form ethyl propanoate.



## 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  $0.1000 \text{ mol L}^{-1}$  hydrochloric acid and required 24.4 mL of the acid for neutralisation.

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

1

A Base is a proton acceptor.

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

3

1.00g in 100 ml - 20 ml sample = 0.2g of NaX

0.1 mol L<sup>-1</sup> HCl 24.4 ml

moles of HCl =  $c \times v$

$$= 0.1 \times 0.0244$$

$$= 2.44 \times 10^{-3}$$

moles of NaX = ~~moles~~  $c \times v$

$\therefore$  moles of NaX must equal moles of

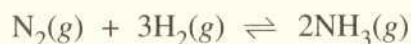
HCl

$$\text{Conc. NaX} = \frac{2.44 \times 10^{-3}}{0.02} = 0.122 \text{ mol L}^{-1}$$

24.4 ml	HCl	$0.1 \text{ mol L}^{-1}$
20 ml	NaX	$10 \text{ g L}^{-1}$

## 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

*explosives*

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

*By liquefying ammonia, the <sup>ammonia</sup> reactant molecules will be less mobile, thus the yield of ammonia produced would increase due to the equilibrium shifting to the right to <sup>increase</sup> ~~increase~~ non gaseous molecules.*

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

*It is essential to monitor temperature and pressure to obtain the desired product at a good rate with maximum % yield.*

*By monitoring the temperature & pressure, the right ratio of ammonia will be formed at a reasonable rate.*

*Also without monitoring conditions inside the reaction vessel, the unbalance in ratio of products may occur.*