

Chemistry

Section I – Part B (continued)

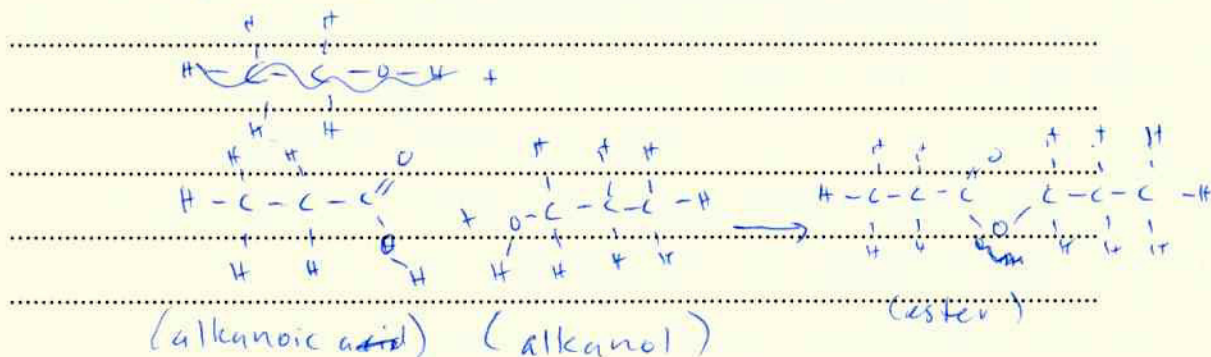
Marks

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

One procedure use to prepare ester in a school laboratory is by reflux.



This is produce by heating a mixture of an alkanolic solution & alkanol substance in a flask which is connected to a condenser tube. As the mixture is heated the reaction forms an ester which goes through the condenser tube into a beaker.

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⁻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 proton acceptor

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

3



~~20~~ 20

36.45g

101

$$m = \frac{M}{L}$$

$$0.1000 = \frac{M}{24.4}$$

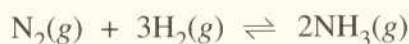
$$0.1 \times 24.4 = M$$

$$M = 2.44$$

$$M \times \frac{20}{101} = 0.48g$$

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

Ammonia is used in the production of bombs.

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

Liquefying the ammonia needs low temperatures, and low temperatures will decrease the yield of ammonia because the reaction is exothermic and therefore the equilibrium will shift to the left and produce more $\text{N}_2(\text{g})$ and $3\text{H}_2(\text{g})$ than ammonia.

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

It is ~~essential~~ essential to monitor the temperature because the reaction is an exothermic one. If temperature is too high, the yield of ammonia will decrease as it will shift the equilibrium to the left. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ -92kJ
 Temperatures of about 200°C is the appropriate as it produces 20% ammonia yield at 25 atmospheres pressure. The pressure must be kept at a constant as increased pressure will cause ~~the~~ many problems to the reaction vessel. High pressure can blow the reaction vessel.