

## 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

needed reflux condenser, bunsen burner, retort stand, matches

- 1) The alkanoic acid and the alcohol is placed in the ~~bun~~ reflux condenser
- 2) The reflux condenser is attached to the retort stand
- 3) The bunsen burner is placed underneath the retort stand and is lit
- 4) The mixture is heated and to prevent the volatile components of the substance from escaping during heating, the substance passes through a condenser to be cooled down back into the flask
- 5) Heating continues ~~until~~ until there is a aroma

## 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

an acid is a proton donor and  
a base is a proton acceptor.

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

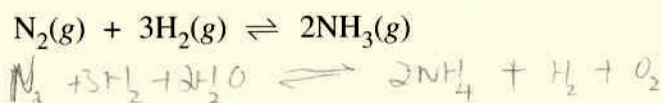
~~1.00 g~~

NaX	20.0
0.1 mol HCl	24.4 ml
$\frac{n}{M}$	
$\frac{\text{NaX}}{100 \text{ ml}}$	$\frac{\text{HCl}}{\text{moles } 0.1 \times 24.4 \text{ ml}}$
20 ml	

$$\text{moles} = 0.122 \text{ mol L}^{-1}$$

## 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

*Ammonia can also be use as a fertiliser.*

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

*In order to liquefy ammonia, water is needed. Condensation of the gas N<sub>2</sub> & H<sub>2</sub> will liquefy ammonia. In order to do that heat is needed, heat is released on the left hand side. ∴ equilibrium will move to the right side to balance out. (opposite changes).*

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

*It is essential to <sup>monitor</sup> maintain the temperature & ~~to~~ <sup>prevent</sup> ~~monitor~~ the inside the reaction vessel to ensure the amount of ammonia is made. If temperature is too high, equilibrium will reach faster, ~~∴~~ producing little amount of ammonia. Moderate temperature = moderate amount of ammonia. Monitoring pressure to make sure the concentration of H<sub>2</sub> to N<sub>2</sub> ratio is 3:1, ~~&~~ and make sure oxygen is present to avoid risk of explosion.*