

Name of the Student: _____

Max. Marks : 24 Marks

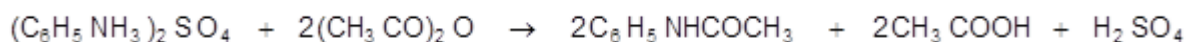
Time : 24 Minutes

Q1.

N-phenylethanamide is used as an inhibitor in hydrogen peroxide decomposition and also in the production of dyes.

N-phenylethanamide can be produced in a laboratory by the reaction between phenylammonium sulfate and an excess of ethanoic anhydride:

- (a) A student carried out this preparation using 1.15 g of phenylammonium sulfate ($M_r = 284.1$) and excess ethanoic anhydride.



- (i) Calculate the maximum theoretical yield of N-phenylethanamide that could be produced in the reaction. Record your answer to an appropriate precision.

Show your working.

(3)

- (ii) In the preparation, the student produced 0.89 g of N-phenylethanamide.

Calculate the percentage yield for the reaction.

(1)

- (b) The student purified the crude solid product, N-phenylethanamide, by recrystallisation.

- (i) Outline the method that the student should use for this recrystallisation.

(4)

- (ii) Outline how you would carry out a simple laboratory process to show that the recrystallised product is a pure sample of N-phenylethanamide.

(3)

- (iii) Assume that the reaction goes to completion.

Suggest **two** practical reasons why the percentage yield for this reaction may **not** be 100%.

1.

2.

(2)

- (c) The reaction to form N-phenylethanamide would happen much more quickly if the student used ethanoyl chloride instead of ethanoic anhydride.

Explain why the student might prefer to use ethanoic anhydride, even though it has a slower rate of reaction.

(2)
(Total 15 marks)

Q2.

- (a) Sodium hydroxide can be obtained as a monohydrate ($\text{NaOH} \cdot \text{H}_2\text{O}$). When heated, the water of crystallisation is lost, leaving anhydrous sodium hydroxide (NaOH).

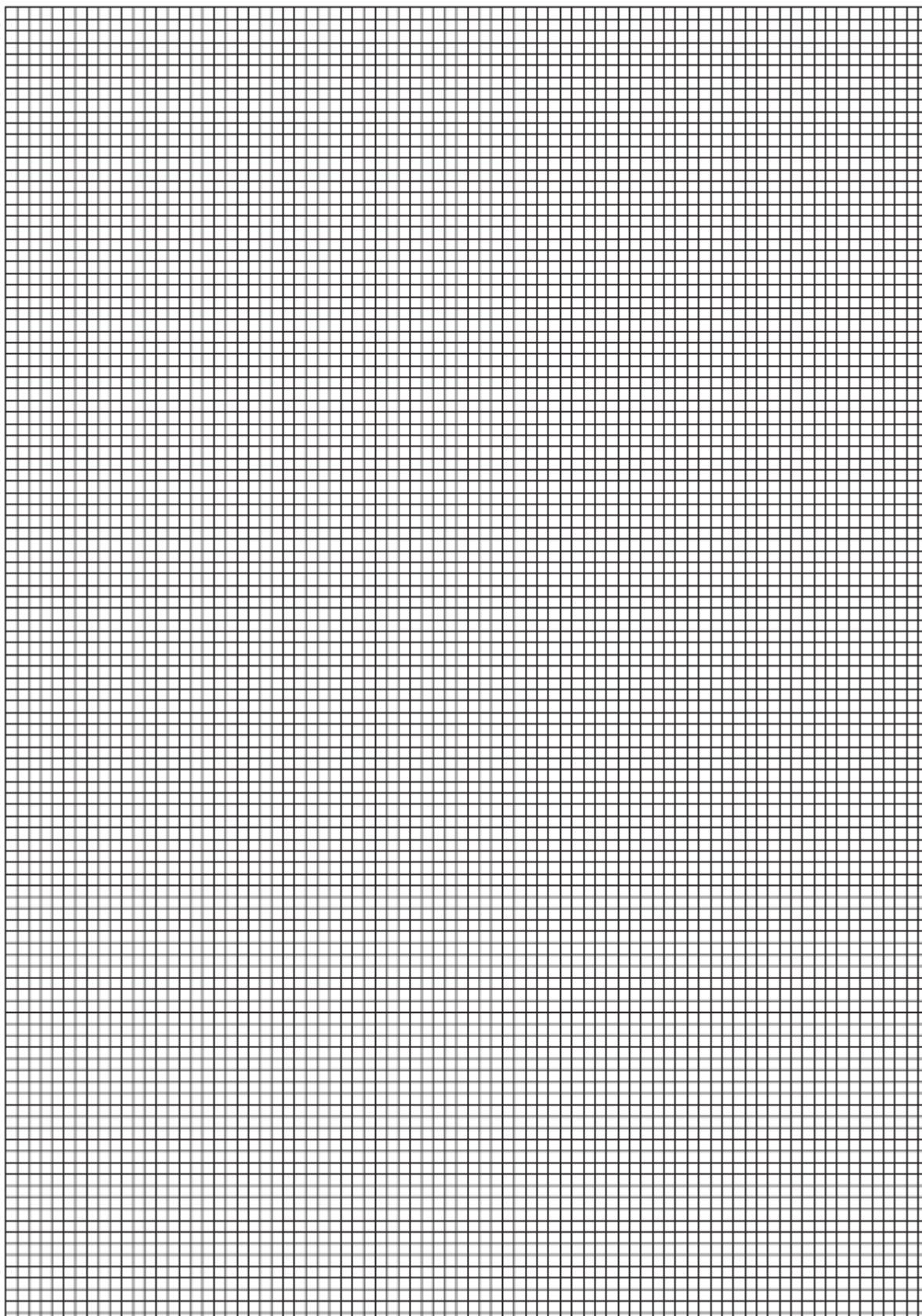
A chemist weighed a clean, dry crucible. The chemist transferred 1.10 g of $\text{NaOH} \cdot \text{H}_2\text{O}$ to the crucible. The crucible and its contents were heated until a constant mass had been reached. The chemist recorded this mass.

The experiment was repeated using different masses of the monohydrate.

For each experiment, the chemist recorded the original mass of $\text{NaOH} \cdot \text{H}_2\text{O}$ and the mass of NaOH left after heating. The chemist's results are shown in the table below.

Mass of $\text{NaOH} \cdot \text{H}_2\text{O}$ / g	Mass of NaOH / g
0.50	0.48
1.10	0.79
2.05	1.41
2.95	2.06
3.50	2.28
4.20	2.93
4.90	3.41

- (i) Plot a graph of **mass of $\text{NaOH} \cdot \text{H}_2\text{O}$** (y-axis) against mass of **NaOH** on the grid. Draw a straight line of best fit on the graph.



(3)

(ii) Use your graph to determine the mass of $\text{NaOH} \cdot \text{H}_2\text{O}$ needed to form 1.00 g of NaOH

_____ g

(1)

(iii) Use your answer from part (a) (ii) to confirm that the formula of sodium hydroxide

monohydrate is $\text{NaOH} \cdot \text{H}_2\text{O}$

(2)

- (b) Sodium hydroxide is used to remove grease from metal components. Sodium hydroxide cannot be used to clean components made of aluminium because it reacts with this metal.

- (i) Balance the equation for the reaction of aqueous sodium hydroxide with aluminium.



(1)

- (ii) In 1986, a sealed aluminium tank exploded while being used by mistake for transporting concentrated sodium hydroxide solution.

Suggest **one** reason why the tank exploded.

(1)

- (c) A strong alkali such as potassium hydroxide is used as the electrolyte in some alkaline batteries for household use. The electrolyte will escape if the battery casing is broken.

Suggest **one** reason why a leak of this electrolyte is hazardous.

(1)

(Total 9 marks)