

relates to the hypothesis.

Example One

During one of the field trips to an ice cream manufacturing factory, students of Kikwite Seed School learned that the freezing point is a constant temperature at which a liquid substance turns into a solid state. Through their interaction with the factory workers, they also learned that many substances especially solids are melted first and cooled for this constant temperature to be determined. Suitable solid raw materials in this factory must have a freezing point below 60°C for a good product to be obtained. The students have been given solid Y which is a potential raw material in the factory but its suitability is yet to be determined.

You are provided with:

Y – a Solid which is a potential raw material in the ice-cream factory.

Boiling tube; Water; Glass beaker; Tripod stand; Heat source; Thermometer and any other relevant apparatus and materials ordinarily found in a chemistry laboratory

TASK

As a student of Chemistry, design and carry out an experiment that would be performed to determine if solid Y is suitable for use in this ice cream making factory.

Aim of experiment

...To determine the freezing point of solid Y.....

Hypothesis

...The freezing point of solid Y is 60°C

Or

...The freezing point of solid Y is less than or greater than 60°C

Variables

Independent: Time

Dependent: Temperature

Controlled: Pressure must be kept constant

Equipment and materials required

- Solid Y
- Tripod stand
- Water
- Boiling tube with rubber stopper
- Heat source
- Wire gauze
- 500ml glass beaker
- Thermometer
- Stirring rod
- Weighing balance

Risks and precautions to mitigate them

- Laboratory coat and gloves were worn to avoid getting in direct contact with solid Y which may be corrosive.
- A face mask was put on to avoid inhaling fumes of solid Y.
- Protective eye goggles were worn to prevent the fumes of solid Y from getting in contact with them.
- Solid Y was melted in a water bath to avoid direct contact with heat since it could be flammable.

Procedure of experiment

- A tripod stand was assembled and a wire gauze was placed on top of it.
- A Bunsen burner was placed below the wire gauze, adjusting the height so that the flame would be in direct contact with the center of the wire gauze.
- 400ml of water was poured into a 500ml glass beaker and the beaker was placed onto the wire gauze. The water was heated until its temperature was 60°C , the temperature being monitored using a thermometer. This served as the hot water bath.
- 4g of solid Y was weighed into a clean dry boiling tube. A rubber stopper into which a thermometer and stirring rod were fitted was pushed gently into the boiling tube.
- The boiling tube was immersed into the hot water and the water heated continually until the solid Y in the boiling tube was melted into a liquid.

- The Bunsen burner was turned off and the boiling tube was removed from the beaker of hot water and placed into an empty beaker after wiping the outside of the tube dry with a paper towel.
- The temperature of the liquid in the boiling tube was recorded every 30 seconds while stirring and continued for at least 4 minutes after the first solid started to appear in the boiling tube or until the liquid had solidified that you were no longer able to stir.

Data record

The results were as shown in the table below:

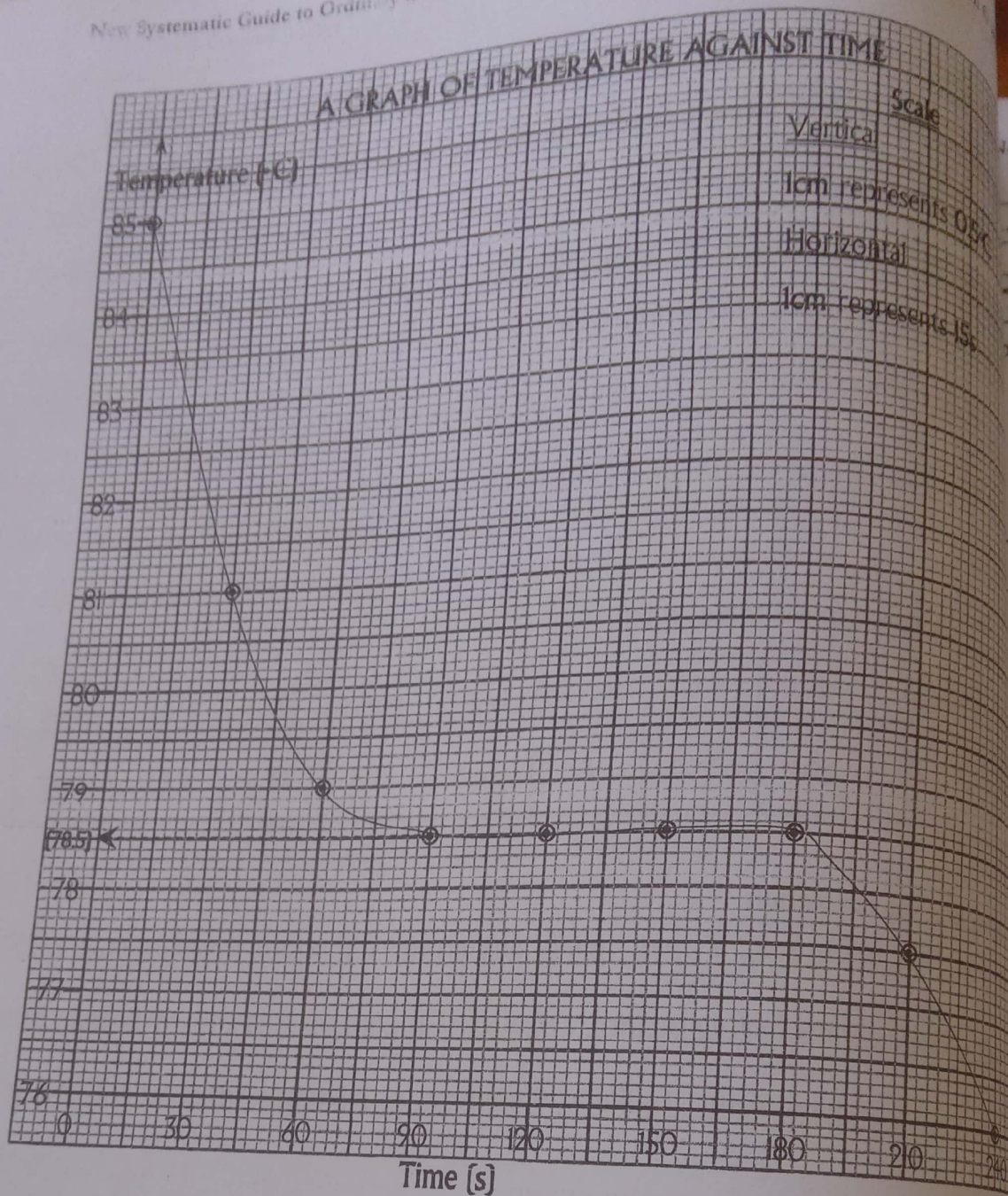
Time (s)	0.0	30.0	60.0	90.0	120.0	150.0	180.0	210.0	240.0
Temperature (°C)	85.0	81.0	79.0	78.5	78.5	78.5	78.5	77.5	76.0

Data analysis and interpretation

From the table, the molten solid Y cools rapidly and attains a constant temperature of 78.5 °C for 90 seconds before cooling further thereafter. The constant temperature during cooling indicates the freezing point of solid Y. Therefore, the freezing point of solid Y is 78.5 °C.

Note

Interpretation can be obtained from a plotted cooling curve of molten solid Y.



Conclusion

...Solid Y cannot be used as a raw material in the factory, since its freezing point of 78.5°C is above the maximum required temperature of 60°C .