

Edexcel Physics GCSE

Topic 14.11: Particle Model

Practical notes

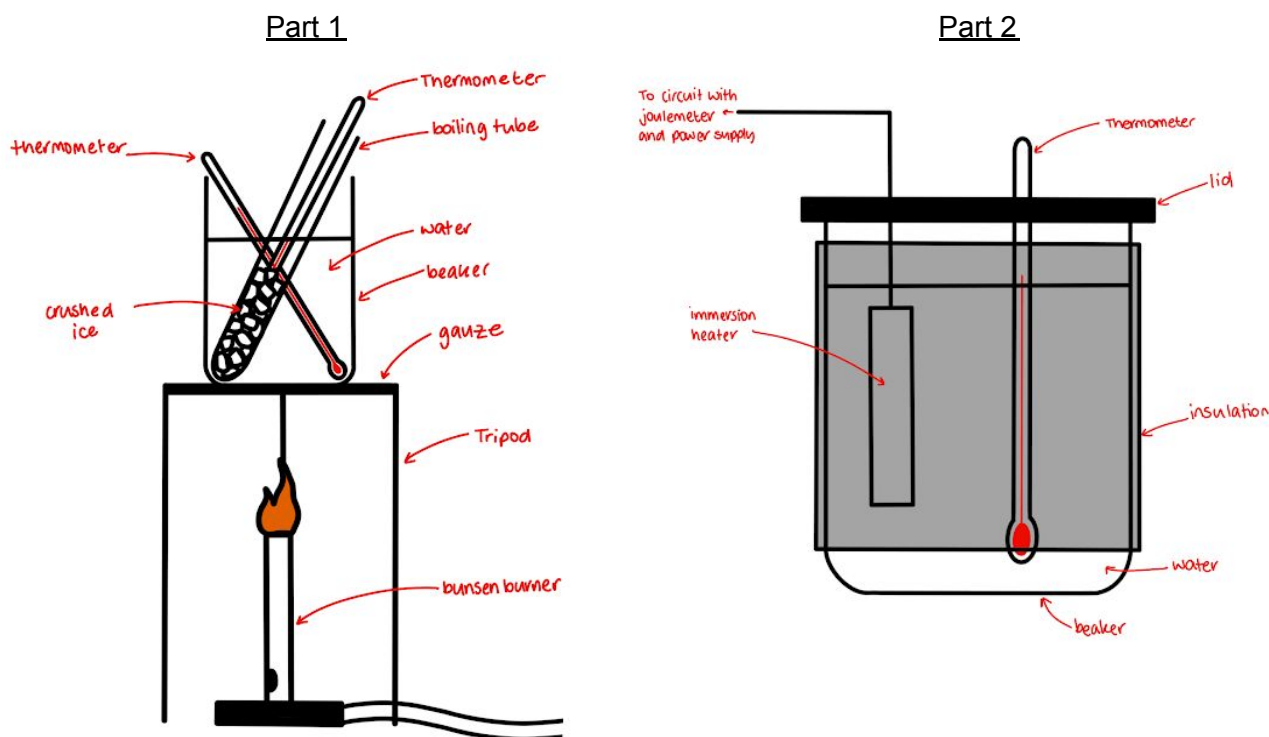


Core Practical 7: Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice

Equipment

- Crushed ice
- Boiling tube
- Thermometer
- Bunsen burner
- Tripod
- Gauze
- Beaker
- Kettle
- Stopwatch
- Joulemeter
- Immersion heater
- Cladding to insulate the beaker (e.g. foam)
- Balance
- Powerpack

Diagram



Method (Part 1)

1. Fill the beaker with boiling water and keep it warm using the bunsen burner as shown in the diagram.
 - The water should remain at a constant temperature – you can ensure this by using a second thermometer in the water bath
2. Fill a boiling tube with crushed ice and take the initial temperature.
3. Place the boiling tube in the beaker and start the stopwatch.
4. Record the temperature of the ice every 30 seconds until all of the ice has melted.
 - Continue taking readings until three minutes after all of the ice has visibly melted
 - Take note of the state of the ice (solid or liquid) for every recorded temperature
5. Plot a graph of temperature against time for the results. The graph should show a plateau when the ice is melting.
 - The energy is going towards breaking the bonds between the water atoms rather than increasing the temperature.

Method (Part 2)

1. Place the empty beaker on the balance and zero it.
2. Fill the beaker with water and record its mass.
3. Place the thermometer and the immersion heater in the water and then insulate the beaker with cladding (ensure the top is also covered with a lid).
 - The immersion heater should also be connected to a joulemeter to measure the energy transferred during heating.
4. Record the initial temperature of the water and turn on the immersion heater.
5. Let the heater heat the water for an hour, or until there is a significant change in temperature, and then take the final temperature, as well as recording the value on the joulemeter.
 - The water should be continually stirred so that the heat is evenly distributed (this can be done using an electric stirrer).
6. Rearranging the formula $Q = mc\Delta T$ to $c = \frac{Q}{m\Delta T}$, you can input the values for mass, change in temperature, and energy transferred to obtain the specific heat capacity of water.

Safety Precautions

- Take care when pouring boiling water from the kettle into the beaker, and do not touch the beaker when it is full of hot water as it may cause burns.
- Ensure hair is tied back and no loose clothing is hanging near the flame when dealing with the bunsen burner.
 - Blazers, lanyards and ties should be removed
 - Sleeves should be rolled up to the elbow
- Ensure the safety (orange) flame is on when you are not heating anything with the bunsen burner, and do not leave the flame lit for longer than necessary so as to reduce the risk of causing a fire.
- Gas taps must be off when not connected to a lit bunsen burner.

