

# Energy forms, changes and sources

Grade 6 science (Year 7 · Class 6) · Lab

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Which lamp wastes more energy as heat? In this lab you measure the temperature rise next to a filament lamp and an LED lamp of similar brightness. The results let you link thermal energy to wasted energy and compare the efficiency of two technologies.

**Level:** Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS3

## Aim

To compare how much thermal energy a filament lamp and an LED lamp give out while producing similar light, and to link the results to wasted energy.

## Equipment

- One filament lamp and one LED lamp of similar brightness, in holders (supplied by the teacher)
- Two thermometers (0 °C to 50 °C)
- Clamp stand and boss
- Ruler
- Stopwatch
- Graph paper

## Safety

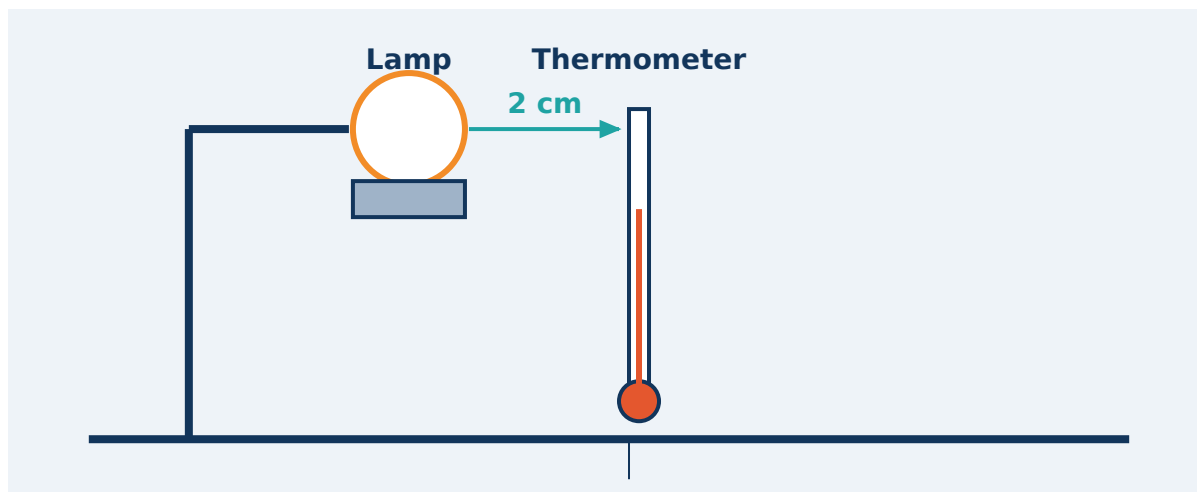
### Safety

Bulbs get hot. Do not touch a filament lamp while it is on or just after switching it off. Keep water away from the lamps and the sockets, and let the teacher connect and switch on the supply.

## Method

1. Clamp the thermometer so that its bulb is 2 cm from the first lamp and measure the starting temperature.
2. Switch the lamp on and start the stopwatch.
3. Read the temperature every minute for 5 minutes and record it.
4. Switch off, let everything cool to room temperature and repeat with the other lamp, keeping the 2 cm gap.

5. Calculate the temperature rise for each lamp.



*The thermometer must stay the same distance from each lamp.*

## Results

Sample measurements:

| Time (min)                      | 0    | 1    | 2    | 3    | 4    | 5    |
|---------------------------------|------|------|------|------|------|------|
| Filament lamp, temperature (°C) | 24.0 | 29.5 | 33.5 | 37.0 | 39.5 | 41.0 |
| LED lamp, temperature (°C)      | 24.0 | 24.4 | 24.8 | 25.1 | 25.3 | 25.5 |

## Analysis questions

### Question 1 Temperature rise

Calculate the temperature rise after 5 minutes for each lamp.

### Question 2 Rate of heating

Calculate the temperature rise in the first minute for each lamp, in °C per minute.

### Question 3 Graph

Plot both sets of data on one graph (time on the horizontal axis) and describe the two curves.

### Question 4 Comparison

Calculate how many times greater the filament rise is than the LED rise.

**Question 5 Conclusion**

Explain what the results show about wasted energy.

**Question 6 Fair test**

State three variables that must be kept the same.

**Question 7 Uncertainty**

The thermometer can be read to  $\pm 0.5$  °C. Calculate the percentage uncertainty of the 5 minute rise for each lamp and say which result is more reliable.