

Radio to gamma waves and digital signals

Grade 8 science (Year 9 · Class 8) · Lab

Name: _____ Date: _____ Class: _____

Which parts of the electromagnetic spectrum pass through everyday materials? In this lab you test visible light, infrared from a remote control and radio waves with the same set of samples, and then compare what blocks each one.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS4-3

Aim

To find which common materials block visible light, infrared from a remote control and radio waves, and to compare how different parts of the spectrum behave.

Equipment

- LED torch and a holder for samples
- Phone with a light-meter app (lux)
- TV remote control and a phone camera that shows infrared as a purple glow
- Small portable radio tuned to a station
- Samples: clear plastic sheet, white paper, cardboard, aluminium foil

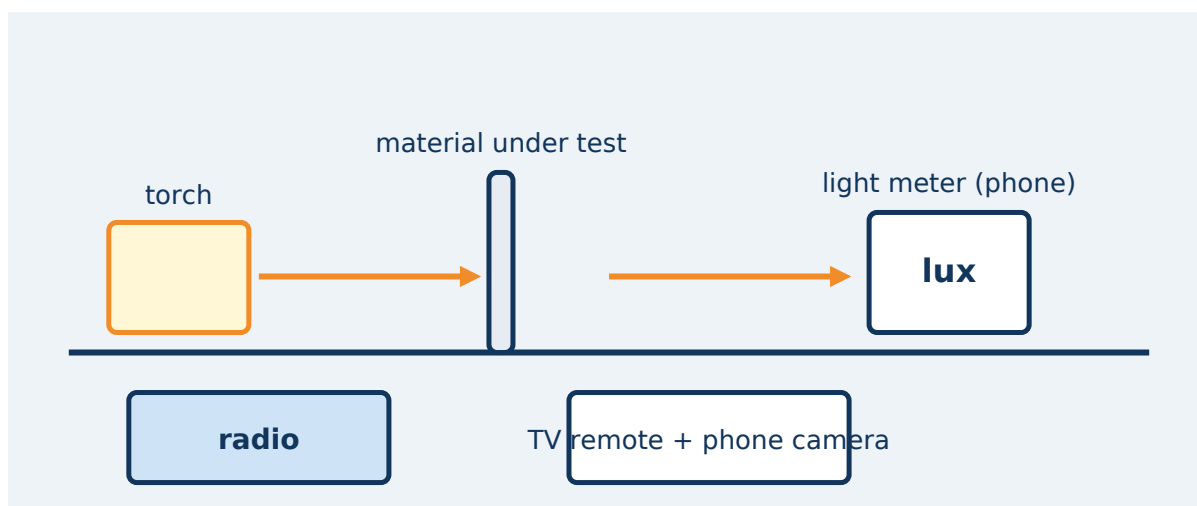
Safety

Safety

Never put foil or any metal in a microwave oven. Do not look straight into the torch beam at close range. Use only a battery radio and take care with the sharp edge of the foil.

Method

1. Point the torch at the light meter from 30 cm and record the lux reading with no material in the beam.
2. Place each sample in the holder between the torch and the meter. Record the reading each time.
3. Point the remote control at the TV through each sample and note whether the TV responds. Check with the phone camera that the remote's light is visible.
4. Tune the radio so that a station is clear. Wrap the radio fully in each sample in turn and record whether the signal stays clear, crackles or goes silent.



Test each material in the same position, 30 cm from the torch.

Results

Sample measurements from a school lab:

Material	Light meter (lux)	Light passed (%)	TV remote works?	Radio signal
None	820	100	yes	clear
Clear plastic sheet	760	93	yes	clear
White paper	310	38	yes	clear
Cardboard	0	0	no	clear
Aluminium foil	0	0	no	silent

Analysis questions

Question 1 Light through plastic

Check the percentage of light passed by the clear plastic sheet using 760 lux and 820 lux.

Question 2 Light through paper

Calculate the percentage of light passed by the white paper.

Question 3 Ranking the materials

Rank the five rows from most to least transparent to visible light.

Question 4 Cardboard and radio

Cardboard blocks visible light but not radio waves. Explain what this shows about different parts of the spectrum.

Question 5 Foil and radio

Explain why the radio went silent when it was wrapped in foil, and give one everyday example of the same effect.

Question 6 Paper and the remote

The remote still worked through paper although only 38 % of the visible light passed. Suggest an explanation.

Question 7 Uncertainty

The light meter readings fluctuate by ± 10 lux. Calculate the percentage uncertainty in the paper reading and suggest how to reduce it.

Question 8 Predicting tracing paper

Predict the lux reading, the remote result and the radio result for a sheet of tracing paper, and justify your answer.