Objectives

SP5.15P Explain that all bodies emit radiation, that the intensity and wavelength distribution of any emission depends on their temperature.

SP5.16P **H** Explain that for a body to be at a constant temperature it needs to radiate the same average power that it absorbs.

SP5.17P **H** Explain what happens to a body if the average power it radiates is less or more than the average power that it absorbs.

SP5.18P **H** Explain how the temperature of the Earth is affected by factors controlling the balance between incoming radiation and radiation emitted.

SP5.19P *Investigate how the nature of a surface affects the amount of thermal energy radiated or absorbed.*

Maths requirements

4c Plot two variables from experimental or other data.

Learning outcomes

6th **SP5.15P** Describe how the intensity and wavelength of emitted radiation depends on the temperature of the body.

6th **SP5.16P** **H** Explain that the power radiated and absorbed must be the same to maintain a body at a constant temperature.

6th **SP5.17P** **H** Explain what happens to the temperature of a body when the average power radiated is not balanced by the average power absorbed.

6th **SP5.18P** **H** Describe the factors that affect the energy absorbed and radiated by the Earth.

8th **SP5.18P** **H** Explain how these factors affect the temperature of the Earth.

Exploring

1. Investigating radiation

This practical forms part of the core practical requirement of the specification. It is supported by the information on *Students' sheet CP4(Investigating amount of thermal energy radiated or absorbed)* and in the Student Book.

Students' sheet CP4(Investigating amount of thermal energy radiated or absorbed) provides instructions for students to investigate the effect of different coloured coverings on the cooling rates of boiling tubes of hot water.

Support: Help students to draw the axes for their graphs and plot the points.

Stretch: Ask students to design a similar investigation to find out which colours are best at absorbing radiation. They could do this by aiming a heat lamp at their tubes or by standing them in strong sunshine. If time permits, students could carry out this investigation.

Expected results

Tubes covered in dark, dull material should cool down faster than tubes covered in light and/or shiny materials.

Expected results

Students should find that the water in the water bath maintains a constant temperature, because there is a balance between the rate at which heat arrives and the rate at which it leaves (the thermostat has a feedback mechanism to boost the heater if the temperature starts to fall). If the setting is adjusted (first turned up and then turned down), the temperature first rises to reach a new steady level then falls to reach a new steady level

⚠ Safety

Take care with high temperature settings on the water bath. Spilled water is a slip hazard.

Course resources

Phys Students' sheet CP4

Equipment

water baths with electrical thermostatic controls, retort stand and clamp holding thermometer, stop clocks