

MODELLING CLIMATE CHANGE: ABSORPTION BY THE ATMOSPHERE

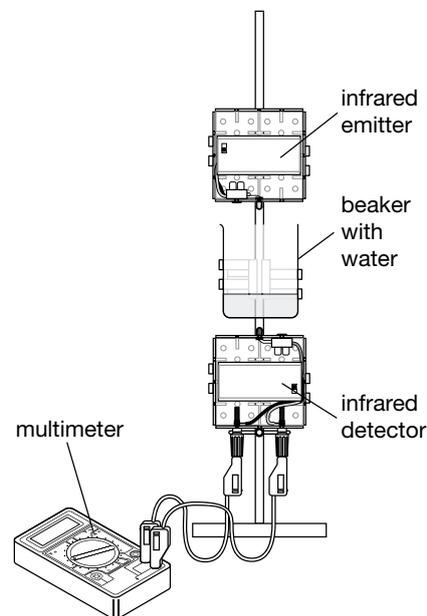
Gases like water vapour and carbon dioxide trap infrared radiation emitted by the Earth. So the atmosphere is like a blanket keeping the Earth warm. In this activity you will investigate the absorption of infrared (IR) radiation.

Task A Measuring infrared absorption

- Using a stand, and three sets of clamps, hold a 100 cm³ beaker between an IR emitter and an IR receiver.
- Use the multimeter set on the 2000 mV scale to measure the voltage when the beaker is empty and record your result in a table like the one shown here.
- Add 25 cm³ of water to the beaker. Do you think the voltage measurement will be higher or lower? Measure and record your result.
- Add another 25 cm³ of water and record the voltage again. Can you explain the pattern in your results?

Task B Modelling the greenhouse effect

- Open the Excel spreadsheet *MCC_EnergyBalance* and click on the tab 'Model 2'.
- Change the percentage of terrestrial radiation transmitted through the atmosphere using the slider bar. What happens to the energy absorbed? What happens to the energy emitted? Can you explain your results?
- Set the transmission at 20%, alter the temperature to achieve a balance and record the temperature.
- Predict whether the equilibrium temperature would be higher or lower if transmission was set at 30%. Use the model to find out.
- How could you use this model to simulate the effect of increasing carbon dioxide in the atmosphere? What is the effect on surface temperature?



| Volume of water (cm ³) | Voltage (mV) |
|------------------------------------|--------------|
| 0 | |
| 25 | |
| 50 | |

