THEORY

When radiant energy (visible light, ultraviolet and infrared) strikes a surface, it can be reflected or absorbed. When light is absorbed, it is transformed into thermal energy (heat).

A surface is green because it reflects green light and absorbs all the other colours.

A surface is white because it reflects all visible colours.

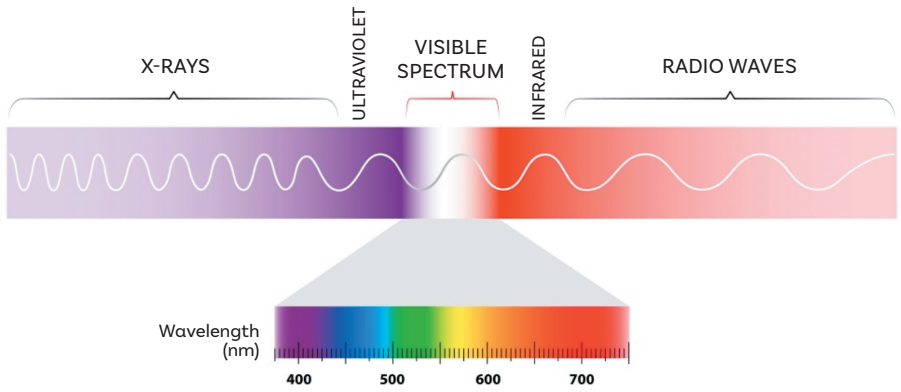
A surface is black because it absorbs all the visible colours.

The walls of buildings are large areas that can absorb the sun's radiation. Some of the radiant energy from the sun is transformed into heat (thermal) energy, which will be conducted through the wall to heat up the house.

WHAT IS THE BEST WALL COLOUR?

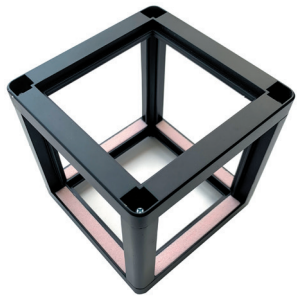
In this experiment, you will investigate how the colour of a wall affects the amount of heat energy absorbed by the wall and what this does to the temperature inside the house.

VISIBLE & INVISIBLE LIGHT



MATERIALS USED IN THIS ACTIVITY

Spring loaded cube
ST 300-40



Paint sample cards

Wood panels
ST 301-75

Polystyrene wall panel — insulation
ST 300-85

Temperature logger
ST 301-80

12V Power supply
ST 300-80

50W lamp
ST 300-61

Temperature sensor panel
ST 300-52

You will also need the STELR Sustainable Housing placement template. This is included at the end of this document.

WATCH > Sustainable housing wall colour investigation video on STELR's YouTube channel
MORE INFO > More sustainable housing videos on the STELR website

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Set up of the equipment showing how to place the lamp on the template

An image of Lee Constable in action from our video investigation

WHAT LEE DID IN THE VIDEO INVESTIGATIONS

- Place the temperature sensor panel in the back wall of the cube with the sensor at the top.
- Place a wood panel in the opposite face of the cube.
- Place a white colour sample against the wood panel so that there are no gaps.
- Insert an insulation panel into the floor.
- Place insulation panels in the side walls and on the top to make a flat roof.
- Connect the temperature sensor to the data logger.
- Place the lamp 11 cm from the wood and colour sample panel.
- Turn on the lamp and the data logger at the same time.
- Record the temperature every 30 seconds for five minutes on your data sheet.
- Turn off the lamp and move it away from the house.
- Record the temperature for a further 5 minutes as the house cools.
- Repeat the experiment using other wall colour samples.
- See Lee's results on page 3. Plot graphs of the results on page 4.

RESULTS

Time Minutes	White Wall Temp °C	Green Wall Temp °C	Red Wall Temp °C	Black Wall Temp °C
0.0	18.0	18.0	18.0	18.0
0.5	18.1	18.0	18.1	18.1
1.0	18.2	18.1	18.2	18.2
1.5	18.2	18.2	18.3	18.3
2.0	18.3	18.3	18.4	18.5
2.5	18.3	18.4	18.5	18.7
3.0	18.4	18.5	18.6	19.0
3.5	18.5	18.7	18.7	19.2
4.0	18.6	18.9	18.9	19.4
4.5	18.7	19.0	19.0	19.6
5.0	18.8	19.2	19.1	19.8
5.5	18.9	19.4	19.3	20.0
6.0	18.9	19.5	19.4	20.2
6.5	19.0	19.6	19.4	20.3
7.0	19.0	19.6	19.5	20.4
7.5	19.1	19.7	19.5	20.5
8.0	19.2	19.7	19.6	20.5
8.5	19.2	19.7	19.5	20.4
9.0	19.2	19.7	19.5	20.4
9.5	19.2	19.6	19.5	20.4
10.0	19.2	19.6	19.4	20.3

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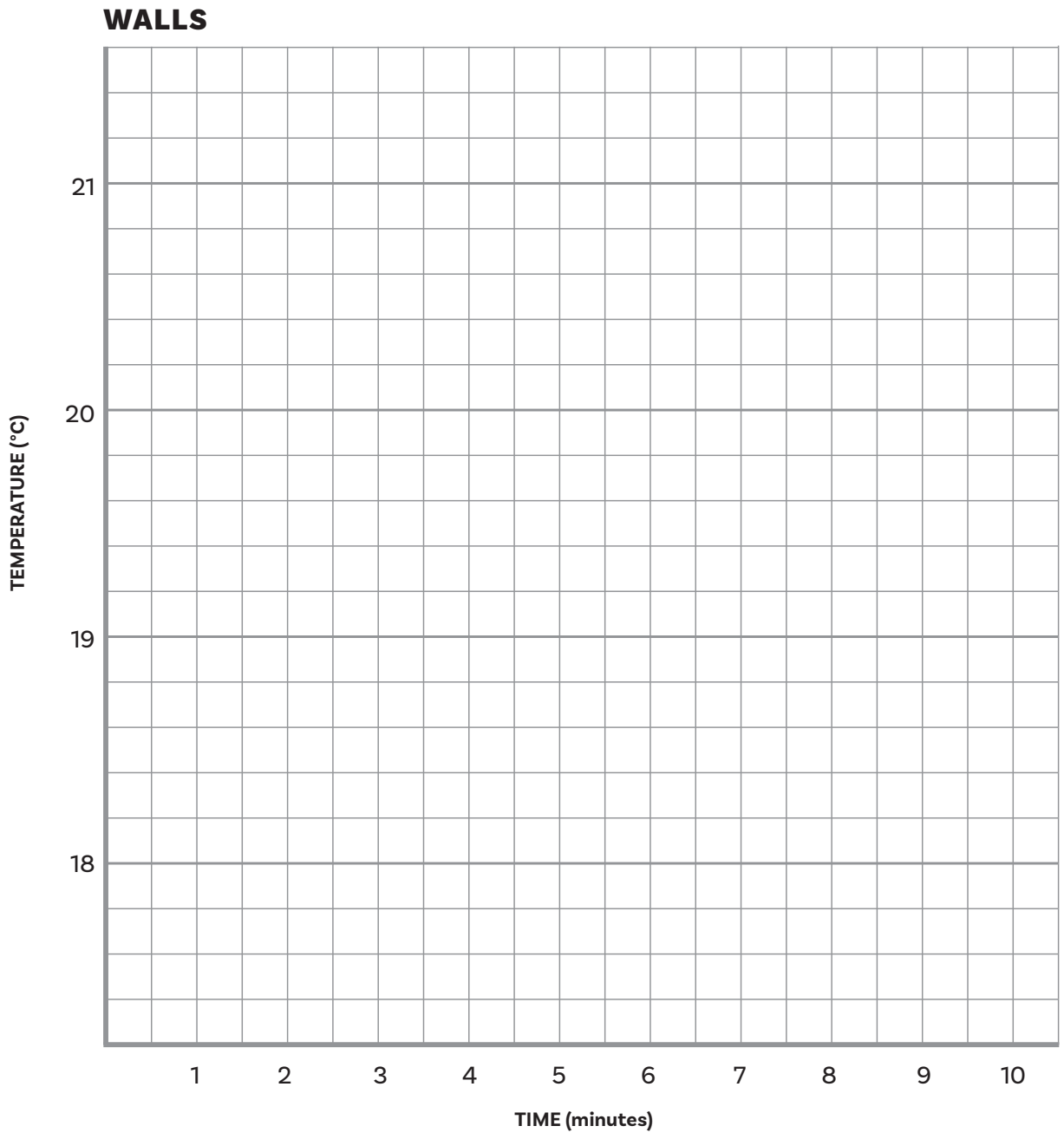
GRAPH

Plot your results on the graph below using a different colour for each wall colour.



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DISCUSSION

QUESTION 1
Which wall colour was most effective at absorbing solar radiation? How do you know?

QUESTION 2
Which wall colour was most effective at reflecting solar radiation? How do you know?

QUESTION 3
Explain how you could use this information to choose a wall colour for an energy efficient home if you were living in a very cold climate or a very warm climate.

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EMAIL ENQUIRIES
STELR.Admin@atse.org.au

TELEHONE ENQUIRIES
+61 3 9864 0900

stelr.org.au

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STELR

An initiative of the Australian Academy of Technology & Engineering

Level 2, 28 National Circuit, Forrest ACT 2603
PO Box 4776, Kingston ACT 2604

Level 6, 436 St Kilda Road, Melbourne VIC 3004
GPO Box 4055, Melbourne VIC 3001

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STELR SUSTAINABLE HOUSING — PLACEMENT TEMPLATE

Print this page at 'actual size' — do not scale to fit the page as this will shrink the template. Place the cube (house) directly in front of the lamp. There should be 11cm between the edge of the cube and the bulb (inside the lamp hosusing).