

## Internal Assessment Resource

**Achievement Standard Science 90943: Research** implications of heat for everyday life

**Resource Reference:** Science 1.4

**Resource Title:** Design an Eco-Home in Dunedin

**Credits:** 4

| Achievement                                      | Achievement with Merit                                      | Achievement with Excellence  |
|--|---|--|
| Research implications of heat for everyday life. | Research, in depth, implications of heat for everyday life. | Research, comprehensively, implications of heat for everyday life. |

### Student instructions

#### Introduction

Many homes in New Zealand have insufficient insulation. People who live in poorly insulated homes must either live in a cold, damp home or use large amounts of energy for heating. Reducing heat losses from homes is therefore of considerable public importance. Many people are beginning to explore new methods of building, which allow for a reduction in the amount of energy required to run a home. Eco-Homes are an excellent example of this. They utilise new heating methods, improved insulation and careful planning and placement to reduce the amount of energy required for heating, as so reduce energy costs and carbon footprint.

In this assessment you will research the planning and development of an Eco-Home in Dunedin and independently prepare a report that describes your findings and explains the impact this aspect of heat has on everyday life.

The assessment will take place over **6** consecutive class periods (one week). At the end of each period you will hand in the work you have done. It will be returned to you at the start of the next period.

#### Task

You will decide on the placement and design of an Eco-Home in the Dunedin area. You must justify your choices in the design considering heat loss and the insulation requirements of the house. Heating constitutes the greatest part of a house's energy requirements and reducing the reliance on power for heating will make a home more Eco- friendly and reduce it's carbon footprint.

- Where are you going to build your house? Why is this important? What

implications does this have?

- What are you going to build the walls out of? What materials are available? Why would you choose different materials for different parts of the house? What properties of the materials must you consider? R values of materials / insulators? (R value = a measure of the insulation properties of the material. Higher is better)
- What must be considered when designing the windows of the house? Different designs available? What are the advantages / disadvantages of these? Why would plenty of light be important? What can the light be used for?
- Roofing materials / design? What needs to be considered? Justify choice.
- Heating your home – what methods are available? Cost, both of initial setup and then ongoing costs. How does this link to the position of your house and the construction / windows.
- Are any grants available for the building of your home? Can you give any examples where your ideas have been incorporated into a house and discuss benefits?
- Record sources of any information. See planning sheet.

In all aspects of your house, **you MUST justify** the choices in terms of heat transfer (Conduction, convection and radiation). In some cases you will use these phenomenon (conductors) and in others you will need to prevent them (insulators).

Key Terms:

Conduction

Convection

Radiation

Specific Heat Capacity

Thermal mass.

Conductors

Insulators

## Additional information

Information about insulation and R-value can be found here:

- [http://www.ornl.gov/sci/roofs+walls/insulation/ins\\_02.html](http://www.ornl.gov/sci/roofs+walls/insulation/ins_02.html)
- <http://www1.eere.energy.gov/consumer/tips/insulation.html>
- <http://www.energywise.govt.nz/sites/all/files/installing-insulation-in-residential->

[buildings-07.pdf](#)

- <http://www.eeca.govt.nz/sites/all/files/dbh-guide-to-smarter-insulation-07.pdf>
- <http://www.eeca.govt.nz/sites/all/files/action-sheet-2-warm-healthy-home-10-09.pdf>

You can also use the weebly site to revisit information on the key terms involved in this internal and examples of them in action.

<http://year11science.weebly.com>

The report can be presented in the format of your choice: Report, PowerPoint or Poster.

**NO LATE** submissions will be accepted.

There will **NO RETAKE** opportunities.

## Resources

### Resource 1: Planning Template

Research question:

| Source   | Information  | Key words  | In your own words  |
|--|--|--|--|
| Paste URL or write bibliographic reference details here. | Paste or write information from sources here. Try to include only what you need. | List the key words in this box. Use individual words, not sentences. There can be many key words. A key word is a word that is important in answering the question and helps you summarise what you have copied. | Take your key words and make new sentences. Use them to help answer your question. |
|  |  |  |  |
|  |  |  |  |
| Summary:   |  |  |  |

Put your question in here. You may need to break your research question into smaller questions. Use a new page for each question. Keep these sheets so that you can show them to your teacher.

Summarise your new sentences here. Your summary should answer your question. If your planning template is more than one page, write your summary on the last page. When your summary is complete, ask your teacher for their feedback and signature. Keep this sheet as evidence of your research.

## Resources

### *Resource 1: Planning Template*

| Research question: |             |           |                   |
|--------------------|-------------|-----------|-------------------|
| Source             | Information | Key words | In your own words |
|                    |             |           |                   |
|                    |             |           |                   |
|                    |             |           |                   |
| Summary:           |             |           |                   |