



# Year 9 Energy Project:

## The thermal house

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*'The best way to predict the future is to design it.'* Buckminster Fuller

Our household energy consumption is enormous, but through good design and engineering, it is possible to easily improve the energy efficiency of our homes.

Your challenge is to design a thermally efficient house, build it, test it and produce a report and visual presentation of your results and conclusion.

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*'Energy conservation is the foundation of energy independence.'* Tom Allen

## Design, Build and Plan

It is important to plan your experiment carefully, and give thought to how you will use the data you gather before you begin to take measurements.

1. Choose a design
  - a. Observe the features of a house
  - b. Describe it in simple terms
  - c. Determine what might affect it
  - d. Create a design
  - e. Further research your house features
2. Build your design
  - a. Build your house
  - b. Modify your design if required
3. Plan your experiment
  - a. Under what conditions will the experiment be conducted? (e.g. place, temperature, timescale)
  - b. What features are you going to study?
  - c. What things might affect it?
  - d. What are you going to keep the same?
  - e. What are you going to change?
  - f. What equipment is needed? (tools, building materials, software)
  - g. How long will it take to perform?
  - h. What are you going to plot on a graph?

*'There are three principal means of acquiring knowledge . . . observation of nature, reflection, and experimentation. Observation collects facts; reflection combines them; experimentation verifies the result of that combination.'*

## Execute and analyse

1. Conduct the experiment
  - a. Under what conditions is the data being gathered?
  - b. Are you influencing the results as the experimenter?
  - c. Are you able to repeat the experiment?
  - d. Why should experiments be repeated?
2. Analyse and present the results
  - a. What are the limits of the experiment?
  - b. What are the sources of error?
  - c. How can the results help you to better understand this feature?

- d. How can the results be clearly presented to others so that the trend or behaviour is clearly understood?
- e. Are the results presented clearly and in detail?

## Write up

The written report is mandatory for any investigation. This one should be between 3-4 pages of A4 written in Arial font size 12 (or similar).

The written report should contain the following sections:

Introduction	A few lines should state the main aspects of the house design you have investigated.
Research	Background information you have researched should describe the main considerations of thermally efficient house design.
Design	The house design with a diagram and list of materials used and why these materials were chosen.
Test Method	A clear set of instructions describing how the house was tested and why this method was chosen.
Results	List the data you gathered, explain the results together with the associated details of your design.
Conclusion	A few lines summarising the overall thermal efficiency of the house, and future developments that might further improve its thermal efficiency.
Evaluation	A few lines identifying any difficulties encountered during design and test phases and what changes you would make if you were doing it again.
Bibliography	A list of references to all the sources you have used. This may include websites and books used.

## Academic integrity

You must present work that is the result of your own efforts. Presenting somebody else's work as your own, without recognising the source, is something we call plagiarism.

If you have looked at resources to help you, these should be clearly listed in the bibliography at the end of the report.

## Schedule

You have five weeks to research, experiment and write up your project.

Lesson 1	Design 1. Identify any variables and equipment that you will need to both build and test the house. Get teacher approval.
Prep 1	Research your design against general design of houses. Make modifications to your design as required. Produce design 2. Gather building materials.
Lesson 2	Finalise design between pair. Construct house.
Prep 2	Complete building house.
Lesson 3	Test House
Prep 3	Analyse your results. Identify data that requires repeating.
Lesson 4	Perform additional experimentation. Start write-up.
Prep 4	Finish writing up report (1 per pair)
Lesson 5	Hand in write up and present results to rest of group. Assessing takes place.

*'No amount of experimentation can ever prove me right; a single experiment can prove me wrong'     Albert Einstein, Physicist (1879 - 1955)*