

Box 1: Keywords

Word	Definition
Ammeter	An instrument used to measure the current in a circuit, in amperes (A)
Change in thermal energy	A product of the mass, specific heat capacity and temperature change of a material
Insulation	A material used to reduce thermal energy transfer to the environment
Parallel (circuit)	An electrical circuit where the components are connected in separate loops.
Series (circuit)	An electrical circuit where components are connected in line with each other, in separate loops.
Specific heat capacity	The amount of energy needed to raise the temperature of 1kg of a material by 1°C
Voltmeter	An instrument used to measure the potential difference in a circuit. Pd is measured in volts (V)
Work done	The amount of force needed to move an object over a given distance; also a measure of energy transferred to an object which is moved

Box 2: Key skills

Accurate practical investigations; data recording; data interpretation and manipulation; graph skills

Box 3: Specific Heat capacity

The **specific heat capacity** of a substance is the amount of **energy** required to **raise** the temperature of **one kilogram** of the substance by **one degree Celsius**.

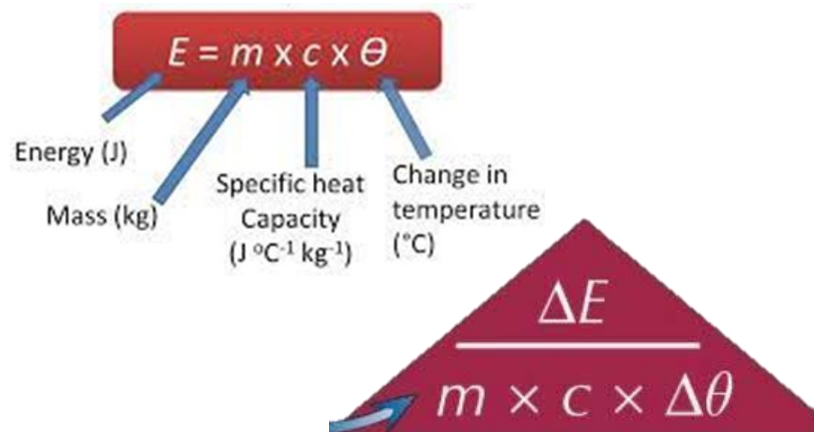
The specific heat capacity of one material is different to that of another material so it will take a different amount of energy to raise the temperature of different materials by 1°C.

If a **large amount of energy** is needed to heat up a substance, it has a **high specific heat capacity** and it **will** be able to store lots of thermal energy.

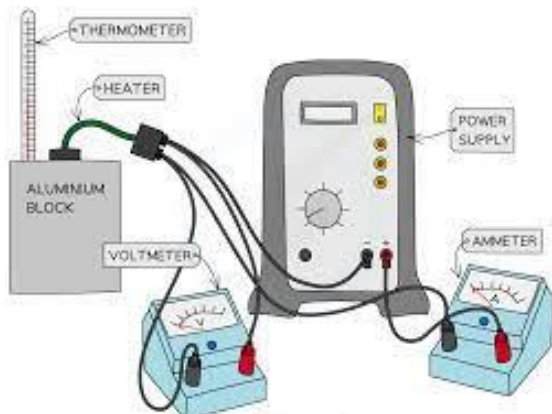
If a **small amount of energy** is needed to heat up a substance, it has a **low specific heat capacity** and it **won't** be able to store lots of thermal energy.



Box 4: The SHC equation



Box 6: Required practical



Method

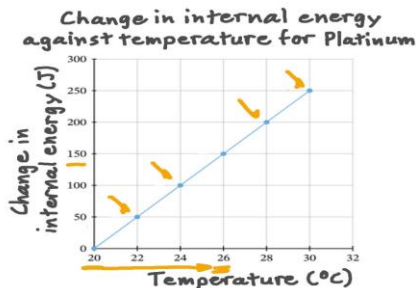
1. Place the **immersion heater** into the central hole at the top of the metal block.
2. Place the **thermometer** into the smaller hole and put a couple of drops of water into the hole to make sure the thermometer is surrounded by hot material.
3. Fully **insulate** the block by wrapping it with an insulating material and place on a heat mat.
4. Set up the heater into a circuit – the ammeter should be connected in series and the voltmeter on parallel to the heater.
5. Record the initial temperature of the block.
6. Connect the heater to the power supply and switch on.
7. Record the temperature of the block each minute for 10 minutes and also the reading on the **ammeter** and **voltmeter** once during the practical.
8. Calculate **Work done** * by the heater using $P = I \times V$ then $W = P \times t$ and plot this against temperature change on a line graph; draw a line of best fit.

(*NOTE: **Work done** is equal to **energy transferred**)

Box 7: Calculating specific heat capacity

Specific heat capacity is the amount of energy needed to raise the temperature of a 1kg object by 1°C.

$$\frac{E}{m\Delta T} = c \quad c_p = \frac{150J}{(0.2kg)(6^\circ C)} = 125 J/kg^\circ C$$



EITHER

Calculate the SHC of the material by dividing the total energy transferred value by the total change in temperature x mass – i.e. substituting your data into the equation as shown above

OR

Calculate the SHC of the material from the **gradient** of a Change in Energy against Temperature graph

Box 8: Pathway

Previous knowledge:

KS3: Energy transfers and insulating materials

KS4 Energy stores and transfers; circuits; calculations

Future links:

Careers:

Material scientists; heating engineers; insulation installers

Box 9: Cross curricular links