1 Explain why in sunny weather it's more practical to wear light-coloured clothing, compared to dark colours.

_____

_____

_____

2 Explain why kettles are usually white or shiny, not dark colours.

_____

_____

3 Explain why solar heating panels are painted black.

_____

_____

4 Explain why in cold weather a person with light-coloured clothing will lose heat more slowly than someone wearing dark colours, if conditions are the same in other ways.

_____

_____

5 Of the three methods of heat transfer (**conduction**, **convection**, **radiation**), which best fits each of the following descriptions:
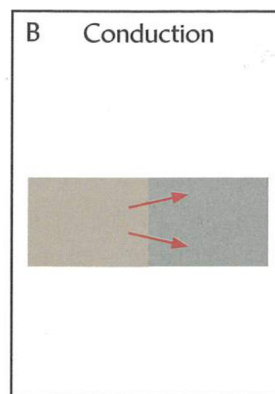
- is able to send energy through empty space. _____

- only happens if there is physical contact. _____
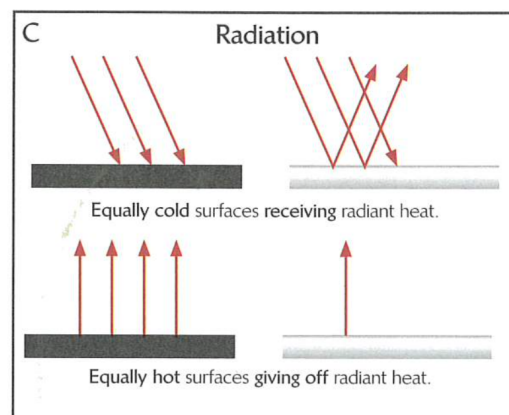
- only happens in gases and liquids. _____

Heat energy moves from warmer to colder things in three ways:
convection, conduction and **radiation**.

A   Convection
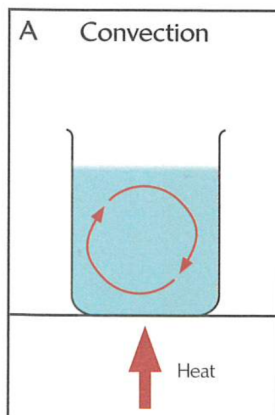
Heat

This involves the circulation of liquids and gases. Hot regions rise, cool dense regions sink.

B   Conduction

This is the transfer of heat from a hot material to a less hot material, but only if they are in contact. Metals conduct heat rapidly.

C   Radiation

Equally cold surfaces receiving radiant heat.

Equally hot surfaces giving off radiant heat.

Can send heat through still air or empty space. This drawing shows the importance of colour in absorbing and giving off IR (infrared) heat. Texture is also important: shiny surfaces absorb and give off least heat, while matt (rough) surfaces absorb and give off most heat.

6 Explain why layers of newspaper are good at keeping fish and chips hot, and yet also good at keeping ice cream cold.

_____

_____

_____

7 When you stand on a stone floor it feels colder than carpet, even though both surfaces are actually at the same temperature. Explain why the stone feels colder.

_____

_____

_____

8 Does the white colour of polar bears help keep them colder or warmer, compared to brown (grizzly) bears in the same conditions? Explain (A) for sunny conditions, and (B) for night conditions.
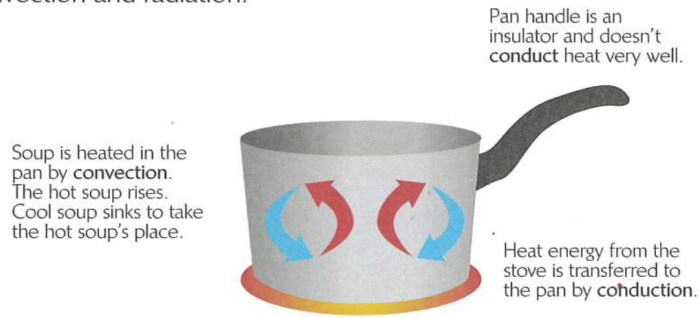
A _____

_____

B _____

_____

Heat is a form of energy. We use it for a lot of things, like warming our homes and cooking our food. Heat always tends to move from warmer to cooler places, and it does so in three ways: conduction, convection and radiation.

Pan handle is an insulator and doesn't **conduct** heat very well.

Soup is heated in the pan by **convection**. The hot soup rises. Cool soup sinks to take the hot soup's place.

Heat energy from the stove is transferred to the pan by **conduction**.

Use the following words to fill in the blanks: *gases, cooler, conductors, insulators, liquids, currents, energy, metal, hot, plastic, temperature.*

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Conduction occurs when heat _____ (1) is passed directly from

one place to another. When you stir a pot of soup on the stove with a metal spoon,

the spoon's _____ (2) will rise. The heat is being conducted from the

_____ (3) soup to the _____ (4) spoon. Metals are excellent

_____ (5) of heat energy. Wood and plastics are not. These 'poor' conductors

are called _____ (6). That's why pans are made of _____ (7),

while the handle is made of a strong _____ (8). Convection is the movement of

_____ or _____ (9) from a cooler area to a warmer area. In a

glass container, you can see these circular convection _____ (10) . Warmer soup

moves up from the hot area at the bottom of the pan to the top where it is cooler. Cooler soup

then moves to take the warmer soup's place.

Heat & Temperature

1 Of these two containers (bucket and cup) of water, which has the
   highest temperature?_____
   And which contains the greatest amount of heat? _____

40 °C

50 °C
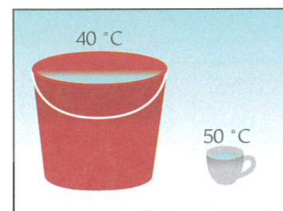
You have just proved to yourself that heat and temperature are not the same thing. Temperature is
measured in degrees centigrade (°C). Heat is a **total quantity** of energy, measured in joules (J).

CHALLENGE

2 **Calculating heat**. (This task is for students confident of their maths ability.)

Heat is a total quantity of energy, and depends on temperature change and on the amount and
type of substance.
   The amount of heat gained (or lost) by water can be calculated using the formula below. Δ is a
scientific symbol used to represent 'a change in the amount'.

$$\Delta H = m \times \Delta t \times 4.2$$

ΔH is the total heat increase or decrease in joules.
m   is the mass of water in grams.
Δt is the temperature rise (or fall) in °C.
4.2 is J/g/°C, because 4.2 J heat raises the temperature of 1 gram water by 1 °C.

Calculate the amount of kilojoules of energy involved in A and B. Show all your working. Use the
correct units. Set your calculation out in the following three steps: FSC.

• Formula: write the formula.
• Substitute: with letters in place of numbers.
• Calculate final answer, and write the correct units.

A Your kettle holds 2000 grams of water. You fill it with 15 °C water from the tap. Calculate how much energy is needed to heat all the water to boiling point.

F: _____

S: _____

C: _____

B After your long shower, the electric hot water cylinder has to heat water from the intake temperature of 15 °C up to the set temperature of 60 °C. The amount of hot water used was 17 litres (17 kg). Calculate how much energy is needed.

F: _____

S: _____

C: _____