

Space Suit challenge

Temperatures can be as hot as 50°C in Death Valley.

The Rough Scientists have been challenged to design a suit – like a spacesuit – to keep one of them cool.

They need help from you, the back-up team!



Photo: NASA

Most people think that space is very cold. But if you stood on the sunny side of the moon, the temperature would be hot enough to boil the blood in your body.

Discuss how to build a spacesuit that can withstand very hot or very cold temperatures.

Here are some science ideas you could use:

There is air trapped in the insulating material. This prevents energy transfer by conduction and slows down cooling and heating.



A cold material next to the skin conducts energy out of the skin and into the colder material.



When a liquid evaporates it takes energy from the surroundings. This causes cooling.



The inside of a thermos flask is silvered. It reflects back energy radiation that would cause cooling.



When a solid changes into a liquid it takes in energy from the surroundings. This causes cooling.



BBC



Space Suit Design Ideas

1 Study the information about the spacesuits

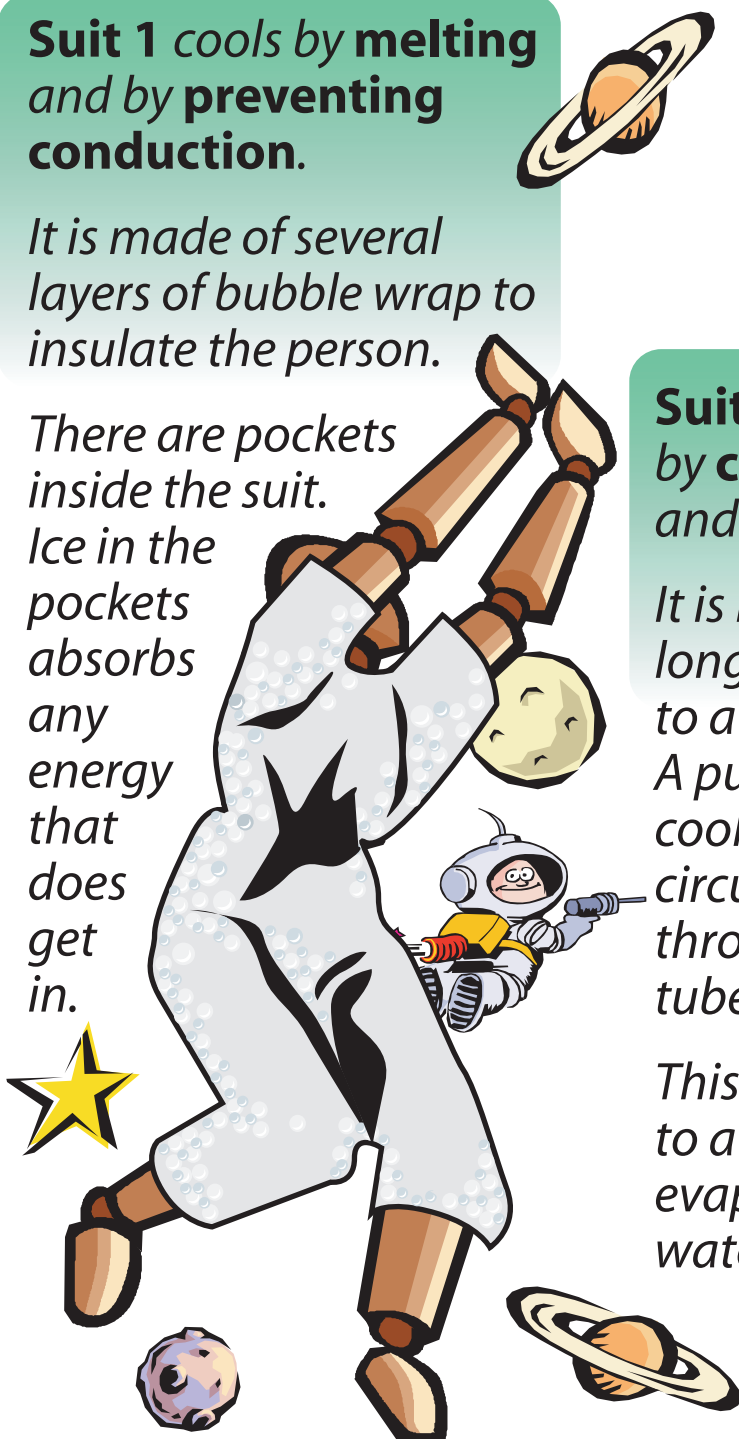
2 Plan what to say to explain on TV:

- ◆ How the spacesuits keep the astronaut (or Rough Scientist) cool
- ◆ Which spacesuit will work best.

Suit 1 cools by melting and by preventing conduction.

It is made of several layers of bubble wrap to insulate the person.

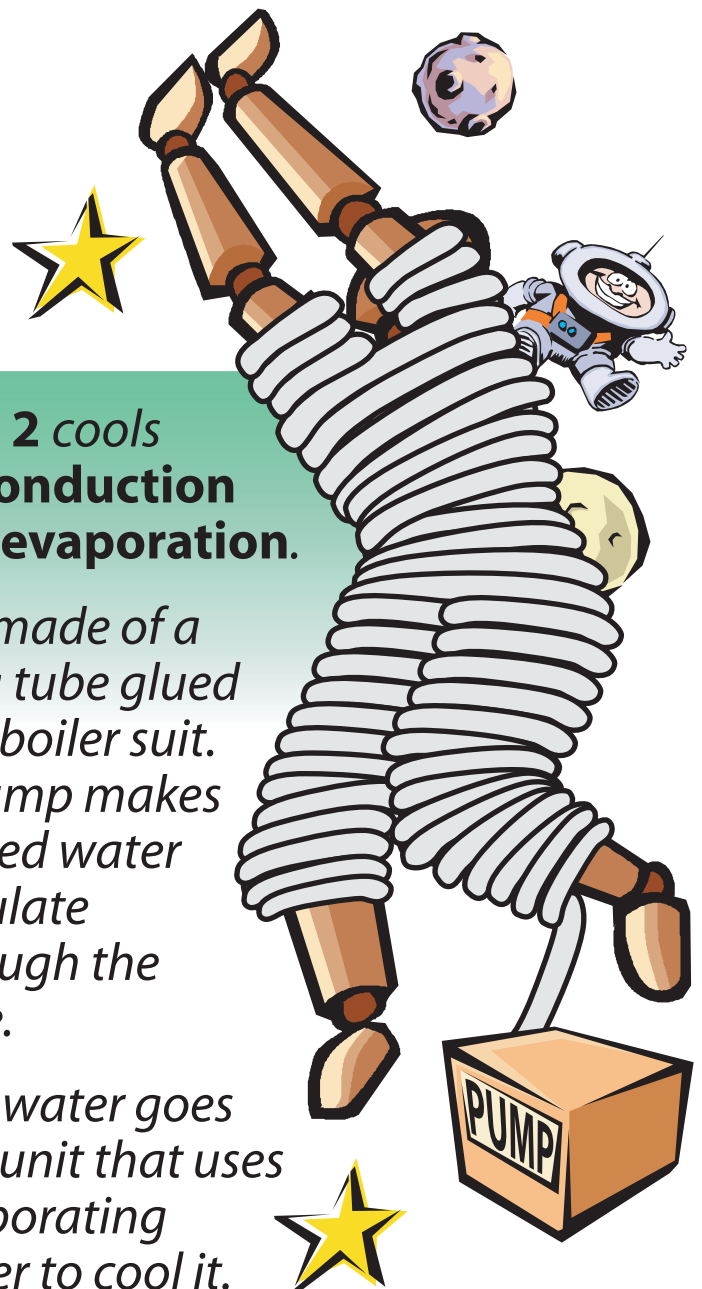
There are pockets inside the suit. Ice in the pockets absorbs any energy that does get in.



Suit 2 cools by conduction and evaporation.

It is made of a long tube glued to a boiler suit. A pump makes cooled water circulate through the tube.

This water goes to a unit that uses evaporating water to cool it.



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Space Suit

More design Ideas

Suit 3 cools by **evaporation** only.

The outside of the suit is made of a spongy material.

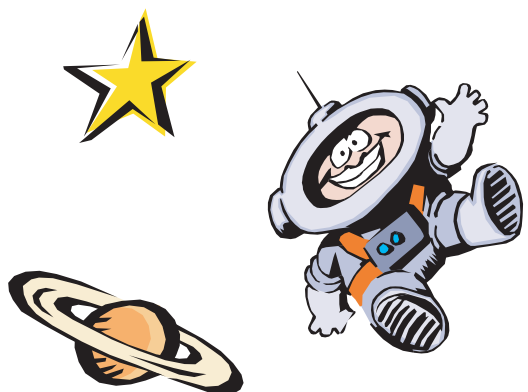
The material is kept wet by a wick effect from a tank of water that the person wears on their back. As the water evaporates from the sponge it cools the suit.



Suit 4 cools by **radiation** only.

The suit has a mirror-like silvered surface. In the vacuum of space, the only way energy can travel is by radiation.

If you reflect the radiation away from the suit, the astronaut will stay cool.



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Space Suit

the Rough Scientists' Design



The Rough Scientists' spacesuit is complicated! It is made of a long tube wrapped all round the body. Copper pipes join the tube to a home-made fridge.

It works like this:

- Mike's chemical reaction cools some water.
- Kathy keeps the water cold in her fridge.
- Jonathan's pump makes the cold water circulate through the tube.

The Rough Scientists want you – the back-up team – to explain on TV how their spacesuit works!

Draw an energy transfer diagram for the suit and the cooling unit.

Show the energy in and the energy out.

1

Plan what to say to explain how the cooling works.

2

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