

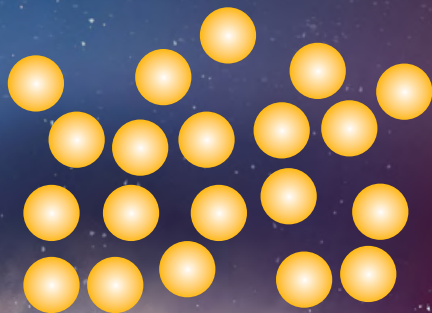
Activity 2.2 Tiny particles



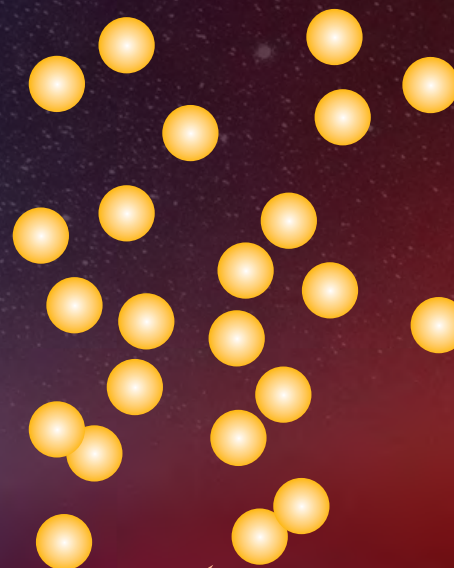
SCIENTIFIC METHOD

The **KINETIC THEORY** describes matter as small particles which are moving all the time. They only stop moving at a temperature of absolute zero, that's -273°C . The addition or removal of energy (heat) leads to changes in the behaviour of the particles and a change in state.

COLD



HOT



In solids, the tiny particles are held in tight structures.



When energy is added the particles vibrate within these structures.

In liquids particles are held less tightly and are able to roll-over one another.



In the gaseous state, particles spread out randomly and move more quickly when energy is added.



What to do:

In a small group, design a skit which demonstrates kinetic theory in terms of the movement of particles and the impact of heating and cooling.

Activity 2.2 Tiny particles Continued

Can we see atoms and molecules?

In 1905 Albert Einstein published four groundbreaking papers; on the particle nature of light, Brownian motion, his famous $E=mc^2$ equation showing how energy and mass are equivalent, and the speed of light (special relativity). Each one of these papers completely changed the way we think about the world. He was only 26 years old. He earned a Nobel prize for physics in 1922.



Albert Einstein aged 25. As a young man he made several startling discoveries.

Brownian motion

What to use:

Each GROUP will require:

- Microscope, slides and cover slips
- small quantity of dilute milk
- pipette
- tissues for drying the slides.

What to do:

Step 1

Add 1 part of milk to 3 parts of water

Step 2

Place one drop of milky water on the slide. Cover with a coverslip.

Step 3

Observe the milk water under 100X power.

Discussion:



You should observe the fatty droplets in the milk jiggling around.

1. You will notice both large and small droplets. Do you observe any difference between the jiggling motion of the large and small droplets?
2. Why do you think there is a difference?
3. How do your observations support the idea that water is made of tiny particles in constant motion?

You may also remember the phenomenon of diffusion from Year 7. How could you explain how a smell spreads through the room, or some food dye spreads through a glass of water, using the particle model?

The jiggling motion of the microscopic fat droplets in the water is called **BROWNIAN MOTION**, after the botanist, Robert Brown, who saw pollen grains jiggling on his microscope slides.

Einstein's analysis of this motion provided evidence that water was made of tiny particles that were constantly moving.



[Click here to see a simulation of Brownian motion.](#)