

Chapter 8: Power and energy

Speedboat matchsticks

Ratings

MESS  DANGER  DIFFICULTY 

Theme

The energy of water; floating on water

Equipment needed

Water; bowl or shallow plate; washing-up liquid; cotton bud; spent matchsticks; ground black pepper (optional)

Experimental method

Fill a bowl with water and float a matchstick on the water in the centre of the bowl. Place a small amount of washing-up liquid on one end of the cotton bud, leaving the other end dry.

With the dry end of the stick, touch the water just behind the match. Watch what happens. Now, use the end with washing-up liquid on to touch the water just behind the match. Watch what happens. The match should shoot across the water like a power point. How many times can you make it do this?

You could do this experiment in a large tray of water, dropping in lots of matchsticks, and get each participant to experiment with moving the matchsticks themselves.

Optional: Dispose of the water, and wash the bowl to ensure no washing-up liquid remains. Then refill with water and sprinkle ground black pepper on so the surface is covered. Now touch the centre of the water with the cotton bud with washing-up liquid on. What happens? (The black pepper should shoot away to the edge of the bowl.)

Big thinking

Water molecules are like a battery – they have a positively and a negatively charged end. The electric charges attract one another and make the water stick together. But at the surface, the water does not stick to the air above, so they pull towards one another more. This is called surface tension and it means that small, light objects can float on water.

Adding washing-up liquid pushed the water molecules at the surface apart, which pushes the boat along. The same thing happens with the ground pepper – it gets pushed to the edge of the bowl. Why does the pepper move farther and faster than the matchstick when you touch the water with the cotton bud? Perhaps because the individual particles are lighter?

You can see water tension in a glass – just look at where the water touches the edge: it is slightly higher than the level of water in the glass. Or pour water on to a water-resistant surface. The water clumps together in drops because of the energy of surface tension. And on a pond, some insects like ‘water boatmen’ can walk on water because surface tension holds them up.

Big questions

Look at the story of Jesus and the children in Matthew 19:13–14. The disciples tried to push the children away, but Jesus kept on drawing them back. Have you ever known a time when you felt pushed away from Jesus? Or from someone else? How might you be more like the surface tension of the water and bring people together? Jesus calls this being a ‘peacemaker’ – it’s a very valuable part to play at home, at school, at work, in politics...