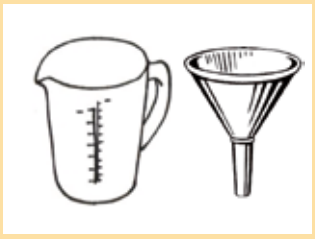
GUZZLER LEARNS ABOUT CHEMICAL ENERGY: DESIGN AND MAKE A LAVA LAMP

Equipment

Vegetable oil, water, 2 measuring jugs – one for water and one for oil, clear plastic bottle*, funnel, food colouring and dropper, a tablet that does not fizz when added to water (e.g. a non-effervescent Vitamin C tablet), any tablet that fizzes in water (e.g. Alka-Seltzer).

*The clear plastic bottle can be any size, depending on the amount of vegetable oil available - also keeping in mind the issue of the disposal of oil; bottles with clear smooth sides are best for seeing the 'lava' in action).



Class Level

All

Preparation

Collection of materials.
THE FIRST SIX ACTIVITIES MAY BE SEEN AS PRELIMINARY ACTIVITIES IN ORDER TO UNDERSTAND THE LAVA LAMP. THE LAMP ITSELF MAY REQUIRE A SECOND SESSION.

As the first five activities require a number of containers, the children could perhaps be asked to bring in some small plastic containers which are fairly clear, e.g. yogurt size. They may also wish to bring in their own plastic bottles.

Have a receptacle at hand for disposal of the oil, depending on the quantity used. (Large quantities of oil should be brought to a 'Bring Centre', where some of it is recycled as a biofuel).

A session on adding different things to water, some of which dissolve (e.g. salt) and some which do not (e.g. sand), would also be a good preparation for this activity.

Background information

Chemical energy is energy that is released during chemical reactions. Batteries, food, and fuel such as coal, oil and petrol are all stores of chemical energy, which can be released under certain conditions (e.g. connecting batteries into a circuit, chewing food, burning fuels...)

Alka-Seltzer tablets contain two chemicals (citric acid and bread soda) which form a chemical reaction when they meet water, producing carbon dioxide gas as one of its products. Alka-Seltzer does not dissolve in oil.

Oil and water do not mix. Oil is lighter than water so it sits on top of water when it is added. The food colouring does not dissolve in oil and is heavier than oil, so it falls through the oil down to the water and mixes with the water. (See DPSM activity 'Diving Drops and Sinking Feelings').

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Background information (continued...)

When you drop the Alka-Seltzer tablet into the oil and water, it falls down through the oil (it does not dissolve in the oil) to the bottom, where it reacts with the water *(a chemical reaction)* to produce carbon dioxide gas. These bubbles of gas rise through the oil to the top of the bottle because they are light, taking some coloured water with them. The bubbles of gas burst when they reach the top, the gas escapes, and the drops of coloured water sink back down through the oil. (Remember the DPSM 'Dancing Raisins' activity?).

When the movement dies down you can start it up again by adding another bit of the tablet, which will produce more carbon dioxide gas.

Trigger questions

Can you name some of the different kinds of energy?
(Magnetic, electrical, sound, light, heat, movement/kinetic, chemical, nuclear).

We will investigate **chemical** energy.

Where do you get your energy from? (Food).

How do you get energy from food?
(A chemical reaction in your body breaks down the food and releases energy).

Do you think oil and water mix? ("We will investigate". No)

When oil spills from a ship in the ocean where does it go? (It floats).

Which do you think will be on top and which on the bottom when you put them both in a bottle? ("We will investigate". Oil on top).

What happens to tablets when you put them into water?
(We will investigate". Some fizz and dissolve, some don't)

Content

SCIENCE: Energy and Forces: Chemical Energy, heat
Materials: Materials and Change Forces

Living Things: Human life processes (food as source of energy; healthy diet/indigestion/ Alka-Seltzer)

Environmental Awareness and Care: Oil spillages in the sea, damage to marine and bird life

MATHS: Number: ordering, operation

Measures: capacity, money

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Skills	Predicting, experimenting, observing, analysing
Cross-curricular Links	**GEOGRAPHY:** Natural Environments: Rocks and Soils: Crust ...lava flow...volcano

Activities

All Children:

ACTIVITIES 1-6: COMPARING OIL AND WATER

The children should predict what they think will happen before they do each of these activities.

Activity 1 :

Put some water into a clear jar.
Add a non-effervescent tablet. What happened?

Did the tablet dissolve in water? *(No)*

Activity 2 :

Put some water into a clear jar and add a piece of Alka-Seltzer tablet. What happened? What did you see? What did you hear? What happened after a while?

(Dissolves with fizzing sound).

Activity 3 :

Put some water in a clear jar or beaker, and add a few drops of food colouring and mix. What happened?
(The water becomes coloured).

Activity 4 :

Put a little oil into a clear jar; add a few drops of food colouring. What happened?

(Food colouring does not dissolve in oil, it stays in little 'blobs').

Activity 5 :

Put a little oil into a clear jar and add a piece of Alka-Seltzer tablet. What happened?

Activity 6 :

Put some water in a jar and add a little oil. What happened? Why?

(The oil stayed on top because it is lighter than water).

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REVIEW:

1. Do oil and water mix? Which is heavier? What would happen to oil spillages from the big tankers at sea if oil was heavier than water? Would this affect the environment differently? (Marine life at the surface, especially seabirds, would be less affected, but marine life at the bottom of the ocean would be badly affected).
2. Do all tablets fizz when they are put in water?
3. Did water and oil behave the same in relation to (i) the food colouring? (ii) The Alka-Seltzer tablet?

Can you explain?

((i) Water gets coloured but the oil does not because food colouring dissolves in water but not in oil; (ii) Alka-Seltzer dissolves in water, but not in oil).

Science & Maths

MAKE A LAVA LAMP

Older children:
Find out the capacity of the plastic bottle (if it is not written on it).
How would you do this? (Fill the bottle with water and empty water into a measuring jug).

Calculate a quarter of the capacity of the bottle, and put this amount of water in the bottle.

Now calculate two-thirds of the capacity of the bottle; measure out this amount of vegetable oil in the measuring jug, and add it to the water in the bottle.

What happens? Do the oil and water mix?

Wait until the oil and water have separated.

(Ask the children if they think food colouring will colour the oil or water or both).
Now add about 10 or 12 drops of food colouring to the bottle.
What happens to the food colouring? Explain.

(It does not dissolve in the oil, but it does dissolve in the water and colours it).

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Science & Maths continued

Now break an Alka-Seltzer tablet into 3 or 4 pieces and drop one of them into the bottle. What happens? What do you see? Describe colour, shapes and size. Where does the tablet go?

Can you explain what is happening?

Where does the energy come from? (Chemical energy from the Alka-Seltzer reacts with the water, producing carbon dioxide gas which tries to escape from the top)

Leave the bottle for an hour or so, observing it from time to time. What do you see?

Now add another bit of Alka-Seltzer tablet. What happens? Can you explain? (The same process repeats, i.e. The 'lava' erupts again).

Younger children:
The 'lava lamp' would probably best be done as a demonstration for younger children.

More Maths

Juniors:
Can you put the following lava lamps in order of height, starting with the biggest and using the sign > (e.g. yellow > red? Their heights are as follows:
Red: 40 cms. Green: 35 cms. Yellow: 42 cms. Purple: 37 cms. Blue: 39 cms.

Value for Money:
Seniors:

1. Sean went shopping to buy a lava lamp for each of his four cousins for Christmas. 'Bright Sparks' had a special offer of 4 lamps for €20. 'Looney Lamps' had an offer of 2 lava lamps for €12. Where do you think Sean bought the lamps? Why?

2. In a closing-down sale, the lava lamps which cost €8 each now have a 25% reduction. What price are they now?

Safety

Care with tablets. Children must not consume them.
Food colouring may stain hands, so some children may wish to put on plastic gloves.

Follow-up activity, Including Maths

The proportions of oil to water can be varied and the children can see if this makes any difference to the behaviour of the 'lava lamp'.

Record the proportions used, and observe the amount of activity in the bottle.

Different-shaped bottles could be used to see different effects.