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February 2021 – Spring Term

#SolveItWithSTEM@Home Secondary Activity Pack

Friday 5th February 2021

Hello Everybody!

Hey there guys and welcome back to the packs. We do hope you have found the last 3 weeks interesting and something a little different to the usual school activities!...
Last week we covered **Food** which involved a growing mould experiment (ew?!) – we hope you liked it and weren't LOAFing around...do you get what I did there?
Anyway...this week we will be looking at the wonderful world of **Water**!

I had a dream once that I was diving in the ocean and a whale starting singing right in my earhole....it wasn't fun at all!
...moving on... we both hope you enjoy this week and share the packs with your family and friends online via **www.fawleyonline.org.uk**

See you next week, Alice and Eddie

Ps. How are you getting on with last week's mould experiment? You should be seeing some changes now to the bread...

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Activity: Why doesn't the water leak?!

(Make sure you have an adult help you with this activity)

The items you will require include:

- Plastic freezer or sandwich bag
- Water
- Sharpened pencils

Don't forget to dispose of the bag thoughtfully. You could even reuse the bag to reduce waste!...don't use it for water though..

Instructions:

- Fill a plastic bag a little more than half way full of water
- Seal the bag
- Quickly stab a sharpened pencil through the bag
- Try stabbing multiple pencils through the bag.....**Why doesn't the water leak?**

How Does the Experiment Work?

The magic of this experiment lies in what the bag is made out of. The material used for the bag is plastic and plastics can contain **polymers**. If you look really, really closely at a plastic bag (with a microscope), you will see it is made up of long chains. These are called **molecules**.

Molecules are used to make up many items in our day-to-day lives. Zipper top plastic bags (like the one used in our experiment), plastic grocery bags, plastic water bottles and plastic food packaging are all made of polymers. Products made of **polymers are flexible, lightweight, leak-proof, and low in cost to produce**.

Think of polymers as long chains of beads. When you stab a pencil through the bag, the polymers move apart. This is the same as if you stuck a pencil between two chains of beads. Because polymers are flexible, when you stab a pencil through the bag, the **polymers push back toward the pencil and form a temporary seal**. This prevents the water from leaking out of the holes. If you remove the pencils from the bag, **the holes will remain in the bag because you have permanently pushed the polymers aside, allowing water to leak out**.

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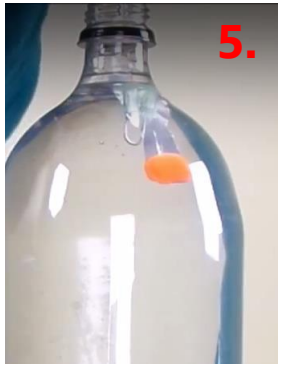
Experiment: A Scuba Diver in a Bottle

(Make sure you have an adult help you with this activity)



Items Required:

- Empty plastic two litre bottle
- Bendy drinking straw
- Small paper clip
- Blu tack
- Thick foil
- Scissors
- Water

Instructions:

- Using the tin foil and scissors, cut out the shape of a scuba diver. Remember he needs to fit through the bottle top.
- Using the bend in the drinking straw, cut out two legs at the fold – this will be used as his air tanks. See **Image 2.** for help.
- Slide the paper clip up into the two straw legs. **See Image 2.**
- Slide the foil diver behind the paper clip. **See Image 2.**
- Place some blu tack at the diver's feet to use as a weight. **See Image 3.**
- Now check that the diver floats with his head just above water - add or remove blu tack to achieve this. **See Image 4.**
- Fill the two litre bottle with water up to the bottles neck and put in the diver. **See Image 5.**
- Screw the bottle cap on tightly, otherwise you'll get wet.
- Squeeze the bottle with both hands and the diver should sink.
- Release the bottle and the diver will float again.

How Does the Experiment Work?

When you first put the diver into the bottle, the combined density of the diver, straw, paperclip and blu tack is slightly less than the density of water, so it floats. A small bubble of air gets trapped in the straw when you put the diver in the bottle. When you squeeze the bottle, you increase the pressure of the water in the bottle, so water is forced up into the straw compressing the air bubble in the straw. As the air bubble gets smaller, the density of the diver increases and the diver begins to sink. When you release the bottle, the pressure lessens and the water moves back out of the straw. The air bubble in the straw returns to its original size causing the diver to become less dense and float back to the top of the bottle.

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Maths: How much water do we really have and how much do we use?

Water use in one day
Conventional Washing Machine = 165L
Dishwasher = 40L
Brushing Teeth, Tap Running = 10L
10 Minute Shower = 100L
Conventional Toilet = 16L

Answer the following questions, using the two tables provided.
Answers will be provided in next week's pack.

1. You have used 175L of water already today. You have washed your laundry once and have brushed your teeth an unknown number of times. How many times have you brushed your teeth today?

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2. You have used 255L of water already today. You have washed a load of laundry, had a shower and washed the dishes in the dishwasher. How many minutes did you shower for?

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3. You are making apple sauce and you have brought in 3 kg of apples from your backyard. How much water (in kg) is contained in the apples?

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4. You are making a large salad with 1 kg of tomatoes, 1 kg of potatoes and 2 kg of spinach. How much water (in kg) will be contained in your salad?

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5. In the whole world there is 1.4×10^{21} L of water. However, only 0.26% of that water is available for human and plant use. How many litres are available for human and plant use?

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6. Out of the water available for humans and plants (answer to question #5), only 0.014% is available to be used as safe drinking water. How many litres of safe drinking water does the world have?

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Water Facts
70% of your body is made of water
95% of a tomato is water
85% of an apple is water
88% of a potato is water
91% of spinach is water
61% of beef is water

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These questions were inspired by the following website:
https://static1.squarespace.com/static/583ca2f2d482e9bbbef7dad9/t/58d5b2ade6f2e12e70f20513/1490399918025/OWF_Math_That_Much_Water.pdf

Answers: w/e 29th January 2021 STEM Pack

Maths (Page 5): Fahrenheit and Celsius

1. I find a recipe which states that my oven needs to be set at a temperature of 400°F. My settings on my oven are in °C. **What temperature should I set my oven to?**

Answer:
204.4°C (to one d.p). As you would be unable to set an oven so accurately, you would set the temperature to 200°C

2. What temperature is 40°C in Fahrenheit? **Answer:** 105°F

3. What temperature is 100°F in Celsius? **Answer:** 38°C

These questions were inspired by the following websites:
Session 2: Units of measure: 4.1 Celsius and Fahrenheit formulas - OpenLearn - Open University - FSM_2_CYMRU

https://www.bbc.co.uk/bitesize/guides/zpm4dmn/test

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We hope you enjoyed this week's activities.

Another pack will be on its way to you next week…

Best wishes
The ExxonMobil Fawley #SolveItWithSTEM Team!