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| **Activity title** |
| **Frozen bubbles** |
| **Stay safe** |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol:⚠ |
| **Time required** |
| 30 minutes |
| **Activity summary** |
| It’s fun to blow bubbles but they usually don’t last very long and are very easy to pop. In this experiment we are going to create a frozen bubble which might last a little longer – well, until it melts! Then we’ll be learning more about bubbles and what makes things freeze, looking at all three states of matter: solid, liquid and gas. |
| **What equipment will you need?** |
| * Water * Golden syrup * Washing up liquid * A straw (make sure it’s biodegradable) * A mixing bowl * A smaller bowl   And have an adult to help. |
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| **How to do it** |
| **Step 1**  Measure 2 tablespoons of water into a bowl.  **Step 2**  Add an equal amount of washing up liquid and golden syrup and gently stir.  **Step 3**  Pour some of the mixture into the smaller bowl and use the straw to blow the mixture into bubbles into the smaller bowl.  **Step 4**  Place in the coldest part of your freezer and wait for 5 to 10 minutes before checking.  If it has been snowing or the temperature outside is below freezing, you can blow your bubbles outside onto the grass.  **Step 5**  Check your bubbles to see if they have frozen.  **Well done – you’ve cracked the Christmas challenge!** |
| **Brilliant bubbles** |
| In this challenge we saw how the bubbles we blew turned from a liquid into a solid by putting it in the freezer. But how are bubbles made and what's going on to make this change?  Bubbles are made from a sandwich of soap and water around a pocket of air. They are always round because a sphere is the smallest most efficient shape and a fascinating fact is that if they stack together they form hexagon shapes in the same way as honeycomb in a beehive! |
| **The big freeze** |
| So, let’s dive deeper into what was happening to change the bubble from a liquid substance to a solid.  All things can exist in three states: **solid**, **liquid** and **gas**.  The water we drink, which comes from the tap, is a liquid. When it is heated up it **evaporates** and becomes steam - which is a gas, and when it cools down it becomes ice which is a solid. These changes happen because of the way the **molecules** in water, or any other substance react to heat.  Examples of liquids: water, lemonade, milk.  Examples of solids: metal, wood, cardboard.  Examples of gases: the air we breathe, clouds, helium in balloons. |
| **Moving molecules** |
| When molecules are heated up, they begin to move and jiggle about - this makes them flow more easily. If they are heated even more, they will move even faster and the distance between each molecule will become greater - this creates a gas.  In fact, if molecules are heated even more they can become another state of matter called p**lasma** – stars are made of plasma but it’s very rare in everyday life.  When the temperature drops the molecules will lose their energy and eventually will stop moving entirely – this creates a solid.  So why isn’t everything around us in the same state? Water is liquid but something like a metal fork is solid. The answer is that different things have different temperatures at which the molecules will change state. Water will turn into a gas at 100 degrees Celsius, and freeze at 0 degrees Celsius, but a metal like Tungsten will need to reach over 5000 degrees Celsius before it will start to boil. |