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| **Insulator experiment to protect Santa's packed lunch** |
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| **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: ⚠  |
| **Age range:** 3 - 8**Approx time:** 2 hours |  | **Key words / Topics:** * Science experiment
* Changing state
* Materials/insulators
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| **Equipment** ⚠ |  |  |
| * 5 ice cubes with a small Christmas toy frozen inside (cake decorations are ideal for this or any small Christmas toy/decoration).
* 5 different types of material which could include bubble wrap, plastic bag, wool, cotton, foam, tin foil etc.
* Small containers big enough to put wrapped ice cubes in.
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| **The Challenge** |  |  |
| Santa always likes to take a delicious, packed lunch on Christmas Eve so he doesn’t get too hungry on the way. The only problem is that often his lunch becomes too warm, and he can’t eat it. Can you help solve the problem?**DRAG****THRUST****LIFT****GRAVITY** |
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| **Instructions** ⚠ |  |  |
| **Step 1**Choose which materials you think will keep his lunch cold for the longest. **Step 2**⚠Wrap up each ice cube singly, in one material each being careful to have the same number of layers for each material. Put each wrapped ice cube in a container. *Remember we are trying to make this a fair test so what else do you think you need to keep the same?***Step 3**Decide where you are going to put your ice cubes and how often you will check them. What signs will you look for to tell you which material is working the best?**Step 4**Why do you think that some of the ice cubes are melting more quickly than others? Do you think the cold from the ice cube is getting out or do you think the warmth from the air is getting into the ice cube?**Step 5**Which material kept your ice cube frozen for longest? When you have decided which material is best, design a lunchbox to keep Santa’s lunch cool this Christmas Eve. Don’t forget to all share your creations with us on social media @IETeducation #SantaLovesSTEM. |
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| **Extension** |  |  |
| We often leave Santa and the reindeer some food on Christmas Eve to thank them for bringing our presents. Unfortunately, we often leave Santa something sweet and sugary and he is worried he soon won’t be able to fit down any chimneys to deliver presents. What could Santa put in his lunchbox to make sure he has a balanced diet even on his busiest night of the year? |
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| **Science** |  |  |
| Extension to understand further: Working scientifically is essential to make sure our findings are accurate. Fair testing is an essential part of this. In simple investigations, scientists will often change only one thing at a time (the ***independent variable***) so they can see what effect this has. It is this change which can be recorded either as an observation or measurement (the ***dependent variable***). Where possible, everything else is kept the same (the ***control variables***). As our test becomes more complex, we can change or record more than one thing.In this activity, we are observing the effects of thermal energy on change of state. Materials melt because of heat which is a form of energy (thermal energy). All objects are made up of particles which are in a constant state of motion. Cold objects have less thermal energy than warm objects and the particles which make them up will be moving much more slowly. If we put a cold object next to a warm object, they will exchange thermal energy until they achieve thermal equilibrium – and become the same. We can stop or slow down this energy exchange by using a thermal insulator.Good thermal insulators have very strong bonds to hold their particles in place. This stops the particles moving around easily and transferring energy to other particles. Which materials do you think are good thermal insulators? Think about the handle of a saucepan. Which materials could we use to make sure we don’t burn ourselves when picking it up? Which materials do you think are good thermal conductors and what do we use them for? Think about a radiator…Watch this video to find out more about temperature and insulation <https://www.bbc.co.uk/bitesize/clips/zkntsbk>. You will see that thermal insulators are important not just for Santa but for many animals too. Have a look at another of our fun activities and examine how polar animals keep warm.  |
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| **Curriculum links**  |

**Early years/pre-school/foundation:**

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| **England: National Curriculum*** **Understanding the World;** Understand some important processes and changes in the natural world around them, including changing states of matter.
 | **Northern Ireland Curriculum****Pre-School Education*** give children opportunities to build with construction materials; and ensure that learning is challenged as children explore their own ideas and use open-ended resources.
* developmentally appropriate materials
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| **Scotland: Curriculum for Excellence****BGE Science; Materials – Early*** Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes.
 | **Wales: National Curriculum** * **Foundation phase;** Knowledge and understanding of the world
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**Extension:**

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| **England: National Curriculum****Science; lower KS2*** observe that some materials change state.

**Science; upper KS2*** demonstrate that dissolving, mixing and changes of state are reversible changes - explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible.
 | **Northern Ireland Curriculum****Primary; The world around us** * KS2 changes that occur to everyday substances, for example, when dissolved in water.
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| **Scotland: Curriculum for Excellence****Science; Materials – Properties and uses of substances; Second*** By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed.
 | **Wales: National Curriculum** * **Science KS3** use a range of apparatus and equipment safely and with skill, taking action to control the risks to themselves and others
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