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| **Make non-alcoholic eggnog** |
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| This is a delicious and creamy festive treat. Who can say no to some delicious eggnog? What’s even better is that it is non-alcoholic, so the adults could even drink it for breakfast!  |
| **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:** 7 to 14 **Approx time:** 10 minutes**Serving:** 4-6 people |  | **Key words / Topics:** * DT
* Science
* Maths
* Changing state
* Dissolving
* Weight
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| **Equipment** ⚠ |  | **Ingredients** |
| * Large mixing bowl
* Weighing scales
* Electric whisk
* A cup to break eggs into
* A measuring jug
* A sieve
* Serving jug
 |  | * 500ml whole milk
* 200g caster sugar
* 100ml double cream
* 100ml water
* 4 egg yolks
* 1 teaspoon vanilla paste
* Ice
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| **Alternative ingredients for dairy-free or vegan eggnog**  |
| Did you know it is possible to make dairy free eggnog too? Simply swap the double cream for full fat coconut milk and swap the whole milk for unsweetened almond milk.   Or if those you will be sharing with are vegan, you can even make your eggnog into an egg-not! Simply replace the eggs in the recipe with vegan vanilla pudding mix. Remember to remove the teaspoon of vanilla paste from your ingredients if you select this option.  |
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| **Instructions** ⚠ |  |  |
| **Step 1**Make the sugar syrup. In a pan add 100ml of water and 200g of caster sugar. Heat gently until the sugar has dissolved. ⚠ Hot sugar can be dangerous, so it is important to get some help with this step.  **Step 2** Put 1 teaspoon of vanilla paste in a large bowl. Add the sugar syrup and egg yolks into a bowl and beat with an electric whisk for 2-3 minutes. **Step 3**Add the cream and milk and beat again until just mixed. ⚠ Be careful mixing with an electric whisk, even everyday items can be dangerous. Always get the support of an adult at this stage.**Step 4**Fill a large jug with ice. Strain in the eggnog mixture into the jug. Stir gently until the outside of the jug feels cold, then pour the eggnog into glasses to serve. You can sprinkle some nutmeg or cinnamon on the top if you want to be extra fancy.  OK, let’s be honest, this most definitely doesn’t fall into the “healthy” category! However, it is a fantastic, indulgent treat. But if you make this delicious drink, do share it with your family or friends to avoid any food waste this Christmas.   |
| **Science** |  |  |
| When you mix all these ingredients together, they combine really well. They don’t separate as water and oil would. This is one of the reasons why it is such a satisfying drink. All the individual parts come together to create something that is even creamier and richer than they would be as separate ingredients.   Milk is a mixture of water, fat and proteins. The higher the fat content, the lower the polarity of the liquid.   So, as we are using cream and full fat milk, we are ensuring that the mixture will combine. If you would like to experiment further, you could try using skimmed milk, or semi skimmed and see if they combine as well as the cream does with the other ingredients.   Let’s think about why some liquids separate and some combine... Everything around us is made up of tiny particles known as molecules. The way in which two liquids mix together depends on these molecules that make up the liquids. Think about when you mix oil and water…what happens?**Molecules** The first reason that water and oil don’t mix is because their molecules are packed differently. The molecules of water are packed very densely, this means that they are very close together. If we take the same amount of water and oil, there will be more molecules of water than oil. This makes it heavier and means that it will always sink underneath the oil. **Polarity** The second reason why they cannot mix with each other is something called polarity. Polarity means a molecule is positively charged at one end and negatively charged at the other. Like a magnet. Water is a polar molecule. Water molecules are made up of two hydrogen atoms and one oxygen atom. Atoms are the very basics of everything in the universe. They are extremely small and come together to form different types of matter. Literally everything is made up of atoms, from the computer screen to your dinner.  As only opposites attract, the water molecules stick together, so they don’t mix well with oil.  |
| **Basic** |  | **Extension** |
| Discuss mixing and weighing ingredients or have everything pre-weighed and ready to go.  |  | Molecules and polarity discussion.[Why don't oil and water mix? - John Pollard - YouTube](https://www.youtube.com/watch?v=h5yIJXdItgo)  |
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| **The Engineering Context** film |
| Baking is engineering. It is using science, maths and technology skills to engineer and create solutions and new tasty products. Engineers need all these skills – precision in weighing out ingredients, the safety required in the kitchen and product design and quality engineering to test, taste and improve with each delicious creation! |

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| **Curriculum links**  |
| **England: National Curriculum*** **Science; lower KS2**
* observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).
* **Science; upper KS2**
* know that some materials will dissolve in liquid to form a solution.
* 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**
* KS1 The effect of heating and cooling some everyday substances.
* KS2 changes that occur to everyday substances, for example, when dissolved in water or heated and cooled.
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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 KS2** use standard measures and S.I. units, e.g. kg, s, N, m.
* **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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