

## Science – Y6 Sp1 - Heat

### Subject Knowledge Notes:

- In this lesson, we explore how heat is spread across and between substances due to the contact between particles
- The key premise is that adding heat to a particle makes the particle vibrate or move more. When that particle is in contact with another particle, it will pass on some of that heat as a vibration. This leads to the second particle being 'warmer' and this heat is then spread across a chain of particles
- This is best shown through a physical demonstration using the particle model

### For this lesson you will need:

- To prepare a demonstration with a group of students to show how heat is passed from one particle to another
- A knife (or other piece of metal/cutlery), a tea light candle, matches to light the candle and an object to balance the knife on. As explained in the note in bold below, the more sets of this you can safely set up and use with the class, the better although you may feel only a demonstration set is needed/is safe in the case of your class

### Lesson Four: how is heat transferred between particles?

 <b>10 minutes</b>	<ul style="list-style-type: none"> <li>• Ask children to try their best to recall the information previously learnt.</li> <li>• If they struggle to do this, ask them to move onto the next question.</li> <li>• After 5 mins, pick children to share their answers aloud, ask children to use a different coloured pen to tick or fix their answers.</li> </ul>
 <b>10 minutes</b>	<ul style="list-style-type: none"> <li>• Demonstrate the process of heat conduction through particles with a group of students using the following process:               <ul style="list-style-type: none"> <li>- (about 4) students to line up shoulder to shoulder, arms linked to show how particles are arranged in a solid</li> <li>- To start with, they should be jiggling/vibrating a little bit to show that there is some heat present (this is true even for cold objects)</li> <li>- State that you are going to 'heat' one side of the solid, this will cause the particle on that far end to vibrate more</li> <li>- Ask the class what you think will happen as the first particle is heated – because all the particles in a solid are in close contact, the vibrations will spread down the chain.</li> <li>- Ask the class how it would feel to touch the far end of the solid at the beginning (cold) and at the end (hot). Explain that this process (where heat is spread through particles in contact) is known as <b>conduction</b></li> </ul> </li> <li>• Students to draw a diagram and note down what they observe in this demonstration</li> </ul>
 <b>10 minutes</b>	<ul style="list-style-type: none"> <li>• Inform children that the following questions we will answer will be based on this text about heat conduction.</li> <li>• Begin reading aloud and ask children to follow under each word with their finger.</li> <li>• Switch readers every so often.</li> <li>• Emphasise any words in bold as key words/phrases.</li> </ul>
 <b>10 minutes</b>	<ul style="list-style-type: none"> <li>• Ask children to answer the following questions using the text just read about heat conduction to find the answer.</li> <li>• Inform children that some of the words are in bold; this gives us a clue about where the key information is, which will help us to find the answers.</li> <li>• Model doing this for the first question</li> <li>• Highlight the answer in the text and talk aloud about the clues that helped you to find the answer e.g. <i>"I have to fill in the gap, so I'm looking for a word in the text that begins with an a"</i></li> <li>• Continue reading the text and stop children to answer the questions.</li> <li>• Call children to share their answers aloud, ask children to use a different coloured pen to tick or fix their answer.</li> </ul>

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 <p>15 minutes</p>	<ul style="list-style-type: none"><li>• Prompt students thinking by getting them to look at the diagram and explain to a partner what they think may be happening</li><li>• Model annotations that need to be made by the students on the diagram, namely that:<ul style="list-style-type: none"><li>- the particles at the bottom vibrate more when they are heated</li><li>- the vibrations pass throughout the pan and make the pan hot</li><li>- The part of the pan touching the food passes heat on to the food which causes it to cook the food</li></ul></li></ul>
 <p>20 minutes</p>	<p><b><i>The key purpose of this investigation is to physically prove to students that heat will conduct through an object from one end to another. Please set up as many sets of this practical as you feel comfortable doing bearing in mind the students that are completely the practical and the classroom setting you have. If nothing else, one demonstration set can be set up and all students can line up and take turns feeling the end of the knife before and after it has been heated.</i></b></p> <ul style="list-style-type: none"><li>• Present the equipment at the front of the class and ask students to discuss with a partner how we might safely use the equipment to check if heat will conduct through a piece of cutlery</li><li>• Set up a few sets of equipment (as discussed, as many sets as you are able/feel comfortable using)</li><li>• Emphasise key safety - only teachers should be going near or touching candle, students must stay seated or move very carefully so as to avoid knocking the set up throughout, candles should not be handled by anyone except a teacher until they have fully cooled down</li><li>• Students should gently touch the handle end of the knife at the beginning before the candle is light and once every minute to feel how warm it is</li><li>• Once complete and the candle and knife are being left to cool down, students should fill in their observations</li></ul>
 <p>10 minutes</p>	<ul style="list-style-type: none"><li>• Students should look at the particle diagram for solids, liquids and gases on the board and consider why it is more difficult to heat a liquid or gas during conduction</li><li>• Use students as volunteers and model heating a solid again before demonstrating heating a liquid and a gas. The crux of the difference is that when particles in a liquid or a gas are heated, they vibrate more but also move more quickly so move away from the source of the heat. Another particle will come into contact with the heated area but again also move away.</li><li>• This phenomenon of a cycle of motion caused by heating is known as a 'convection current' and eventually allows all particles to be heated but causes this movement at the same time (and is therefore not as efficient)</li></ul>
 <p>5 minutes</p>	<ul style="list-style-type: none"><li>• Return to page 3 and explain how heat is passed across particles is in a couple of sentences.</li></ul>