Science – Y6 Sp 1 – Heat

Subject Knowledge Notes:	**For this lesson you will need:**
- The particle theory reviewed in the previous lesson is used in this lesson to consider what happens to particles when they are heated and what impact this has on the substance overall - When particles are heated they 'jiggle' or vibrate and move faster in liquids and gases. This means they push other particles around them away which makes the substance they are in expand - When particles lose energy by cooling, they jiggle or vibrate less (and move more slowly in liquids and gases) this means the substance that they are in contracts - It is possible to see these overall affects in a range of physical examples but mostly through the use of online videos rather than in the classroom	- Space and preparation time for students to act out (model) particles as in the previous lesson. Again it is worth training a few students to model these processes before the lesson to enable the quality of the modelling to be at a higher and more accurate level

Lesson Two: Why does heat cause expansion in a substance?

 **10 minutes**	• Ask children to try their best to recall the information previously learnt. • If they struggle to do this, ask them to move onto the next question. • After 5 mins, pick children to share their answers aloud, ask children to use a different coloured pen to tick or fix their answers.
 **10 minutes**	• Inform children that the following questions we will answer will be based on this text about heat and particles. • Begin reading aloud and ask children to follow under each word with their finger. • Switch readers every so often. • Emphasise any words in bold as key words/phrases.
 **10 minutes**	• Ask children to answer the following questions using the text just read about heat and particles to find the answer. • 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. • Model doing this for the first question • Highlight the answer in the text and talk aloud about the clues that helped you to find the answer e.g. *"I have to fill in the gap, so I'm looking for a word in the text that begins with an a"* • Continue reading the text and stop children to answer the questions. • Cold call children to share their answers aloud, ask children to use a different coloured pen to tick or fix their answer.
 **15 minutes**	• Use a small group of students to model how particles behave in colder/hotter solids, liquids and gases (the key point being that when they 'jiggle/vibrate' more, they slightly push each other away which makes them take up more space) • Class to form into groups to act out how particles behave in colder/hotter solids, liquids and gases • Pause group and pick one group to demonstrate to the others to point out key aspects of the model that some may not quite be getting right (i.e. as a solid, some groups may not link arms to show that they are bonded together. Show a group that is doing this to the rest of the class to improve everyone's modelling) • Call out 'colder solid', 'hotter gas' at random to test students' ability to model these variations in phases of matter until they are confident

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10 minutes	• Students to discuss and write out whether they think each diagram represents each of the suggested answers (hotter/colder phase of matter) • Cold call children to share their answers aloud, ask children to use a different coloured pen to tick or fix their answer.
5 minutes	• Students to discuss with a partner – what kind of investigation could we do to see if something actually expands or contracts (recapping the meaning of these words if necessary) • Take answers from a few students to consider as a class
5 minutes	• https://www.youtube.com/watch?v=9vRMZSEF_a4 class watch this video as a demonstration of gases expanding and contracting to show that this is indeed what happens. If you have time, there are other videos available from a range of sources that also demonstrate what happens when solids and liquids expand and contract (the obvious example for a liquid being a thermometer!) • In this video, liquid nitrogen (which is colder than -198°C) is used to call down in the air in a number of rubber balloons. As they are rapidly cool the particles move with this energy and therefore taking up less room. This makes the balloons contract. • When they are placed back on the open surface, the relative warmth of the table top enables them to slowly gain energy and expand again to take up their original volume.
10 minutes	• Explain to the class that we can use apply our understanding of expansion and contraction to some real world examples • Go through the first task together, discussing the answer as a group • For the rest of this task, the level of support provided depends on the students in the class. You can either leave the class to discuss and attempt the rest of the examples independently or you can discuss each class and fill in the answers all together as you go along to ensure everyone completes it at the same speed. • If the class are attempting it independently, go through the answers on the board once they have attempted all the tasks and get students to mark/correct their work with a different pen of a different colour
5 minutes	• Look at the diagram a pressurized container and the fact that it says ‘do not leave until direct sunlight’ • Students to discuss why it could be dangerous to heat a pressurized gas in a metal container • Take answers from the class but emphasized an explanation based on how particles in a gas behave when they are heated
5 minutes	• Return to page 3 and explain why heat makes things expand in a couple of sentences.