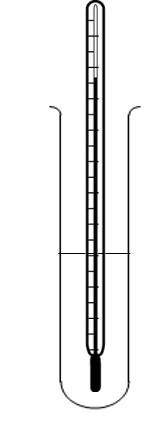
**Exothermic reaction**



During an exothermic reaction, the temperature of the chemicals in the test tube increases.

When the reaction has finished, the test tube contains the products of the reaction, any unreacted reactant and water (if the chemicals are in solution).

The chemicals then gradually cool until they are at the same temperature as the surroundings.

What is going on?

*Fill in the gaps to explain what happens when chemicals cool down.*

*You should only use the words* ***temperature*** *and* ***energy****.*

An exothermic reaction heats the chemicals in the test tube which gives them a lot of \_\_\_\_\_\_\_\_\_\_\_. This makes the particles move very quickly. The chemicals now have a higher \_\_\_\_\_\_\_\_\_\_\_.

Some particles of the chemicals bash into the particles that make up the air and make them move faster. \_\_\_\_\_\_\_\_\_\_\_ is transferred from the chemicals to the surrounding air. Losing \_\_\_\_\_\_\_\_\_\_\_ means the \_\_\_\_\_\_\_\_\_\_\_ of the chemicals goes down.

Eventually the \_\_\_\_\_\_\_\_\_\_\_ of the chemicals reaches the same \_\_\_\_\_\_\_\_ as the surrounding air. \_\_\_\_\_\_ has been transferred to the surroundings.

*Chemistry > Big idea CCR: Chemical reaction> Topic CCR3: Energy and reactions > Key concept CCR3.1: Exothermic and endothermic reactions*

|  |
| --- |
| **Response activity** |
| **Exothermic reaction** |

**Overview**

|  |  |
| --- | --- |
| Learning objective: | During a chemical reaction energy may be transferred to or from the surroundings. |
| Observable learning outcome: | Describe how the temperature of the chemicals will change with time after an exothermic reaction. |
| Activity type: | Response, focused cloze |
| Key words: | temperature, energy, exothermic |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic question:

* Temperature change 1

|  |  |
| --- | --- |
| **P** | **PRIOR UNDERSTANDING**  This activity explores ideas from an earlier key concept (PMA1.2), to aid transition from earlier stages of learning. |

**What does the research say?**

Research (Erickson and Tiberghien, 1985) found that student explanations differ from the scientific explanation because they do not always take into account all the systems which are interacting. For example, in this case students need to consider the surrounding air (and its temperature) as well as the reaction system. In order to correctly predict and explain the change in temperature of the chemicals, students need to recognise the temperature difference between the reaction system and the surroundings. They also need to recall that energy will move spontaneously from the object at the higher temperature to the object at the lower temperature.

**Ways to use this activity**

The activity provides an opportunity to re-teach a challenging concept and to allow students to practise correct use of the words ‘energy’ and ‘temperature’.

At the end of the reaction the test tube will contain the products of the reaction and also any excess of a reactant. For this reason, the general word ‘chemicals’ has been used to refer to the contents of the test tube.

**Expected answers**

An exothermic reaction heats the chemicals in the test tube which gives them a lot of **energy**. This makes the particles move very quickly. The chemicals now have a higher **temperature**.

Some particles of the chemicals collide with the particles that make up the air and make them move faster. **Energy** is transferred from the chemicals to the surrounding air. Losing **energy** means the **temperature** of the chemicals goes down.

Eventually the **temperature** of the chemicals reaches the same **temperature** as the surrounding air. **Energy** has been transferred to the surroundings.

**Acknowledgments**

Developed by Helen Harden (UYSEG) from an original idea by Peter Fairhurst (UYSEG).

Images: Helen Harden and Alistair Moore

**References**

Erickson, G. and Tiberghien, A. (1985). Heat and Temperature. In Driver, R., Guesne, E. & Tiberghien, A. (eds.) *Children's Ideas in Science.* Milton Keynes and Philadelphia: Open University Press.