RS•C

Changes in chemistry

Target level

This probe is intended for use with 11–14 year old students who have been taught the distinction between chemical and physical change. It may also be used with 14–16 year old students to check their knowledge.

Topics

Chemical and physical change.

Rationale

The distinction between chemical and physical change is not absolute, and there are examples of changes which teachers find difficult to classify (see Chapter 2 of the Teachers' notes). Students are often expected to distinguish between chemical and physical changes early in their study of chemistry, but some find this quite difficult. The probe provided here asks students to explain what they mean by chemical and physical change, to classify three examples and explain their reasons. Particle diagrams for 'before' and 'afterwards' are provided to help the students.

These ideas are discussed in Chapter 6 of the Teachers' notes.

During piloting, teachers suggested that this 'could be a useful teaching tool' that helped 'to clarify the idea in some pupils' minds'. It was felt that the use of particle diagrams was helpful. Students were reported to enjoy the activity, and found it easy to understand what to do.

One teacher commented that the activity 'helped [students] to grasp the differences but they found it hard to define the changes'. It might be appropriate to suggest to students who are not sure what to put for the definitions (at the start of the probe) to move on to the examples, and return to the definitions later.

Resources

- Student worksheet
  – Changes in chemistry

Feedback for students

A suggested answer sheet for teachers is provided. When providing feedback on this probe teachers should bear in mind the difficulties of defining the physical/chemical change distinction, as discussed in Chapter 2 of the Teachers' notes.

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Changes in chemistry – answers

Alternative reasons that may be accepted are given in parentheses

1. A physical change is a change where no new substance is produced.

(….a change that does not involve the breaking/forming of strong chemical bonds.)

(…..a change where molecules/ions etc are rearranged, but not changed.)

2. A chemical change is a change where a new substance is produced.

(…..a change that involves the breaking/forming of strong chemical bonds.)

(…..a change where new molecules/ions etc are formed.)

3. Physical change:

No new substance is produced

(the same molecules are present before and after the change)

(the change may readily be reversed)

(the energy change involved is modest)

4. Chemical change:

A new substance is formed

(strong chemical bonds are broken – *eg* in the oxygen molecules - and new chemical bonds are formed in the metal oxide)

(different particles are present after the change - oxide ions rather than oxygen molecules)

(this change is not easily reversed)

(a great deal of energy is often given out in this change)

5. Physical change:

No new substance is formed (NB the solution is not a pure substance, but a mixture)

(the same particles are present after the change as before)

(this reaction is readily reversed – by evaporation)

(the energy change for dissolving is minimal)

Note, however, that the ionic bonds in the lattice have been disrupted, which may suggest dissolving could be considered as a chemical change.

Note: Energy changes are not the best way to characterize these changes.

Changes in chemistry

In science we describe the changes that occur to substances as either physical changes or chemical changes. Explain what you think these terms mean:

1. **A physical change is**

_____

_____

_____

2. **A chemical change is**

_____

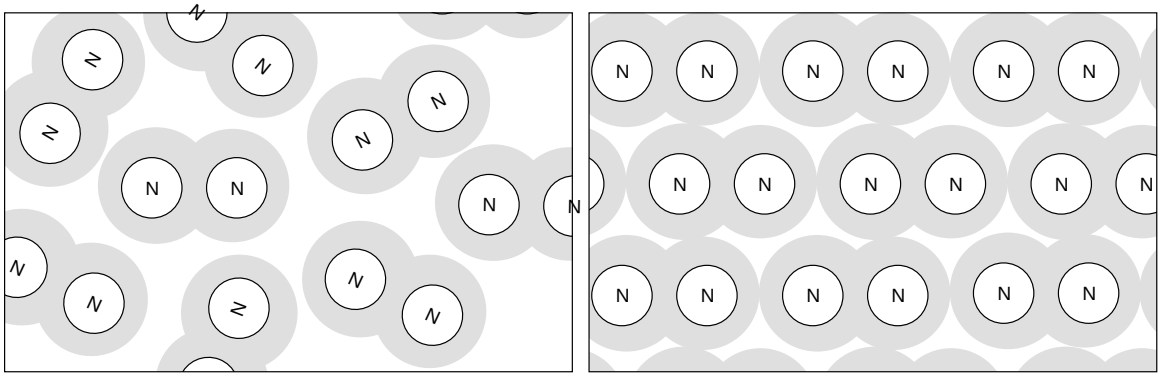
_____

_____

Below and over the page you will find three examples of substances being changed. The diagrams show some of the molecules or other particles before and after the change. For each example:

- decide whether the change is physical or chemical, and
- try to explain your reasons.

3. **Some very cold liquid nitrogen is cooled even further, until it freezes:**



before after

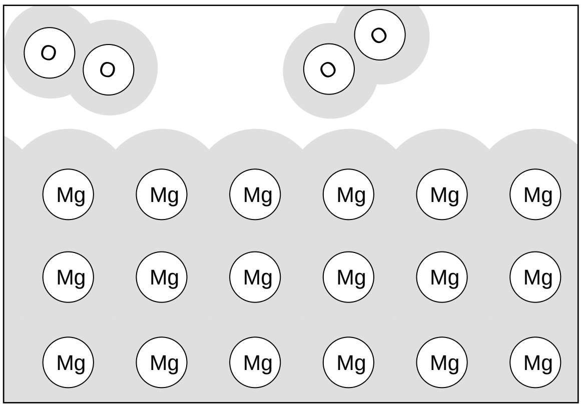
This is a _____ change because

_____

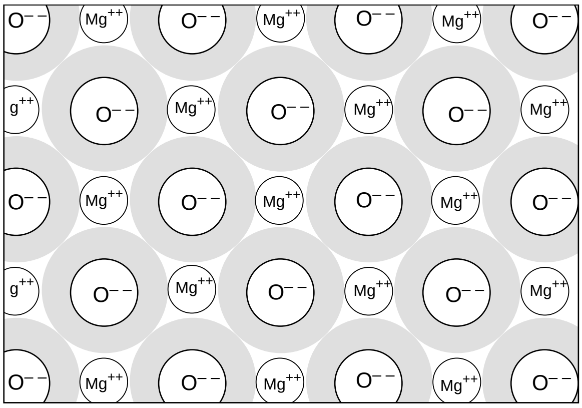
_____

_____

4. Some magnesium is heated in oxygen until it burns:



before



after

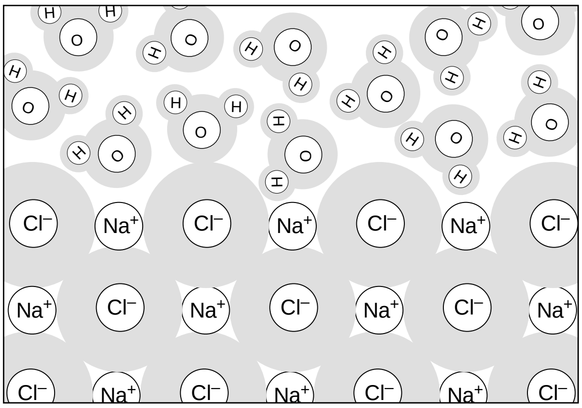
This is a ________________________ change because

____

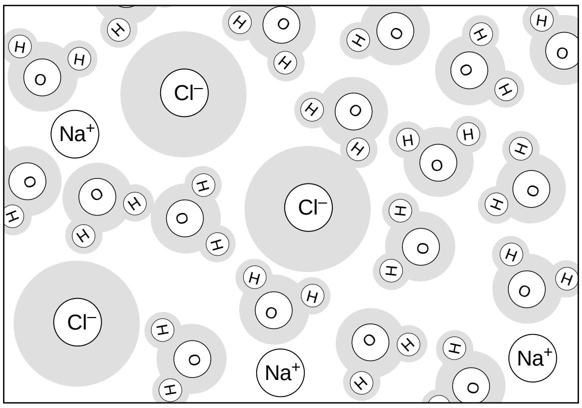
____

____

5. Some sodium chloride is added to a beaker of water, and left to dissolve:



before



after

This is a ________________________ change because

____

____

____