

Telling physical and chemical changes apart

Grade 7 science (Year 8 · Class 7) · Worksheet answers

Full answers and reasons are given for every problem. When a problem asks you to classify a change, always check that your reason mentions whether a new substance is made. The key result of each step is shown in bold.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS1-2

Problem 1 Two kinds of change

1. A change that alters the shape, size or state of a material without making a new substance.
2. A change that makes at least one new substance with different properties.
3. **Physical: ice melting. Chemical: wood burning.** (Any sensible examples.)

Problem 2 Sorting changes

1. **P** (shape only).
2. **C** (the egg white sets and changes for good).
3. **P** (state change).
4. **C** (burning makes new gases and ash).
5. **P** (shape only).
6. **C** (heat, light and new substances).

Problem 3 Spotting the clues

1. Any three from: gas bubbles, colour change, new solid forming, heat or light given out, new smell.
2. a) **Yes**: a gas is made; b) **No**: melting is physical; c) **Yes**: a new brown substance forms; d) **No**: water evaporates and is the same substance.

Problem 4 Reactants and product

1. **Copper and oxygen.**
2. **Copper oxide.**
3. It means "react to make" (or "produces").
4. **Two reactants and one product.**

Problem 5 Complete the word equations

1. iron + sulfur → **iron sulfide.**
2. zinc + oxygen → **zinc oxide.**

3. **magnesium** + oxygen → magnesium oxide.

Problem 6 Which is physical?

1. **B**, chocolate melts.
2. Melting only changes the state, so no new substance is made.
3. A, C and D are chemical changes because new substances form (ash and gases, sour milk compounds, rust).

Problem 7 Can you undo it?

1. **The wax** returns to solid wax when it cools.
2. Cooking changed the egg proteins into new substances, so cooling cannot reverse it.
3. Wax: **physical**. Egg: **chemical**.

Problem 8 Boiling or reacting?

1. **Beaker Q**.
2. The bubbles in P are water vapour, which is the same substance as the liquid water. The bubbles in Q are a new gas made by the reaction, and it forms at only 22 °C.
3. **Carbon dioxide**. Bubble it through limewater: the limewater turns milky (cloudy).

Problem 9 A rusting chain

1. The colour changes to orange-brown and the surface becomes flaky: a new substance has formed.
2. iron + oxygen + water → **hydrated iron oxide (rust)**.
3. Any two from: oil or grease it, paint it, keep it dry, coat it with another metal.

Problem 10 Milk going off

1. The sour smell, lumps and bubbles show that new substances have formed.
2. The cold slows the particles, so bacteria work slowly and fewer reactions happen.
3. The change made new substances. **The change cannot be reversed**: heating and cooling only change temperature and cannot turn the new substances back into fresh milk.

Problem 11 Zinc in acid

1. $27.5\text{ °C} - 21.0\text{ °C} = \mathbf{6.5\text{ °C}}$.
2. **Hydrogen** (the squeaky pop).
3. zinc + hydrochloric acid → **zinc chloride + hydrogen**.

Problem 12 Chalk and vinegar

1. **Calcium carbonate and ethanoic acid**.

2. **Calcium ethanoate, water and carbon dioxide.**
3. Pass the gas through limewater: it turns **milky**.

Problem 13 A spirit lamp

1. **ethanol + oxygen → carbon dioxide + water.**
2. Reactants: ethanol and oxygen. Products: carbon dioxide and water.
3. Heat and light given out (the flame), plus water droplets as a new substance.

Problem 14 Temperature data

1. **22 °C.**
2. **31 °C.**
3. $31\text{ °C} - 22\text{ °C} = 9\text{ °C}.$
4. No. A rise supports a reaction but is not proof, because other changes can warm or cool a mixture. You need another clue, such as a gas, a new solid or a colour change.

Problem 15 Frying an egg

1. **Chemical:** the egg white changes permanently to a new firm, white substance.
2. Chocolate melting is physical and can be reversed by cooling. The fried egg cannot be reversed.
3. A change of smell or colour, or heat from the pan being taken in by the egg would be extra clues.

Problem 16 Iron in blue solution

1. The nail becomes coated with a brown solid and the blue solution turns paler (green).
2. $\text{iron} + \text{copper sulfate} \rightarrow \text{iron sulfate} + \text{copper}.$
3. Reactants: iron and copper sulfate. Products: iron sulfate and copper. The brown coating is **copper**.

Problem 17 Mixture or new substance?

1. **P: the magnet picks up the iron filings. Q: the magnet does not attract the black solid.**
2. **Sample Q:** heating made iron sulfide, a new substance. In P the powders are only mixed and both keep their properties.
3. Pass a magnet over P to pull out the iron. This fails for Q because the iron has joined chemically with sulfur and is no longer magnetic.

Problem 18 A leaf in sunlight

1. **carbon dioxide + water → glucose + oxygen** (using light energy).
2. Reactants: carbon dioxide and water. Products: glucose and oxygen.

3. New substances with different properties are made, so atoms have been rearranged.

Problem 19 Five mystery changes

1. A: **physical**; B: **chemical**; C: **physical**; D: **chemical**; E: **chemical**.
2. Heating the blue crystals makes a new white substance and steam. The change can be reversed by adding water, but a new substance is still made, so being reversible does not prove a change is physical.
3. The sugar turns into black carbon and other substances, shown by the colour change and burnt smell, and it cannot be turned back into sugar.

Problem 20 Spot the errors

1. **Dissolving is a physical change:** the sugar is still there and can be recovered by evaporating the water.
2. **Bubbles only mean a chemical change if a new gas is made.** Boiling water makes bubbles of water vapour, which is a physical change.
3. **A temperature change alone is not proof.** A hot drink warming a cold spoon or ice melting in your hand (cooling) are physical.