

Using symbols and the periodic table

Grade 8 science (Year 9 · Class 8) · Worksheet answers

Each answer states the fact or calculation that earns the result, and the final answer is in bold. Use them to find out exactly where a mistake began.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS1-1

Problem 1 Writing symbols

1. **C, O, Na, Fe, Ca.**
2. Na, Fe and Ca have two letters: **3 symbols.**

Problem 2 Co or CO

1. Co has a lowercase o, so it is the single element cobalt. CO has two capital letters, so it means carbon and oxygen joined together.
2. **Co** is the element; CO is a compound.

Problem 3 Element or compound

Copper (Cu), helium (He) and aluminium (Al) are made of one kind of atom, so they are **elements**. NaCl, H₂O and NaHCO₃ contain several elements, so they are **compounds**.

Problem 4 Group and period

Magnesium: **group 2, period 3**. Potassium: **group 1, period 4**. Chlorine: **group 17, period 3**. Neon: **group 18, period 2**.

Problem 5 Order by atomic number

1. Boron (5), neon (10), magnesium (12), silicon (14), potassium (19): **B, Ne, Mg, Si, K.**
2. In period 2: **boron and neon.**

Problem 6 Property cards

1. A and C are probably **metals**: shiny, conduct electricity and do not break.
2. B is probably a **non-metal**.
3. B does not conduct electricity and breaks when hit, which is typical of a brittle non-metal.

Problem 7 Cables and coatings

1. Copper is a good conductor of electricity.

2. Plastic is an insulator, so it does not conduct electricity.
 3. Sulfur is a brittle non-metal that does not conduct, so it would break and not carry current.
- Copper conducts; sulfur does not.**

Problem 8 Latin symbols

1. **Gold.**
2. The symbol comes from the Latin name aurum.
3. Lead is **Pb** (plumbum) and silver is **Ag** (argentum).

Problem 9 Elements inside compounds

MgO: magnesium and oxygen, $1 + 1 = 2$ **atoms**. Fe₂O₃: iron and oxygen, $2 + 3 = 5$ **atoms**.
CaCO₃: calcium, carbon and oxygen, $1 + 1 + 3 = 5$ **atoms**.

Problem 10 Mixture or compound

1. The stirred powders are a **mixture**.
2. The black solid is the **compound iron sulfide**.
3. In the mixture each element keeps its own properties (iron is attracted). In the compound the atoms are joined chemically, so the iron no longer behaves as iron.

Problem 11 Salt from two elements

1. Salt is a white crystal that is safe to eat, while sodium is a soft silvery metal and chlorine is a poisonous gas.
2. The atoms are chemically joined in a new arrangement, so the compound is a new substance with new properties. **New substance, new properties.**

Problem 12 Group 1 pattern

1. The melting point **decreases** as atomic number increases down the group.
2. The trend predicts a **lower** value than 39 °C (about 28 °C in reality).
3. At 70 °C, rubidium (39 °C) and potassium (63 °C) are liquid; **rubidium and potassium** melt, while lithium and sodium stay solid.

Problem 13 Noble gases at work

1. Both are in **group 18**.
2. Noble gases are almost completely unreactive, so they will not burn or react with the hot filament.
3. Argon is in **period 3**.

Problem 14 Silicon

1. **14.**
2. Period 3, group 14.
3. It lies beside the metal/non-metal staircase and has properties in between those of metals and non-metals.

Problem 15 Mass of metal blocks

1. Aluminium $2.70 \times 10.0 = 27.0$ g. Iron $7.87 \times 10.0 = 78.7$ g. Copper $8.96 \times 10.0 = 89.6$ g. Lead $11.3 \times 10.0 = 113$ g.
2. Heaviest: **lead (113 g)**. Lightest: **aluminium (27.0 g)**.

Problem 16 Predict from position

1. X is **chlorine (Cl)**, Y is **potassium (K)**, Z is **neon (Ne)**.
2. X is a reactive non-metal (halogen). Y is a soft, reactive alkali metal. Z is an unreactive noble gas.
3. Potassium is so reactive it has to be stored away from air and moisture (under oil), while neon is unreactive and needs no special protection.

Problem 17 Kitchen compounds

1. NaHCO_3 4 elements; sucrose 3; vinegar acid 3; NaCl 2; CaCO_3 3.
2. NaHCO_3 : $1 + 1 + 1 + 3 = 6$. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$: $12 + 22 + 11 = 45$. $\text{C}_2\text{H}_4\text{O}_2$: $2 + 4 + 2 = 8$. NaCl : 2. CaCO_3 : 5.
3. **NaHCO_3 , NaCl and CaCO_3** contain a metal (sodium or calcium).

Problem 18 Why gold shines in rivers

1. Gold is very unreactive, so it stays as the element. Sodium is very reactive, so it has already reacted to form compounds.
2. No: potassium is in the same group as sodium, so it is also very reactive and exists only in compounds. **Same group, similar reactivity.**
3. Gold stays shiny and does not tarnish.

Problem 19 Halogens data

1. $17 - 9 = 8$; $35 - 17 = 18$; $53 - 35 = 18$.
2. Period 3 has **8** elements; period 4 has **18**; period 5 has **18**.
3. Gas, gas, liquid, solid: melting and boiling points rise down the group, so astatine is predicted to be a **solid**.

Problem 20 Fixed ratio in water

1. A: $1.0 : 8.0 = 1 : 8$. B: $4.0 : 32.0 = 1 : 8$. The ratio is the same.

2. Hydrogen is 1/9 of the mass: $27.0 \div 9 = \mathbf{3.0\ g}$.
3. In a mixture the gases are not chemically combined, so any amounts can be mixed; a compound always has the fixed ratio.