

How much solute can dissolve in water

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

Use these answers to check your work only after attempting every problem. Follow each step of the method, because the working matters as much as the result. Final answers are shown in bold.

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

Problem 1 Solute, solvent, solution

1. **Sugar.**
2. **Water (tea).**
3. **A solution (sweet tea).**

Problem 2 Dissolving or not

1. **Dissolving.**
2. **Not dissolving** (it is melting).
3. **Not dissolving:** the sand stays as separate grains.
4. **Dissolving** (the coffee spreads through the milk).

Problem 3 Reading the beakers

1. **Beaker Q.**
2. It has solid lying at the bottom, which shows that no more can dissolve.
3. Heat it or add more water: **more solvent or a higher temperature.**

Problem 4 Litres and millilitres

1. $250 \div 1000 = \mathbf{0.25\ L}.$
2. $1500 \div 1000 = \mathbf{1.5\ L}.$
3. $0.4 \times 1000 = \mathbf{400\ mL}.$
4. $60 \div 1000 = \mathbf{0.06\ L}.$

Problem 5 Faster or slower

1. **Faster.**
2. **Slower.**
3. **Faster.**

Problem 6 Name the parts

1. Solute **salt**, solvent **water**.
2. Solute **iodine**, solvent **ethanol**.
3. Solute **sugar**, solvent **water**.

Problem 7 Concentration of a drink

1. Concentration (g/L) = mass (g) ÷ volume (L).
2. $15 \text{ g} \div 0.30 \text{ L} = \mathbf{50 \text{ g/L}}$.
3. $50 \text{ g/L} \times 0.10 \text{ L} = \mathbf{5.0 \text{ g}}$.

Problem 8 Mass of solute

1. $40 \text{ g/L} \times 0.75 \text{ L} = \mathbf{30 \text{ g}}$.
2. $0.75 \times 1000 = \mathbf{750 \text{ mL}}$.

Problem 9 Find the volume

1. $V = 24 \text{ g} \div 80 \text{ g/L} = \mathbf{0.30 \text{ L}}$.
2. $0.30 \times 1000 = \mathbf{300 \text{ mL}}$.

Problem 10 Salt limit

1. $2 \times 36 \text{ g} = \mathbf{72 \text{ g}}$.
2. $80 - 72 = \mathbf{8 \text{ g undissolved}}$.
3. **Yes, it is saturated**, because solid remains.

Problem 11 Reading a solubility graph

1. **124 g per 100 g of water**.
2. $124 \div 2 = \mathbf{62 \text{ g}}$.
3. $148 - 88 = \mathbf{60 \text{ g more}}$.

Problem 12 Fizzy drink

1. **The warm bottle**.
2. A gas is less soluble in warmer liquid, so the gas leaves the drink faster in the warm bottle.
3. Keep it cold and keep the cap on tightly: **store it cold**.

Problem 13 Cubes and crystals

1. **The small crystals**.
2. They have more surface in contact with the water, so more particles are pulled away every second.
3. **No**: the maximum mass is the same, because solubility depends on temperature, not on lump size.

Problem 14 Spot the error

1. The sugar does not disappear: it is spread as particles and the mass stays the same.

2. Saturated means no more solute can dissolve, not sweet or strong; a saturated solution can be weak if the solute is not very soluble.
3. **Dissolved sugar keeps its mass, and a saturated solution is one that holds the maximum solute at that temperature.**

Problem 15 Diluting syrup

1. $120 \text{ g/L} \times 0.050 \text{ L} = \mathbf{6.0 \text{ g}}$.
2. $6.0 \text{ g} \div 0.300 \text{ L} = \mathbf{20 \text{ g/L}}$.
3. $120 \div 20 = \mathbf{6 \text{ times}}$ lower.

Problem 16 Crystals from cooling

1. $1.5 \times 169 \text{ g} = \mathbf{253.5 \text{ g}}$.
2. $1.5 \times 64 \text{ g} = \mathbf{96 \text{ g}}$.
3. $253.5 - 96 = \mathbf{157.5 \text{ g of crystals}}$.

Problem 17 Temperature effect compared

1. Potassium nitrate: $169 - 32 = 137 \text{ g}$. Sodium chloride: $38 - 36 = 2 \text{ g}$. **137 g and 2 g**.
2. $137 \div 2 = 68.5$: **about 69 times bigger**.
3. **Potassium nitrate**, because its solubility falls a lot on cooling, so many crystals form; salt hardly changes.

Problem 18 Plan a saturation test

1. Measure 100 g of water. Add the salt in small weighed portions (for example 5 g), stirring until each portion dissolves, and stop when a portion does not completely dissolve.
2. Control the temperature, the mass of water, the stirring time and the salt type.
3. Solid remains at the bottom after long stirring, so the solution is saturated.
4. Add smaller portions near the end and repeat the test: **smaller portions give a more precise limit**.

Problem 19 Sports drink

1. $60 \text{ g/L} \times 0.600 \text{ L} = \mathbf{36 \text{ g}}$.
2. $60 \text{ g/L} \times 0.250 \text{ L} = \mathbf{15 \text{ g}}$.
3. $600 \div 250 = \mathbf{2.4 \text{ glasses}}$.
4. 60 g/L is far below 2000 g/L, so the drink is **unsaturated**.

Problem 20 Adding salt in portions

1. 36 g dissolved after 6 portions and the 7th did not fully dissolve: **36 g per 100 g of water**.
2. $48 - 36 = \mathbf{12 \text{ g undissolved}}$.

3. After 36 g the water was already saturated, so portion 7 could not dissolve.
4. The solubility is still 36 g, so **still 12 g undissolved**.