

How much solute can dissolve in water

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

Name: _____ Date: _____ Class: _____

These 20 problems train you to use the ideas of dissolving, saturation, solubility and concentration. You will convert units, calculate concentrations in g/L, read solubility graphs and explain why some solutions form crystals on cooling.

They suit Grade 7 science students, NGSS middle school classes, Year 8 in the UK and Class 7 in India. Write the formula, the substitution and the unit each time you calculate.

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

Problem 1 Solute, solvent, solution (easy)

Aarav stirs 2 teaspoons of sugar into a cup of tea.

1. Name the solute.
2. Name the solvent.
3. Name the mixture that results.

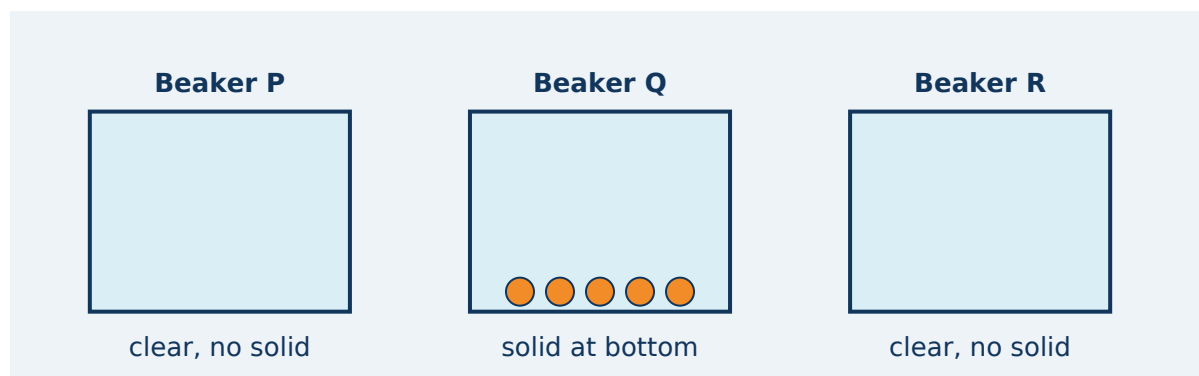
Problem 2 Dissolving or not (easy)

Decide whether each is an example of dissolving.

1. Salt stirred into soup
2. Ice cubes melting in a drink
3. Sand shaken in water
4. Coffee powder stirred into hot milk

Problem 3 Reading the beakers (easy)

Three beakers each hold 100 g of water at the same temperature, and the same salt was added to each.



Beakers P, Q and R.

1. Identify the saturated solution.
2. Explain how you know.
3. State what you could do to the saturated solution to dissolve the solid.

Problem 4 Litres and millilitres (easy)

Convert each volume.

1. 250 mL to litres
2. 1500 mL to litres
3. 0.4 L to millilitres
4. 60 mL to litres

Problem 5 Faster or slower (easy)

Write faster or slower for each change in how quickly sugar dissolves in water.

1. Stirring the mixture
2. Using cold water instead of warm
3. Using powdered sugar instead of one big lump

Problem 6 Name the parts (easy)

Name the solute and the solvent in each solution.

1. Salt water
2. Iodine dissolved in ethanol
3. Lemon squash made with sugar and water

Problem 7 Concentration of a drink (medium)

Sana dissolves 15 g of sugar in water to make 0.30 L of drink.

1. Write the formula for concentration.
2. Calculate the concentration in g/L.
3. Calculate the mass of sugar in 0.10 L of the drink.

Problem 8 Mass of solute (medium)

A salt solution has a concentration of 40 g/L. A student needs 0.75 L of it.

1. Calculate the mass of salt in the solution.
2. Convert 0.75 L to millilitres.

Problem 9 Find the volume (medium)

A technician dissolves 24 g of salt to make a solution of concentration 80 g/L.

1. Calculate the volume of the solution in litres.
2. Convert the volume to millilitres.

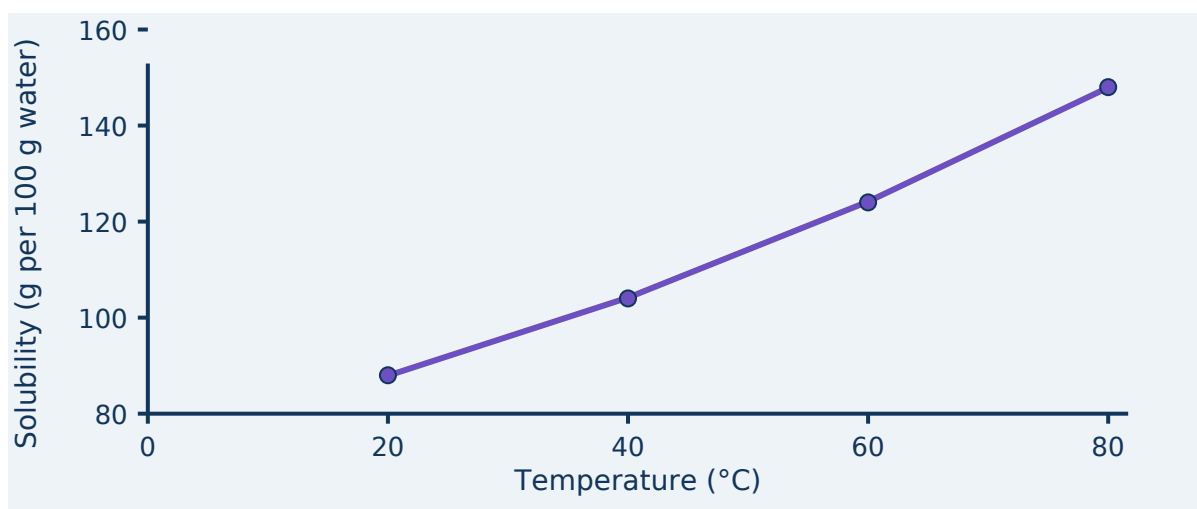
Problem 10 Salt limit (medium)

Salt dissolves to a maximum of 36 g in 100 g of water at 20 °C. Mateo has 200 g of water at this temperature.

1. Calculate the maximum mass of salt that dissolves.
2. He adds 80 g of salt and stirs well. Calculate the mass left undissolved.
3. State whether the solution is saturated.

Problem 11 Reading a solubility graph (medium)

Use the graph of sodium nitrate.



Solubility of sodium nitrate against temperature.

1. Read the solubility at 60 °C.
2. Calculate the mass that dissolves in 50 g of water at 60 °C.
3. Calculate how much more dissolves in 100 g of water at 80 °C than at 20 °C.

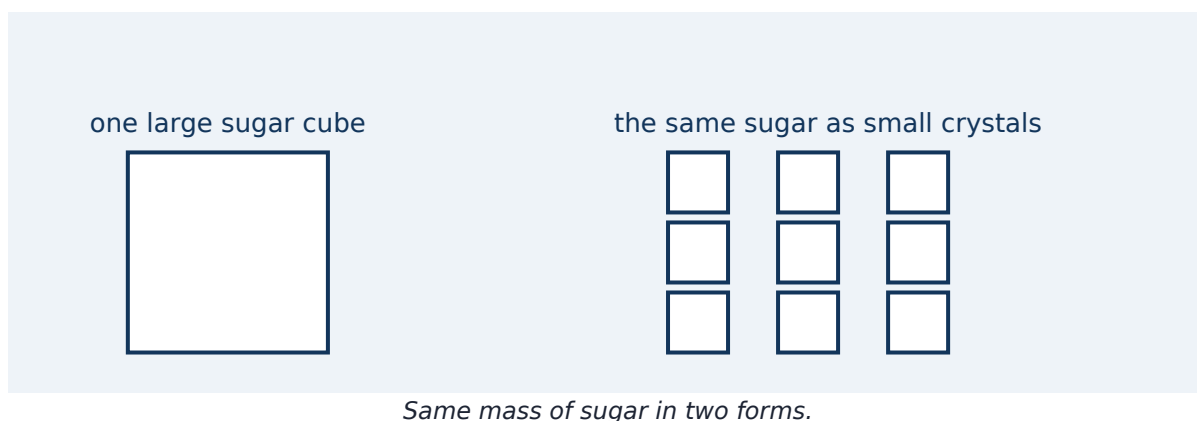
Problem 12 Fizzy drink (medium)

Liam leaves one bottle of fizzy drink in a warm car and another in a fridge. He opens both.

1. Predict which bottle loses more bubbles.
2. Explain using the effect of temperature on the solubility of a gas.
3. Suggest a way to keep a fizzy drink fizzy for longer.

Problem 13 Cubes and crystals (medium)

Compare the large sugar cube with the small crystals of the same mass.



1. Predict which dissolves faster in water at the same temperature.
2. Explain using the surface of the solid touching the water.
3. State whether the maximum mass that can dissolve is different for the two forms.

Problem 14 Spot the error (medium)

Tunde writes: 'When sugar dissolves, it disappears and the mass goes. A saturated solution is one that is very sweet and strong.'

1. Identify the first mistake.
2. Identify the second mistake.
3. Write a correct version of both sentences.

Problem 15 Diluting syrup (medium)

Pooja takes 50 mL of syrup with concentration 120 g/L and adds water to make a total of 300 mL.

1. Calculate the mass of sugar in the 50 mL.
2. Calculate the concentration of the diluted drink in g/L.
3. State how many times the concentration has decreased.

Problem 16 Crystals from cooling (hard)

Potassium nitrate dissolves to 169 g in 100 g of water at 80 °C and 64 g at 40 °C. A saturated solution is made with 150 g of water at 80 °C and cooled to 40 °C.

1. Calculate the mass dissolved at 80 °C in 150 g of water.
2. Calculate the mass that can stay dissolved at 40 °C.
3. Calculate the mass of crystals that forms.

Problem 17 Temperature effect compared (hard)

Between 20 °C and 80 °C, potassium nitrate rises from 32 g to 169 g per 100 g of water, and sodium chloride rises from 36 g to 38 g.

1. Calculate the increase in solubility for each solid.
2. Calculate how many times bigger the first increase is than the second.

3. Explain which solid is better for making crystals by cooling a hot solution.

Problem 18 Plan a saturation test (hard)

Kofi wants to find the solubility of a white salt in water at 20 °C using only a balance, a beaker and a spoon.

1. Describe a method that finds the saturation point.
2. List three variables to control.
3. Explain how he knows when the solution is saturated.
4. State one way to make the result more accurate.

Problem 19 Sports drink (hard)

A sports drink has a concentration of 60 g/L of sugar and is sold in a 600 mL bottle.

1. Calculate the mass of sugar in the bottle.
2. Emeka drinks 250 mL. Calculate the mass of sugar he drinks.
3. Calculate the number of 250 mL glasses in the bottle.
4. Explain whether the drink is saturated, given that sugar can dissolve to about 2000 g per litre.

Problem 20 Adding salt in portions (hard)

Chen adds salt to 100 g of water at 20 °C in portions of 6.0 g, stirring each time:

Portion	1	2	3	4	5	6	7	8
Total added (g)	6	12	18	24	30	36	42	48
Result	dissolved	dissolved	dissolved	dissolved	dissolved	dissolved	some left	more left

1. Calculate the solubility from the data.
2. Calculate the mass undissolved after portion 8.
3. Explain why portion 7 only partly dissolved.
4. Predict the mass undissolved if Chen warms the water to 40 °C and the solubility stays at 36 g.