

Testing materials to choose the right one

Grade 6 science (Year 7 · Class 6) · Worksheet

Name: _____ Date: _____ Class: _____

These twenty problems train you to describe and compare materials by their properties. You sort conductors and insulators, rank hardness, read test data and choose materials for real jobs.

The problems begin with recall and finish with multi-step data and design tasks. They suit Grade 6, Year 7 and Class 6 students following MS-PS1-3 style standards.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS1-3

Problem 1 What is a property? (easy)

1. Define the word *property* for a material.
2. Give two properties of a steel spoon.

Problem 2 Conductor or insulator? (easy)

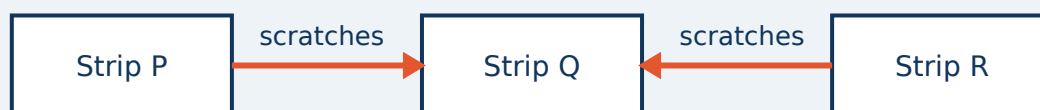
1. Sort these into conductors and insulators: copper wire, rubber glove, iron nail, dry wood, graphite pencil lead, plastic ruler.
2. Name the part of a test circuit that tells you the result.

Problem 3 Magnet sort (easy)

1. A magnet is held near a steel paper clip, an aluminium can, a copper coin, a glass marble and an iron nail. Which items are attracted?
2. Is aluminium magnetic?

Problem 4 Scratch order (easy)

1. Strip P scratches Strip Q. Strip R also scratches Strip Q (see the figure). Strip R is scratched by Strip P. Put P, Q and R in order from softest to hardest.



Arrows point to the strip that gets scratched.

Scratch test arrows.

Problem 5 Match the property (easy)

1. Which property makes each use sensible? Choose from hardness, flexibility, conductivity:
(a) copper in a phone charger cable, (b) rubber in a bicycle tyre, (c) steel in a drill bit.

Problem 6 Reading a results table (easy)

1. Material K lit the bulb, was attracted by a magnet and was not scratched by a copper coin.
Material L did not light the bulb, was not magnetic and was scratched by a copper coin.
Which one is more likely to be steel?
2. Which one could be a plastic?

Problem 7 Saucepan design (medium)

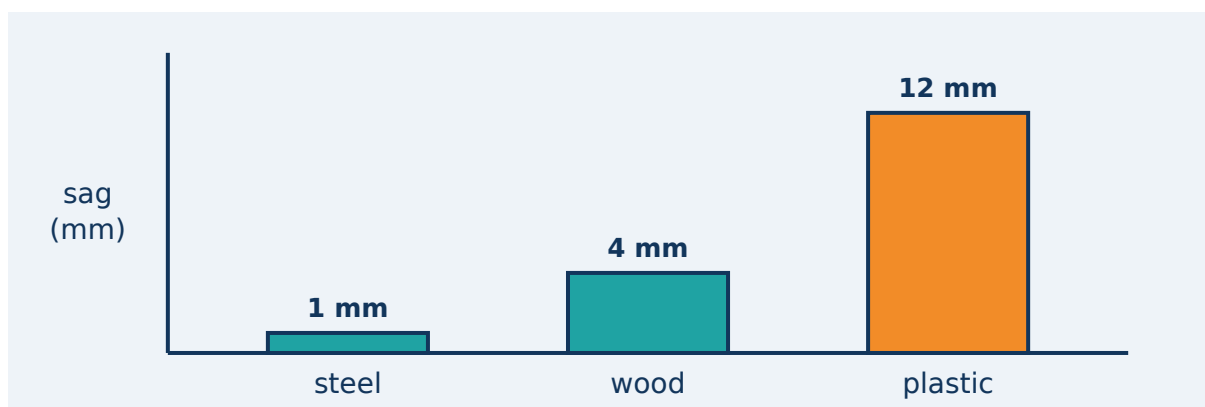
1. A saucepan is made of steel with a plastic handle. Explain why the base is metal and why the handle is not.

Problem 8 Cans at Kofi's school (medium)

1. Kofi's school collected 120 cans. A magnet picked up 45 of them. Calculate how many cans are aluminium.
2. Calculate the percentage of cans that are steel.

Problem 9 Bending rods (medium)

1. Rods of the same size are fixed at one end and a 200 g mass hangs from the free end.
The figure shows how much each rod sags. Which rod is the most flexible?
2. How many times more does the plastic rod sag than the steel rod?



Sag of three rods under the same load.

Problem 10 Electric cable (medium)

1. An electric cable has a copper core covered with plastic. Explain the job of each part.

Problem 11 Fair test: flexibility (medium)

1. Mei tests three plastic strips for flexibility. State two variables she must keep the same and the variable she measures.

Problem 12 Aluminium savings (medium)

1. Assume making 1 kg of new aluminium takes 200 MJ of energy, and recycling 1 kg takes 5 % of that. Calculate the energy to recycle 20 kg and the energy saved compared with making 20 kg from new.

Problem 13 Stirring soup (medium)

1. Bilal needs a spoon for stirring boiling soup. Compare a copper spoon, a wooden spoon and a plastic spoon that softens at 70 °C. Choose one and explain.

Problem 14 Could it be aluminium? (medium)

1. A shiny metal lights a bulb and is attracted by a magnet. Could it be aluminium? Explain, and name a metal it could be.

Problem 15 Wrong conclusion (medium)

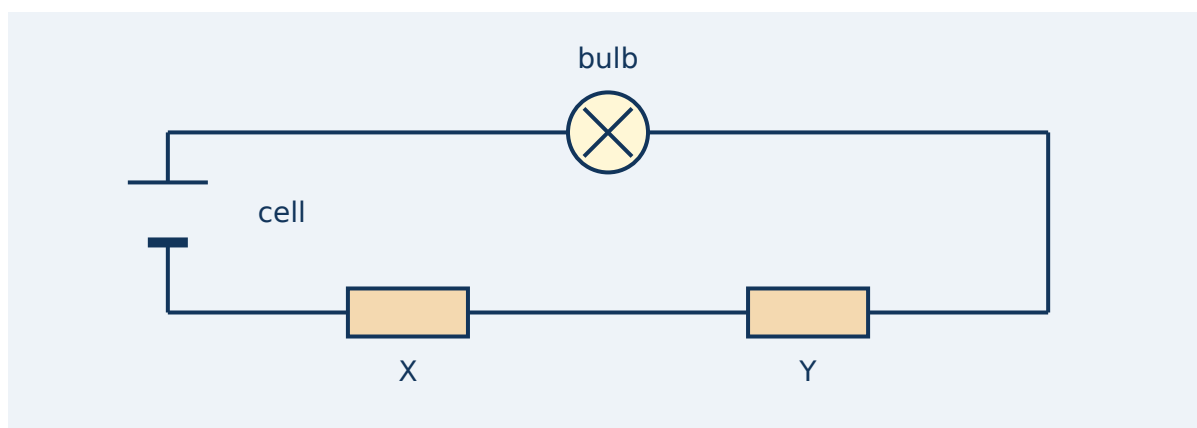
1. Diego attracts an iron nail with a magnet and writes: "All metals are magnetic." Explain the mistake and describe a test that would show he is wrong.

Problem 16 Scrap yard sort (hard)

1. A load of 36 kg of scrap contains steel, aluminium and glass. A magnet removes 40 % of the load as steel. Of the remaining mass, 60 % is aluminium and the rest is glass. Calculate the mass of steel, aluminium and glass.

Problem 17 Two samples in series (hard)

1. Two samples X and Y are connected in the same circuit one after the other (see the figure). Predict whether the bulb lights when X is copper and Y is wood, and when X is copper and Y is graphite. Explain.



Two samples in one circuit.

Problem 18 Decision matrix (hard)

1. A heat-proof mat is scored from 1 to 5 for heat insulation, strength and low cost. Weights are insulation $\times 3$, strength $\times 2$, cost $\times 1$. A (plastic): 4, 3, 5. B (ceramic): 5, 4, 2. C (wood): 3, 2, 5. D (steel): 1, 5, 4. Calculate each total and choose the best material.

Problem 19 Bottle bank (hard)

1. A town collects 500 glass bottles each day for recycling. Each bottle has a mass of 0.30 kg. Calculate the mass collected in 365 days, in kilograms and in tonnes (1 t = 1000 kg).
2. Give one reason, linked to a property of glass, why it is good to recycle it.

Problem 20 Mystery rod (hard)

1. A reddish-brown rod lights a bulb, is not attracted by a magnet, is scratched by a steel nail and bends without snapping. Which common metal is it most likely to be? Justify with each result and name one observation that would separate it from aluminium.