

Series and parallel circuit patterns

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

Name: _____ Date: _____ Class: _____

These problems train you to recognise series and parallel circuits, predict what bulbs and switches do, combine cells and explain how short circuits and fuses work. You will read circuit diagrams, count voltages and justify designs. They suit Grade 7, Year 8 and Class 7 science (NGSS MS-PS2-3).

Start with level 1. For each prediction, give a reason that mentions the paths of the current.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS2-3

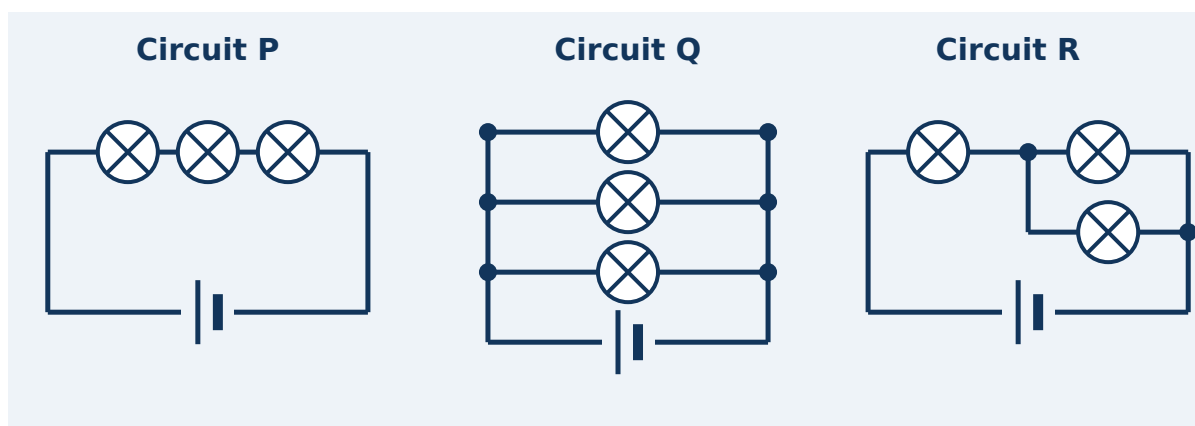
Problem 1 Two ways to join bulbs (easy)

Aisha in Dubai is revising circuits.

1. State how many paths a series circuit has.
2. State how many paths a parallel circuit has.
3. Name the type of circuit that has branches.

Problem 2 Name the circuits (easy)

Look at the three circuits in the figure.



Circuits P, Q and R, each with a cell and bulbs.

1. State which circuit is a series circuit.
2. State which circuit is a parallel circuit.
3. State which circuit has a mixture of both.

Problem 3 Circuit symbols (easy)

The figure shows four symbols from a circuit diagram.



Four circuit symbols, A to D.

1. Name symbol A.
2. Name symbol B.
3. Name symbols C and D, and say which one lets current flow.

Problem 4 A blown bulb in series (easy)

Kimani in Nairobi sets up five bulbs in series. The third bulb breaks.

1. State how many bulbs stay lit.
2. Explain your answer.
3. State what you would do to find the broken bulb.

Problem 5 A blown bulb in parallel (easy)

Mei in Singapore has three lamps in parallel. One lamp fails.

1. State how many lamps stay lit.
2. Explain why the other lamps are not affected.
3. State why homes are wired this way.

Problem 6 Counting cells (easy)

Each cell gives 1.5 V.

1. Calculate the voltage of four cells joined in series.
2. State the voltage of four cells joined in parallel.
3. Calculate how many cells in series are needed for 9.0 V.

Problem 7 What a switch does (easy)

A switch is in a series circuit with a bulb and a cell.

1. Describe what happens to the circuit when the switch is open.
2. State why the bulb is off when the switch is open.
3. State a household example of a switch that controls a lamp.

Problem 8 Adding bulbs (medium)

Chidi in Enugu has a cell and one bright bulb. He adds an identical second bulb.

1. Predict what happens to the brightness if the bulb is added in series.

2. Explain the change.
3. Predict what happens if the second bulb is added in parallel.

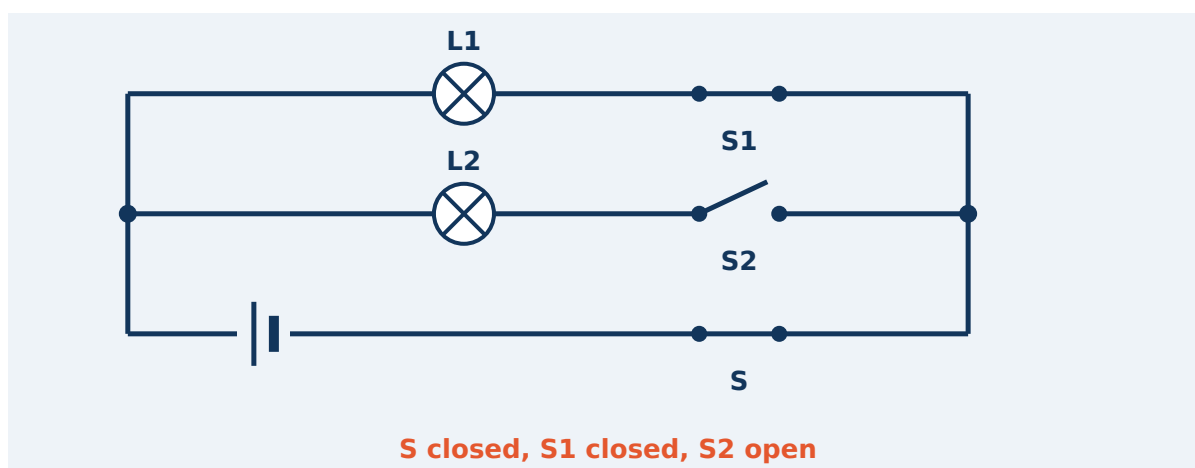
Problem 9 Garden lights (medium)

Sofia in Cape Town has a string of solar garden lights with 6 bulbs in series. Each bulb needs 2.0 V.

1. Calculate the voltage needed for the whole string.
2. State what happens if one bulb is removed.
3. Calculate how many of these bulbs could be used in series on a 4.0 V supply.

Problem 10 Two switches (medium)

The figure shows a parallel circuit with a main switch and two branch switches.



S closed, S1 closed, S2 open
Parallel circuit with switches S, S1 and S2.

1. State which lamps are lit as drawn (S closed, S1 closed, S2 open).
2. State which lamps are lit if S is opened and S2 is closed.
3. State what is needed for both lamps to be lit.

Problem 11 Bicycle lamps (medium)

Rahul in Chennai wires the front and rear lamps of his bicycle in parallel to a dynamo.

1. Explain how this wiring helps if the rear lamp fails.
2. Explain why each lamp gets the full voltage.
3. State where one switch should be placed to turn both lamps off.

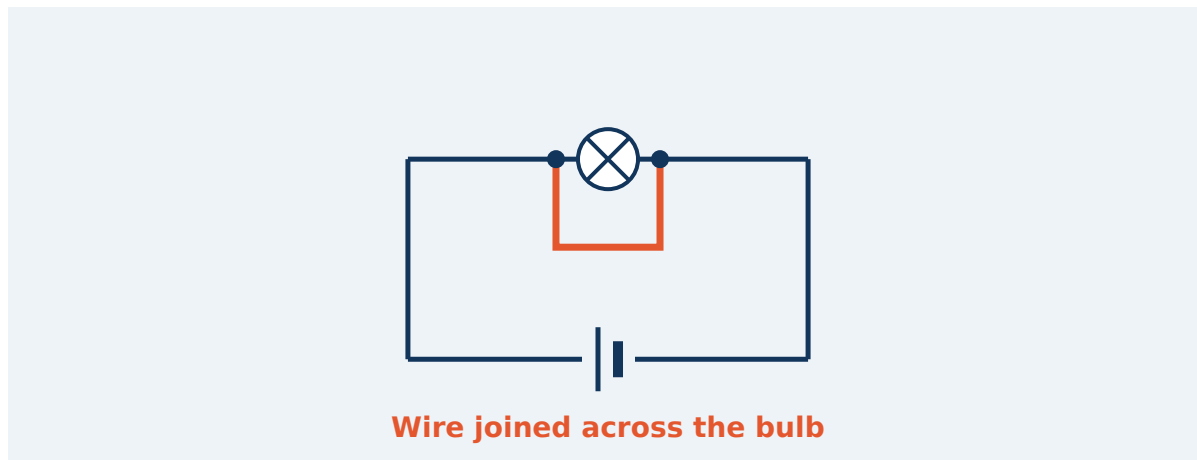
Problem 12 Two cells in parallel (medium)

A torch with one 1.5 V cell lasts about 10 hours. Her cousin Ahmed adds an identical second cell in parallel.

1. State the voltage of the two cells.
2. Predict how long the torch could now last.
3. Explain why the torch is not brighter.

Problem 13 A wire across the bulb (medium)

In the figure, a wire has been connected across the bulb.



A short wire connected across a bulb.

1. Predict what happens to the bulb.
2. Explain what the current does.
3. Explain why this can be dangerous.

Problem 14 How a fuse works (medium)

A plug on a lamp contains a 3 A fuse.

1. Describe what a fuse does if too much current flows.
2. Explain why the fuse must be in series with the lamp.
3. Name another device that protects a circuit.

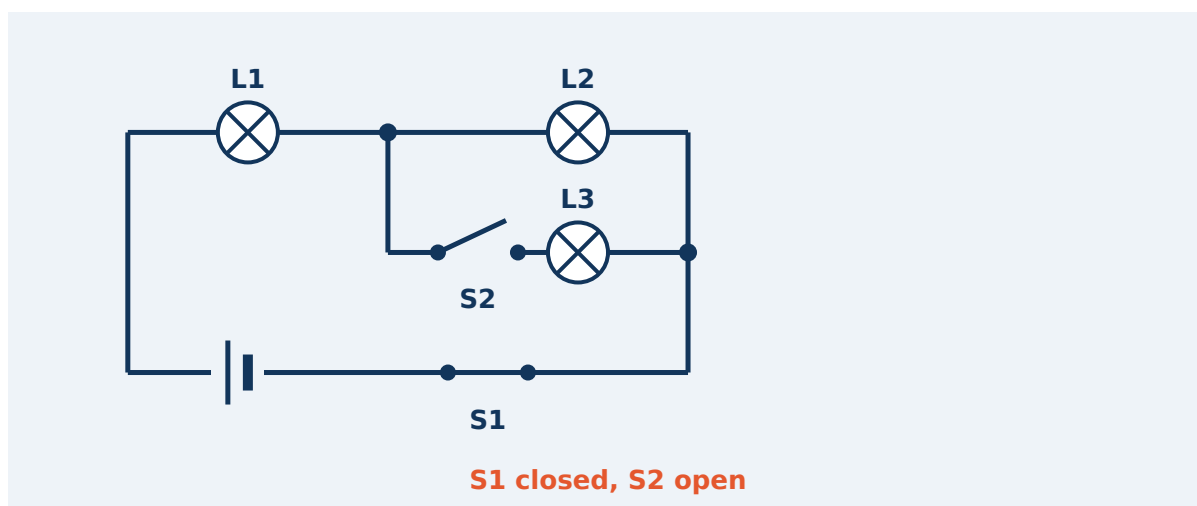
Problem 15 Torch design (medium)

Design a torch with two bulbs.

1. State how the two bulbs should be connected so that one failing bulb does not switch off the other.
2. State where a single switch must go to turn both on and off.
3. List the components in order starting from the cell.

Problem 16 Switch table (hard)

In the figure, lamp L1 is in series with the parallel pair L2 and L3. All lamps are identical.



Series and parallel lamps with two switches.

1. State which lamps are lit as drawn.
2. State which lamps are lit if S2 is closed.
3. State which lamps are lit if S1 is opened.
4. If S1 and S2 are closed, state which lamp is brightest and explain why.

Problem 17 Ranking circuits (hard)

Three circuits use the same cell and identical bulbs: circuit 1 has one bulb, circuit 2 has two bulbs in series, circuit 3 has two bulbs in parallel.

1. Rank the brightness of one bulb in each circuit, from brightest to dimmest.
2. Rank how long the cell lasts, from longest to shortest.
3. Explain your ranking of cell life.

Problem 18 Shorting a branch (hard)

A parallel circuit has two identical bulbs on separate branches. A wire is joined across one of them.

1. Predict what happens to both bulbs.
2. Explain why the second bulb is also affected.
3. Explain why a fuse in the main wire may melt.

Problem 19 Spot the errors (hard)

A student makes three statements.

Statement 1: "Bulbs in parallel share the energy, so they are dimmer."

Statement 2: "In a series circuit, only the first bulb gets any current."

Statement 3: "A short circuit makes a bulb brighter."

1. Correct statement 1.
2. Correct statement 2.
3. Correct statement 3.

Problem 20 Design for the job (hard)

Tomas in Texas designs three circuits.

1. An alarm must sound if either of two window switches is closed. Say whether the switches are in series or parallel and explain.
2. A machine must start only when both guard doors are shut. Say whether the door switches are in series or parallel and explain.
3. A hallway light must be controlled from two places independently. State which type of circuit gives independent bulbs and why this matters if one bulb fails.