

# Electromagnetic Induction

## 1 · Key words: say it like this

learn this sentence

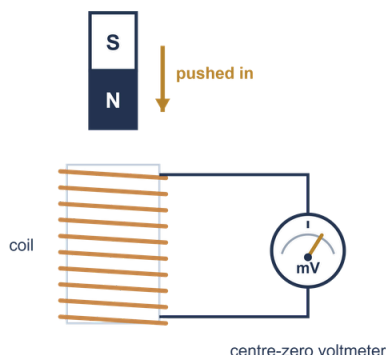
A \_\_\_\_\_ is \_\_\_\_\_ across the ends of a \_\_\_\_\_  
when it \_\_\_\_\_ a \_\_\_\_\_.

Word bank: conductor · cuts · induced · magnetic field · voltage

**Cutting the field.** A voltage is only induced while the coil and the magnet are **moving relative to each other**, so the coil cuts the field. In a complete circuit, an **induced current** flows.

## 2 · A magnet and a coil

predict the voltmeter

When the **N pole** is **pushed into** the coil, the needle moves to the **right**.

What happens to the needle this time? Tick one direction and one size in each row.

| Change                                              | DIRECTION                |                          |                          | SIZE OF READING          |                          |                          |
|-----------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                                                     | ← left                   | → right                  | no reading               | bigger                   | smaller                  | same / zero              |
| The magnet is held <b>still</b> inside the coil     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The magnet is <b>pulled out</b> of the coil         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The magnet is pushed in <b>faster</b>               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| A coil with <b>more turns</b> is used               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The magnet is turned round: <b>S pole</b> pushed in | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The magnet is pushed in more <b>slowly</b>          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

### MAKE THE INDUCED VOLTAGE BIGGER

- ☐ Use **more turns** on the coil
- ☐ Move the magnet **faster**
- ☐ Use a **stronger** magnet

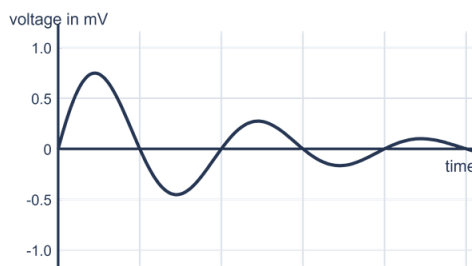
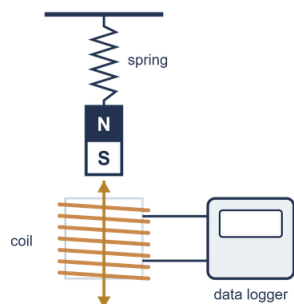
### DIRECTION OF THE INDUCED VOLTAGE

- ☐ The induced voltage **changes direction** when the magnet's **direction** changes (in → out)
- ☐ ... or when the **other pole** goes in first
- ☐ No movement = no cutting = **no voltage**

## 3 · Exam-style question

6 marks

A magnet hangs on a spring above a coil. The coil is connected to a data logger. The magnet is pulled down and let go, so it bounces up and down through the coil. The graph shows the voltage.



- (a) Explain why the data logger records a voltage. [2]
- (b) Which feature of the graph shows that the voltage is alternating? [1]
- (c) Explain why the peaks on the graph get smaller. [2]
- (d) Suggest one change that would make the peaks bigger. [1]