

Exercise walk-through

7.3

Induced potential, the generator effect and transformers – physics only, HT (4.7.3)

AQA · GCSE · Physics

Exercises 2.1·2.3

2.1 State the two conditions that induce a potential difference in a conductor. [2]

2.2 A transformer has 100 primary and 500 secondary turns; input 12 V. Calculate the output pd. [2]

2.3 State why a transformer's core is iron. [1]

Exercises 2.1·2.3

2.1 State the two conditions that induce a potential difference in a conductor. [2]

2.1 The conductor moves relative to a magnetic field, or the magnetic field around it changes.

2.2 A transformer has 100 primary and 500 secondary turns; input 12 V. Calculate the output pd. [2]

2.2

$$V_s = V_p \times \frac{n_s}{n_p} = 12 \times \frac{500}{100} = \mathbf{60 \text{ V}}$$

(equation C1, answer A1)

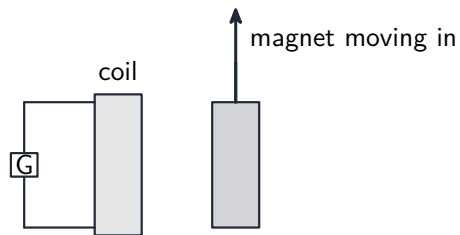
2.3 State why a transformer's core is iron. [1]

2.3 Iron is easily magnetised, so the changing primary field is carried strongly to the secondary coil.

Exercise 3.1

3.1 A magnet is pushed into a coil connected to a sensitive meter.

- (a) Explain why the meter deflects. [2]
- (b) State two changes that increase the deflection. [2]
- (c) The magnet is pulled out faster. State what happens to the induced pd's size and direction, and explain using the opposing field. [3]



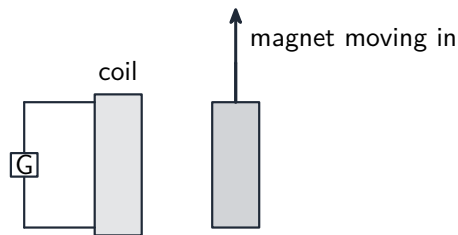
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3.1 (a) The magnet moving into the coil changes the magnetic field around the coil; the changing field induces a pd, driving a current through the meter. **3.1** (b) Any two: move the magnet faster; use a stronger magnet; more turns on the coil. **3.1** (c) The pd is larger (faster change) and reversed in direction (the flux through the coil now decreases instead of increasing); the induced current's own field opposes the change – reinforcing the field while the magnet leaves, opposing it while the magnet enters.

Exercise 3.2

3.2 A transformer steps 230 V down to 11.5 V for a doorbell; the primary has 2000 turns.

- (a) Calculate the secondary turns. [3]
- (b) The bell draws 0.50 A. Calculate the primary current (assume 100% efficiency). [3]
- (c) Explain why the transformer only works with alternating current. [2]

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3.2 (a)

$$n_s = n_p \times \frac{V_s}{V_p} = 2000 \times \frac{11.5}{230} = \mathbf{100} \text{ turns}$$

(equation C1, substitution C1, answer A1) **3.2** (b) Power out: $P = V_s I_s = 11.5 \times 0.50 = 5.75 \text{ W}$ (C1); input current:

$$I_p = \frac{P}{V_p} = \frac{5.75}{230} = \mathbf{0.025} \text{ A}$$

(C1, A1) **3.2** (c) A transformer needs a **changing** field in the core; alternating current continually changes the primary's field, inducing a pd in the secondary – a direct current gives a steady field and induces nothing.

Exercise 3.3

3.3 A bicycle dynamo powers a 6.0 V, 3.0 W lamp.

- (a) Sketch the pd–time graph for one full rotation and name the output type. [2]
- (b) Calculate the lamp's current. [2]
- (c) The rider pedals faster. Describe the graph's change and the lamp's brightness change. [3]

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3.3 (a) A sine-like curve crossing zero once per half rotation; ac output. **3.3** (b)

$$I = \frac{P}{V} = \frac{3.0}{6.0} = \mathbf{0.50 \text{ A}}$$

(C1, A1) **3.3** (c) The peaks come more frequently (higher frequency) and the peaks are higher (faster rotation, larger induced pd); the lamp is brighter because more energy is transferred per second.