

Solutions

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

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

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.

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.

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.