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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electromagnetic Induction — Paper 1

Worked Answer Key (Multiple Choice)

Fahad H. Ahmad

Contact: +92 323 509 4443

M.Eng NUS Singapore · B.Eng NUST · 15+ years of teaching experience in Singapore, UAE & Pakistan · 60,000+ subscribers and 20 million+ video lecture views.

Fahad H. Ahmad · **+92 323 509 4443**

Electromagnetic Induction — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **Electromagnetic Induction (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team — induced e.m.f. (rate of change of magnetic flux linkage), the a.c. generator, Fleming's right-hand rule, and the transformer equation $V_p/V_s = N_p/N_s$ with all turns calculations verified numerically. Use this key to mark your work and to see the one-line reasoning behind each correct letter. The compilation is organised into three parts — keep your eye on the part heading, as the exam-paper question numbering restarts in each part.

Part A · Principles of Electromagnetic Induction

Q #	Exam reference	Answer	Brief working / reason
A1	Q37	**A**	Induced e.m.f. depends on the **rate** of change of magnetic flux. The faster the magnet moves, the faster the flux through the coil changes, so the e.m.f. increases → **moving the magnet more quickly**.
A2	Q40	**B**	An e.m.f. is induced only when there is **relative motion** (changing flux). If coil and magnet move at the same speed in the **same direction**, there is no relative motion and no flux change → zero reading.
A3	Q34	**B**	Induced e.m.f. ∝ speed of the magnet. At the top (P) and bottom (R) turning points the magnet is momentarily **at rest** ($v = 0$), so the flux is not changing and the e.m.f. is zero → **at P and at R**.
A4	Q34	**A**	The field runs horizontally from N to S. To induce an e.m.f. the wire must **cut** the field lines, i.e. move perpendicular to the field. Moving the wire vertically **up (direction A)** cuts the horizontal lines and registers a reading; moving along the field (C / D) cuts none.

Part B · The A.C. Generator

Q #	Exam reference	Answer	Brief working / reason
B1	Q33	**D**	An a.c. generator produces an **alternating** output that reverses direction each half-turn, so V–t is a sine curve swinging equally above and below zero → graph **D**. (A and B never go negative; C is a flat d.c. line.)
B2	Q37	**B**	Rotating **twice as fast** doubles the frequency (twice as many cycles in the same time) *and* doubles the peak e.m.f. (faster flux

Q #	Exam reference	Answer	Brief working / reason
			change → larger amplitude). The trace with double frequency and larger amplitude is **B**.
B3	Q34	**B**	A simple a.c. generator induces an e.m.f. by spinning **a coil of wire** in the magnetic field, so the flux through it changes continuously → **a coil of wire**.
B4	Q35	**D**	A generator (here driven by the wind) converts kinetic energy of movement into electrical energy → **a wind turbine**. (A motor does the reverse; battery and fire are not kinetic→electrical.)

Part C · The Transformer

Q #	Exam reference	Answer	Brief working / reason
C1	Q34	**D**	Transmitting at very high voltage means a very **low current** ($P = VI$), and since power loss in the cables = I^2R, low current gives **low power loss** → **low power loss, low current**.
C2	Q39	**D**	Step-up/down ratio: $V_s = V_p \times N_s/N_p = 230 \times 20/300 =$ **15.3 V**. This far exceeds the lamp's 6.0 V rating, so it **lights brightly and then goes out** (filament burns out).
C3	Q38	**B**	The core is made of soft **iron**: it is easily magnetised and demagnetised, concentrating the magnetic flux to link the two coils efficiently → **iron**.
C4	Q36	**D**	A transformer needs a **changing** flux. A steady **d.c.** primary current gives constant flux, so no e.m.f. is induced in the secondary → **there is no output voltage**.
C5	Q35	**A**	Core must be easily magnetised → **iron**; coils must conduct well with low resistance → **copper** → **iron core, copper coils**.
C6	Q34	**A**	$N_s = N_p \times V_s/V_p = 200 \times 12/240 =$ **10 turns** (100% efficient, so the turns ratio equals the voltage ratio) → **10**.
C7	Q35	**B**	Power is generated and transmitted as **alternating current** (only a.c. works with transformers) and stepped up to **very high voltage** to cut transmission losses → **alternating, very high**.
C8	Q37	**B**	$N_s = N_p \times V_s/V_p = 720 \times 6.0/24 =$ **180 turns** → **180**.
C9	Q37	**D**	Before transmission the voltage is stepped **up**; since power is conserved ($P = VI$), increasing the p.d. **decreases the current**, reducing I^2R losses in the cables → **increase the p.d. and decrease the current**.
C10	Q36	**D**	A transformer changes voltage and current but never the **frequency**, and the output is still a.c. (4800→480 is a step-down, so current rises, but the question of how it compares is governed

Q #	Exam reference	Answer	Brief working / reason
			by it staying a.c. at the same frequency) → **the same frequency a.c.**

Note from Megalecture. Every transformer turns/voltage calculation in Part C was checked numerically using $V_p/V_s = N_p/N_s$. Remember the two golden rules of this topic: an e.m.f. appears only when the magnetic flux is *changing*, and a transformer works on a.c. only. These are original Megalecture worked solutions prepared for revision use.