Electromagnetic effects

Mark Scheme 4

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electromagnetic effects
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 4

Time Allowed: **52 minutes**

Score: **/43**

Percentage: **/100**

1 **(a) (i)** $N_1/N_2 = V_1/V_2$ in any form, symbols, words or numbers — C1
12 (turns) [possible unit penalty] — A1

(ii) mention of magnetic / electromagnetic field)
change of flux linkage / magnetism)
OR field lines being cut) any 3 — B1 x 3
Induced current / emf / voltage)
Fewer coils in secondary so smaller emf / voltage
OR larger current)

(iii) heat in either coil / wires)
eddy currents in core / heat in core) any 1 — B1
magnetic leakage from core)
sound from core/coil)

(b) (i) 12 V d.c. OR low d.c.voltage

(ii) diode OR rectifier [Ignore extras unless wrong] — B1

(c) $V_1I_1 = V_2I_2$ in any form, or words or numbers
OR power in = power out or equivalent — C1

8 A — A1 [10

2 **(a)** a.c./changing current (in primary))
magnetic flux/field/force in core)
alternating/changing magnetic field) any 3 — B1 × 3
accept without magnetic if used in previous line
field cuts secondary)
changing flux linkage in (secondary))
induces emf/current in (secondary))

(b) more/increasing turns on secondary OR less/decreasing turns on primary
OR step up — B1

(c) $V_1I_1 = V_2I_2$ in any form OR 24 000 × 12 000 = 400 000 × I_2 — C1
720 A — A1

(d) less heat/energy/power loss OR more efficient energy transfer)
thinner/smaller cables)
less metal used) any 2 — B1+B1
less massive pylons)
ignore less electricity loss

[Total: 8]

3 **(a** Fig.8.1 nothing seen/no current/no deflection/no voltage B1
Fig. 8.2 deflection (of needle)/current in mV/voltage induced B1
Fig. 8.3 deflection (of needle)/current in mV/voltage induced
(**ignore** size of deflection) M1
same direction as Fig. 8.2 A1

(b) increase speed B1
increase turns (of wire)/more coils (**ignore** longer wire) B1
increase magnet strength (**ignore** larger magnet) B1

[Total: 7]

4 **(a) (i)** <u>step-up</u> transformer B1

(ii) less heat/energy/power loss (from lines) / thinner wires (possible) B1
OR lower current NOT more efficient

(b) $P = V \times I$ in any form, figures or symbols / (P =) VI C1
2.5 A A1

(c) $P = I^2R$ in any form, figures or symbols / (P =) I^2R C
18.75 W e.c.f. from **(b)** A1

(d) $V = IR$ in any form, figures or symbols OR (V =) IR OR
$P = V^2 / R$ in any form, figures or symbols OR (P =) V^2 / R OR $V = (PR)^{1/2}$ C1

7.5 V e.c.f. from **(b)** or **(c)** A1

(e) 22,000 – 7.5 – 7.5 OR 22,000 – 7.5 ecf C1
21,985 V e.c.f. (minimum 4 s.f.in this case) A1
OR
55,000 – 37.5 = 54962.5 (C1)
54962.5 / 2.5 = 21985 V (minimum 4 s.f. in this case) (A1)

[10]

5	**(a)**	3 complete circles about thick wire, roughly concentric on wire	B1	
		clockwise or anticlockwise arrows on any 2 correct circles, and no contradictions	B1	
	(b) **(i)**	reduced		
	(ii)	same OR none	B1	
	(c) **(i)**	thin wire is a current-carrying conductor in a magnetic field	B1	
		field produced by current in thick wire	B1	
		OR alternative approach:		
		(both wires produce a magnetic field	B1)	
		(fields interact	B1)	
	(ii)	inwards/towards thick wire/to right/towards T_1T_2	B1	
	(iii)	smaller force	B1	
				[8]