Electromagnetic effects

Mark Scheme 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electromagnetic effects
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 2

Time Allowed: **63 minutes**

Score: **/52**

Percentage: **/100**

1 **(a) (i)** Upper box: (split-ring) commutator OR split-ring B1
Lower box: brush(es) OR contact(s) B1

(ii) X (is the N pole) B1

(b) (i) Any two from: B2
Greater current (through coil) OR battery with greater voltage
More turns in coil OR coil with greater area
Use stronger magnet OR soft-iron core in coil OR bring magnetic poles closer to coil

(ii) Coil rotates in opposite direction
OR rotates anticlockwise B1
OR rotation reversed

(c) Magnetic field is cut (by the wires of the coil) B1

Electromagnetic induction takes place
OR Voltage/e.m.f. is induced/produced (causing current in the coil)
OR Current is induced (in the coil) B1

[Total: 8]

2 **(a)** slip-rings (and brushes) B1

(b) (i) sinusoidal curve, any value at $t = 0$ B1

(ii) appropriate T value indicated on graph B1

(iii) smaller T / time of one cycle OR higher frequency B1

higher maximum current / greater amplitude / higher peaks / higher peak-to-peak B1

(c) diode / rectifier B1

[Total: 6]

3	**(a)** **(i)**	$(V_2=)V_1N_2/N_2$ **OR** $230 \times 2000/40\,000$	C1
		11 / 11.5 / 12 V	A1
	(ii)	any three from: alternating / changing magnetic field (in core) (magnetic field) transferred (**allow** conducted) to coil Q changing flux linkage / in Q e.m.f. / voltage induced in Q	B3
	(b) **(i)**	diode	B1
	(ii)	it conducts in (only) one direction	B1
			[Total: 7]

4	**(a)** **(i)**	electromagnetic induction	B1
	(b)	pointer deflects	B1
		pointer returns to zero	B1
	(ii)	greater deflection (of pointer)	B1
		pointer deflects in opposite direction and returns to zero **OR** deflects for shorter time	B1
			[Total: 5]

5	**(a**		changing (magnetic) flux	B1
			induces e.m.f. in secondary IGNORE induces current	B1
			no change of flux with constant supply voltage / d.c.	B1
	(b)	**(i)**	$I_1V_1 = I_2V_2$ in any form **OR** I_2V_2/V_1	C1
			(I_2 = 1.2 × 12/120 =) 0.12 A	A1
		(ii)	transformer 100% efficient **OR** has no (heat/energy) losses **OR** output power = input power	B1

[Total: 6]

6	**(a**	**(i)**	(magnetic field) lines closer together / denser / more lines	B1
		(ii)	(magnetic field (lines) direction reversed	B1
	(b)	**(i)**	ammeter needle deflects / reading on ammeter	B1
			(magnetic) field cuts coil **OR** changing (magnetic) field	B1
			(electromagnetic) induction	B1
		(ii)	deflection / reading on ammeter smaller **OR** lasts longer	B1
			slower rate of cutting field lines **OR** slower rate of change of field	B1

[Total: 7]

7 **(a)** at least 3 concentric circles centred on wire B1
arrows clockwise on each circle / at least one circle B1
spacing of circles increasing as radius increases B1

(b) arrow pointing down on side AB, up on side CD B1

(ii) forces on AB and CD are opposite OR up and down and separated / not in same line (so cause rotation)
OR have moments in same sense / direction
OR cause couple / torque B1

(iii) to reverse current in loop or keep current in AB or CD in the same direction
OR keep current on side near a pole in the same direction when (plane of) coil is vertical
OR every half turn
OR when AB and CD swap sides B1
so that:
rotation continues (in same direction)
OR so that rotation doesn't reverse its direction
OR to maintain sense/direction of moments/couple
OR coil turns more than half a revolution B1

[Total 7]

8 **(a** first box only ticked in each line 2 × B1 [2]

(b) **(** output/V/I/power increases M1
greater (rate of change of) field/flux
OR sensible reference to V_1 / V_2 = N_1 / N_2 OR V_1 proportional to V_2 A1 [2]

(ii) output/V/I/power zero M1
accept nothing happens **NOT** no change
field/flux does not change
ignore transformers only work with a.c./don't work with d.c. A1 [2]
special case for answer about what happens at moment of switching on/off:
correct statement of some output etc. for short time M1
change of field/flux A1

[Total: 6]