Mark scheme

Electromagnetic effects

Physics 0625 · Questions from Paper 3 and Paper 4

Total marks

78

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
6	7	8	8	5	8	8	8	10	10	**78**

Question 1 [6]

1(a)	any **three** from: current in relay coil produces magnetic field relay / switch R is closed heater connected to 120 V or switches on	**B3**
1(b)	$V_s / V_p = N_s / N_p$ in any form	**C1**
	(V_s =) (60 × 120) ÷ 480 OR 120 ÷ 8	**C1**
	15 (V)	**A1**

Question 2 [7]

2(a)(i)	arrow <u>up</u> from side WX of coil **AND** an arrow <u>down</u> from side YZ of coil	**B1**
2(a)(ii)	any **three** from: stronger / more powerful magnets smaller gap between coil and magnet(s) larger current in coil more coils / turns	**B3**
2(b)	$V_p / V_s = N_p / N_s$ **OR** ratio used	**C1**
	4000 ÷ (225 ÷ 4.5) OR (4000 × 4.5) ÷ 225 OR 4000 ÷ 50	**C1**
	80	**A1**

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Question 3 [8]

3 **(a)**	V_1/V_2 or N_1/N_2 or V_1/N_1 or V_2/N_2 in any form substitution correct **and seen** 25 turns	Allow full credit for use of 25 turns to give 12V, with working seen	C1 **M1** A1
	Y and Z (either order)		B1
(b)	240 (V)		B1
(c)	core iron NOT steel		B1 B1
(d)	good conductor OR low resistance OR to reduce heating OR for high efficiency IGNORE good/bad conductor of heat		B1 [8]

Question 4 [8]

4(a)	relative movement (between conductor and magnetic field) And any **two** from: connect conductor/coil to (sensitive) meter use of magnet/magnetic field	**B1**
	deflection on meter (indicates emf) OR voltage generated OR current in conductor	**B2**
4(b)(i)	(soft-) iron	**B1**
4(b)(ii)	more turns on output coil (than input coil) ora	**B1**
4(b)(iii)	Vs / Vp = Ns / Np in any form	**C1**
	Vs / 12 = 300 / 20 OR Vs = (300 / 20) × 12 OR Vs = 15 × 12 OR 12 / 20 = ? / 300	**C1**
	180 (V)	**A1**

Question 5 [5]

5(a)	(pole A:) N AND (pole B:) S	**B1**
5(b)	vertical	**B1**
	up	**B1**
5(c)	vertical	**B1**
	down	**B1**

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Question 6 [8]

6(a)(i)	anti-clockwise (seen from brushes)	**M1**
	I correctly described	**A1**
	F down on left / up on right	**A1**
6(a)(ii)	arrow labelled correct direction on coil	**B1**
6(a)(iii)	electrons –ve OR repelled from –ve connection of supply	**B1**
6(b)(i)	rotates in opposite direction	**B1**
6(b)(ii)	turns faster OR greater moment / turning effect	**B1**
6(b)(iii)	turns faster OR greater moment / turning effect	**B1**

Question 7 [8]

7(a)(i)	magnetic field mentioned			**B1**
	coil / wire cuts (magnetic) field **OR** changing (magnetic) field (through coil)			**B1**
	e.m.f. / voltage induced **OR** produced by electromagnetic induction			**B1**
7(a)(ii)	(plane of coil) horizontal **OR** in position shown in diagram coil cutting magnetic field the fastest			**B1** **B1**
7(b)	current in coil	**OR**	energy supplied to / lost from lamp	**B1**
	current in (magnetic) field experiences a force		student must do more work / supply more energy / more energy needed	**B1**
	opposes the change causing it		greater force to do more work	**B1**

Question 8 [8]

8(a)(i)	three concentric circles centred on X	**B1**
	second and third circles further apart than first and second circles	**B1**
	direction of arrows clockwise	**B1**
8(a)(ii)	strength of magnetic field increases	**B1**
	its direction reverses	**B1**
8(b)	any three from: • $P = I^2R$ **OR** power (loss) = I^2R • (high voltage allows) low current (so at same power output, less power / energy lost) • thin wires have high resistance (so more power / energy lost) • (low) current has a greater effect (on efficiency) than (high) resistance (of the thin wires)	**B3**

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Question 9 [10]

9(a)(i)	(A is carbon) brushes	**B1**
	(B is) slip rings	**B1**
9(a)(ii)	strengthens the magnetic field (of the magnet)	**B1**
9(b)	graph is sinusoidal with positive and negative e.m.f.	**B1**
	graph shows minimum of one cycle completed in 0.5 s	**B1**
	e.m.f. is a maximum at 0.00 s, curves to a minimum at 0.25 s and curves to maximum at 0.50 s **OR** e.m.f. is a minimum at 0.00 s and curves to a maximum at 0.25 s and curves to a minimum at 0.50 s braille: e.m.f. starts at time zero at either maximum or minimum value	**B1**

9(c)(i)	**either:** less power loss (for same power transmission) **AND** (because) $P = I^2R$ **OR** low current (for same power transmission) **AND** (allows) thinner / cheaper cables	**A2**
	any **one** from: • less power loss (for same power transmission) • $P = I^2R$ • low current (for same power transmission) • thinner / cheaper cables	C1
9(c)(ii)	5400	**A2**
	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$ **OR** $(N_s =)\ \frac{N_p V_s}{V_p}$ **OR** $(N_s =)\ \frac{450 \times 300\,000}{25\,000}$	C1

Question 10 [10]

10(a)	(soft) iron	**B1**
10(b)(i)	(at least) one complete field line between the poles of the bar (either above or below the bar)	**B1**
	no crossing **AND** attempt at correct shape **AND** at least six lines from / to poles	**B1**
	at least **one** arrowhead towards S pole	**B1**
10(b)(ii)	current (in the coil) decreases	**B1**
	(current decreases so magnetic field) strength decreases	**B1**
	(field strength decreases so) fewer field lines (in same area) **OR** (field strength decreases so) field lines further apart	**B1**
10(c)	*Any two from:* 1 (changing resistance causes) changing current (through solenoid) 2 (changing current causes) changing magnetic field (around solenoid) 3 (square) coil cuts (changing) magnetic field **OR** coil in changing magnetic field	**B2**
	e.m.f. induced (between terminals)	**B1**

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