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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electric Current — Paper 1

Worked Answer Key (Multiple Choice)

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Electric Current — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **Electric Current (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team using the standard relations $Q = It$, $V = IR$ (Ohm's law), $P = VI$, *energy* = VIt, and the resistance rule $R \propto$ *length* / *area*. Calculations use the data given in each question. Use this key to mark your work and to see the one-line reasoning behind each correct letter. The compilation is split into two parts — note that the exam-paper question numbering restarts in each part.

Part A · Electrical Quantities (charge, current, voltage, resistance, power, energy)

Q #	Exam reference	Answer	Brief working / reason
A1	M/J 16 P11	**D**	Q = It. Time = 4.0 min = 240 s, so Q = 2.0 × 240 = **480 C**.
A2	M/J 16 P11	**D**	One volt = one joule per coulomb (V = energy/charge, J/C). → **one joule per coulomb**.
A3	M/J 16 P11	**A**	R ≈ 5 Ω. The meter ranges should match the expected readings and not be over-sized. With a 0–2 V supply the current is at most 2/5 = 0.4 A, which fits the 0–0.5 A range neatly → **0–2 V and 0–0.5 A**.
A4	M/J 16 P12	**A**	I = Q/t. Time = 3.0 min = 180 s, so I = 45/180 = **0.25 A**.
A5	M/J 16 P12	**C**	Power of a lamp needs the current *through* it (ammeter in series with the lamp) and the p.d. *across* it (voltmeter in parallel with the lamp). Only circuit **C** places the voltmeter across the lamp and the ammeter in series with it.
A6	M/J 17 P11	**A**	Charge per minute = 3 × 20 = 60 C in 60 s. I = Q/t = 60/60 = **1.0 A**.
A7	M/J 17 P12	**C**	I = V/R = 6.0/3.0 = 2.0 A. Q = It = 2.0 × 60 = **120 C**.
A8	M/J 17 P12	**C**	To find R = V/I the ammeter must be in series with R (reads R's current) and the voltmeter in parallel with R only (reads R's p.d.). Circuit **C** does this correctly.
A9	M/J 18 P12	**C**	Units: It = charge (C), I^2R = power (W), V^2/R = power (W). Only **VIt** = power × time = energy (J).
A10	M/J 19 P11	**D**	V = energy/charge = J/C, and also V = power/current = W/A. The matching combination is **watt / ampere**.
A11	M/J 19 P11	**A**	A device that measures current is an ammeter, drawn as a circle with the letter A → symbol **A**.
A12	M/J 19 P12	**A**	The variable resistor is in parallel with the motor, and the two lamps are in series with that pair. Raising the variable resistance raises the total resistance, so the total current (through the lamps) falls →

Q #	Exam reference	Answer	Brief working / reason
			lamps dimmer. More of the branch current is now forced through the motor → motor turns faster. → **lamps dimmer, motor faster**.
A13	M/J 19 P12	**B**	Take I = 2 A, V = 10 V, R = V/I = 5 Ω — these are self-consistent (A, C and D can all be correct). But e.m.f. is measured in *volts*, not joules, so "the e.m.f. *E* is 12 J" **cannot** be correct → **B**.
A14	M/J 20 P11	**A**	The unit of e.m.f. is the volt = **J/C**. For identical cells in *parallel* the battery e.m.f. equals that of just one cell (only their current capacity adds, not their e.m.f.). The row giving J/C together with "the e.m.f. of one of the cells" is **A**.
A15	O/N 16 P12	**C**	To find power of a heater: ammeter **in series** (to read the current) and voltmeter **in parallel** (to read the p.d.) → row **C**.
A16	O/N 17 P11	**B**	The voltmeter must be in parallel across the lamp and the ammeter in series with it. Circuit **B** has the voltmeter connected across the lamp and the ammeter in series in the loop.
A17	O/N 18 P11	**D**	Work done = QV = charge × e.m.f. = 2.0 × 10 = **20 J**.
A18	O/N 18 P12	**D**	To measure resistance, connect the **voltmeter in parallel** and the **ammeter in series** with the conductor, then R = V/I → option **D**.
A19	O/N 18 P12	**C**	P = energy/time = 240/0.010 = 24 000 W. I = P/V = 24000/2000 = **12 A**.
A20	O/N 19 P12	**B**	A = single cell, C = a.c. supply, D = battery (cells) — all are sources. **B** is a voltmeter, a measuring instrument, so it does **not** represent a power source.
A21	O/N 20 P12	**C**	A battery stores chemical **energy**, whose unit is the joule (J) → **energy, J**.
A22	O/N 20 P12	**B**	Two lamps in parallel ⇒ total current = 2 × 4.0 = 8.0 A. t = Q/I = 150 000/8.0 = 18 750 s = 18750/3600 = **5.2 hours**.

Part B · Resistance and Resistivity

Q #	Exam reference	Answer	Brief working / reason
B1	M/J 16 P11	**B**	On a V–I graph, gradient = V/I = resistance. P is the steeper line, so **P has the greater resistance**. Same material and length ⇒ R ∝ 1/A, so the higher-resistance wire has the *smaller* area; the larger area belongs to **Q**. → greater R = P, larger area = Q → row **B**.
B2	M/J 18 P11	**D**	R ∝ length / area. Wire Y has 2× length and ½ area, so R_Y = R × (2)/(½) = **4R**.
B3	M/J 19 P11	**D**	For a metal wire (ohmic) the V–I graph is a straight line through the origin; its gradient V/I is the **resistance of the wire**.

Q #	Exam reference	Answer	Brief working / reason
B4	M/J 20 P12	**C**	R ∝ length / area. Second wire: 2× length, 4× area ⇒ R_2 = R × (2)/(4) = **R/2**.
B5	O/N 18 P11	**A**	For a fixed resistor (ohmic, constant R), I ∝ V, so the I–V graph is a straight line through the origin → graph **A**.
B6	O/N 18 P11	**D**	R = ρl/A, so R ∝ l/A. Going from (l = 0.50 m, A = 1.0×10^{-6} m²) to (l = 2.0 m, A = 0.50×10^{-6} m²) multiplies R by (2.0/0.50) × (1.0/0.50) = 4 × 2 = 8. R = 0.75 × 8 = **6.0 Ω**.
B7	O/N 19 P12	**A**	As the thermistor warms its resistance *falls*, so V = IR rises less and less steeply: the V–I curve bends over (concave down, gradient decreasing) → graph **A**.

Note from Megalecture. These are original Megalecture worked solutions prepared for revision use. Watch the part headings: the exam question numbers reset between "Electrical quantities" and "Resistance and resistivity". For all numerical items the working uses the figures printed in each question (with charge in coulombs, time in seconds and so on).