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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Electric Circuits — Paper 1

Worked Answer Key (Multiple Choice)

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Electric Circuits — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **D.C. Electric Circuits (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team — series and parallel resistance combinations and all circuit calculations were verified independently (no Cambridge mark scheme was used). Where helpful, take all identical components to have equal resistance and treat ammeters as having zero resistance and voltmeters infinite resistance, as is standard at this level. Use this key to mark your work and to see the one-line reasoning behind each correct letter.

D.C. Circuits · Questions 1–18

Q #	Exam reference	Answer	Brief working / reason
1	M/J 16 P11	**C**	Same cell and lamp in each circuit, so the brightest lamp carries the largest current, i.e. the circuit with the **lowest total resistance**. A = R + lamp; B = 2R + lamp; C = (R‖R = R/2) + lamp; D = R + (R‖R = R/2) + lamp. Smallest extra resistance is in **C** (only R/2), so the lamp is brightest in **C**.
2	M/J 16 P12	**A**	Three 1.5 V cells in parallel. Identical cells in parallel keep the e.m.f. at **1.5 V** (not 4.5 V), but the larger total charge stored means the battery can **supply current for a longer time** than a single cell → option A.
3	M/J 16 P12	**A**	The 6.0 V is across two parallel branches. Top branch = two equal resistors with point A at the midpoint, so A sits at 3.0 V below the top rail. Lead K is on the top rail (6.0 V). Voltmeter reads $V_K - V_A = 6.0 - 3.0 =$ **3.0 V** → connect L to point **A**.
4	M/J 17 P11	**C**	Identical cells in parallel have the **same** e.m.f. as one cell, but the combined charge capacity (and reduced internal resistance) means the battery **lasts longer** than a single cell → option C.
5	M/J 19 P11	**C**	X and Y share high-resistance transmission wires. Switching X **off** reduces the total current, so less voltage is dropped in the wires and **more voltage reaches lamp Y**. Greater voltage across Y means greater power, so both the **voltage and the power supplied to Y increase** → option C.
6	M/J 19 P12	**D**	The variable resistor is in series with the rest of the circuit. Increasing its resistance increases the total resistance, so the supply current falls. The lamps get dimmer and the motor turns more slowly → **"lamps dimmer and motor rotates more slowly."**
7	M/J 20 P12	**C**	Ammeter X is in the main line (reads the total current). The switch is connected in **parallel** with the branch containing the lower resistor and ammeter Y. Closing the switch provides a near-zero-resistance bypass:

Q #	Exam reference	Answer	Brief working / reason
			the total resistance falls so **X increases**, while almost all the current now goes through the switch instead of Y, so **Y decreases** → option C.
8	O/N 16 P12	**B**	In a series circuit the same current passes through every component, so **"the current is the same in all resistors connected in series"** is correct (B). In parallel the voltage is shared equally, not the current.
9	O/N 17 P11	**C**	Two identical 2.0 V cells in parallel: the e.m.f. of the battery stays at **2.0 V**. By symmetry each identical cell delivers the same current, so **$I_1 = I_2$** → row C.
10	O/N 17 P12	**A**	The two middle resistors are in parallel, so voltmeters 1 and 2 read the same: $V_2 = V_1 =$ **2.0 V**. That parallel pair is in series with the bottom resistor across the 6.0 V supply, so $V_3 = 6.0 - 2.0 =$ **4.0 V** → row A.
11	O/N 18 P11	**B**	Three identical resistors in series share the e.m.f. equally. Voltmeter Q across **two** of them reads 8.0 V, so each resistor drops 4.0 V. Voltmeter P (across one resistor) reads **4.0 V**, and the cell e.m.f. = 3 × 4.0 = **12 V** → row B.
12	O/N 18 P12	**D**	Three 6.0 Ω resistors. All in series = 18 Ω (largest). All in parallel = 6/3 = 2.0 Ω (smallest). Difference = 18 − 2 = **16 Ω** → option D. (Check: the other shown nets give (6+6)‖6 = 4 Ω and 6 + (6‖6) = 9 Ω, both inside this range.)
13	O/N 19 P11	**B**	Identical wording to Q8: the current is the same through every resistor in a **series** circuit → option B.
14	O/N 19 P11	**A**	Greatest ammeter reading = lowest total resistance. A: 2‖4‖4 = 1.0 Ω. B: (2‖4) + 4 = 5.33 Ω. C: (4‖4) + 2 = 4.0 Ω. D: 2 + 4 + 4 = 10 Ω. The smallest resistance is arrangement **A** (1.0 Ω), giving the greatest current.
15	O/N 19 P12	**B**	At fixed mains voltage, power $P = V^2/R$, so the lowest resistance gives the highest power. Position 1 (series) = 2R → lowest power = **low**. Position 3 (one resistor) = R → **medium**. Position 2 (parallel) = R/2 → highest power = **high**. So low = 1, medium = 3, high = 2 → row B.
16	O/N 20 P11	**C**	X and Y are in series across 10 V, with $R_Y = 4R_X$. The voltage divides in the ratio of resistance, so $V_X = 2.0$ V and $V_Y = 8.0$ V. Difference $V_Y - V_X = 8.0 - 2.0 =$ **6.0 V** → option C.
17	O/N 20 P11	**D**	Two identical resistors in parallel give R/2 = 4.0 Ω, so each resistor R = 8.0 Ω. In series the total is R + R = 8.0 + 8.0 = **16 Ω** → option D.
18	O/N 20 P11	**D**	I_1 is in the main line, so it carries the total current: $I_1 = I_2 + I_3$. The two parallel branches are a single lamp (I_2) and two lamps in series (I_3); the two-lamp branch has the higher resistance, so $I_2 > I_3$. Hence **$I_1 > I_2 > I_3$** → option D.

Note from Megalecture. Two items in this compilation repeat earlier questions word-for-word (Q13 repeats Q8 on series/parallel current and voltage). They are answered consistently above. All resistance combinations and circuit potentials were checked independently. These are original Megalecture worked solutions prepared for revision use.