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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Uses of an Oscilloscope — Paper 1

Worked Answer Key (Multiple Choice)

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Uses of an Oscilloscope — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **Uses of an Oscilloscope (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team. Oscilloscope items use *time read from the time-base* (time = divisions × time-base setting), *voltage read from the Y-gain* (V = divisions × Y-gain setting) and *frequency f = 1/T*; the speed of sound is taken as stated in each question. Use this key to mark your work and to see the one-line reasoning behind each correct letter. The compilation is organised into two parts, matching the original file — keep your eye on the part heading, as the exam-paper question numbering restarts in each part.

Part A · Thermionic Emission, Cathode-Rays & Uses of an Oscilloscope

Q #	Exam reference	Answer	Brief working / reason
A1	M/J 16 P12	**C**	The hot filament emits **electrons** (negative), so the attracting plate must be **positive**. Thermionic emission needs a **high** filament temperature → positive plate, high temperature.
A2	M/J 18 P11	**B**	Sound and echo peaks are **8 divisions** apart; each division = 0.01 s, so the round-trip time = 8 × 0.01 = 0.08 s. Distance to wall = v t / 2 = 300 × 0.08 / 2 = **12 m**.
A3	M/J 18 P12	**C**	With the time-base on, a d.c. input gives a **horizontal line**. Deflection = V / Y-gain = 1.5 / 0.5 = **3 divisions**, so the line sits 3 divisions above the centre → trace **C**.
A4	O/N 16 P11	**A**	The bright spot is moved by the electric field between the deflecting plates P and Q. To shift the spot you must **apply a voltage (p.d.) between plates P and Q**.
A5	O/N 17 P11	**B**	A hot metal filament releases **electrons** by thermionic emission.
A6	O/N 18 P11	**A**	The trace covers 8.0 cm in 24 ms, so 1.0 cm ≡ 3.0 ms. The peaks are 3.0 cm apart = 9.0 ms for the round trip; time to reach the wall = half of this = **4.5 ms**.
A7	O/N 18 P12	**C**	With a d.c. input and the **time-base off**, the spot is deflected only vertically (no horizontal sweep), giving a **vertical line** → trace **C**.
A8	O/N 19 P11	**C**	A continuous electron flow needs a **hot filament** (1) to release electrons and a **high positive potential** (3) to pull them away. A gas or magnetic field is not required → **1 and 3**.
A9	O/N 19 P11	**C**	Pulse height = 2 cm (the "1 cm" marker is one square), so v = Y-gain × height = 2 × 2 = **4 V**. One full cycle (on + off) = 2 cm, so T = 2 × 0.01 = 0.02 s and f = 1/T = **50** → v = 4, f = 50.

Q #	Exam reference	Answer	Brief working / reason
A10	O/N 20 P12	**A**	The trace is a sine wave swinging both sides of the centre line, so the signal is **a.c.** Amplitude (peak deflection) = 1.5 divisions, so amplitude = 1.5 × 2 = **3 V** → a.c., 3 V.

Part B · Action and Use of Circuit Components

Q #	Exam reference	Answer	Brief working / reason
B1	M/J 16 P11	**A**	The component that conducts in one direction only is the **diode** (triangle + bar) → symbol **A**. (B is a lamp, C is a fuse, D is a different component.)
B2	M/J 16 P11	**B**	V across the LDR = 6.0 × R_{LDR} / (R_{th} + R_{LDR}). This is smallest when R_{LDR} is small (bright/**light**: 500 Ω) and R_{th} is large (**cold**: high Ω) → **cold and light**.
B3	M/J 16 P12	**B**	Series divider: V_1 across the fixed 6.0 Ω, V_2 across R. Raising R increases its share of 6.0 V, so **V_1 decreases and V_2 increases**.
B4	M/J 17 P11	**C**	V_{LDR} = 2.0 V means R_{LDR} is one third of the total, i.e. R_{th} = 2 R_{LDR}. This fits warm room (R_{th} = 1000 Ω) with bright light (R_{LDR} = 500 Ω): V = 6 × 500/1500 = **2.0 V** → warm room, bright light.
B5	M/J 18 P11	**A**	Largest current needs the smallest total resistance, so both components must have low resistance: thermistor **hot** (high temperature) and LDR in **bright light** → high temperature, in bright light.
B6	M/J 18 P11	**B**	R is in parallel with the lower resistor. Increasing R raises the lower combined resistance, so it takes a larger share of the supply: **V_1 (upper) decreases and V_2 (lower) increases**.
B7	M/J 18 P12	**D**	An LDR is drawn as a resistor (rectangle) with two arrows pointing **in** towards it (light falling on it) → symbol **D**. (A is an LED; B is a thermistor; C is a variable resistor.)
B8	M/J 19 P11	**D**	The starter-motor circuit carries a very large current (100 A), so it needs short, thick (low-resistance) wires; the ignition-switch circuit carries only 1 A → **the ignition switch circuit carries a smaller current than the starter motor circuit**.
B9	M/J 19 P11	**A**	To recharge, current must flow **into** the battery's + terminal. Only a single series diode pointing towards + (as in **A**) lets current flow that way during the correct half-cycle; B drives current the wrong way, and C/D place the diode in parallel.
B10	O/N 16 P11	**D**	Bands yellow–violet–orange = 4, 7, then ×10^3: R = 47 × 1000 = **47 000 Ω**.
	O/N 16 P12		

Q #	Exam reference	Answer	Brief working / reason
B11		C	As temperature falls, the thermistor's resistance **increases**. It then takes a larger share of the supply, so the p.d. across the fixed resistor (the voltmeter reading) **decreases** → resistance increases, voltmeter reading decreases.
B12	O/N 17 P11	B	An LED conducts (and lights) only when forward biased — current in one direction. The triangle points to the right, so it emits light only when the current is **towards the right only**.
B13	O/N 17 P12	A	A thermistor's resistance rises when it gets colder (decrease in temperature); an LDR's resistance rises when it gets darker (decrease in brightness) → **decrease in temperature and decrease in brightness**.
B14	O/N 18 P12	D	Least resistance needs both components at low resistance: thermistor **hot** (low R) and LDR in **light** (low R) → **hot and light**.
B15	O/N 19 P11	A	A diode in series gives **half-wave rectification**: only one polarity passes, the blocked half is flat at the zero line. The trace is positive humps separated by flat sections → trace **A**.
B16	O/N 20 P11	C	(Same set-up as B4.) V_{LDR} = 2.0 V needs R_{th} = 2 R_{LDR}: warm room (1000 Ω) with bright light (500 Ω) gives 6 × 500/1500 = **2.0 V** → warm room, bright light.
B17	O/N 20 P12	C	Equal X and Y give output = 6 V across Y. Halving X makes output = 12 × Y/(½X + Y) = 12 × 1/1.5 = 8 V. Change = 8 − 6 = **+2.0 V**.

Note from Megalecture. This compilation combines two syllabus areas that share the same file ("thermionic emission / cathode-rays / oscilloscope" and "action and use of circuit components"); the exam-paper question numbers restart in each part, so we have labelled them A1–A10 and B1–B17. Items B4 and B16 are the same potential-divider question repeated, and are answered consistently above. These are original Megalecture worked solutions prepared for revision use.