A-Level Physics: **w25 11**

Question 35 (Answer: **D**)

- Adding an identical resistor in parallel halves the external resistance.
- The total circuit resistance falls, so the battery current rises – the ammeter reads more.
- A larger current through r means a larger p.d. across it, so both quantities increase.

A-Level Physics: **w25 12**

Question 34 (Answer: **D**)

- E.m.f. is the total energy the cell converts per unit charge.
- So EQ is the *total* energy, including what is dissipated inside the cell itself.
- The external circuit receives only VQ, which is less by the I^2r lost internally.

A-Level Physics: **w25 14**

Question 33 (Answer: **A**)

- A potentiometer uses all three terminals: the whole track across the supply, and the slider as the output.
- The ammeter has to be in series with the LDR so that the LDR's current passes through it.
- So look for the track connected across the supply with the ammeter in the LDR branch.

Question 37 (Answer: **A**)

- Closing the switch brings the second resistor into the circuit in parallel, lowering the external resistance.
- A lower total resistance means a larger current from the battery.
- More current means more lost across r, so the terminal p.d. the voltmeter reads falls.

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5(a)	sum of current(s) into junction = sum of current(s) out junction **or** (algebraic) sum of current(s) at a junction is zero
5(b)(i)	$(V =)\ E - Ir$
	$(V =)\ 5.0 - (38 \times 10^{-3} \times 4.7) = 4.8$ (V)
5(b)(ii)	$R_{(Z)} = 120\ \Omega$
	$I_2 = 38 \times 10^{-3} - (4.8 / (100 + 120))$
	$I_2 = 0.016$ A
	or
	$R_{(Z)} = 120\ \Omega$
	$R_{(EXT)} = 4.8 / 38 \times 10^{-3}$ $(= 126\ \Omega)$ $1 / R_{(Y)} = 1 / 126 - 1 / (120 + 100)$ $(R_{(Y)} = 297\ \Omega)$ $I_2 = 4.8 / 297$
	$I_2 = 0.016$ A

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5(b)(iii)	$P = IV$ **or** $P = I^2R$ **or** $P = V^2 / R$
	$P = 0.016 \times 4.8$ **or** $P = 0.016^2 \times (4.8 / 0.016)$ **or** $P = 4.8^2 / (4.8 / 0.016)$ $P = 0.077$ W
5(b)(iv)	resistance of the LDR / Z increases (as light intensity decreases)
	total resistance (of the circuit) increases **or** current in the battery decreases
	(potential difference across the internal resistor decreases so) the terminal potential difference increases

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Question 37 (Answer: **C**)

- The terminal p.d. obeys $V = E - Ir$, so a graph of V against I is a straight line of gradient $-r$.
- The line falls from 1.6 V at zero current to zero at 80 mA.
- $r = 1.6/(80 \times 10^{-3}) = 20\ \Omega$; B is the intercept, which is the e.m.f., not a resistance.

A-Level Physics: **s25 12**

Question 35 (Answer: **D**)

- With $2.0R$ the current is $E/3.0R$ and the terminal p.d. is $\frac{2}{3}E$.
- With $4.0R$ the total is $5.0R$, so the current falls to $E/5.0R$.
- Less current means less lost across the internal $1.0R$, so the terminal p.d. rises to $\frac{4}{5}E$.

A-Level Physics: **s25 13**

Question 36 (Answer: **C**)

- The terminal p.d. is $V = E - Ir$.
- E and r are properties of the battery and do not change when the resistor is adjusted.
- A larger I means a larger Ir lost inside, so V falls.

A-Level Physics: **s25 14**

Question 33 (Answer: **A**)

- The cell has negligible internal resistance, so anything connected straight across it always gets the full e.m.f.
- A lamp in parallel with the variable resistor therefore keeps the same p.d. however the resistor is set.
- Same p.d. across the same lamp means the same power; in the other circuits the resistor takes a share of the lamp's current or voltage.

Question 34 (Answer: **B**)

- A loudspeaker (the horn), a bell and a buzzer (the two dome shapes) all work by pushing a diaphragm against the air.
- That is why each of their symbols opens outwards – the shape represents the radiating surface.
- The remaining symbol is a plain rectangular element with no diaphragm, so it is not designed to emit sound.

Question 36 (Answer: **B**)

- With the switch open no current flows, so nothing is lost across r and $V = E$.
- Closing the switch drives a current, so now Ir is dropped inside the cell.
- The terminal p.d. falls to $V = E - Ir$.

7(a)(i)	(V =) 1.50 – 1.36 (= 0.14 V)
	current = V / R = 0.14 / 0.28 = 0.50 A
7(a)(ii)	resistance = V / I
	= 1.36 / 0.50 = 2.7 Ω
7(a)(iii)	R = 2.7 – 1.0 = 1.7 Ω
7(b)(i)	two resistors correctly shown in parallel with cell and no other components
7(b)(ii)	(external) resistance is now smaller **and** (so) current (in cell) is greater / (external) resistance smaller fraction of total resistance / internal resistance larger fraction of total resistance
	(greater p.d. across internal resistance so) terminal p.d. is less