Assess Quizzes from the o-book – Explanations for the answers.

Chapter 9 Review – Support

Q	Reason
1	When S_2 is closed the current flows through S_2 rather than through the high resistance of the bulb A. S_1 has to be closed for either bulb to light up.
2	If the switch S is open current will only flow in parts of the circuit that is not in series with S. In B, there is no switch in the circuit containing bulbs Q and R so they will light up, but not P
3	Kirchhoff's voltage law say that the voltage gains must equal the voltage losses, so it need to include a statement about the voltage gains in the cell. It must also make a correct statement about voltage losses and note that the voltage loss across XY is the same no matter which branch the current takes. You do not add the voltages of each branch.
4	KCL is about the current entering a junction being equal to the current leaving. The correct option says that the currents entering X = currents leaving X. However, the option that the current entering X = current leaving Y is true, it is not KCL as it involves two junctions.
5	$\frac{1}{R_{eq}} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ $R_{eq} = 2\Omega$ $R_{total} = 2 + 10 = 12\Omega$ [in series] $I = \frac{V}{R} = \frac{6}{12} = 0.50\,A$
6	Same circuit as in Q5 $\frac{1}{R_{eq}} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ $R_{eq} = 2\Omega$ $R_{total} = 2 + 10 = 12\Omega$ $I = \frac{V}{R} = \frac{6}{12} = 0.50\,A$ $V_{10\Omega} = IR_{10\Omega} = 0.50 \times 10 = 5.0\,V$

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7	$V_{12\Omega} = I_{12\Omega}R_{12\Omega}$ $V_{12\Omega} = 4 \times 12$ $V_{12\Omega} = 36V$ Current through 4Ω branch: $V_{4\Omega} = I_{4\Omega}R_{4\Omega}$ $I_{4\Omega} = \frac{V_{4\Omega}}{R_{4\Omega}} = \frac{36}{4} = 9\,A$ By Kirchhoff's current law: $I_{out} = I_{12\Omega} + I_{4\Omega} = 3 + 9 = 12\,A$
8	New data compared to Q7 $\frac{1}{R_{parallel}} = \frac{1}{12} + \frac{1}{4} = \frac{1+3}{12} = \frac{1}{3}$ $R_{parallel} = 3\Omega$ $R_{total} = 3 + 10 = 13\Omega$ $V_{total} = I_{total}R_{total}$ $= 2 \times 13 = 26V$
9	P = VI = 12.0 × 1.5 = 18 W
10	$P = VI = V \times \frac{V}{R} = \frac{V^2}{R}$ $= \frac{6^2}{2}$

Chapter 9 Review – Consolidate

Q	Reason
1	All would read 10 V. Some other values are CA, CB, DE = 0 V; BF, BD = 10 V.
2	There are 4 equal resistors across the 12 V so the PD across each resistor = 3 V. Thus A would read 3 V, B reads 3 V and C would read 6 V.
3	Total resistance:

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	$R = \frac{V}{I} = \frac{12}{1} = 12\Omega$ $R_{total} = R + R + 8\Omega$ $12 = R + R + 8\Omega$ $R = 2\Omega$
4	$W = P \times t = (I^2 R) \times t = (\frac{V}{R})^2 R \times t = \frac{V^2 Rt}{R^2} = \frac{V^2 t}{R}$
5	When L2 is added, the total resistance of the circuit increases, thus the current (I) decreases (assuming V remains the same). Hence, when the current (I) decreases the reading on the ammeter also **decreases**.

Chapter 9 Review – Extend

Q	Reason
1	$V_2 = V - V_1 = 18 - 12 = 6V$ $R_{L1} = \frac{V_1}{I} = \frac{12}{0.5} = 24\Omega$ $R_{L2} = \frac{V_2}{I} = \frac{6}{0.5} = 12\Omega$
2	$W = Pt = VIt$ $= 18 \times 0.5 \times 60 \times 60$ $= 32400J$
3	$I_A = \frac{V_A}{R_L}$ $I_B = \frac{2V_A}{R_L} = 2 \times I_A$ I_C is a hard one to work out. The PD across the right cell plus left cell equals $2V_A$. However, this PD is across the two bulbs. It doesn't matter if the bulbs are side-by-side or separated as they are in this circuit. The PD across each is the same and adds up to the PD across the two cells (KVL). We can calculate the current I_c: $I_C = \frac{V_C}{R_C} = \frac{2V_A}{2R_L} = \frac{V_A}{R_L} = I_A$ Thus, I_A and I_C are equal, and I_B is twice I_A. The order is then $I_A = I_c$, I_B

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4	$P = VI$ $V = \frac{P}{I} = gradient$ $V = \frac{40}{5} = 8V$
5	$R \propto \frac{L}{A}$ $R_A = \frac{2L}{\frac{A}{2}} = 4\frac{L}{A}$ $R_B = \frac{2L}{A} = 2\frac{L}{A}$ $R_C = \frac{L}{2A} = 0.5\frac{L}{A}$[smallest] $R_D = \frac{3L}{\frac{A}{2}} = 6\frac{L}{A}$ [largest]