Further electrical circuit questions
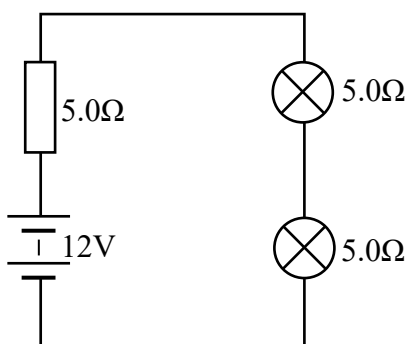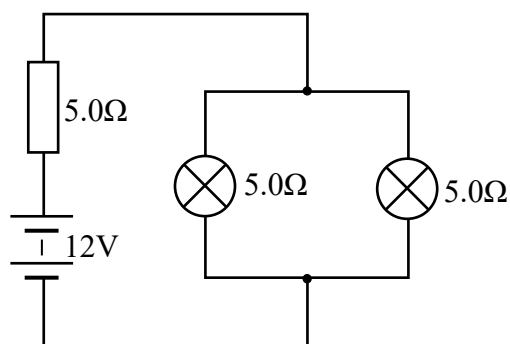
1. In the following circuits the lamps are identical.

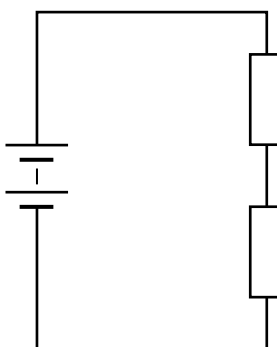circuit 1   circuit 2

(a) For circuit 1, calculate:
   (i) the current flowing though each lamp,
   (ii) the power dissipated in each lamp.

(b) For circuit 2, calculate the current flowing though each lamp.

(c) (i) Explain how the brightness of the lamps in circuit 1 compares with the brightness of the lamps in circuit 2.
   (ii) Explain why the battery would last longer in circuit 1.

(d) One of the lamps in circuit 2 breaks and no longer conducts.
   Describe and explain what happens to the brightness of the other lamps.
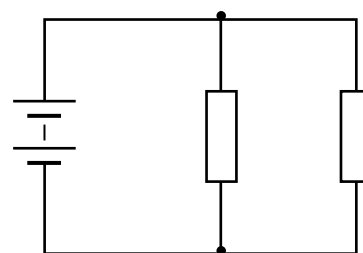
(0.8A, 3.2W; 0.8A; same, less current; brighter)

2. Two identical resistors can be connected to a power supply in two ways, circuit A, or circuit B.
   (i) In which circuit is the total power larger?
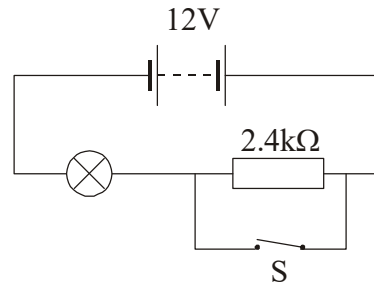   (ii) How many times larger is it?

(B, 4x)
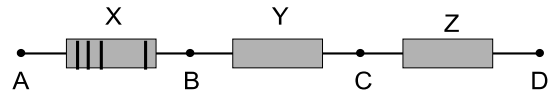

circuit A   circuit B

3. (a) Calculate the current in a 12V, 36W lamp when it is connected to a 12V supply:
       (i)   directly, *(3.0A)*
       (ii) in series with a 2.4k☒ resistor. *(5.0x10⁻³A)*

    (b) When the 2.4k☒ resistor is suddenly put into the circuit by opening switch S, the voltage across the lamp takes a few seconds to fall to its final value. Explain why this is so.

4. Three unknown components, X, Y and Z, are connected in series.
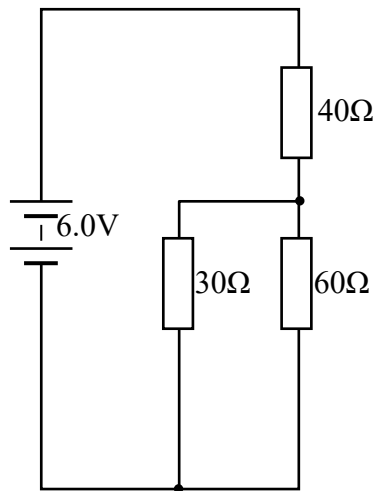   Component X is a resistor, with bands: brown, black, orange, silver.
    A battery is connected between A and D, first one way round, then the other. The table shows the results of connecting a voltmeter between AB, BC and CD.
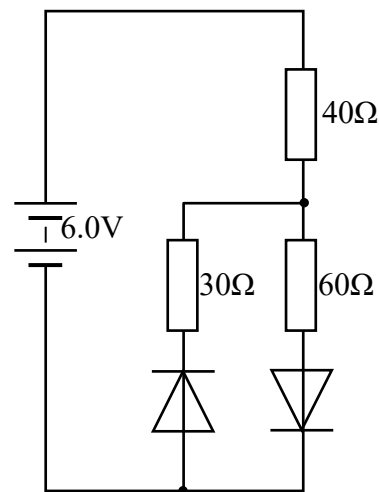
    Identify X, Y and Z as fully as you can. *(*ans @ end)*

	one way	other way
AB	2.6V	0V
BC	0.6V	–9V
CD	5.8V	0V

5.

(a)   (b)

(a) For the circuit (a), calculate:
    (i)   the current in the 30Ω resistor,
    (ii) the current in the 60Ω resistor,
    (iii) the voltage across the 40Ω resistor

(b) For the circuit (b), calculate:
    (i)   the current in the 30Ω resistor,
    (ii) the current in the 60Ω resistor,
   (iii) the voltage across the 40Ω resistor

(67mA, 33mA, 4.0V; 0A, 54mA, 2.16V)

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6. In this circuit, each resistor has a resistance of 100Ω.

    The battery voltage is 12V.

    (a) Calculate the voltage between C and F.

    (b) When a resistor R is connected between D and F, there is zero voltage between C and F.
        (i) Calculate the value of resistor R.
        (ii) Calculate the current that flows from the battery in this case.
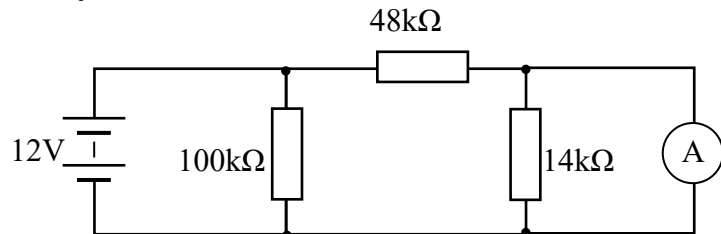
    (4V; 67Ω, 0.12A)
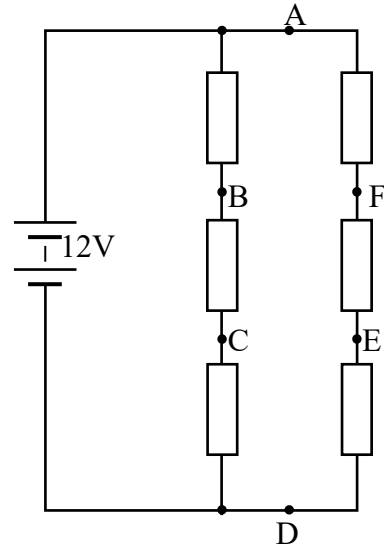
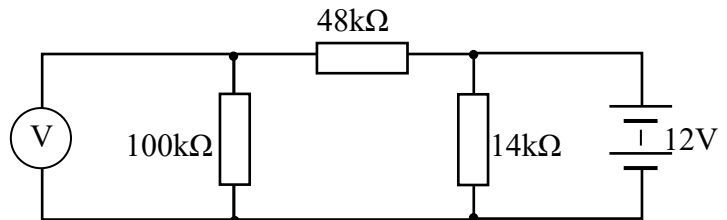7. This question is about detecting possible faults in the soldered joints of this circuit.
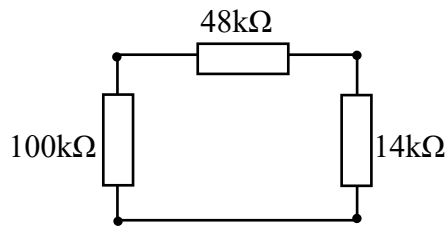
    (a) In the first test, a 12V supply and an ammeter were connected, as shown. Calculate the expected current in the ammeter.

    (b) The ammeter was then replaced by a voltmeter, which gave a reading of 2.7V. Show that this is the reading you would expect.

    (c) In the final test, the 12V supply and the voltmeter were connected as shown. This time, the voltmeter reading was almost 12V, showing a fault in the circuit connections. What was the fault?

    (0.25mA, 100kΩ not connected)

    *(Qu4:10kΩ, diode, 22kΩ)

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