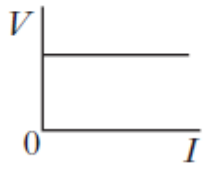
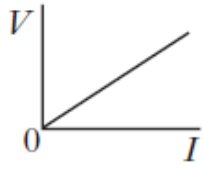
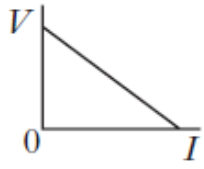
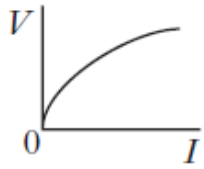
Homework 2 – Ohm's Law

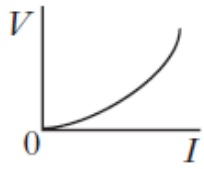
1. Identify which graph shows how the potential difference V across a resistor varies with the current I in the resistor.

A 

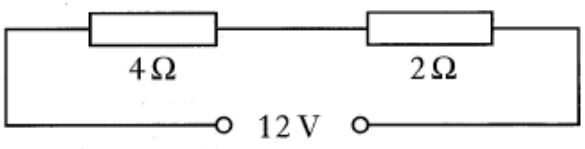
B 

C 

D 

E 

2. Two resistors are connected in series with a 12 V d.c. supply.

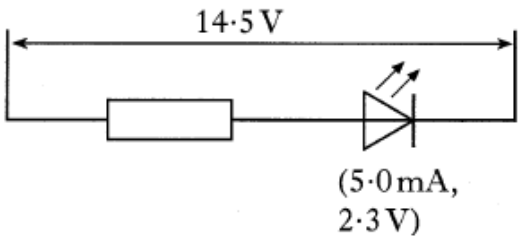


The current in the 2 Ω resistor is 2 A.

Which row in the table correctly gives the current in the 4 Ω resistor and the voltage across the 4 Ω resistor?

	Current (A)	Voltage (V)
A	1	4
B	1	12
C	2	8
D	2	12
E	4	8

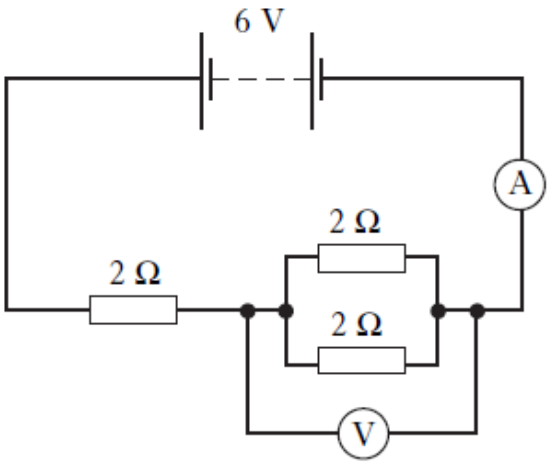
3. The supply voltage is 14·5 V. The current through the LED is 5·0 mA, when the potential difference across it is 2·3 V.



Calculate the value of the series resistor.

A 0·46 Ω
B 2·90 Ω
C 460 Ω
D 2440 Ω
E 2900 Ω

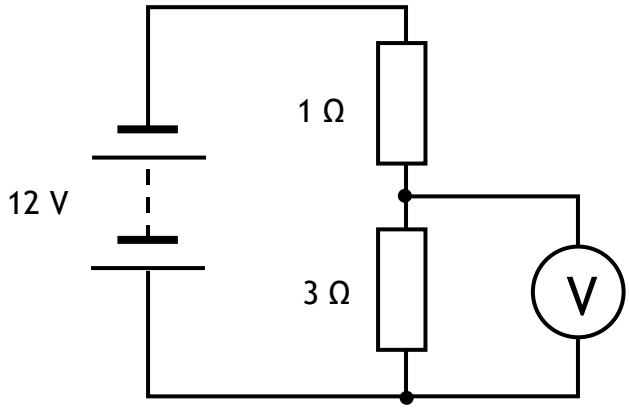
4. A circuit is set up as shown.



Identify which row in the table shows the readings on the meters.

	Reading on voltmeter (V)	Reading on ammeter (A)
A	2	2
B	2	1
C	3	2
D	4	1
E	4	2

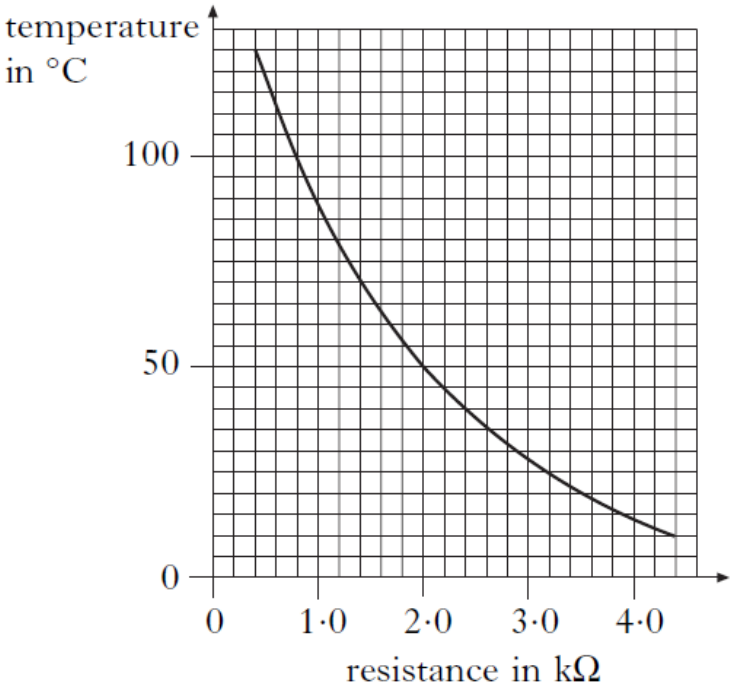
5. Consider the following circuit.



Calculate the reading on the voltmeter.

A 3 V
B 4V
C 8 V
D 9 V
E 12 V

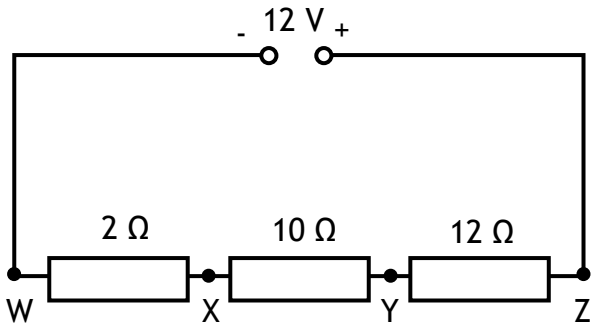
6. The graph below shows how the resistance of a thermistor varies with temperature.



The thermistor is connected in a circuit. At a temperature of 50 °C, the current in the thermistor is 4 mA.
Calculate the voltage across the thermistor at this temperature.

A 0·008 V
B 0·5 V
C 2 V
D 8 V
E 8000 V

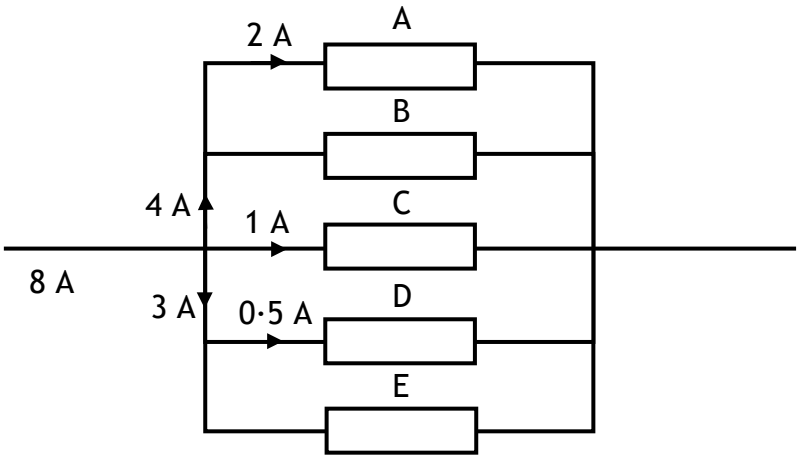
7. A circuit is set up as shown below.



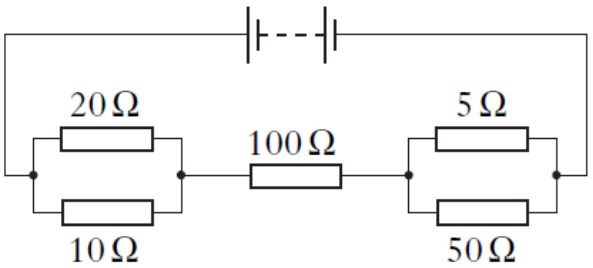
Calculate the potential difference between X and Y.

A 1·2 V
B 4·0 V
C 5·0 V
D 10·0 V
E 12·0 V

8. Identify the resistor in the diagram below with the smallest resistance.



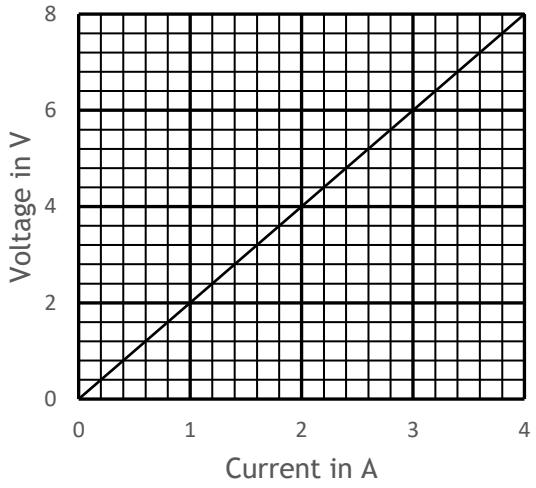
9. In the circuit shown below, the current in each resistor is different.



Identify which resistor the current is smallest in.

A 5 Ω resistor
B 10 Ω resistor
C 20 Ω resistor
D 50 Ω resistor
E 100 Ω resistor

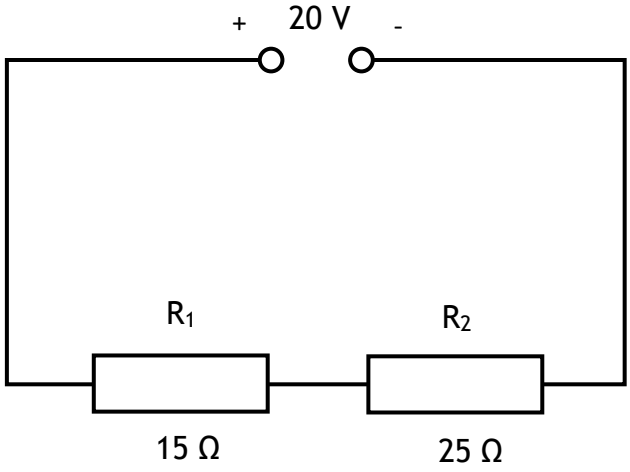
10. The graph below shows the relationship between the voltage across a resistor and the current in a resistor.



Calculate the resistance of the resistor.

A 0·5 Ω
B 2 Ω
C 4 Ω
D 12 Ω
E 15 Ω

11. A student connects two resistors in series with a power supply set at 20 V.

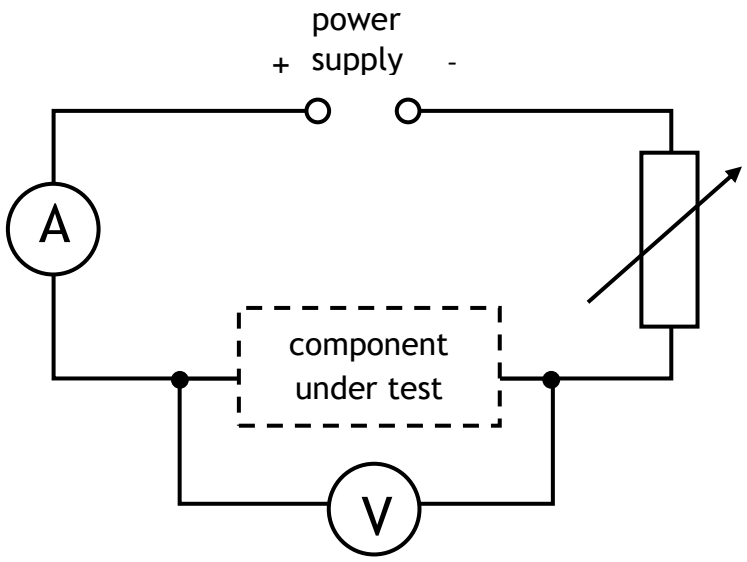


(a) Calculate the current in the circuit.

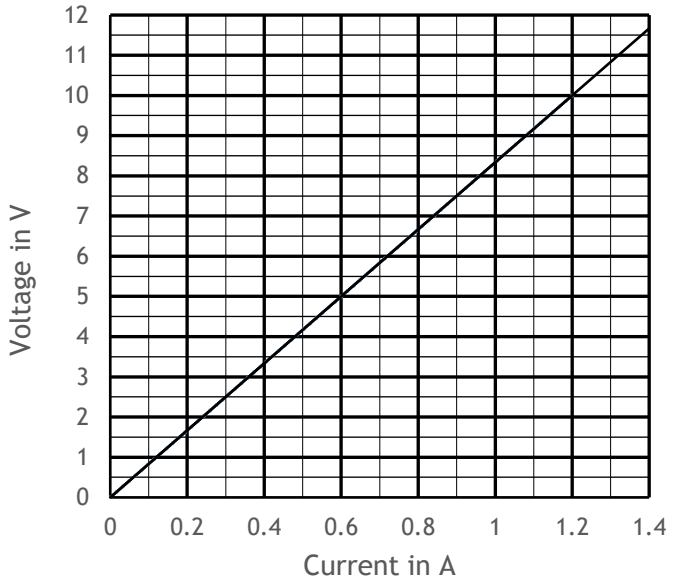
(b) Calculate the potential difference across resistor R_1.

(c) Redraw the circuit diagram showing meters correctly connected to measure the quantities in (a) and (b) above.

12. A student uses the circuit below in experiments to investigate how the voltage across different components varies when the current in the component is changed.



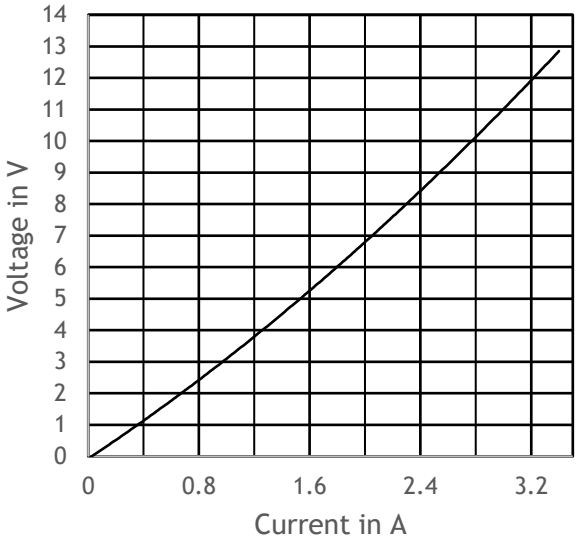
(a) The student places component X in the circuit and carries out the experiment.
The graph below shows how the voltage across component X varies with current.



(i) Calculate the resistance of component X when the current is 1·2 A.

(ii) Using information from the graph, explain what happens to the resistance of component X as the current is increased.
Justify your answer by calculation or otherwise.

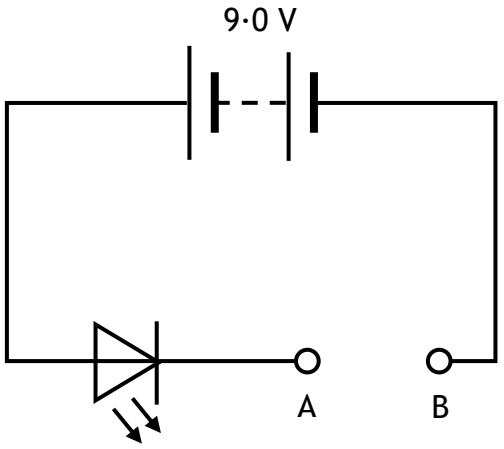
(b) The student replaces component X with component Y, repeats the experiment and obtains the following graph.



(i) The student concludes that the resistance of component Y is not constant. Explain why the student in correct in coming to this conclusion.

(ii) Calculate the resistance of component Y when the voltage across it is 12 V.

13. One design of a smoke detector has an LED which lights to show that the battery is in good condition.
A 9·0 V battery is used in the LED circuit shown below.
One component is missing, between A and B.

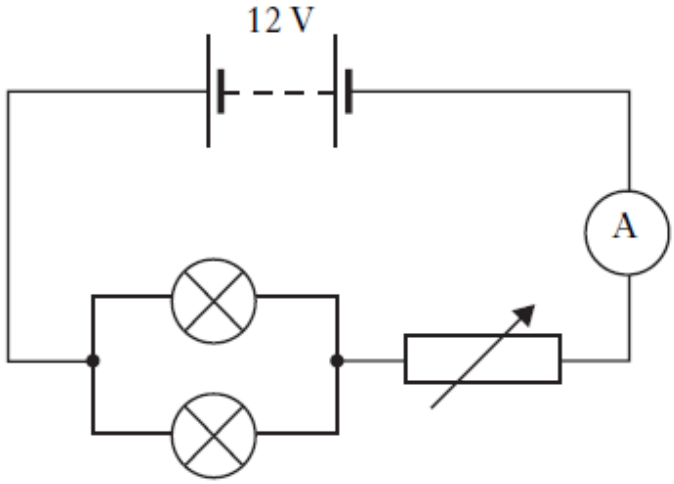


In normal operation, the LED carries a current of 20 mA and the voltage across it is 1·9 V.

(a) State the name of the component that should be connected between A and B.

(b) Calculate the value which this component should have so that the LED operates normally.

14. The circuit shown is used to control the brightness of two **identical** lamps.
The variable resistor is adjusted until the lamps operate at their correct voltage of 3·0 V.



(a) When the lamps operate at the correct voltage, the reading on the ammeter is 1·2 A.
Calculate the current in one lamp.

(b) Calculate the resistance of one lamp.

(c) Calculate the combined resistance of the two lamps in this circuit.

(d) When the lamps operate at their correct voltage, the resistance of the variable resistor is 7·5 Ω.
Calculate the total resistance in the circuit.

(e) One of the lamps is removed.
(i) State what happens to the reading on the ammeter.
(ii) Justify your answer.