A Level · OCR · Physics

9 mins 9 questions

Multiple Choice Questions

Potential Dividers

Potential Divider Circuits / Variable Resistance Components / Investigating Potential Divider Circuits

Medium (5 questions)	/5
Hard (4 questions)	/4
Total Marks	**/9**

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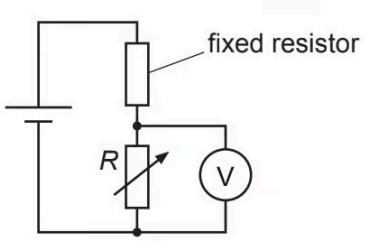
Medium Questions

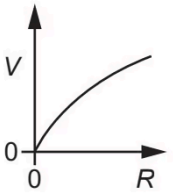
1 A potential divider circuit is shown below.



The resistance of the variable resistor is *R*. The potential difference across the variable resistor is *V*.

Which graph shows the correct variation with *R* of *V*?

A



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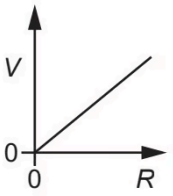

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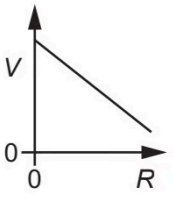

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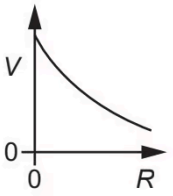

(1 mark)

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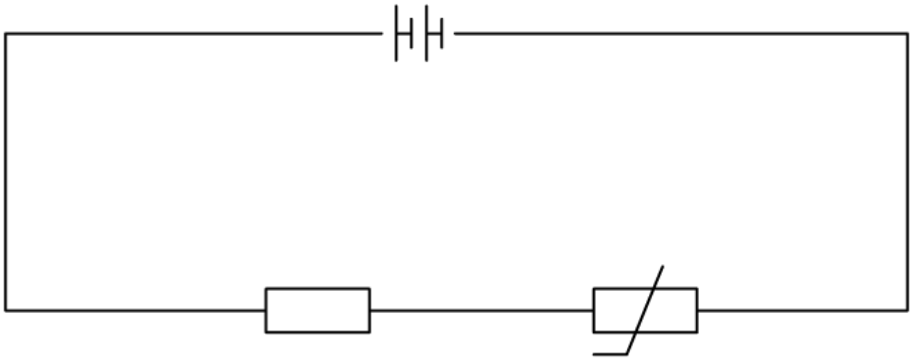
2 A student is investigating a potential divider circuit.

He connects a battery with a thermistor and resistor as shown in Figure 1 below.

Figure 1



The resistance of the resistor is 10Ω and the resistance of the thermistor is 15Ω. The potential difference (p.d.) across the thermistor is 6.0 V. What is the electromotive force(e.m.f) of the battery?

A. 4 V

B. 9 V

C. 10 V

D. 15 V

(1 mark)

3 A circuit is made to investigate the range of a variable resistor in Figure 2.

The student makes a circuit where a variable resistor and fixed resistor are connected to a 9.0 V supply of negligible internal resistance.

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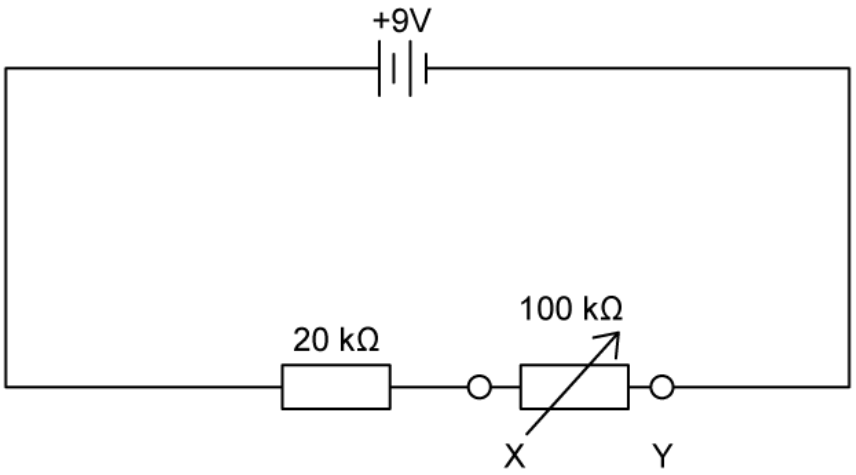
Figure 2



What range of voltages can be obtained between X and Y?

A. Zero to 1.5 V

B. Zero to 7.5 V

C. 1.5 V to 7.5 V

D. 1.5 V to 9.5 V

(1 mark)

4 A researcher designs an experimental circuit (Figure 3) to explore the correlation between voltage and variations in temperature and light intensity. The voltage across the thermistor and light-dependent resistor (LDR) is expected to fluctuate in response to changes in temperature and light conditions.

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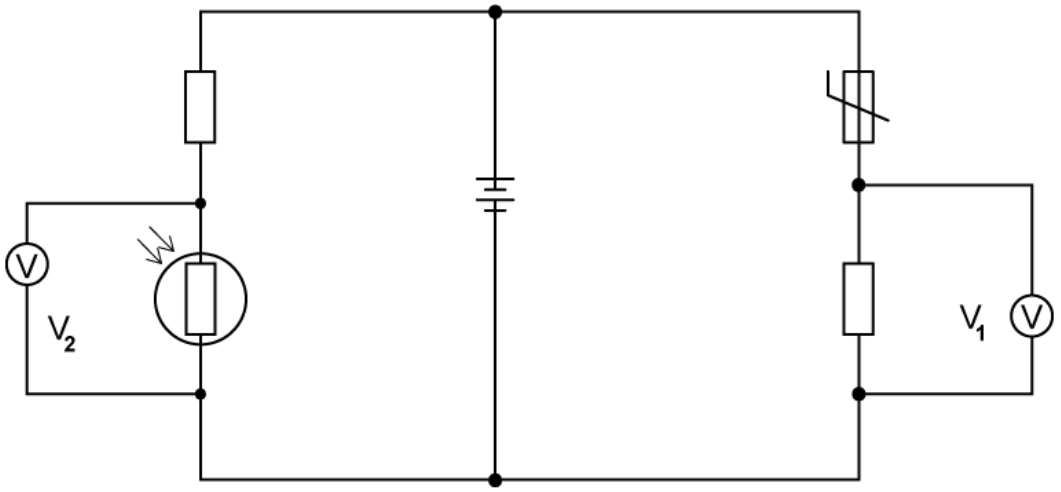
Figure 3



What conditions do the student need to create to ensure the reading on V_1 and V_2 are both low?

	Temperature	Light level
A	low	low
B	low	high
C	high	low
D	high	high

(1 mark)

5 An individual is conducting an examination of a potential divider circuit, comprising a light-dependent resistor (LDR) and a fixed resistor, illustrated in Figure 4.

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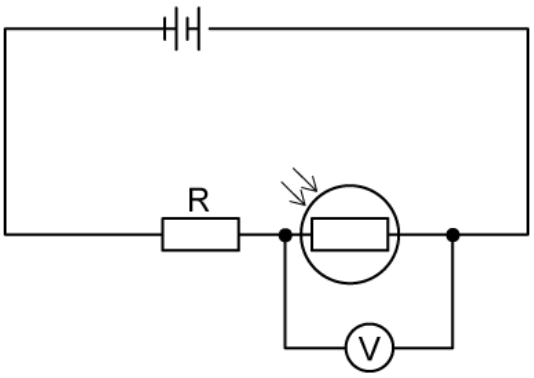
Figure 4



The voltmeter reading has increased. What has happened to the light intensity and resistance of the LDR to cause this?

A. The light intensity decreases and the LDR resistance decreases.

B. The light intensity decreases and the LDR resistance increases.

C. The light intensity increases and the LDR resistance decreases.

D. The light intensity increases and the LDR resistance increases.

(1 mark)

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Hard Questions

1 In a potential divider circuit, two resistors in series connect to a voltage source V_{in}. The ratio of the output voltage to the input voltage across the second resistor to the first resistor is $\frac{1}{5}$.

The first resistor is replaced with one which has twice the resistance, the second resistor is replaced with one which has triple the resistance, and the input voltage source is doubled.

What is the new value of the ratio of output voltage to input voltage for the second resistor?

A. $\frac{1}{11}$

B. $\frac{3}{11}$

C. $\frac{3}{8}$

D. $\frac{3}{5}$

(1 mark)

2 The potential divider circuit below consists of a resistor of resistance *R* in series with a pair of resistors with resistances *R* and *r* in parallel with each other. The cell can be

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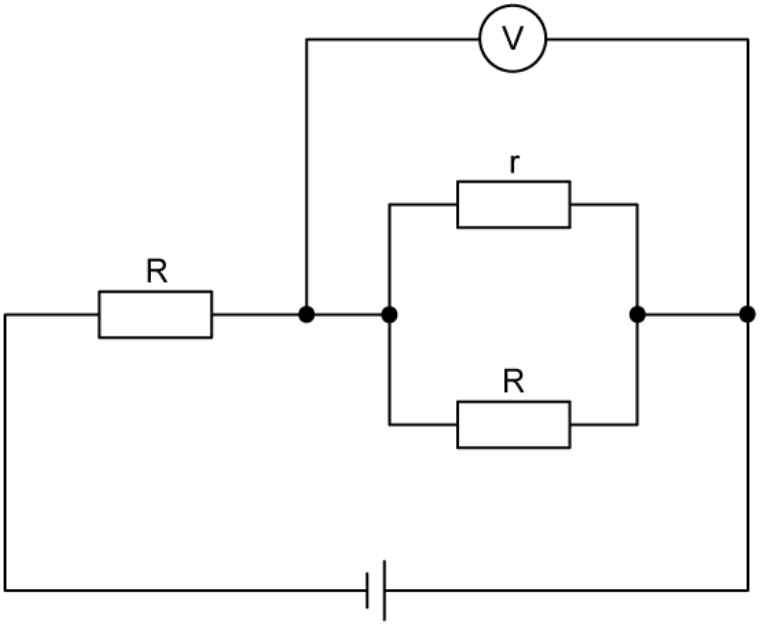
assumed to have negligible internal resistance.



What is the ratio of the voltage across the voltmeter to the voltage across the cell?

A. $\frac{2r}{R + r}$

B. $\frac{r}{2R}$

C. $\frac{r}{R + 2r}$

D. $\frac{2r}{2R + r}$

(1 mark)

3 A potential divider circuit powered by a cell of e.m.f $\mathcal{E}$ and negligible internal resistance is built in which the output of the divider acts as the input voltage to a second potential

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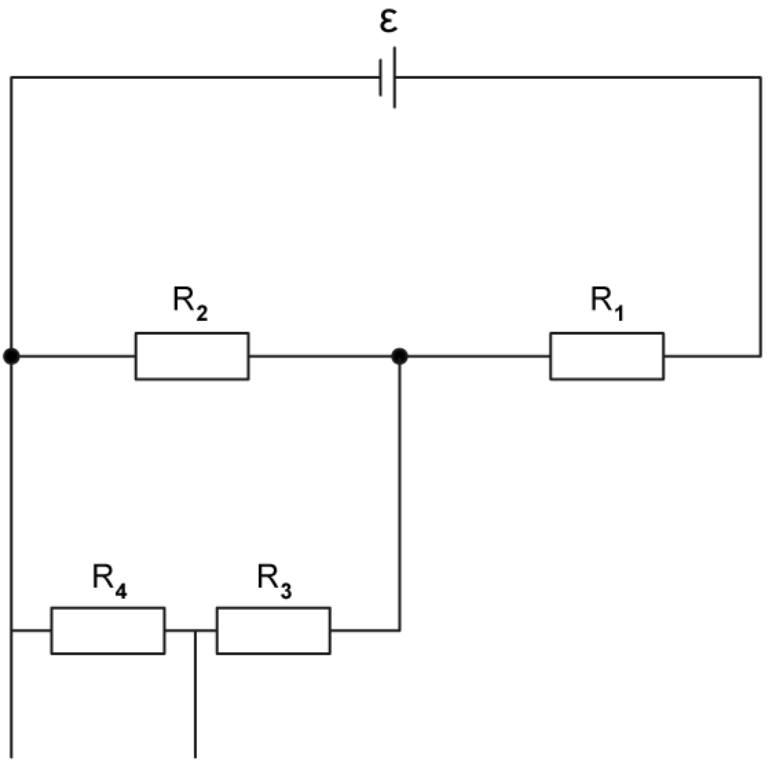
divider as shown in the diagram.



The formula for the resistance of each of the resistors in the circuit is given by the formula: $R_n = nR$

Which expression is correct for the current passing through the resistor labelled R_4?

A. $\frac{2\mathcal{E}}{23R}$

B. $\frac{6\mathcal{E}}{23R}$

C. $\frac{8\mathcal{E}}{23R}$

D. $\frac{14\mathcal{E}}{23R}$

(1 mark)

4 A student constructs a potential divider circuit powered by a cell of e.m.f $\mathcal{E}$ consisting of an LDR resistor of resistance R_{LDR} in series with a parallel combination of another identical LDR and a fixed resistor of resistance R as shown in the diagram below.

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A student has a variable light-source that illuminates the two LDRs equally. The student

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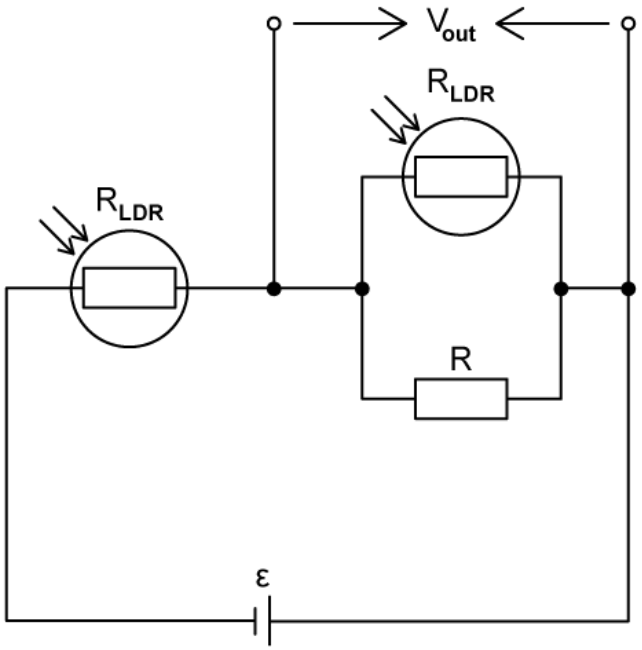
knows that R_{LDR} is inversely proportional to the light intensity L incident on the LDRs.



Which of the following graphs represents the data for V_{out} as a function of L?

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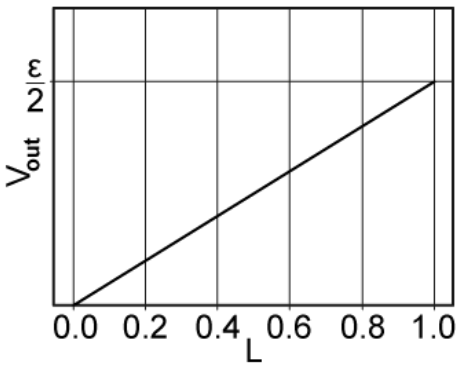
A



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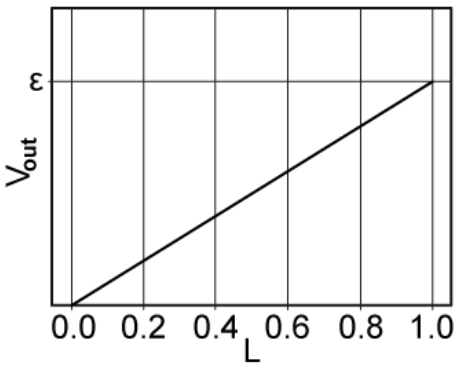

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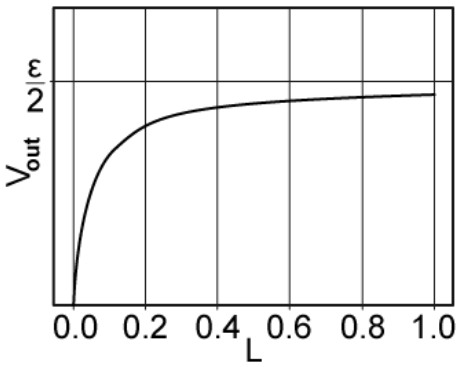

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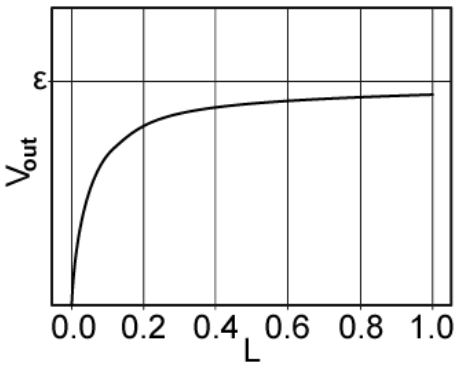

(1 mark)

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