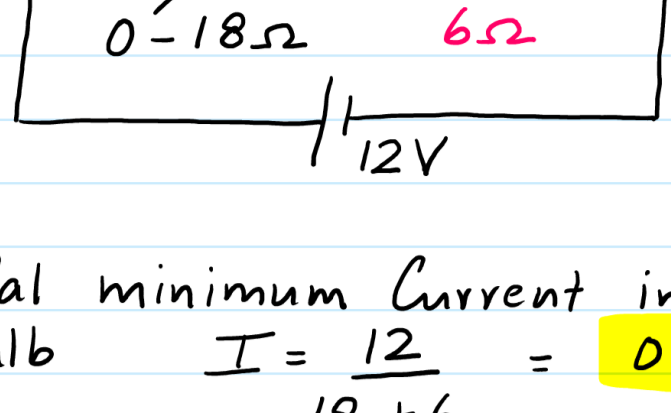


28 February 2021 17:02

Comparison b/w a Variable Resistor Circuit & a potential divider circuits.

1) Variable Resistor Circuit

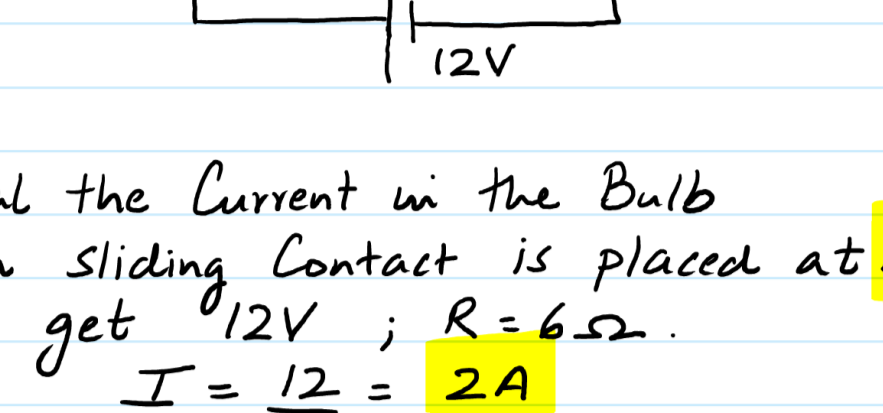


(i) Cal minimum Current in the Bulb $I = \frac{12}{18+6} = 0.5A$

(ii) Cal maximum Current in the Bulb $I = \frac{12}{0+6} = 2A$

$0.5A \leq I \leq 2A$

2) Potential divider Circuit.



(i) Cal the Current in the Bulb when sliding Contact is placed at B. Bulb gets 12V; $R = 6\Omega$. $I = \frac{12}{6} = 2A$

(ii) Cal the Current in the Bulb when the sliding Contact is placed at A. Bulb gets 0V; $R = 6\Omega$. $I = \frac{0}{6} = 0A$

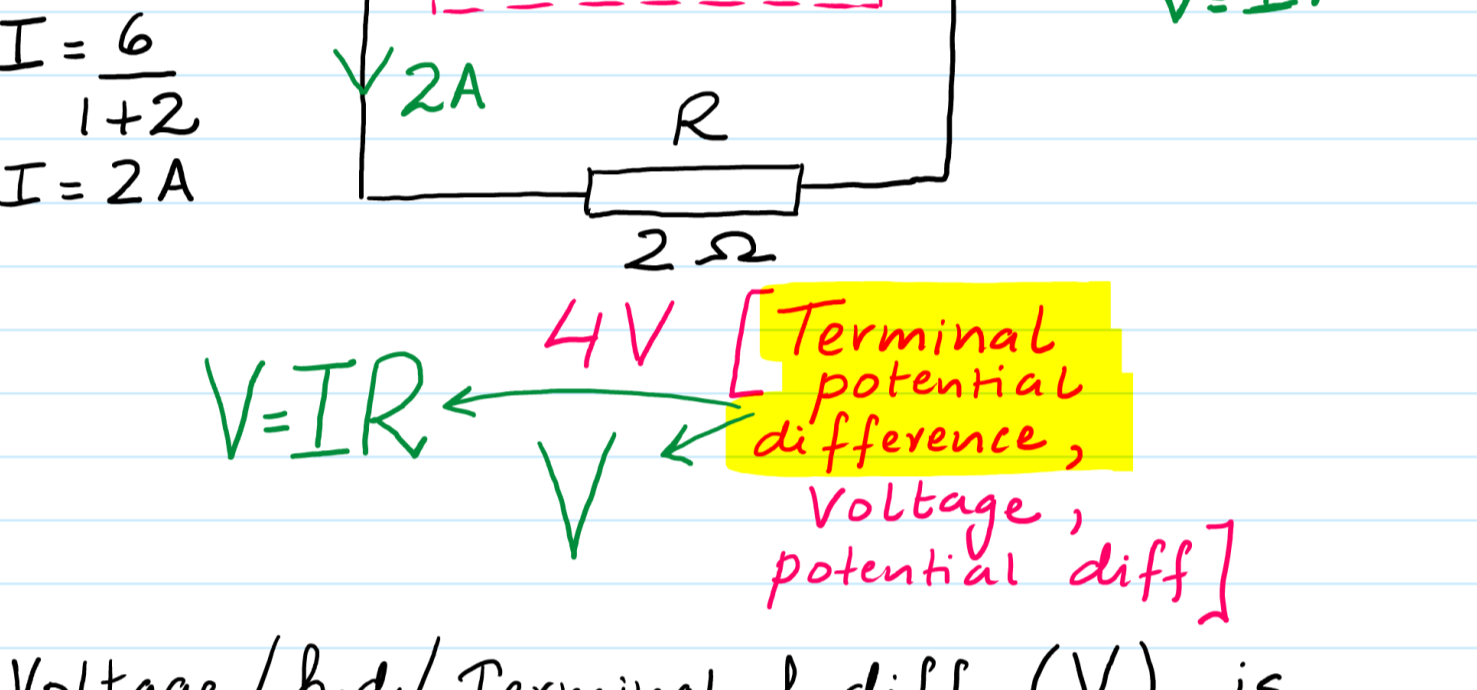
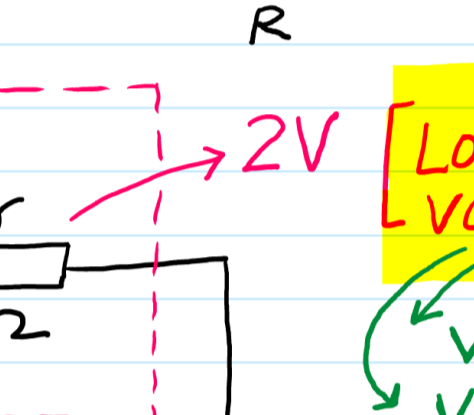
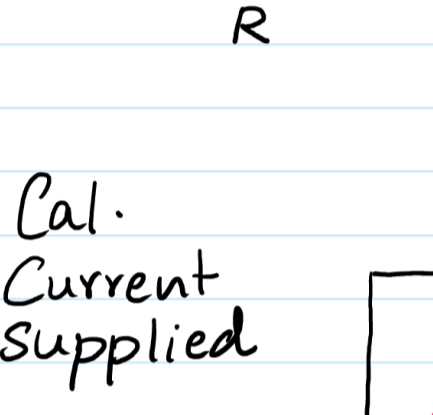
$0A \leq I \leq 2A$

Note: Both circuits can be used to adjust the brightness of the Bulb however a potential divider circuit provides a wider range of Current i.e. bulb off, bulb dim, bulb bright. $0A \leq I \leq 2A$.

Concept of External resistor (R), internal resistance (r), Voltage (V), Potential drop (v) and Electromotive force (E) :-

- External Resistor (R) refers to any component / appliance connected in the circuit
- Internal resistance (r) refers to the resistance offered by the chemicals inside the battery to the flow of current

Previous Papers vs Recent Papers



Voltage / p.d / Terminal p.diff (V) is defined as the amount of Electrical Energy converted into other forms eg light, Heat etc when a unit charge flows through the external circuit. $(V = IR)$

Lost volts (v) is defined as the energy dissipated (Lost) in the form of heat when a unit charge flows through the internal resistance / internal circuit. $(v = Ir)$

Emf (E) = It is defined as the amount of Chemical Energy converted into Electrical forms when a unit charge flows through a complete circuit i.e. (the internal & external circuit) $(E = V + v)$

formulas for Emf (E)

- $E = V + v$
- $E = V + Ir$
- $E = IR + Ir$
- $E = I(R + r)$

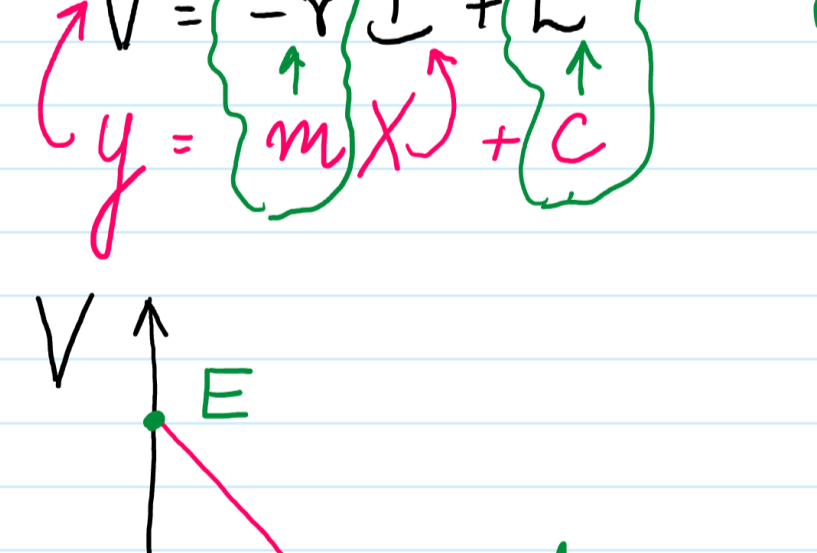
Plot a graph of V (y-axis) against I (x-axis)

$E = V + Ir$

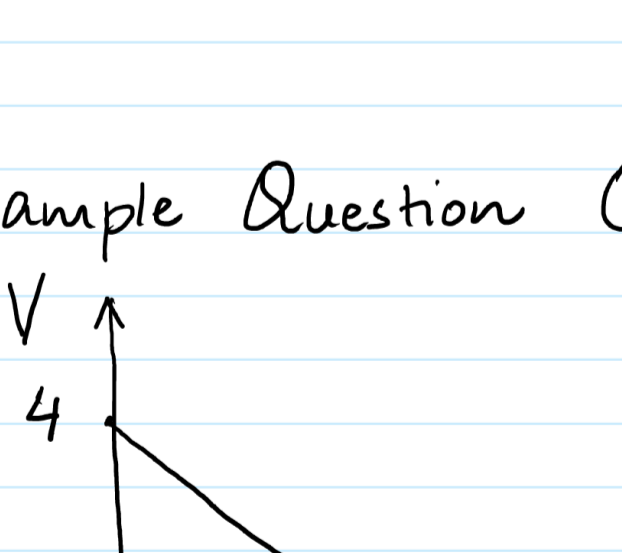
Re-arrange $V = E - Ir$

$V = -rI + E$
 $y = mX + C$

A straight line graph with a negative gradient & a positive y-intercept



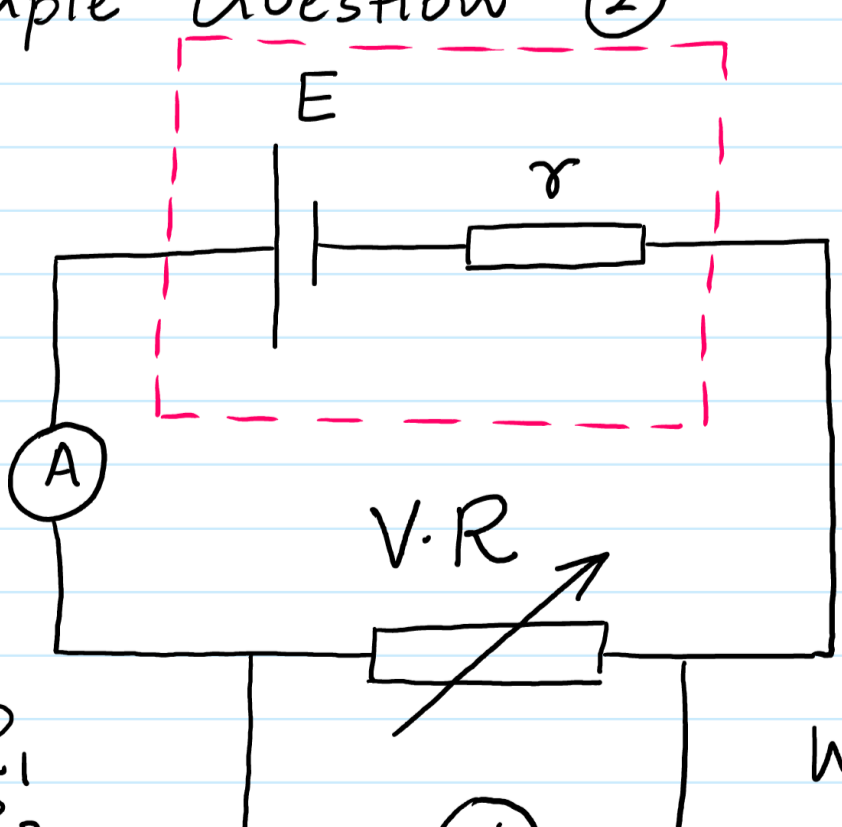
Example Question 1



- Calculate
- $E = 4V$
 - $r = 2\Omega$
 - Sketch a new graph where $E = \text{halved}$ and $r = \text{doubled}$

new value of $r = \frac{2}{0.5} = 4\Omega$

Example Question 2



Q When V.R is set at R_1 , Voltmeter reads 1V & ammeter reads 0.25A

- Cal R_1
 Cal R_2
 Cal E
 Cal r

When V.R is set at R_2 , Voltmeter reads 0.9V & ammeter reads 0.3A.

(i) $R_1 = \frac{1}{0.25} = 4\Omega$

(ii) $R_2 = \frac{0.9}{0.3} = 3\Omega$

$E = V + Ir$

$E = 1 + 0.25r \rightarrow 1$

$E = 0.9 + 0.3r \rightarrow 2$

$r = 2\Omega$

$E = 1.5V$