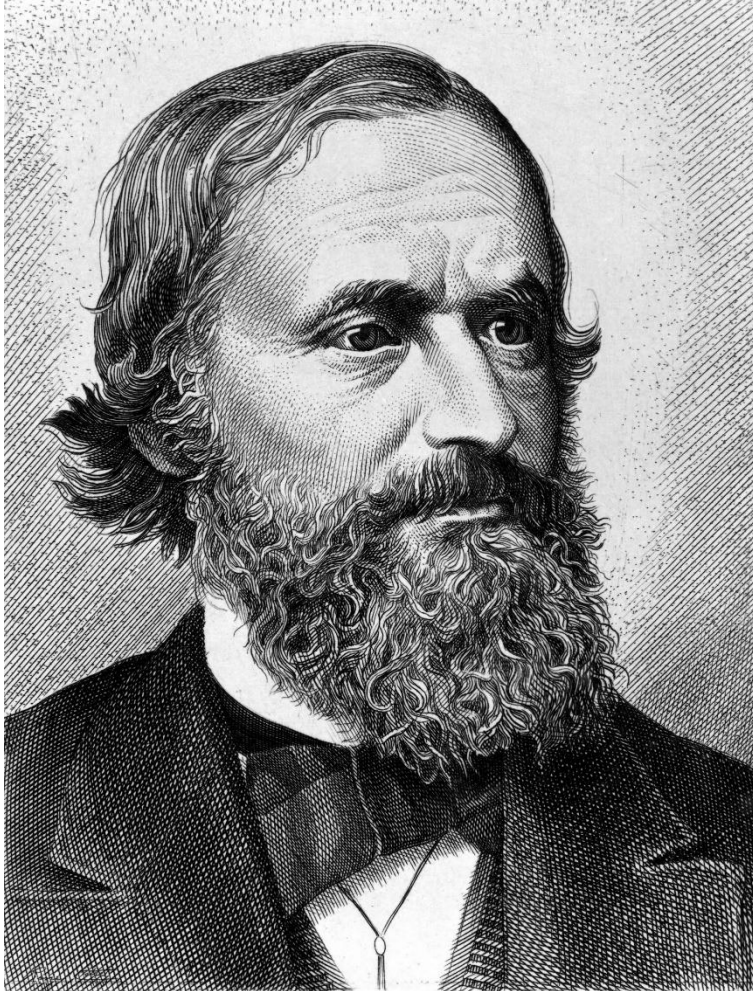




# Kirchhoff's Circuit Laws

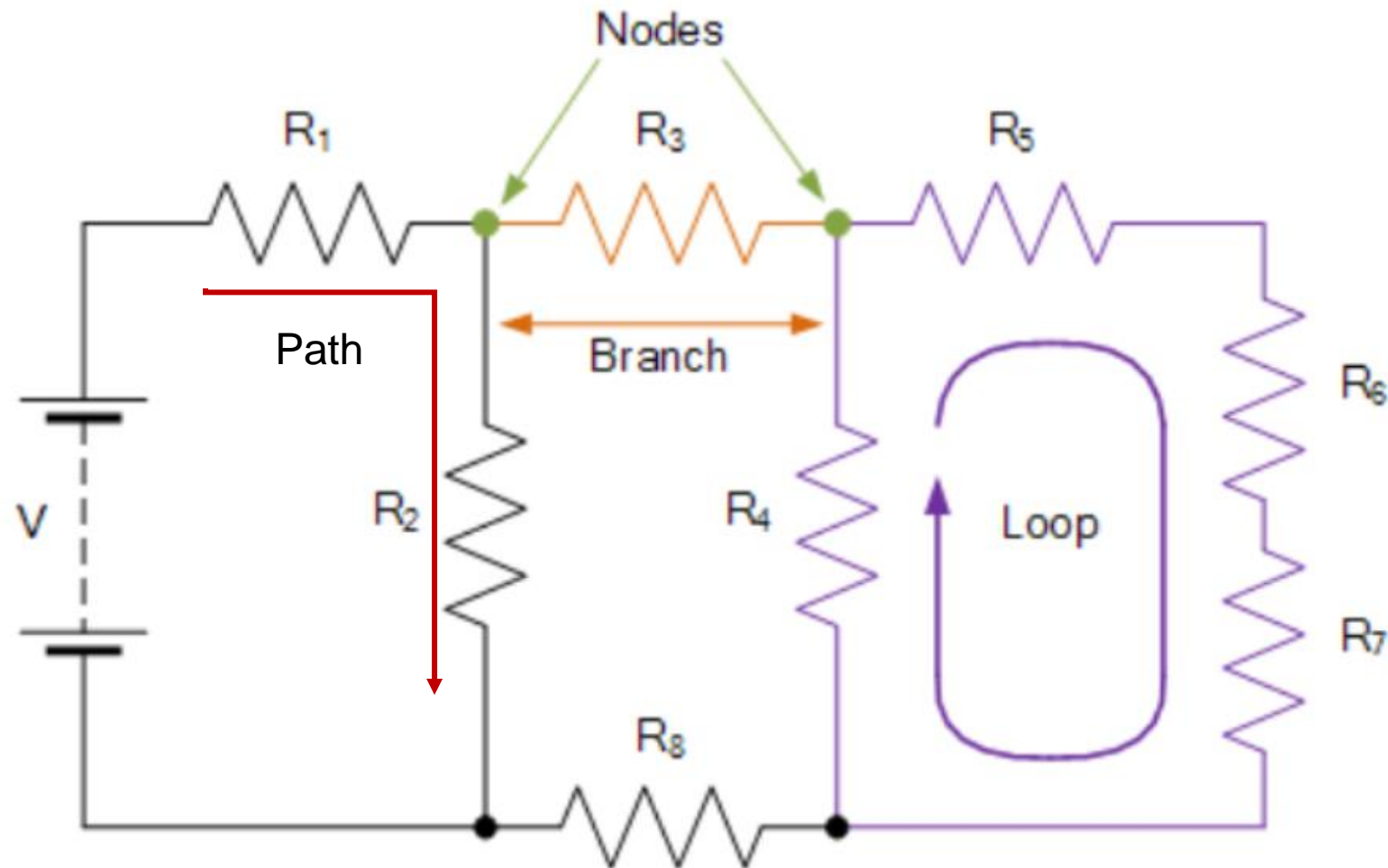
Instructed By: Mr. Supun Dissanayaka

# Gustav Robert Kirchhoff



“A German physicist who made significant contributions to the fundamental understanding of black-body radiation emitted by heated objects, spectroscopy, and **electrical circuits**”

# Common DC Circuit Theory Terms


































# Active & Passive elements

“Active elements generate or amplify energy signals”

“Passive elements stores or dissipates a given energy signal”

## ACTIVE

## PASSIVE

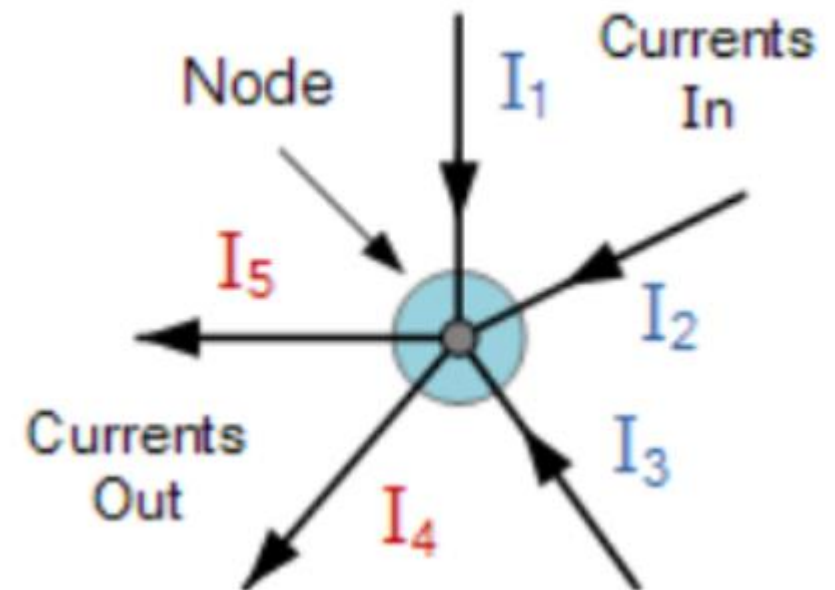
Transistor			Resistor		
Diode			LDR		
LED			Thermistor		
Photodiode			Capacitor		
Integrated Circuit		-	Inductor		
Operational Amplifier			Switch		
Seven Segment Display			Variable Resistor		
Battery			Transformer		

# The Current Law (KCL)

## Conservation of Charge

“total current or charge entering a junction or node is exactly equal to the charge leaving the node as it has no other place to go except to leave, as no charge is lost within the node”

$$I_1 + I_2 + I_3 + (-I_4) + (-I_5) = 0$$

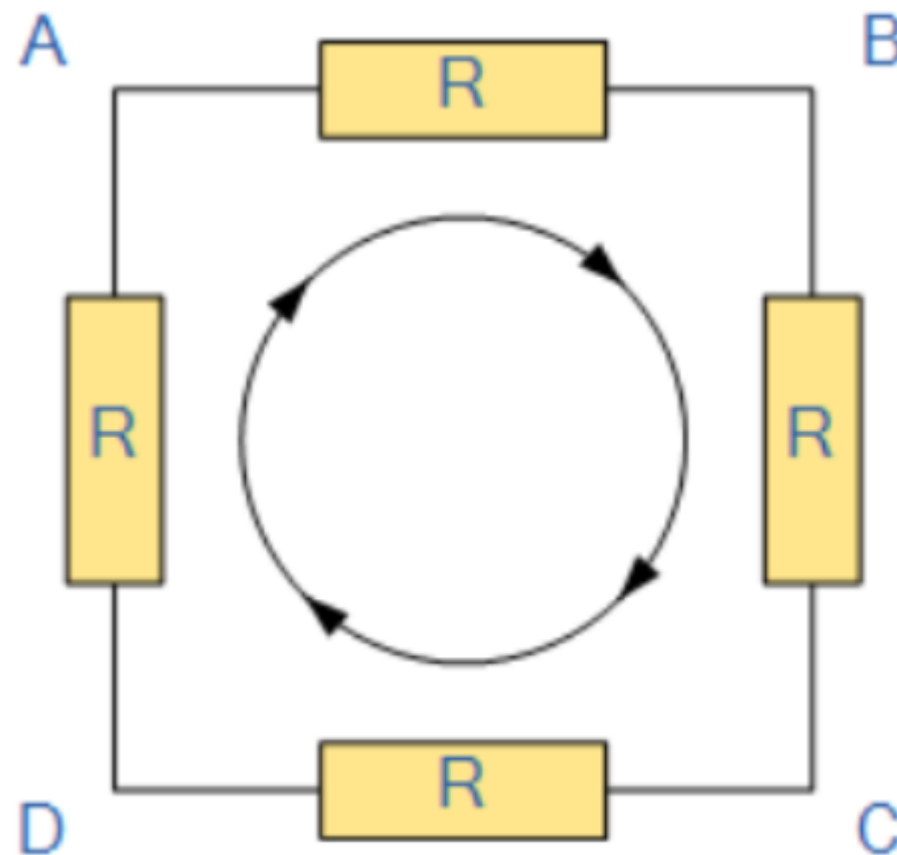


# The Voltage Law (KVL)

## Conservation of Energy

“in any closed loop network, the total voltage around the loop is equal to the sum of all the voltage drops within the same loop”

$$V_{AB} + V_{BC} + V_{CD} + V_{DA} = 0$$

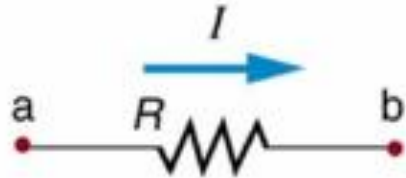




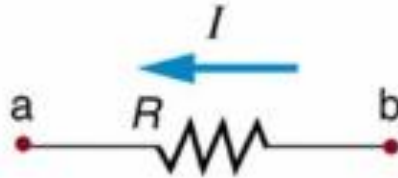
# The Voltage Law (KVL)

## Conservation of Energy

Direction of traverse a  $\longrightarrow$  b      Direction of traverse a  $\longrightarrow$  b



$$\Delta V = V_b - V_a = -IR$$

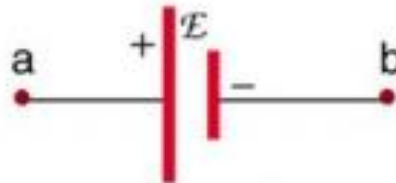


$$\Delta V = V_b - V_a = +IR$$

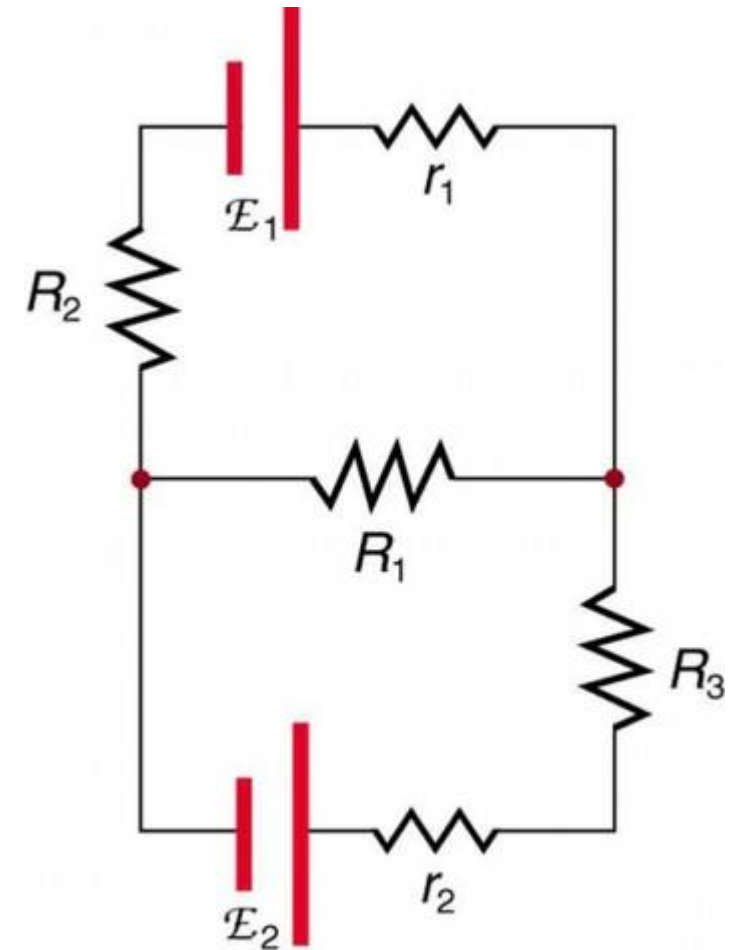
Direction of traverse a  $\longrightarrow$  b      Direction of traverse a  $\longrightarrow$  b



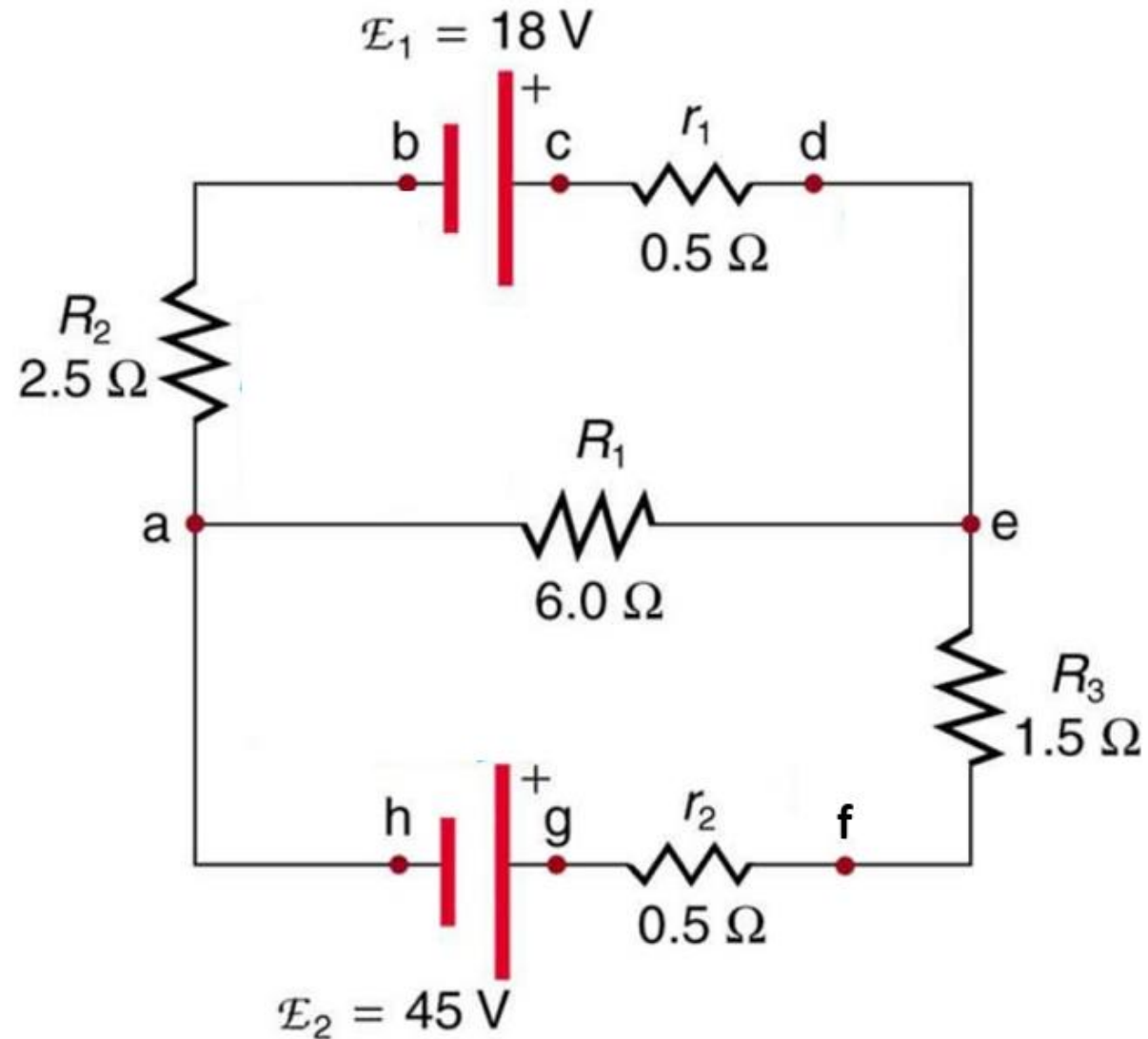
$$\Delta V = V_b - V_a = +\mathcal{E}$$



$$\Delta V = V_b - V_a = -\mathcal{E}$$

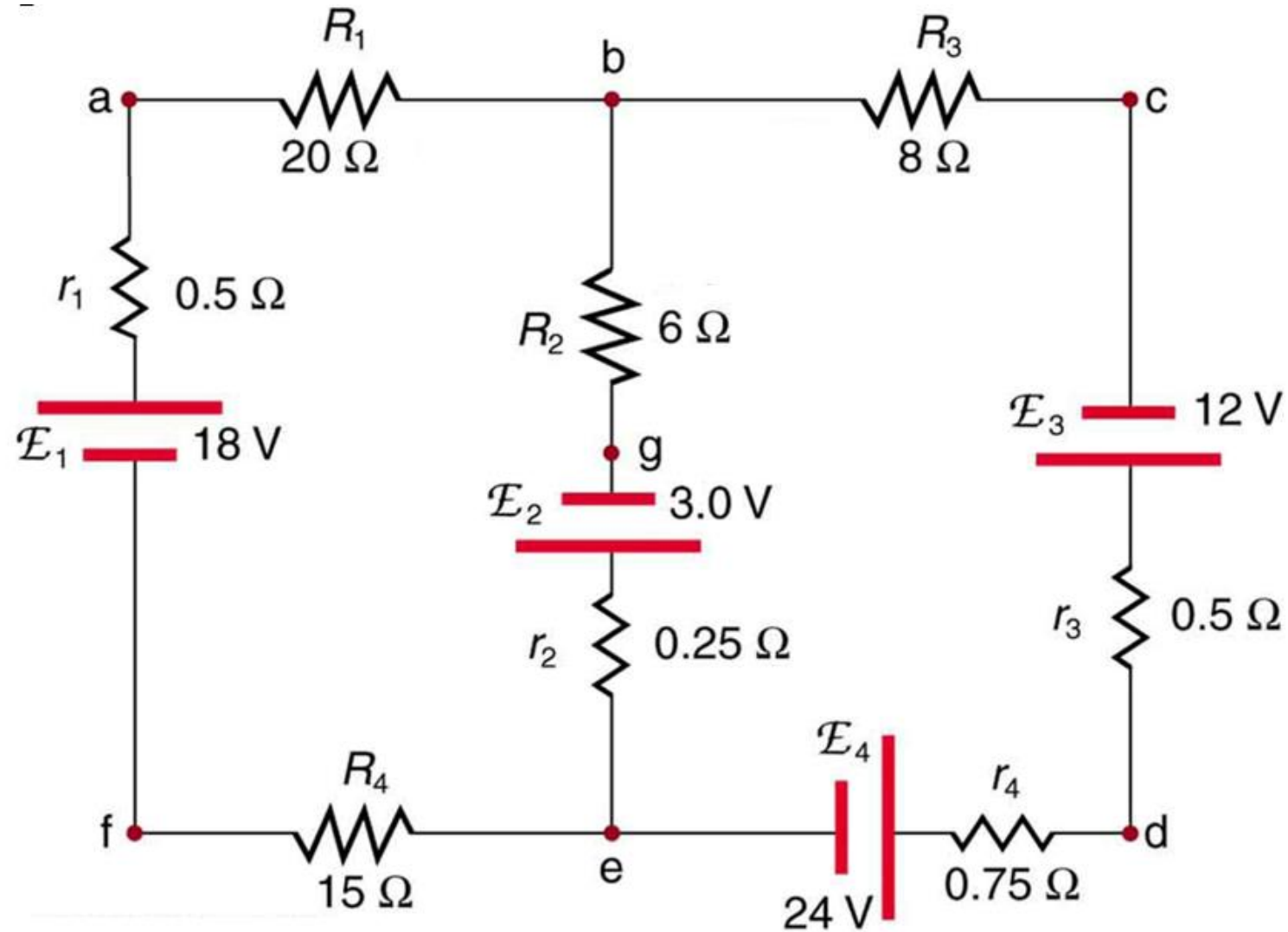


# Examples I





# Examples II



Good Luck with the Tasks...