
RRB JE | SSE 2023
Foundation Batch
Analog Electronics
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Analog Electronics

- → Operational Amplifier
- → Mode of Operation

→ Application of OP-Amp

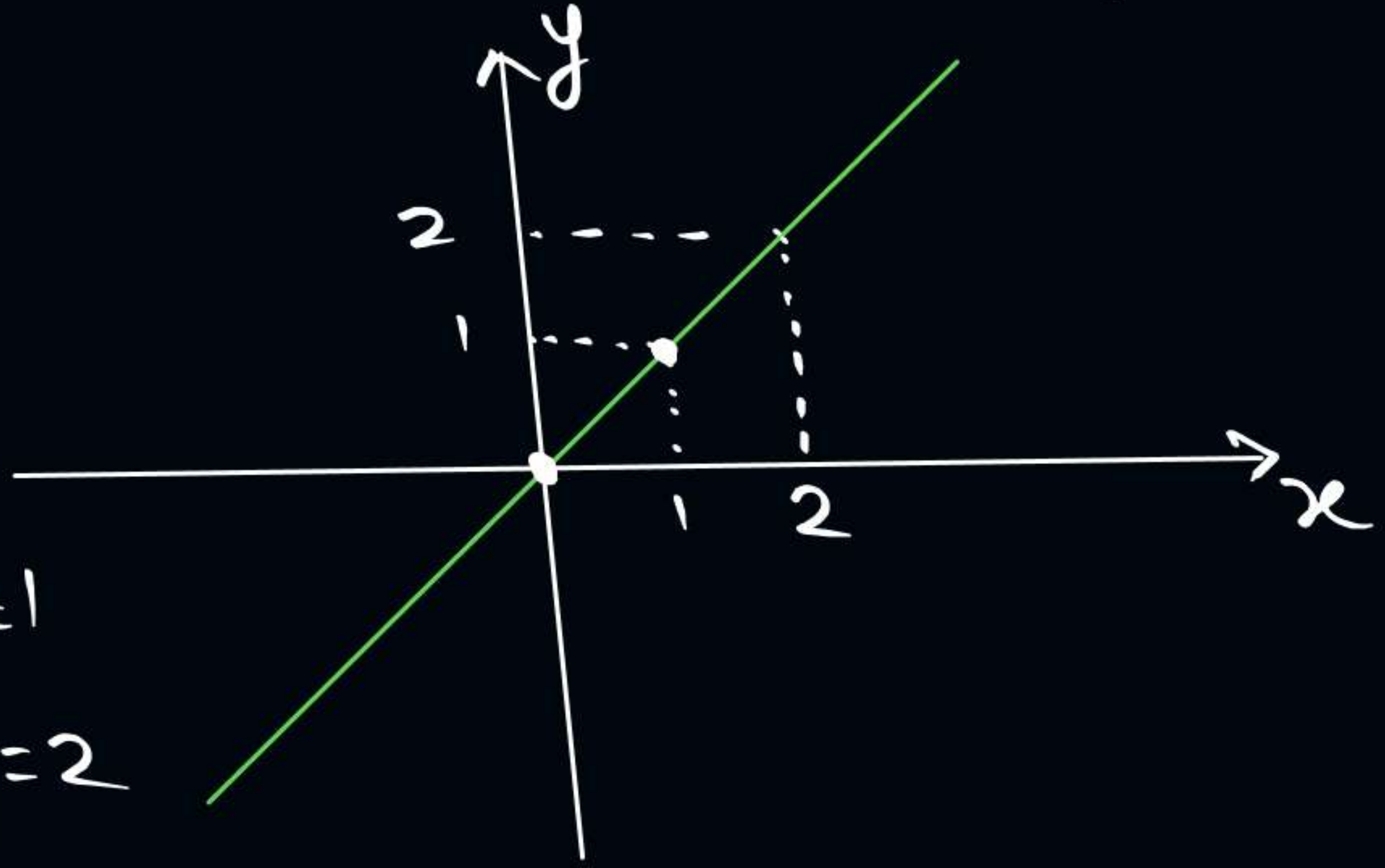
Linear

Non-linear

$y = x$

$x = 1, y = 1$

$x = 2, y = 2$



Linear Application:

Negative feedback → OP-Amp

Non-linear Application:

Positive feedback → OP-Amp

→ Voltage Regulator

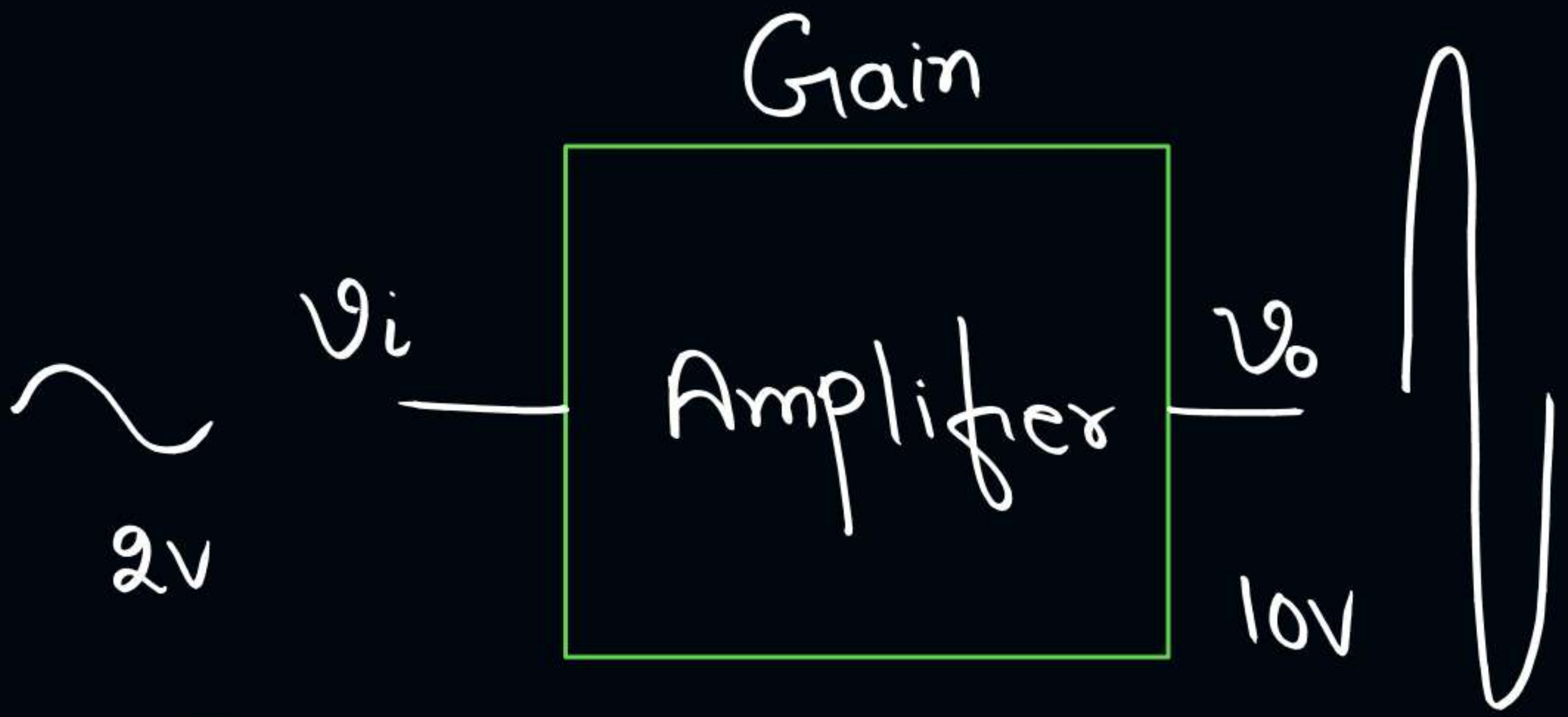
→ Timer

→ PLL

Operation Amplifier:

What is amplifier ?

It is circuit which amplifies the voltage signal.



$$\text{Gain} = \frac{10}{2} = 5 \rightarrow \underline{\text{Constant}}$$

Voltage = V volt

current = I Amp

$\frac{\text{Volt}}{\text{amp}}$ $\frac{V}{I}$ = Resistor = Ω (ohm)

$\frac{I}{V}$ = conductance (G)

(℧)

(mho)

(Simens)

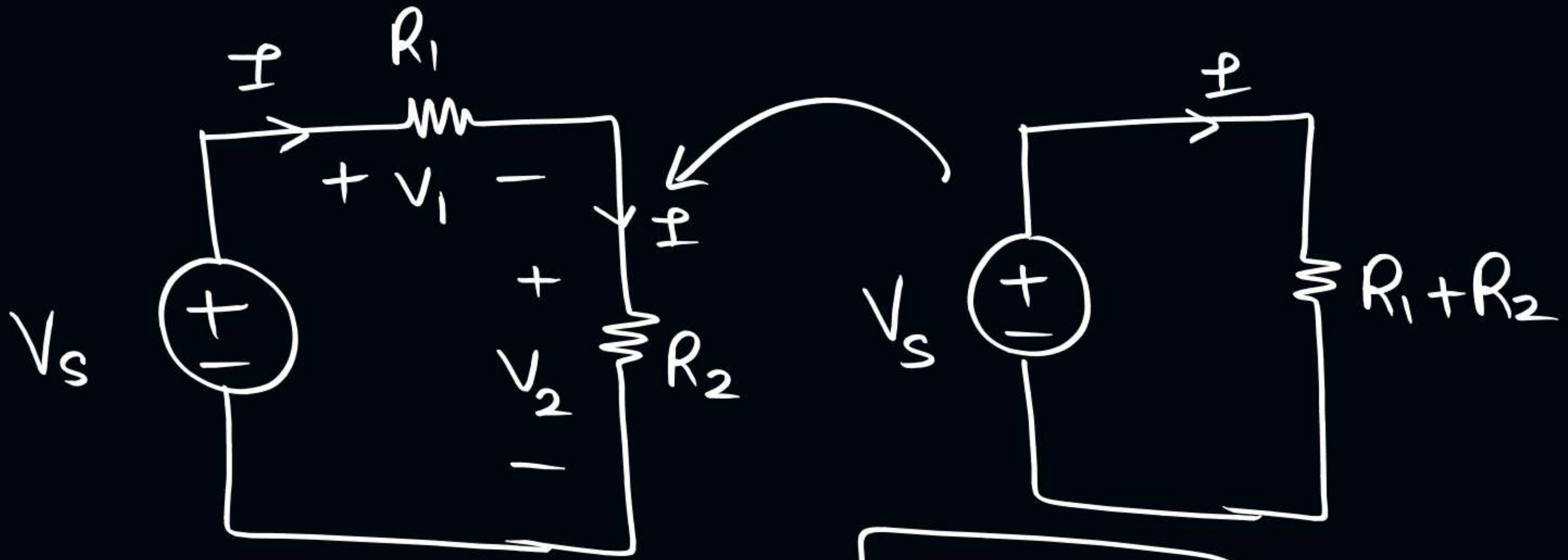
$$G = \frac{1}{R}$$

Resistor: R (ohm → Ω)

oppose → Electric current

Conductor: (G) → mho ($\mho$)

→ Support → Electric current



$$V_2 = I \cdot R_2$$

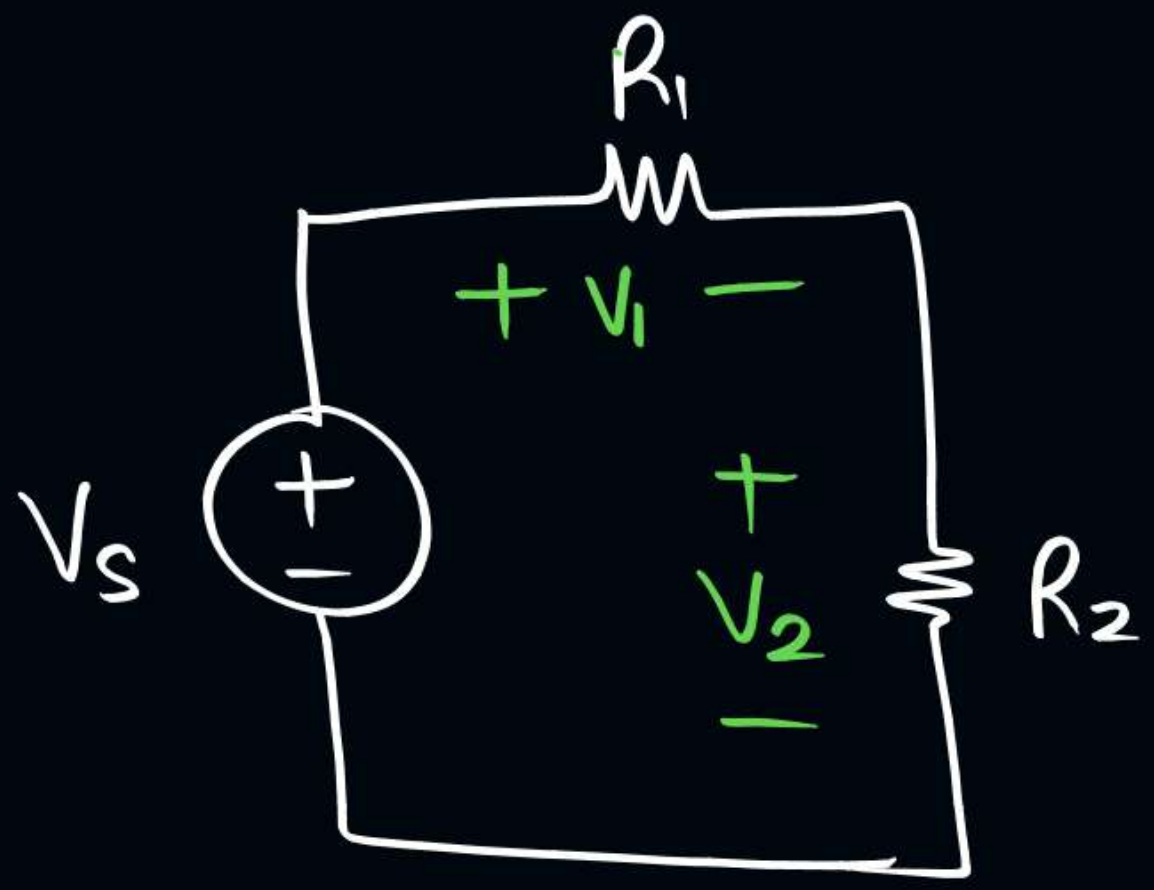
$$V_2 = \frac{R_2}{R_1 + R_2} \cdot V_s$$

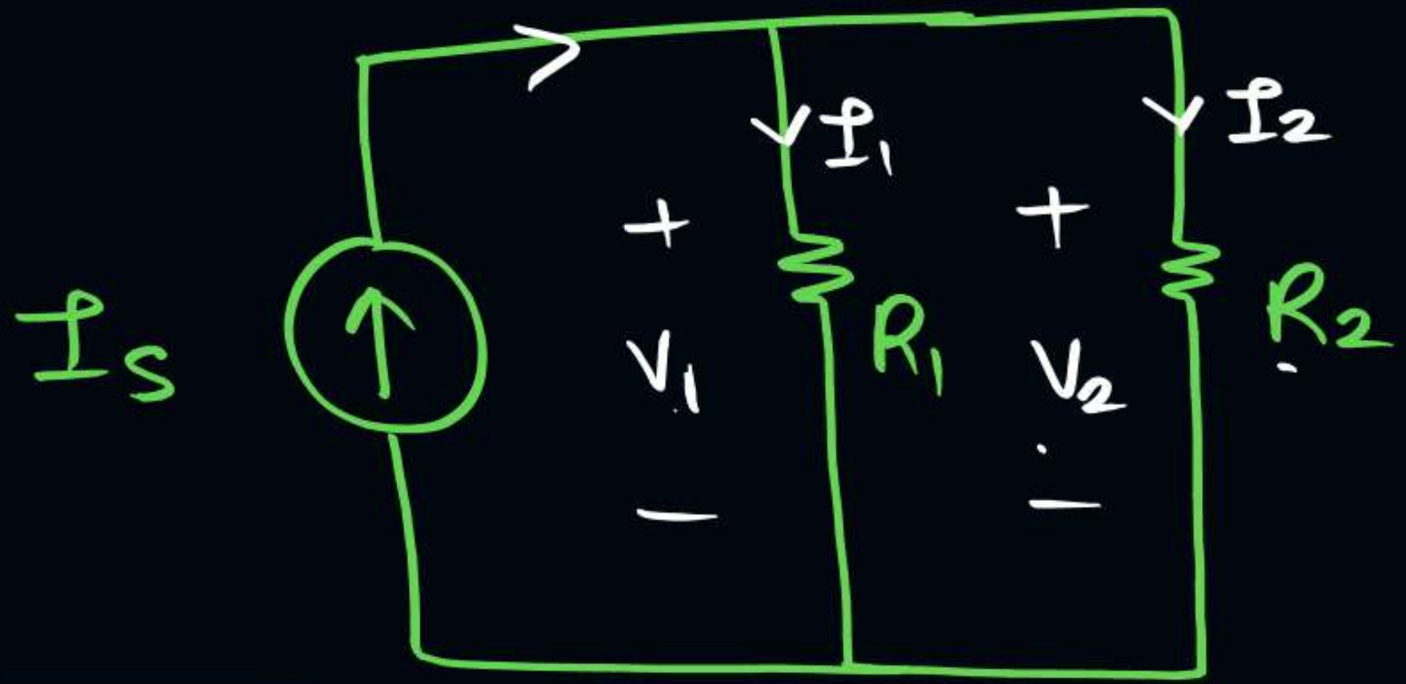
$$I = \frac{V_s}{R_1 + R_2}$$

$$V_1 = R_1 \cdot I$$

$$V_1 = \frac{R_1}{R_1 + R_2} \cdot V_S$$

$$V_2 = \left(\frac{R_2}{R_1 + R_2}\right) V_S$$



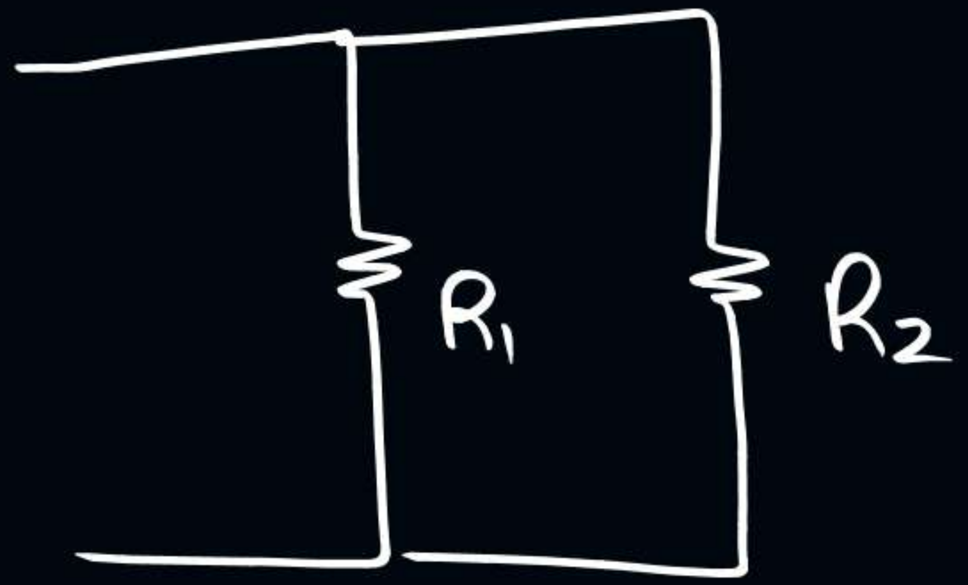


$$V_1 = V_2 = V = \frac{I_S \cdot R_1 R_2}{R_1 + R_2}$$

$V_1 = V_2$ → Parallel Connection

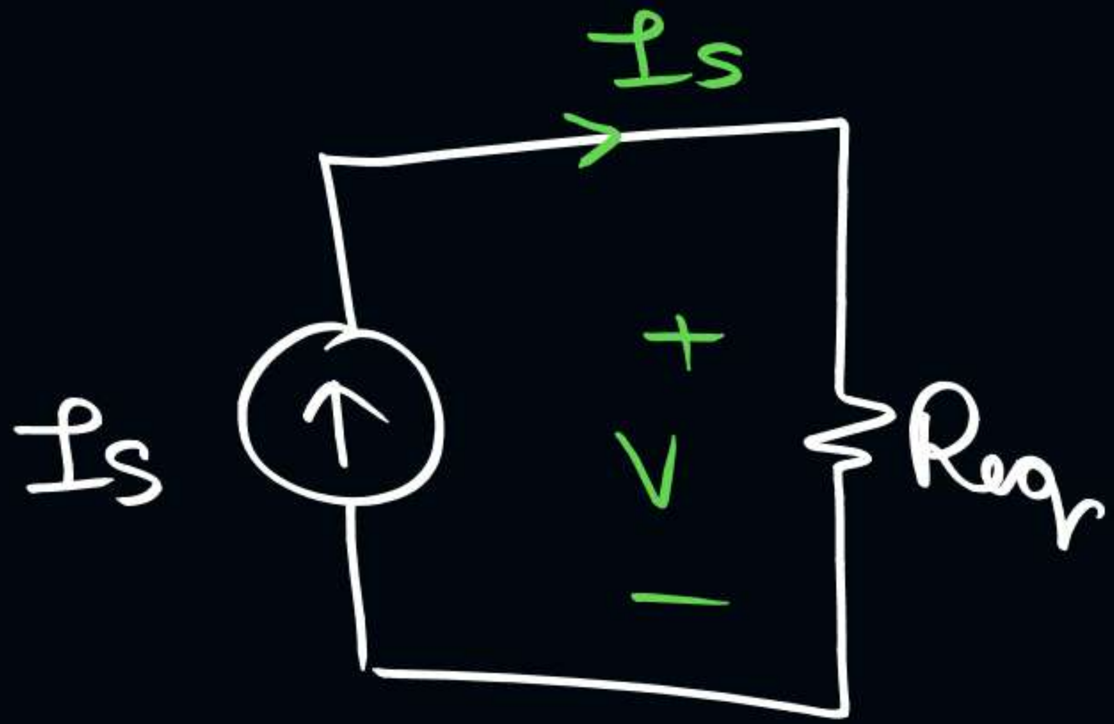
$$I_1 = \frac{V}{R_1} = \frac{1}{R_1} \cdot \frac{I_S \cdot R_1 R_2}{R_1 + R_2}$$

$$I_1 = \left(\frac{R_2}{R_1 + R_2}\right) I_S$$



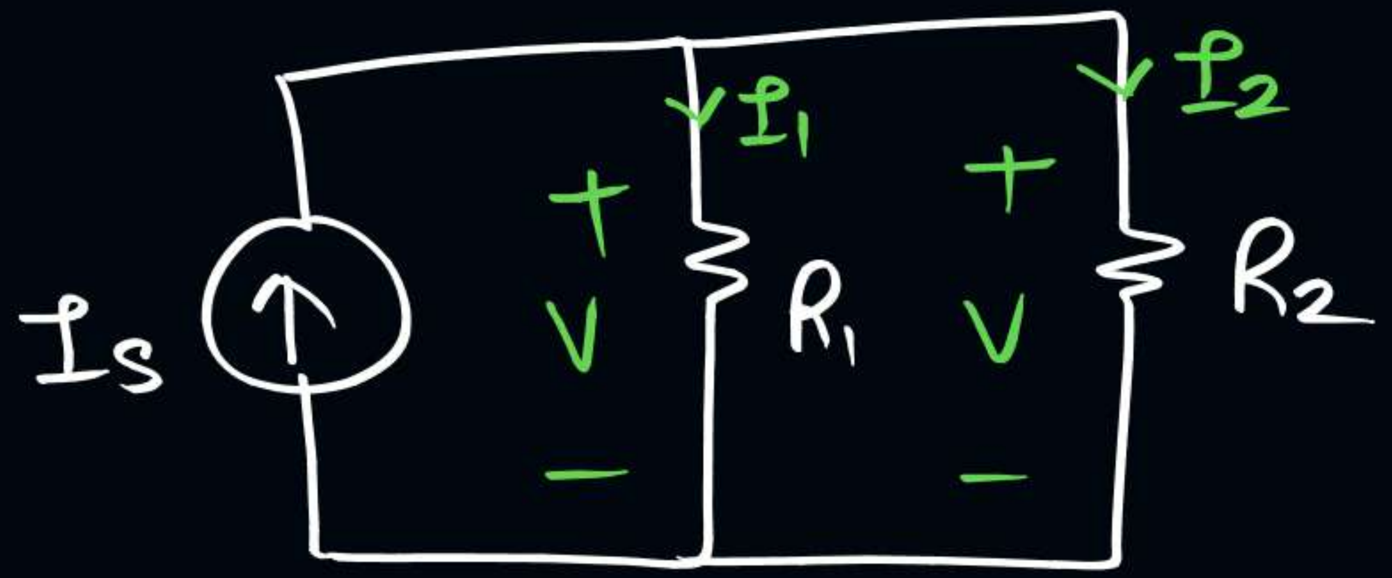
$$R_{eq} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$



$$V = I_s \cdot R_{eq}$$

$$V = I_s \cdot \frac{R_1 R_2}{R_1 + R_2}$$



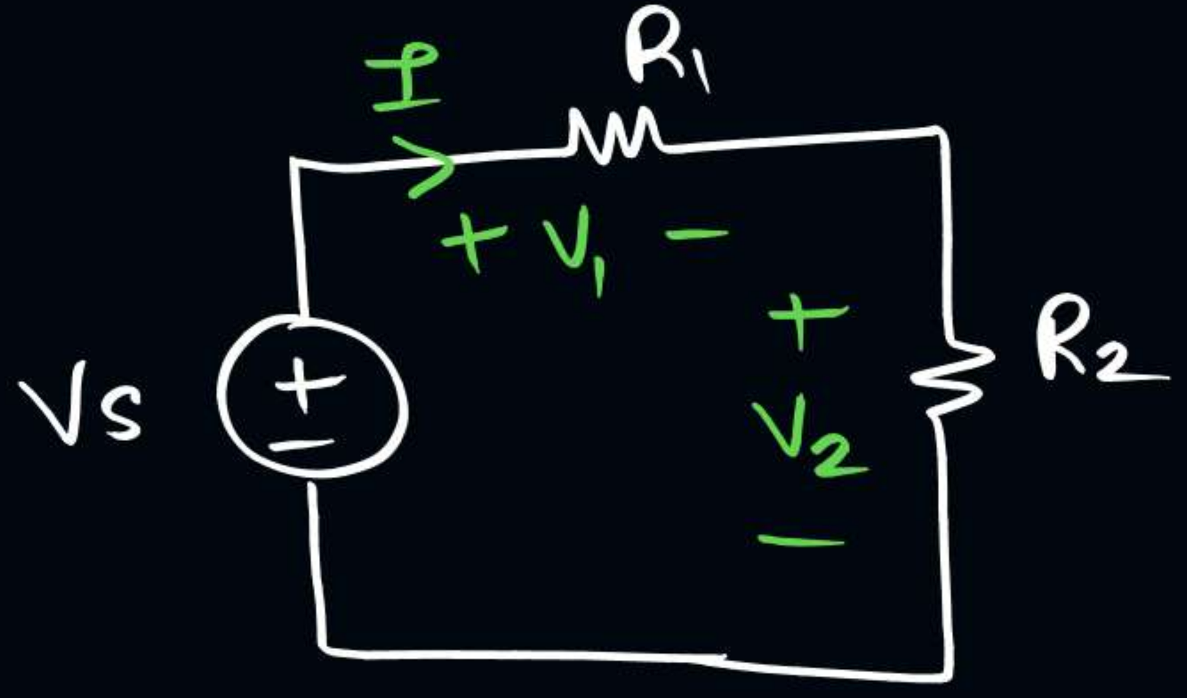
$$I_1 = \frac{V}{R_1}$$

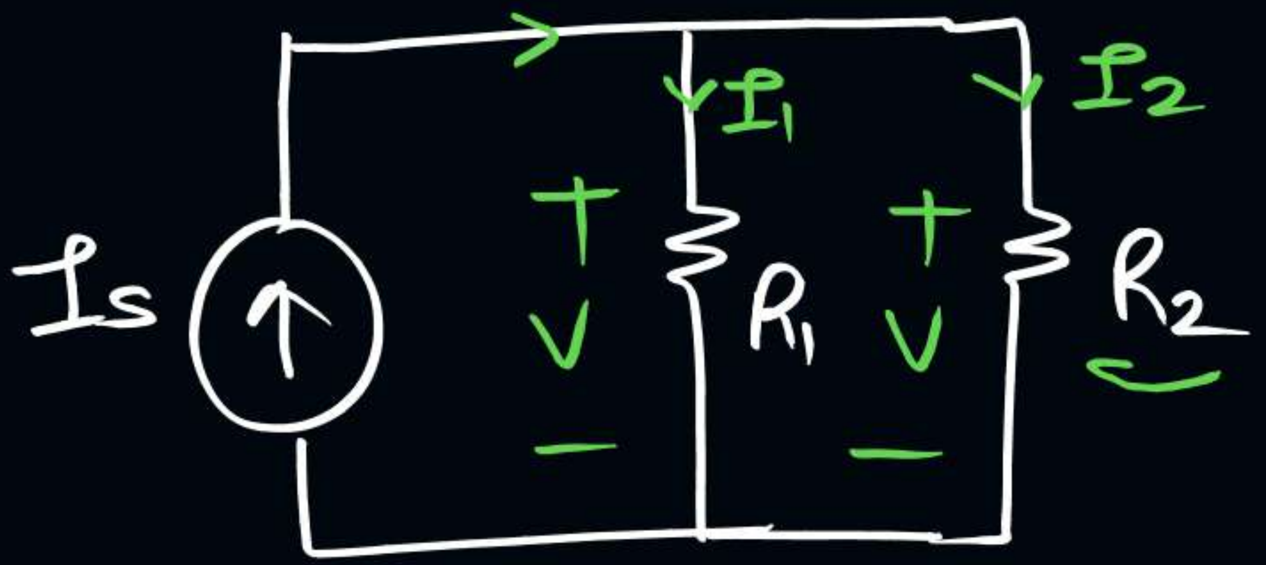
$$V = I_s \cdot \frac{R_1 R_2}{R_1 + R_2}$$

$$I_1 = \frac{I_s \cdot R_2}{R_1 + R_2}$$

$$I_2 = \frac{V}{R_2} = \frac{1}{R_2} \cdot \frac{I_s \cdot R_1 R_2}{R_1 + R_2}$$

$$I_2 = \frac{I_s \cdot R_1}{R_1 + R_2}$$





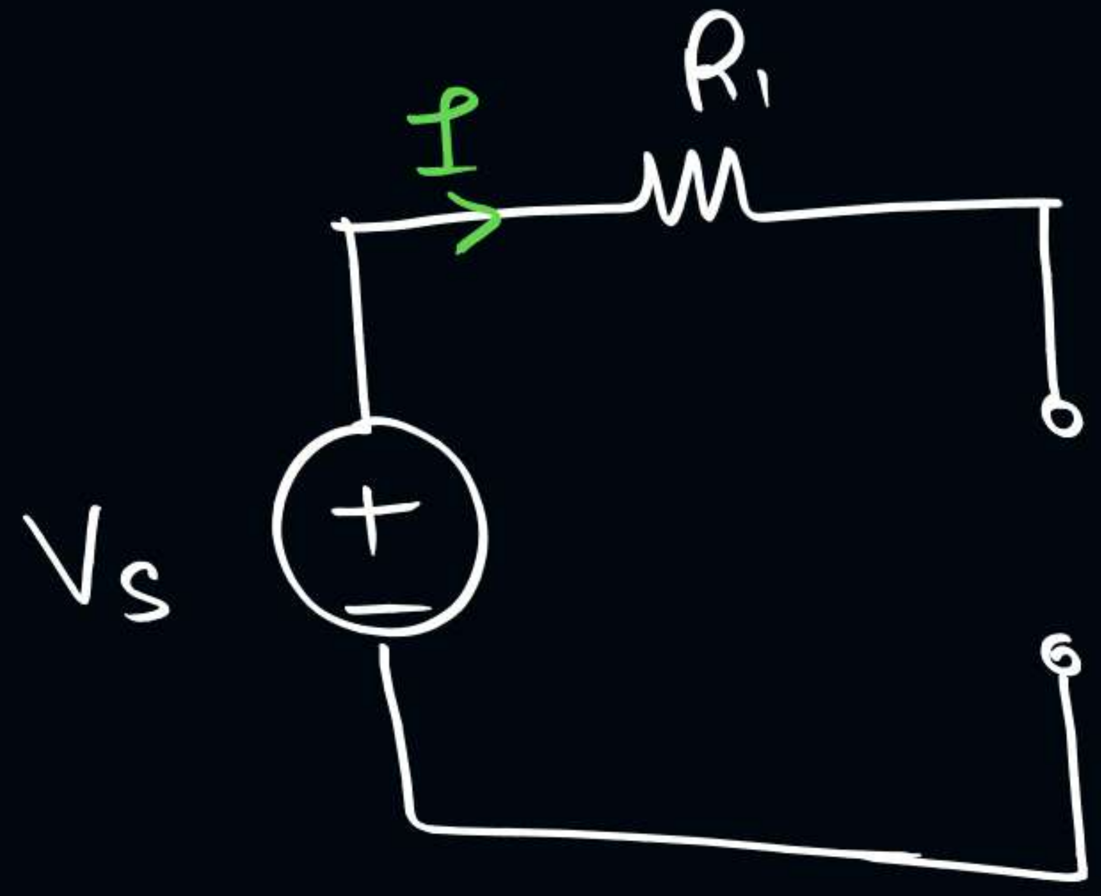
$$I = \frac{V_s}{R_1 + R_2}$$

$$V_1 = V_s \cdot \frac{R_1}{R_1 + R_2}$$

$$V_2 = \frac{V_s \cdot R_2}{R_1 + R_2}$$

$$V = I_s \cdot \frac{R_1 R_2}{R_1 + R_2}$$

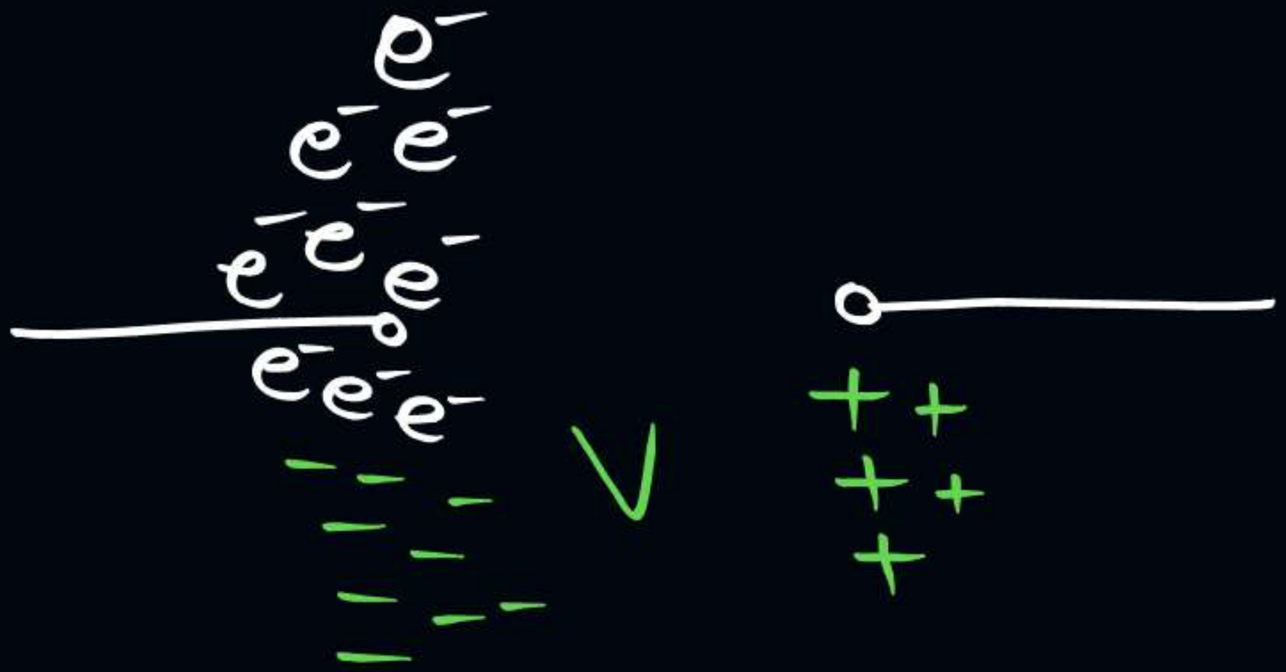
$$I_1 = \frac{R_2}{R_1 + R_2} \cdot I_s \qquad I_2 = \left(\frac{R_1}{R_1 + R_2}\right) I_s$$



$I = 0$ Amp

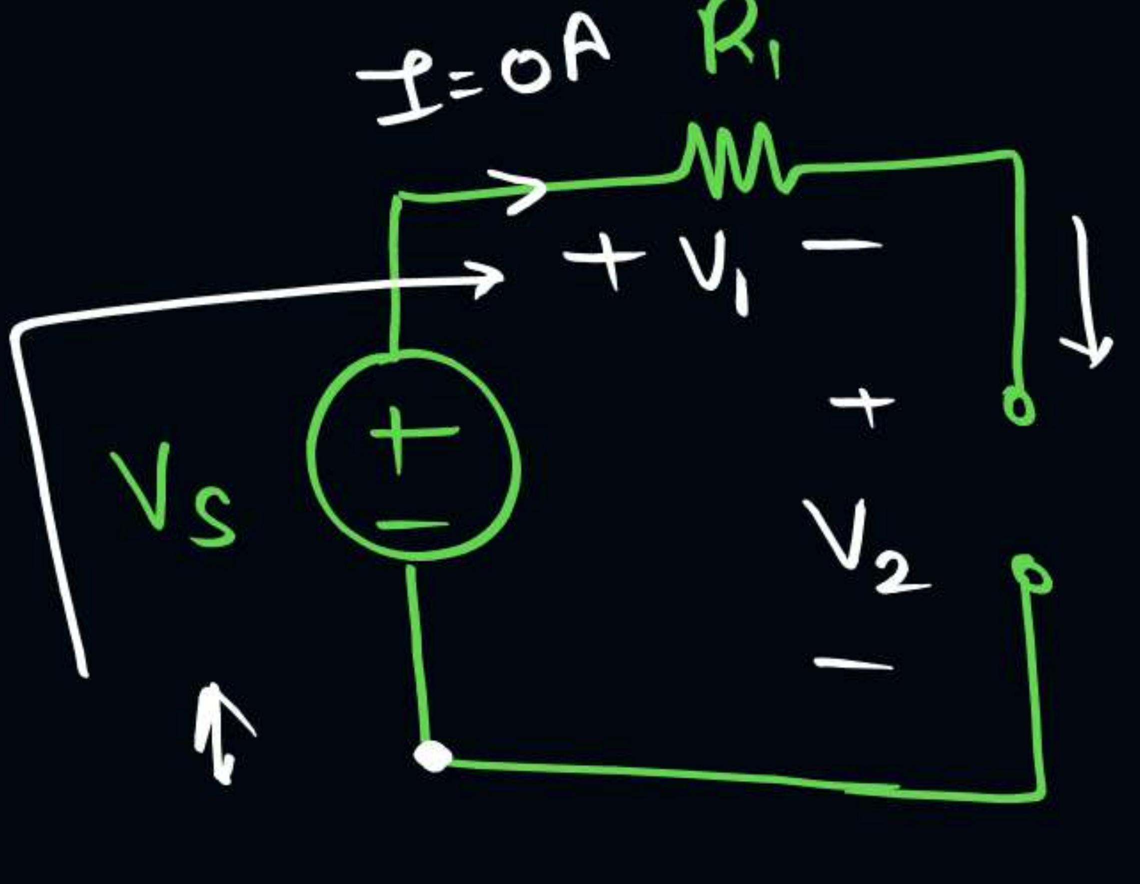
Current:

Flow of e^- in particular direction is known as current.



Charge of

$e^- = -1.6 \times 10^{-19}$ C



$$V_1 = 0 \times R_1 = 0 \text{ Volt}$$

KVL:

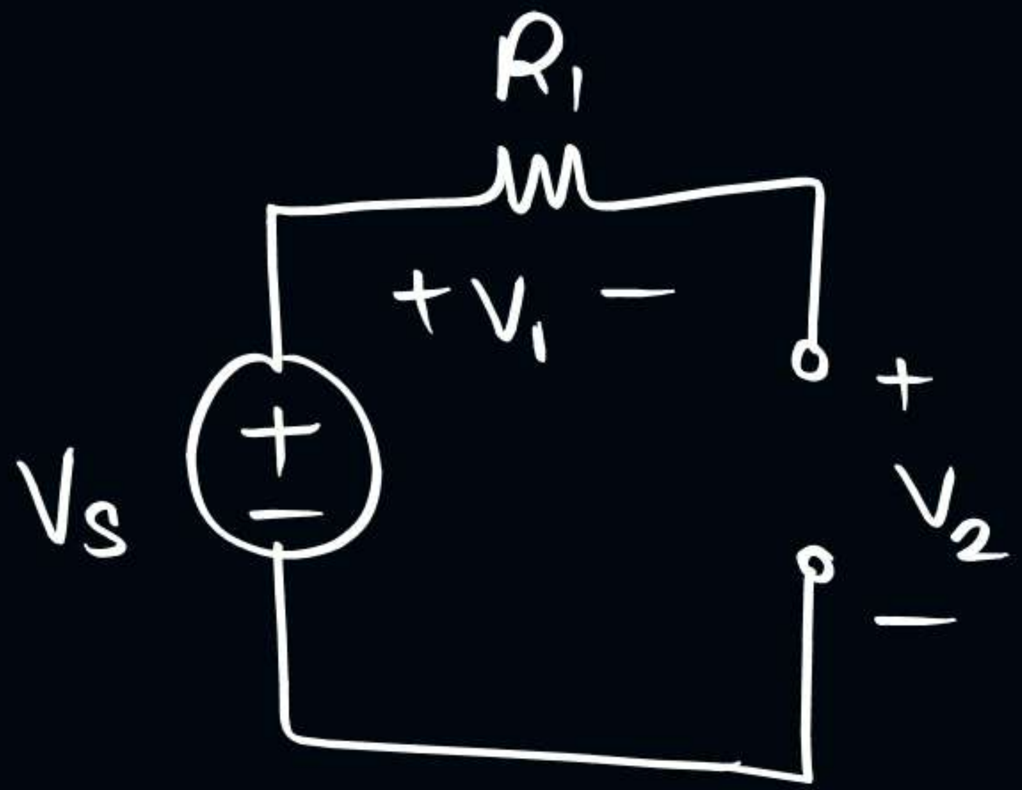
Applied on Voltage in a Loop.

$$-V_S + V_1 + V_2 = 0$$

$$V_1 + V_2 = V_S$$

$V_1 = 0$

$\boxed{V_2 = V_s}$



$V_1 = 0 \;, \quad \boxed{V_2 = V_s}$

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