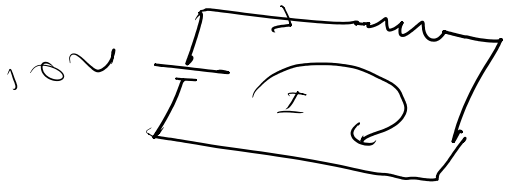
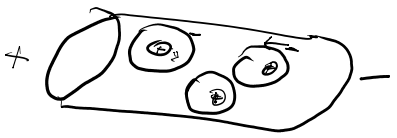
Lecture 3

Wednesday, February 9, 2022 9:55 AM

Flow of Current

Conductor & Insulator



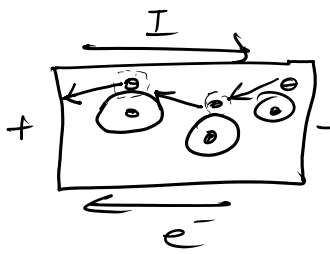


Insulator

e^- flow →

Current flow →

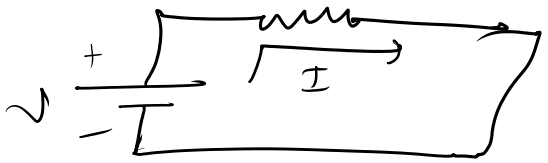
Conducton



⟶ Current flow

Semi Conducton CSE 251

Ohm's Low



V ↑
I ↑

$$I \propto V$$

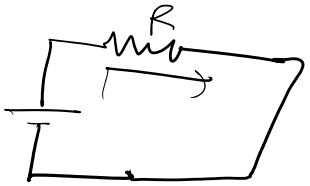
Conductance

$$I \propto V$$

$$\Rightarrow I = KV$$

$$\Rightarrow \boxed{I = GV}$$

G → Conductance



V = 30 (V) → Volt

G = 15 unit

I = ? = 15 × 30

= 450 (A) → Ampere

C/s

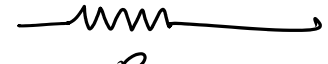
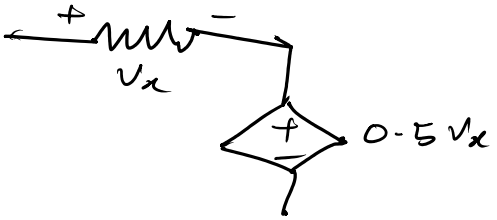
$V = 30\ V \quad Cr = 15\ unit \Rightarrow I = 450\ A$

$V = 30\ V \quad Cr = 1.5\ unit \Rightarrow I = 1.5 \times 30\ A$
$= 45\ A$

★ Resistance $= \frac{1}{Cr}$

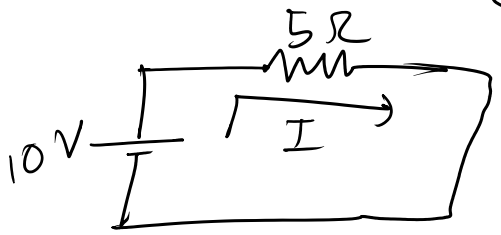
$R = \frac{1}{Cr}$

Circuit Symbols

1. Voltage Source → DC → 
   → AC → 
2. Current Source → 
3. Ground → 
4. Resistance → 
   R
5. Dependant Source → 

Resistance → Ohm (Ω)

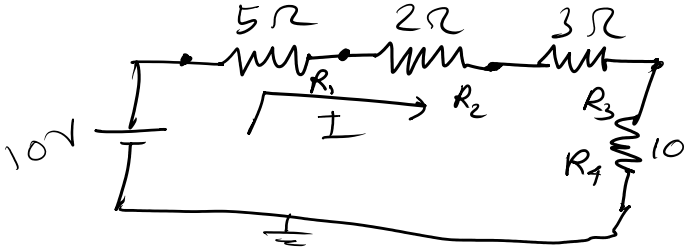
Ohm's law → $I = \frac{V}{R}$ ★★★



$I = \frac{10}{5}\ A = 2A$

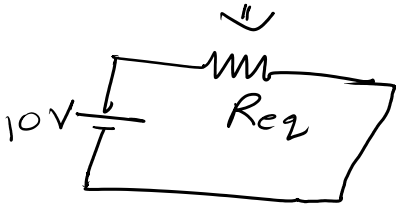
Orientation

Series



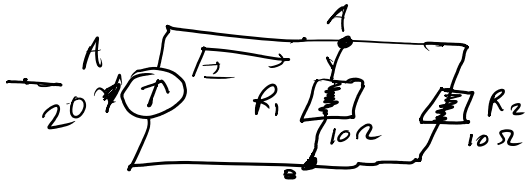
$I = ?$

$I = \frac{V}{Req} = \frac{10}{5+2+3+10} = 0.5\ A$



$Req = R_1 + R_2 + \ldots + R_n$

Parallel



$\frac{1}{Req} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots \frac{1}{R_n}$

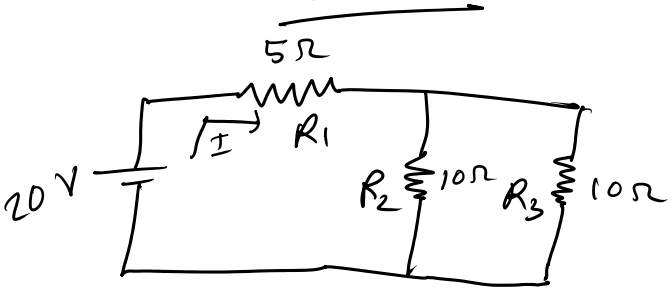
$Req = \left(\frac{1}{10} + \frac{1}{10}\right)^{-1}$

$= 5\Omega$

$V = IReq$

$= 20 \times 5 = 100\ V$

Mixed



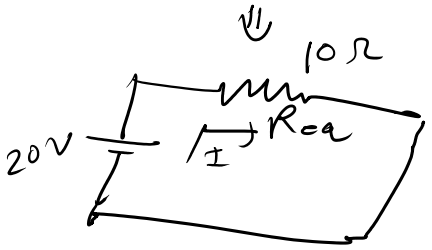
$$R_{eq} = R_1 + R_2 \| R_3$$

$$= R_1 + \left(\frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$$

$$= 5 + \left(\frac{1}{10} + \frac{1}{10}\right)^{-1}$$

$$= 5 + 5$$

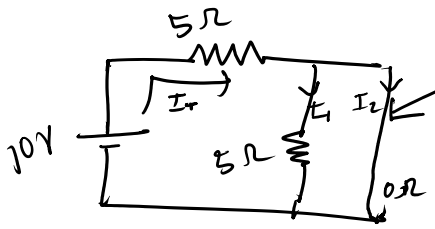
$$= 10\,\Omega$$



$$\therefore I = \frac{V}{R_{eq}}$$

$$= \boxed{2\,A}$$

Open & Short Circuit



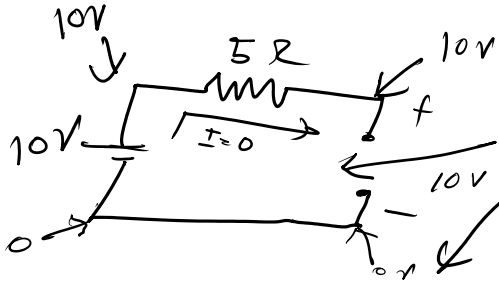
Shorted → No element that causes Voltage Drop. But Current flows

Current → Easier Path preferable

→ No Resistance

→ Low Resistance

→ High Resistance

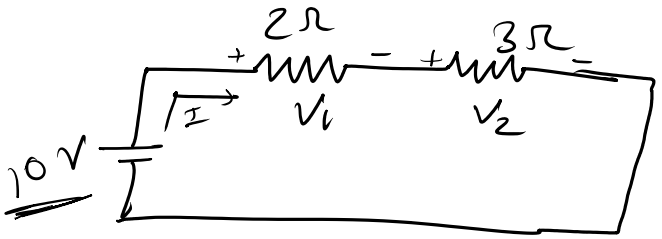


Open Circuit

→ No Path for Current flow

Voltage Drop may happen

Divider Rules



$$V_1 = V \times \frac{R_1}{R_1 + R_2}$$

$$= 10 \times \frac{2}{2+3}$$

$$= 4V$$

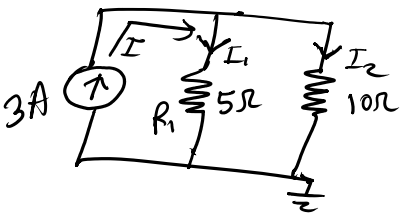
$$V_2 = 10 \times \frac{3}{2+3}$$

$$= 6V$$

Voltage Divider Rule

$V = IR$

$V \propto R$



$$I_1 = I \times \frac{R_1}{R_1 + R_2}$$

$$= 3 \times \frac{5}{5+10} = 1A$$

$$I = \frac{V}{R}$$

$$I \propto \frac{1}{R}$$

$$I_1 = I \times \frac{R_1^{-1}}{R_1^{-1} + R_2^{-1}}$$

$$= 3 \times \frac{5^{-1}}{5^{-1} + 10^{-1}}$$

$$= 3 \times \frac{2}{3}$$

$$= 2A$$

$$I_2 = I \times \frac{R_2^{-1}}{R_1^{-1} + R_2^{-1}}$$

$$= 3 \times \frac{10^{-1}}{5^{-1} + 10^{-1}}$$

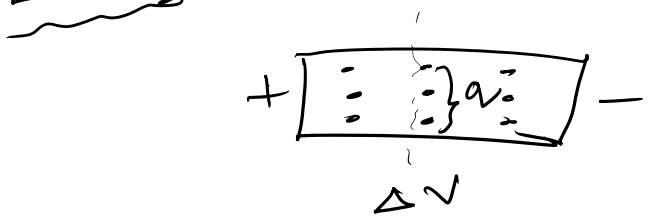
$$= 3 \times \frac{1}{3}$$

$$= 1A$$

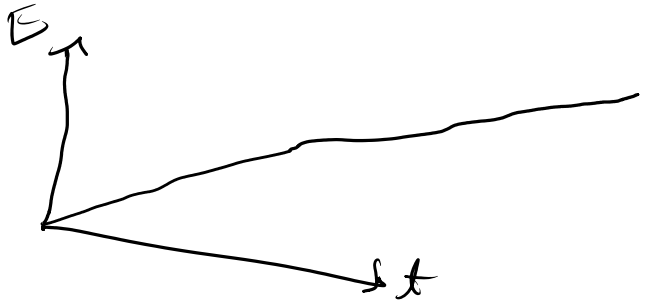
Current Divider Rule

Power

Energy



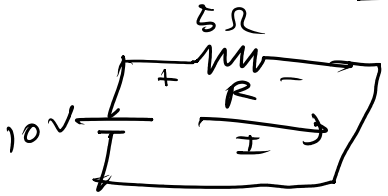
$E = q\Delta V$



Power

$$P = \frac{E}{t} = \frac{q\Delta V}{t} = \Delta V I$$

$$\boxed{P = VI}$$



$$I = \frac{V}{R} = 2A$$

$$P = VI = 10V \times 2A = 20W$$

$$P = VI = V \cdot \frac{V}{R}$$

$$\therefore \boxed{P = \frac{V^2}{R}} = \frac{10^2}{5} = \boxed{20W}$$

$$P = VI = IR \cdot I = I^2R$$

$$\therefore \boxed{P = I^2R}$$

$\therefore P = I^2 R$