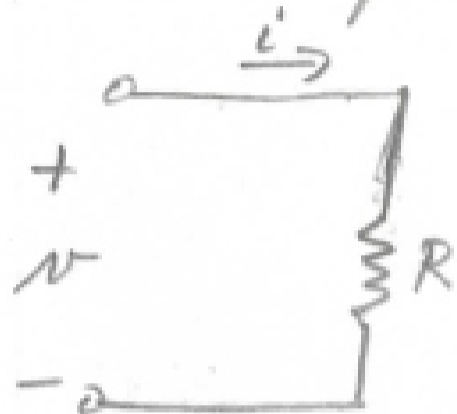


A. Resistance and Ohm's Law

1. Resistor — circuit element which restricts current flow

a) Circuit symbol



← use passive sign convention

b) unit of measure — ohm (Ω)

c) satisfies the relation

$$V = iR$$

d) i) Ohm's Law

ii) straight line — \therefore linear element

iii) R is slope 

$$P = VI = i^2 R = \frac{V^2}{R}$$

+ i
enters
+ V

d) $P = \underbrace{Vi}_{\text{always positive}} = i^2 R = \frac{V^2}{R}$

always positive

\therefore power is always absorbed (heat)

e) $W(t) = \int_{-\infty}^t |P| dt \geq 0$

P is always positive

$\therefore R$ is a passive element

B) Conductance

1. reciprocal of resistance $G = \frac{1}{R}$

2. circuit symbol



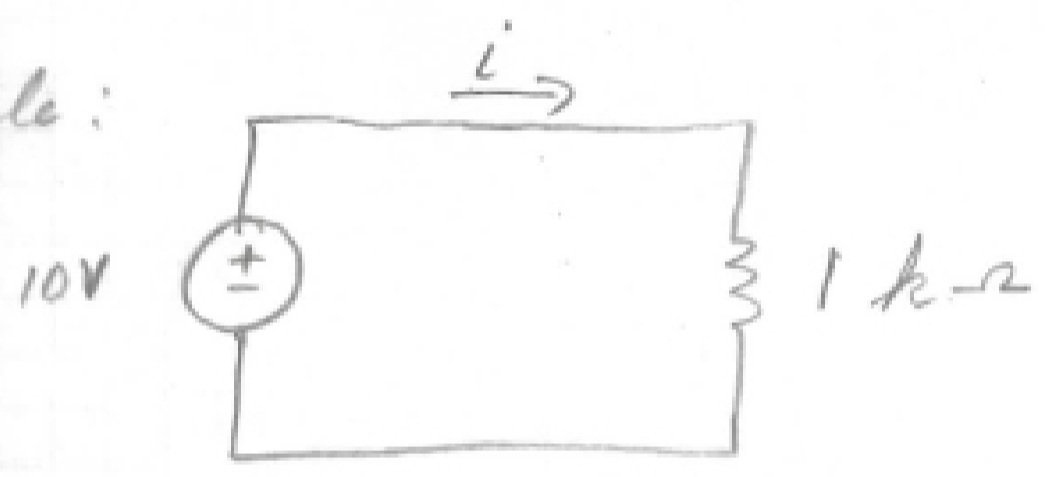
Siemen (S)

3. Unit of measure - mho (Ω)

4. Satisfies the relation

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

Example:



Find i and power absorbed by resistor

a) $i = \frac{v}{R} = \frac{10}{1 \times 10^3} = 10 \text{ mA}$

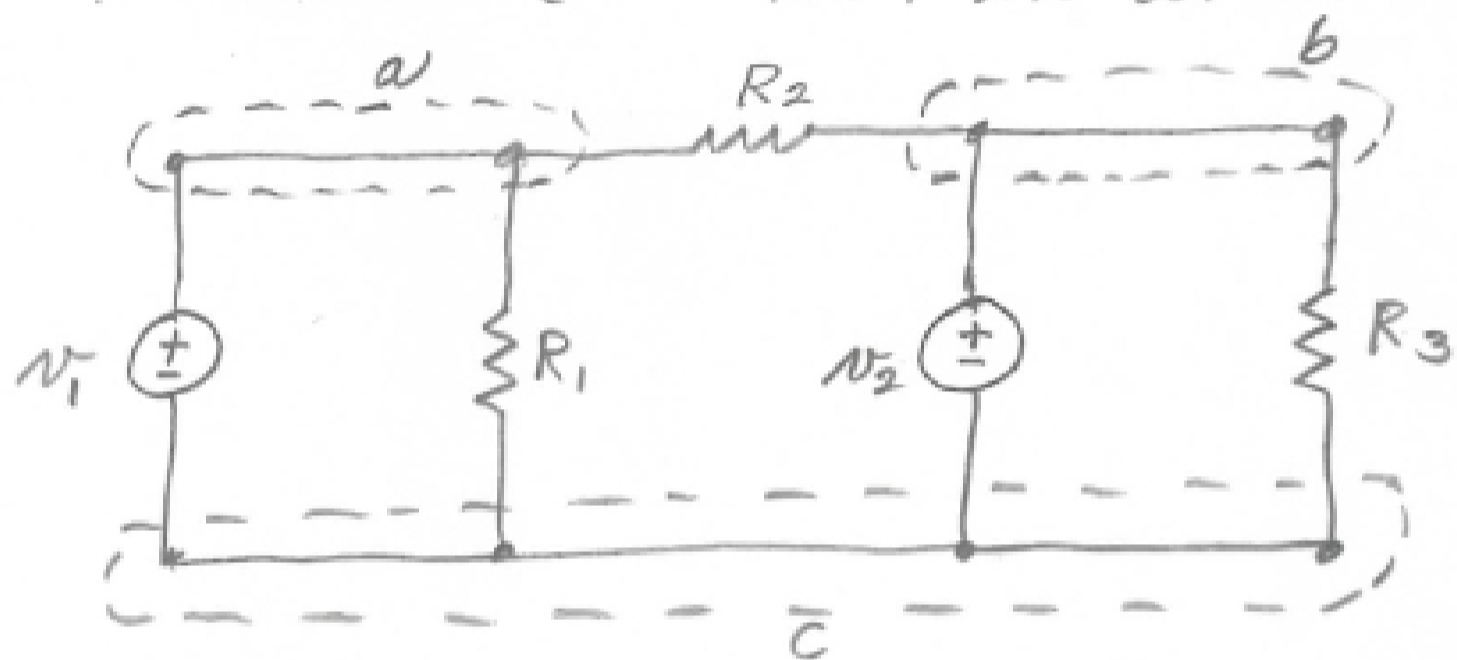
b) $P = v i = (10)(10 \text{ mA}) = 100 \text{ mW}$

C. Branches, nodes and loops

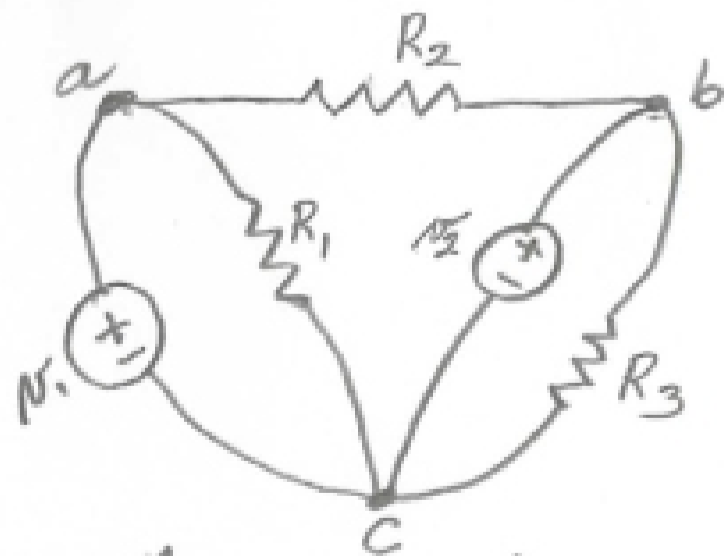
1. Branch - a single circuit element

- a) voltage source
- b) current source
- c) resistor

2. Node - a point where two or more elements (branches) are connected



- a) Assume wires are perfect conductors
- b) $\therefore R_w = 0$
- c) \therefore No voltage change along a wire
- d) can redraw circuit



e) three nodes