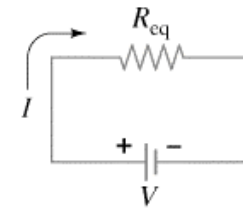
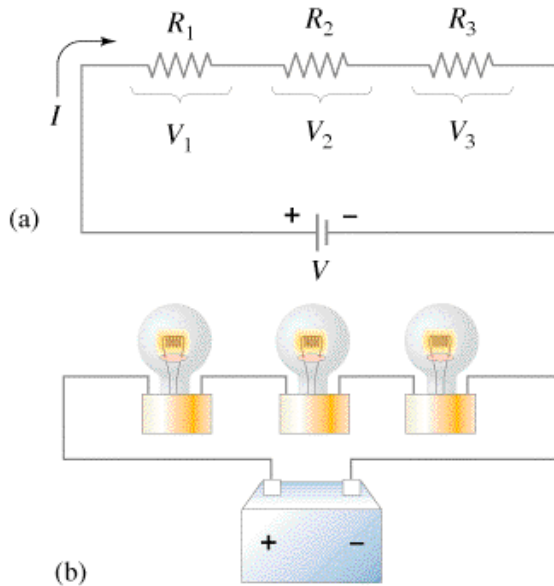


Ch 19. DC Circuits

I. Resistors in Series



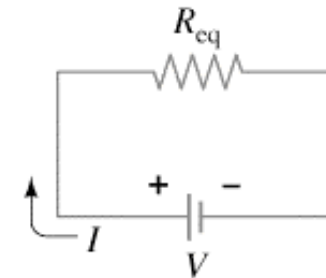
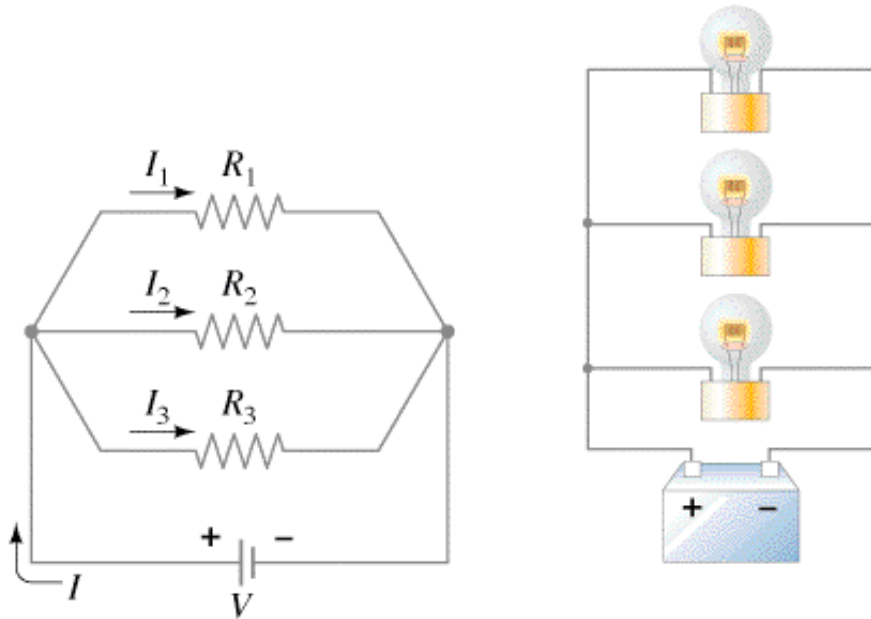
Same current I

$$V = V_1 + V_2 + V_3 = IR_1 + IR_2 + IR_3$$

Equivalent resistance R_{eq} :

$$V = IR_{eq}$$
$$R_{eq} = R_1 + R_2 + R_3$$

II. Resistors in Parallel



Equivalent resistance R_{eq} :

$$I = I_1 + I_2 + I_3$$

V the same across each R

$$I_1 = V/R_1; I_2 = V/R_2; I_3 = V/R_3$$

Special case: two in parallel

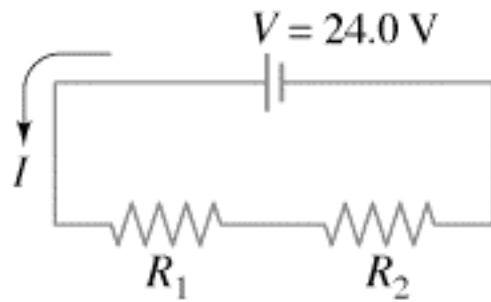
$$I = V/R_{eq}$$

$$V/R_{eq} = V/R_1 + V/R_2 + V/R_3$$

$$1/R_{eq} = 1/R_1 + 1/R_2 + 1/R_3$$

$$R_{eq} = R_1 R_2 / (R_1 + R_2)$$

Examples



(a)

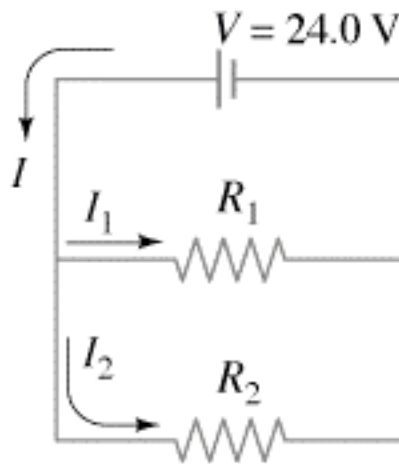
$$R_1 = 100\Omega, R_2 = 300\Omega$$

$$R_{\text{eq}}?$$

$$P_1? P_2? P_{\text{total}}?$$

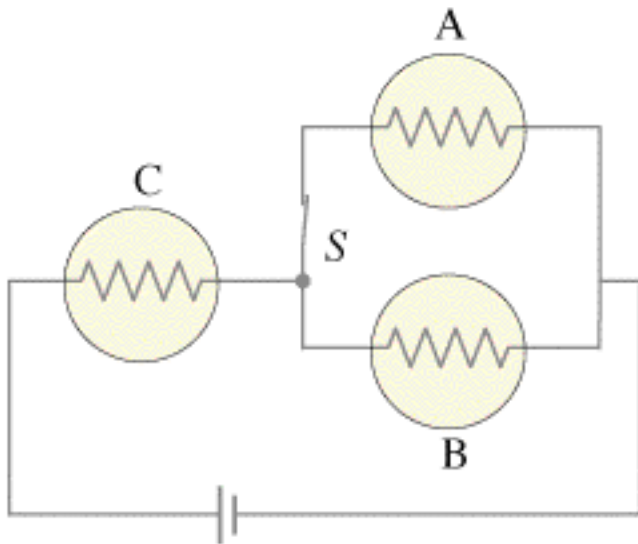
$$I_1? I_2? I_{\text{total}}?$$

$$V_1? V_2? V_{\text{total}}?$$



(b)

Examples



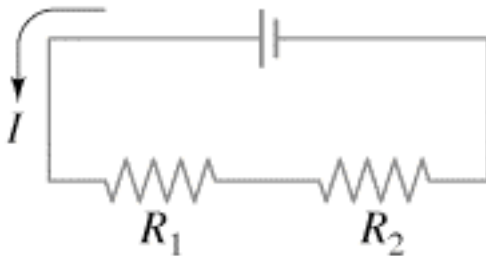
$R_A=R_C=100\Omega$, $R_B=300\Omega$,
 $V=35V$

S closed, R_{eq} ? I_A , I_B , I_C ?
 V_A , V_B , V_C ?

S open, R_{eq} ? I_A , I_B , I_C ?
 V_A , V_B , V_C ?

III. Comparison

Series



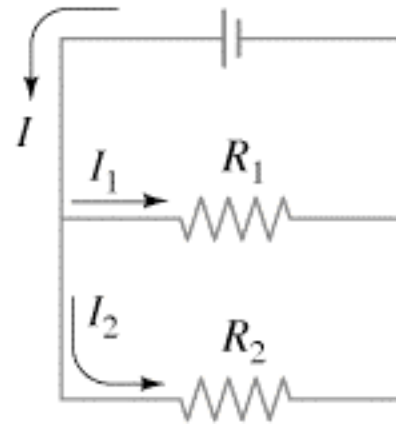
I same

V add up

$$R_{eq} = R_1 + R_2$$

Larger than either one

Parallel



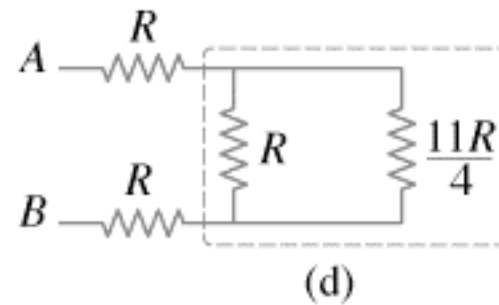
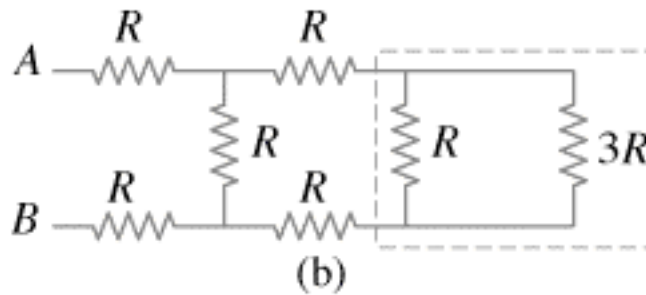
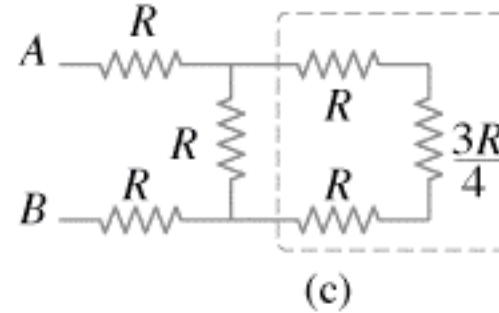
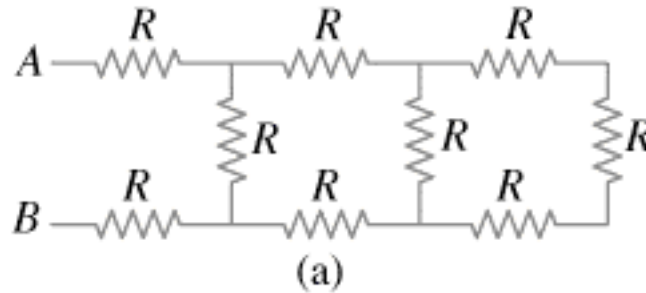
V same

I add up

$$R_{eq} = R_1 R_2 / (R_1 + R_2)$$

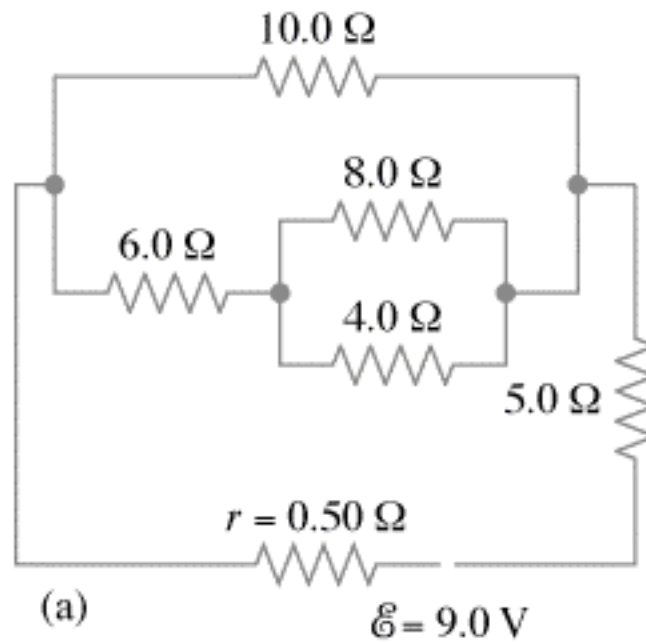
Smaller than either one

Complex Circuits



Draw equivalent circuits
Simplify step by step

More Example



Electrical Hazard

