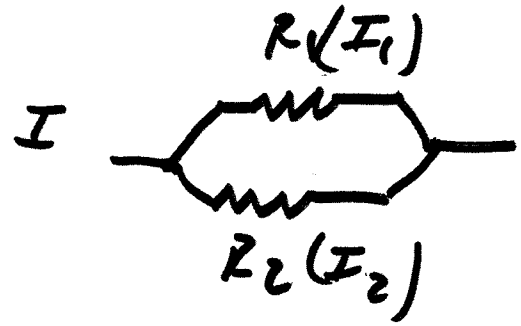
Read
Finish Chp 13
14.1 - 14.2

Review

series $R_s = R_1 + R_2$
same I
Different V
R_s larger



parallel $I = I_1 + I_2$

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

same V
Different I
R_p smaller

Ex $R_1 = 2\ \Omega$
$R_2 = 2\ \Omega$

$R_s = 2\Omega + 2\Omega = 4\Omega$

$\frac{1}{R_p} = \frac{1}{2\Omega} + \frac{1}{2\Omega} = 1\Omega^{-1}$ $R_p = 1\Omega$

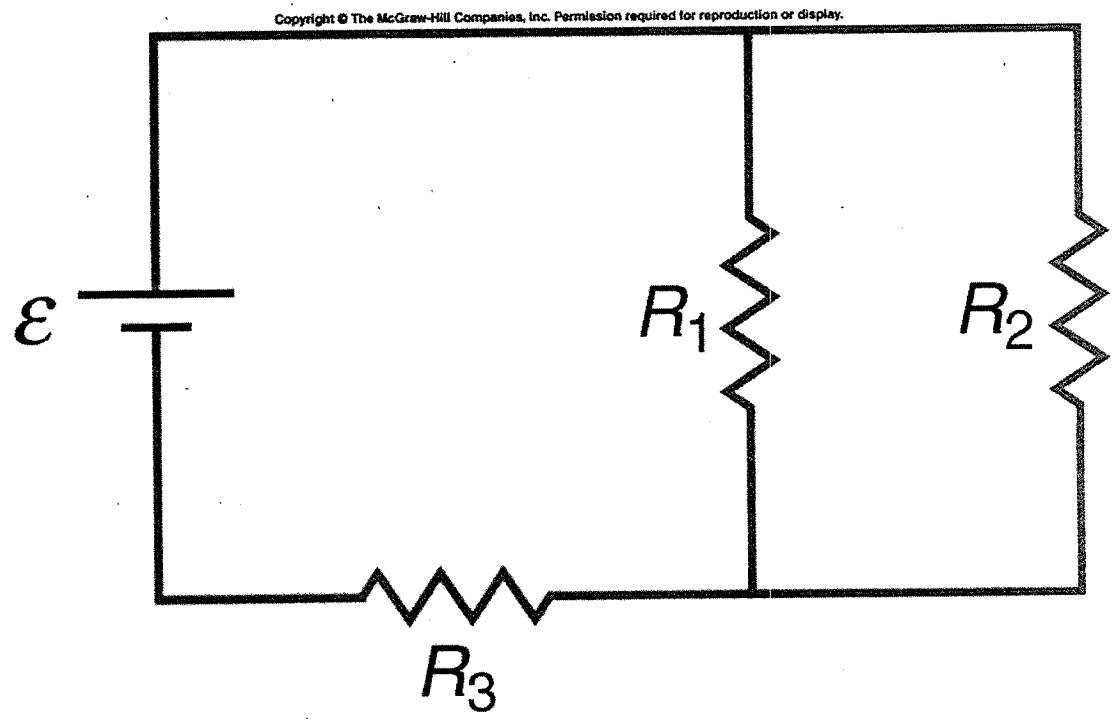
note parallel
same voltage so if R_1 large I small
R_2 small I large

Interactive Question

C

In the circuit shown, R_3 is greater than R_2, and R_2 is greater than R_1. $\mathcal{E}$ is the electromotive force of the battery whose internal resistance is negligible. Which of the three resistors has the greatest current flowing through it?

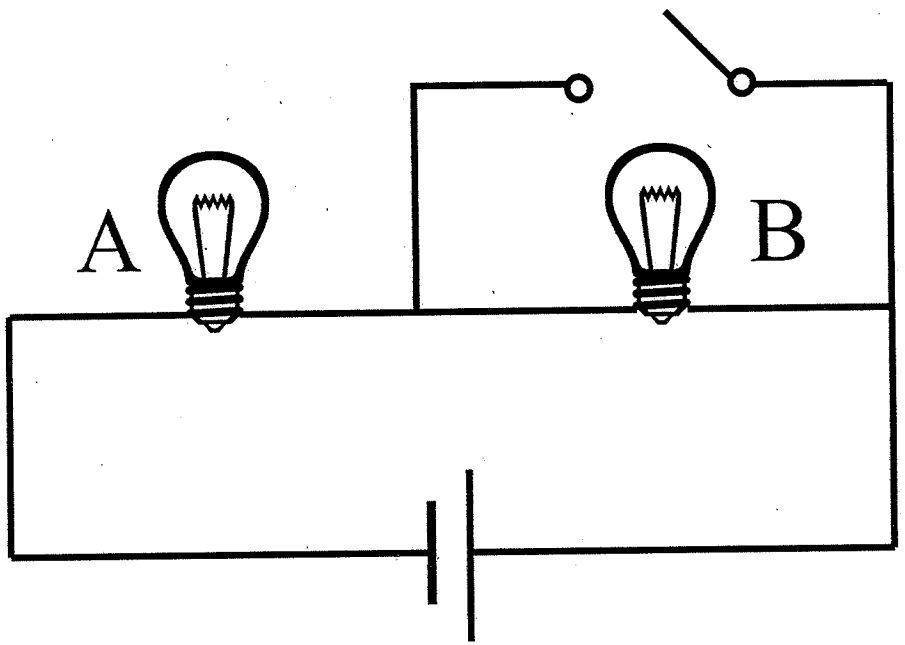
A) R_1
B) R_2
C) R_3
D) R_1 and R_2 are equal, and greater than R_3
E) They are all equal



Interactive Question

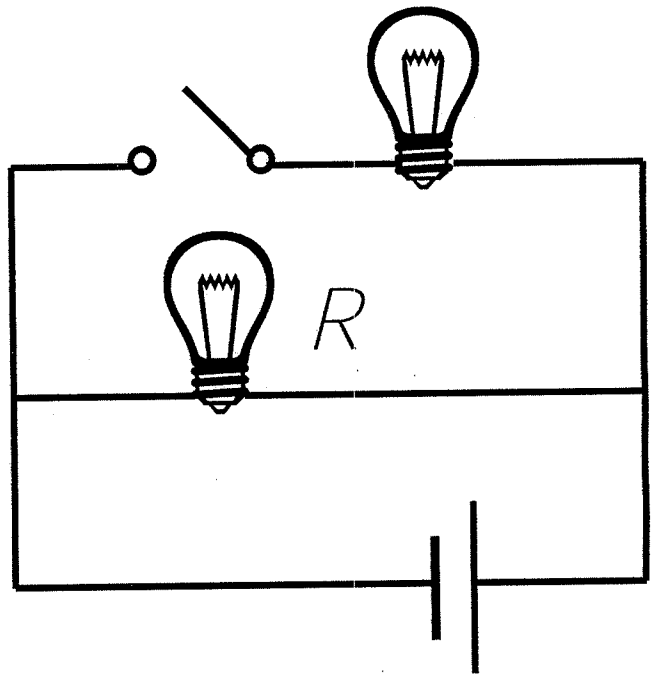
(A)

The circuit below consists of two identical light bulbs burning with equal brightness and a single 12 V battery. When the switch is closed, the brightness of bulb A



A) increases
B) decreases
C) remains unchanged

Interactive Question



A simple series circuit contains a resistance R and an ideal battery. If a second resistor is connected in parallel with R by closing the switch,

A) the voltage across R will decrease.
B) the voltage across R will increase.
C) the total current in the circuit will increase.
D) the equivalent resistance of the circuit will increase.

Problem: How much does it cost to run a 1200 W hair dryer for 10 minutes?

$P = 1200\ W$

Energy = $.10 / kW \cdot hr$ $\quad t = 10\ min$

want money

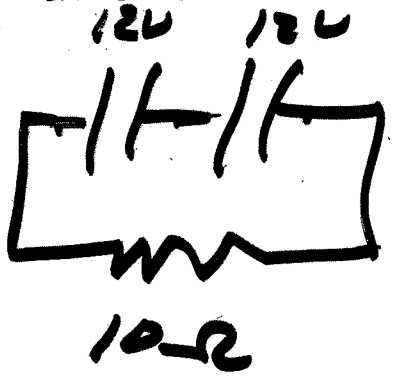
$$money = Energy \cdot \frac{money}{Energy}$$

$$= power \cdot time \times \frac{money}{Energy}$$

$$(1200\ W)(10\ min)\left(\frac{.10}{kW \cdot hr}\right)\left(\frac{1\ kW}{1000\ W}\right)\left(\frac{1\ hr}{60\ min}\right) = .02$$

2 cents

Problem: A light bulb with a resistance of 10 Ω is placed in series with two 12 V batteries. How much power is dissipated by the bulb?



$\mathcal{E} = 24\,V$ want power

$R = 10\,\Omega$

Power from batteries $P = I\mathcal{E}$

power from bulb $P = I^2R$

need to find I

$\Delta V = \mathcal{E} = IR \qquad I = \frac{\mathcal{E}}{R} = \frac{24\,V}{10\,\Omega} = 2.4\,A$

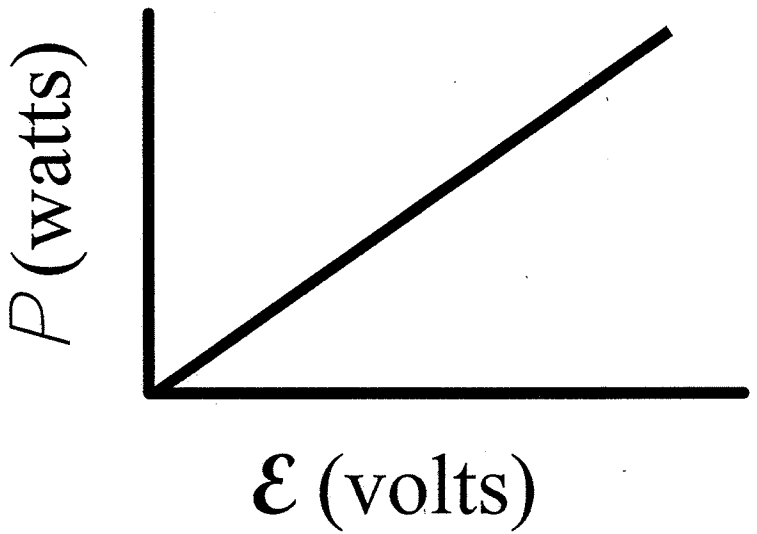
A) $P = I\mathcal{E} = (2.4\,A)(24\,V) = 57.6\,W$

B) $P = I^2R = (2.4\,A)^2(10\,\Omega) = 57.6\,W$

Interactive Question

(A)

In the graph shown, what physical quantity does the slope represent?



A) Current
B) Energy
C) Voltage
D) Resistance
E) Power

Problem: A 4 amp current is maintained in a simple circuit with a total resistance of 2 Ω. How much heat is generated in 3 seconds?

Given $I = 4A$

$R = 2\Omega$

$t = 3s$

want Energy

Energy = power x time

$= (I^2 R \times t)$

$= (4A)^2 (2\Omega \times 3s) = \underline{96\ J}$

Problem: A 100 W light bulb is designed to operate at 120 V ac.

A) What is the effective current in the light bulb?

B) What is the resistance of the bulb?

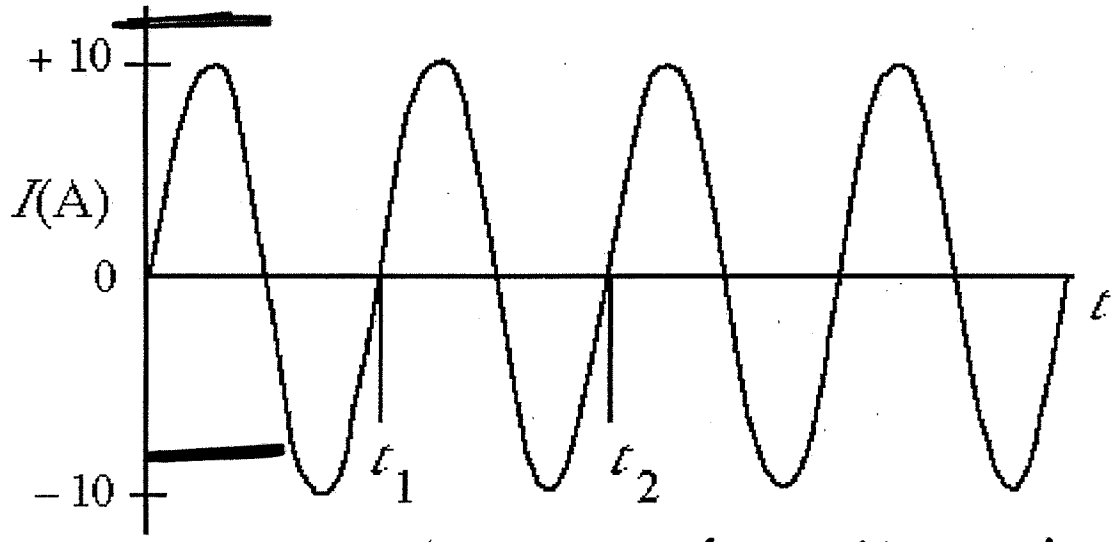
Given 100 W

$\mathcal{E} = 120\ V$ want I

A) $P = \mathcal{E} I \quad I = \frac{P}{\mathcal{E}} = \frac{100\ W}{120\ V} = .833\ A$

B) $\Delta V = \mathcal{E} = IR \quad R = \frac{\mathcal{E}}{I} = \frac{120\ V}{.833\ A} = 144\ \Omega$

Problem: The figure below shows the time variation of the current through the heating element of an iron when it is plugged into a standard ~~120 V~~, 60 Hz outlet. What is the (A) rms current and (B) resistance of the iron?



A) $I_{RMS} = .707\, I_{max} = (.707)(10A) = 7.07A$

B) $\mathcal{E} = IR \qquad R = \frac{\mathcal{E}}{I} = \frac{120V}{7.07A} = 17\Omega$