Read 14.3

H.W Due today

Next H.W available

office hours 11:30-12:30

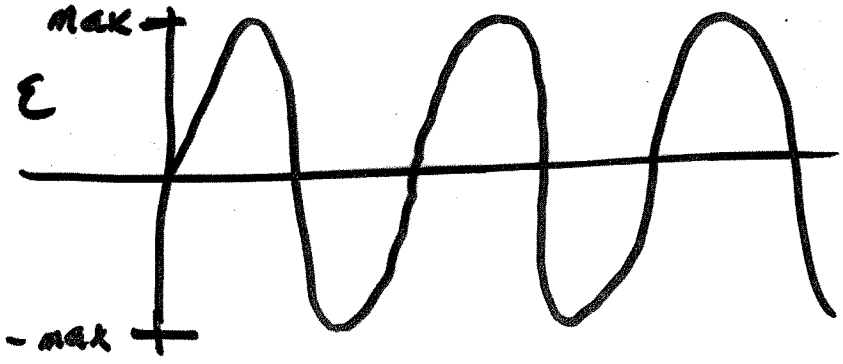
Review

$P = I\mathcal{E}$ power battery

$P = I^2R$ power resistor

Energy = power x time

AC power

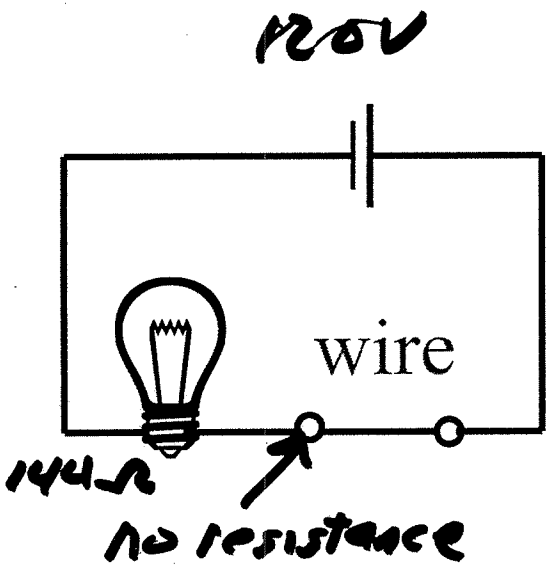


$\mathcal{E}_{RMS} = .707\,\mathcal{E}_{max}$

$I_{RMS} = .707\,I_{max}$

$\mathcal{E}_{RMS} = I_{RMS}R$

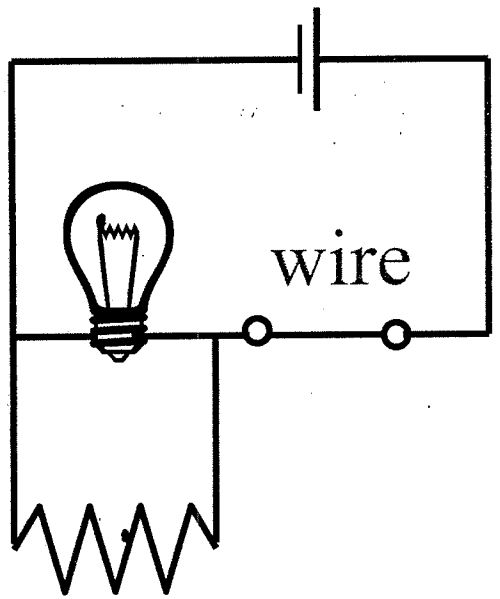
Problem: How many amps run through a tungsten wire when it is hooked up in series to a 100 watt light bulb and plugged into a 120 V electrical outlet? The light bulb has a resistance of 144 Ω.



$$\mathcal{E} = IR$$

$$I = \frac{\mathcal{E}}{R} = \frac{120\,V}{144\,\Omega} = .83\,A$$

Problem: How many amps run through a tungsten wire when it is hooked up in series to a 100 watt light bulb that is in parallel with a 600 W heater and plugged into a 120 V electric outlet?



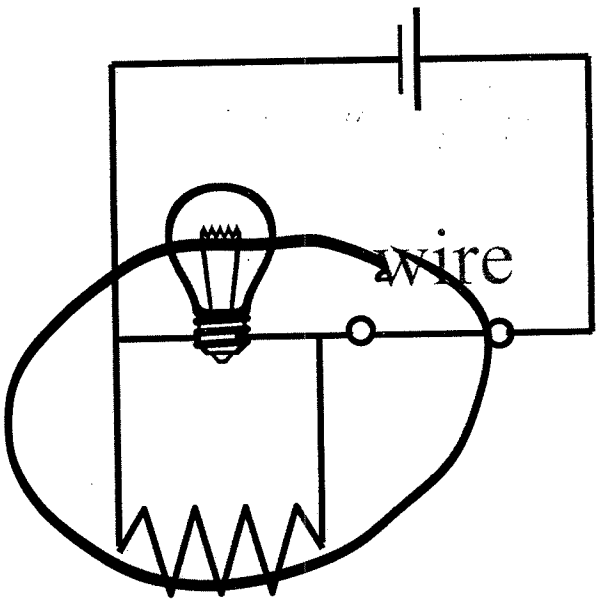
The heater has a resistance of 24 Ω (which we can determine using $P=\mathcal{E}I$, and $\mathcal{E}=I^2R$ with $\mathcal{E}$=120 V.) We already know the light bulb has a resistance of 144 Ω.

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{144\,\Omega} + \frac{1}{24\,\Omega} = .486\,\Omega^{-1}$$

$$R_{eq} = 20.5\,\Omega = \frac{1}{.486}$$

$$I = \frac{\mathcal{E}}{R_{eq}} = \frac{120\,V}{20.5\,\Omega} = 5.8\,A$$

Problem: What if 600 W heater is replaced with a 740 W heater with a resistance of 19.5 Ω?

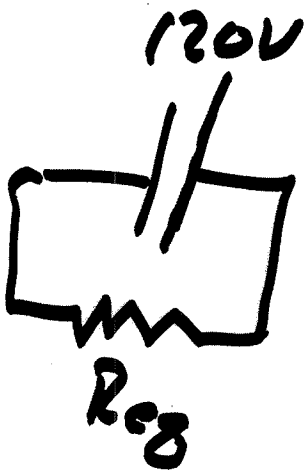


$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{144\,\Omega} + \frac{1}{19.5\,\Omega} = .0582\,\Omega^{-1}$$

$$\frac{1}{R_{eq}} = .0582\,\Omega^{-1} \qquad R_{eq} = 17\,\Omega$$

$$I = \frac{\mathcal{E}}{R_{eq}} = \frac{120\,V}{17\,\Omega} = 7.0\,A$$



Interactive Question

At 120 V, which has a larger resistance, a 100 W light bulb or a 60 W light bulb?

A) 100 W
B) 60 W
C) They both have the same resistance

Interactive Question

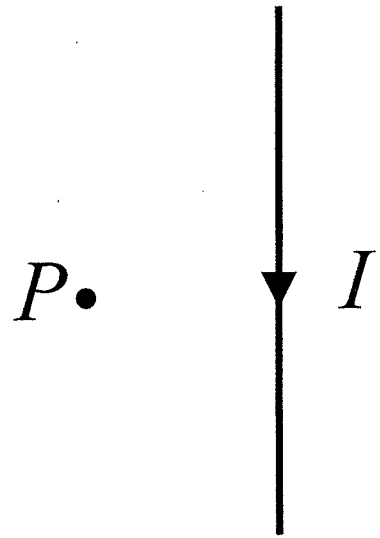
(A)

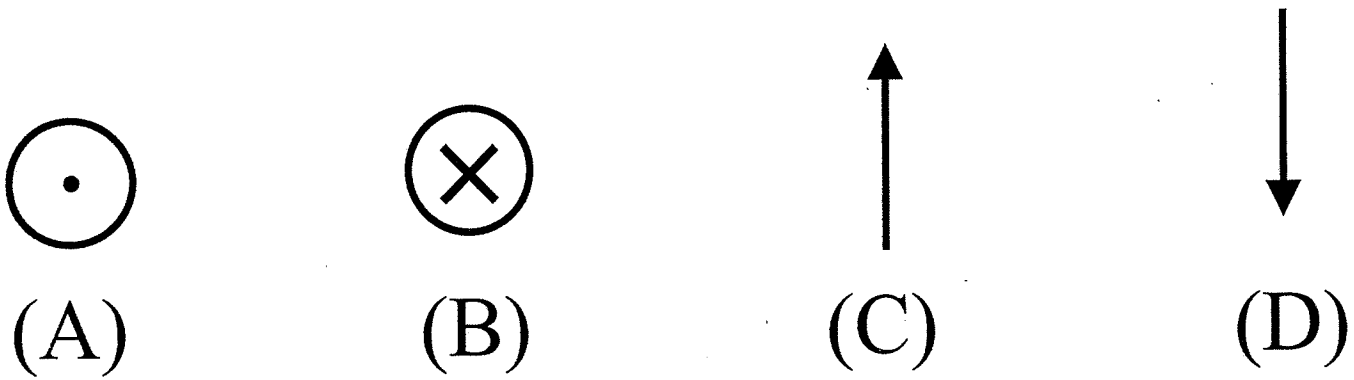
If a 100 W light bulb is placed in series with a 60 W light bulb (instead of in parallel as they were designed for), which will burn brighter?

A) 60 W
B) 100 W
C) The same
D) It depends on the order of the bulbs

Interactive Question

A long straight wire has a current going in the direction shown in the figure to the right. Which direction is the magnetic field at point *P*?





(A) (B) (C) (D)

E) None of the above

Interactive Question

C

A long straight wire has a current going in the direction shown in the figure to the right. Which direction is the magnetic field at point *P*?

(A)

(B)

(C)

(D)

E) None of the above