Further Power, Energy, and Efficiency Questions (Teacher)

The average North American household uses about 30 kilowatt-hours per day. How much is this in Joules?

1 W = 1 J/s

*1 hour*60 min/h*60 s/min = 3600 s*

*30 kWh = (30,000 J/s)*3600s*

=108,000,000 J or 1.1 x 10^8 J

A professional cyclist can produce about 100 watt-hours in 1 hour. That's about enough energy to power:

(a) A clock radio for 10 hours
(b) A compact fluorescent light bulb for 6 hours, 40 minutes
(c) A laptop computer for 2 hours
(d) A 19-inch LCD TV for 1 hour, 40 minutes
(e) A toaster for 7½ minutes
(f) An iron for 4 minutes

Calculate the power rating (i.e. the power requirement, in Watts, or Joules/s) of each of the appliances above.

1 W = 1 J/s

*1 hour*60 min/h*60 s/min = 3600 s*

*100 Watt-hours = (100 J/s)*3600 s*
= 360,000 J

*a) P = 360,000J/(10hrs*3600s) = 10 J/s = 10 W*
*b) P = 360,000J/(6 h*3600s + 40 min*60s) = 15 W*
*c) P = 360,000 J / (2 h * 3600 s) = 50 W*
*d) P = 360,000 J/(1 h * 3600 s+40 min * 60 s) = 60 W*
*e) P = 360,000 J /(7.5 min * 60 s) = 450 W*