

ECE203 DC Circuits

Homework Set 1 – Solutions

HW1.1

A 1.5 kW electric coffeemaker takes 4 minutes to make a pot of coffee. If this is done three times a day and power costs 12 cents/kWh, what is the cost of its operation for 365 days?

Power = 1.5 kW

time = 4 min = 0.0667 hr

Energy/Pot = 0.1 kWh, @ \$0.12/kWh

$$\text{Cost} = 365 \times 3 \times 0.1 \times 0.12 = \$13.14 .$$

HW1.2

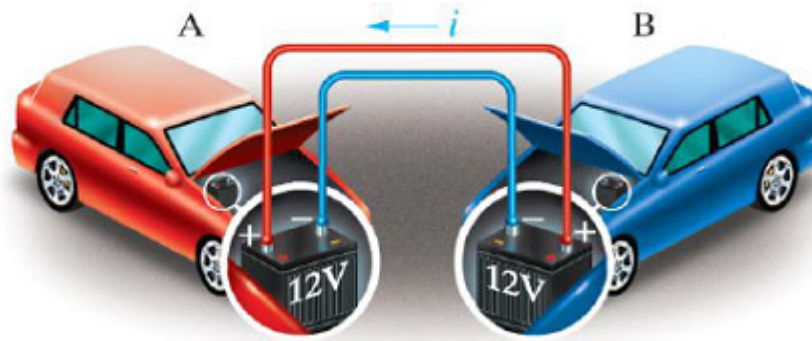
Problem 1.1

$$\frac{(260 \times 10^6)(540)}{10^9} = 104.4 \text{ gigawatt-hours}$$

HW1.3

Problem 1.15

- Which car has the dead battery?
- If this connection is maintained for 1 min, how much energy is transferred to the dead battery?



- [a] In Car A, the current i is in the direction of the voltage drop across the 12 V battery (the current i flows into the + terminal of the battery of Car A). Therefore using the passive sign convention,
 $p = vi = (30)(12) = 360 \text{ W}$.
Since the power is positive, the battery in Car A is absorbing power, so Car A must have the "dead" battery.

[b] $w(t) = \int_0^t p dx; \quad 1 \text{ min} = 60 \text{ s}$

$$w(60) = \int_0^{60} 360 dx$$

$$w = 360(60 - 0) = 360(60) = 21,600 \text{ J} = 21.6 \text{ kJ}$$