P11.19

$\Delta E^{TH} = W_{EXT} + Q$

$-200\,J = 500\,J + Q$

$Q = -700\,J$

↑ ENERGY WAS REMOVED FROM SYSTEM

P11.20

$\Delta E^{TH} = W_{EXT} + Q$

$\Delta E^{TH} = -400J + 600\,J$

$\Delta E^{TH} = 200\,J$

SYSTEM'S THERMAL ENERGY INCREASES BY 200 J

P11.21

$\Delta E^{TH} = W_{EXT} + Q$

$150\,J = W_{EXT} + 300\,J$

$W_{EXT} = -150\,J$

↑ SYSTEM DOES 150 J OF WORK ON THE ENVIRONMENT

P11.22

$\Delta E^{TH} = W_{EXT} + Q$

$\Delta E^{TH} = 20\,J - 10\,J$

$\Delta E^{TH} = 10\,J$

↖ THERMAL ENERGY OF SYSTEM INCREASES BY 10 J

$\Delta E^{TH} = N \frac{D}{2} k_B \Delta T$

↑ SINCE ΔE^{TH} ↑

ΔT ALSO ↑

P11.5 1000 Calories → J?

1 Cal = 1000 cal

1 cal = 4.19 J

$$1000\ \text{Cal} \times \frac{1000\ \text{cal}}{1\ \text{Cal}} \times \frac{4.19\ \text{J}}{1\ \text{cal}} = 4190000\ \text{J} \quad \text{or} \quad 4.19 \times 10^6\ \text{J}$$

P11.6

$$100\ \text{W} = 100\ \frac{\text{J}}{\text{S}}$$

$$100\ \frac{\text{J}}{\text{S}} \times \frac{60\ \text{S}}{1\ \text{MIN}} \times \frac{60\ \text{MIN}}{1\ \text{hr}} \times \frac{24\ \text{HR}}{1\ \text{DAY}} = 8640000\ \frac{\text{J}}{\text{DAY}}$$

OR

$$8640000\ \frac{\text{J}}{\text{DAY}} \times \frac{1\ \text{cal}}{4.19\ \text{J}} \times \frac{1\ \text{Cal}}{1000\ \text{cal}} \simeq 2062\ \frac{\text{Calories}}{\text{DAY}}$$