Physics 11 - Practice Questions

Unit: 6.4 Measuring Thermal Energy

1. A 5.0 kg block of lead at 250°C cooled down to 20°C. How much heat does it give off in doing so? [c=130]

$\Delta E = mc\Delta T$

$m = 5.0\,kg$

$c = 130$

$\Delta T = -230°C$

$\Delta E = (5)(130)(-230)$

$\Delta E = -1.5 \times 10^5\,J$

$1.5 \times 10^5\,J$ of heat given off (-)

2. How much heat must be transferred into 5.0 kg of water to raise its temperature from 20°C up to 97°C [c=4200]

$m = 5.0\,kg$

$\Delta T = 77°$

$c = 4200$

$\Delta E = mc\Delta T$

$\Delta E = (5)(4200)(77°)$

$\Delta E = 1.6 \times 10^6\,J$

3. If water has a specific heat capacity of 4200 J/kg/°C, how much heat is needed to warm 50.0 kg of water from 15°C up to 85°C?

$c = 4200$

$m = 50.0\,kg$

$\Delta T = 70°C$

$\Delta E = mc\Delta T$

$\Delta E = (50)(4200)(70)$

$\Delta E = 1.5 \times 10^7\ J$

4. If 24kJ of energy will warm 0.600 kg of metal from 20°C up to 220°C, what is the specific heat capacity of the metal?

$\Delta E = 24\,000$

$m = 0.600\,kg$

$\Delta T = 200°C$

$\Delta E = mc\Delta T$

$24\,000 = (0.6)(c)(200)$

$24\,000 = 120(c)$

$200\ J/kg/°C = c$

5. A 60 W incandescent light bulb is 5% efficient. A 60W fluorescent bulb is 15% efficient. How much more light will the fluorescent light bulb give off that the incandescent bulb, in the same period of time?

15% is 3x more efficient than 5%.

6. A 1500W kettle warms 1.00 kg of water from 291°K to 361°K in a time of 3.6 min. How efficient is this kettle?

$P_{out} = W/t$ $P_{in} = 1500\ W$

$W = \Delta E = mc\Delta T$

$m = 1$ $c = 4200$ $\Delta T = 70$

$\Delta E = (1)(4200)(70)$

$\Delta E = 294000$

$W = \frac{294000\ J}{216\ s} = 1361\ W$

* 3.6 min = 216 seconds

$\frac{1361\ W}{1500\ W} \times 100$

91%