

Name _____ Date _____ Period _____

Mechanical Equivalent of Heat

Niagara Falls

When water flows over a waterfall, it loses GPE and gains KE. As it crashes at the bottom of the falls, its KE is converted into heat. If all the GPE of the water is converted into heat with no loss due to evaporation or by any other means, on kilogram of water that falls one meters increases its temperature my only a small amount.



Recall from Chemistry the equation:

$$Q = mc\Delta T$$

Where Q stands for heat, m is the mass, c is specific heat and ΔT is the change in temperature. The specific heat of water is $4184 \text{ J/kg } ^\circ\text{C}$.

1. Use the following equivalencies to determine how much 1 kilogram of water increases in temperature by falling 1 meter.

$$\mathbf{GPE_{lost} = KE_{gained} = Heat_{gained}}$$

2. How much would the temperature rise if:
a. 2 kg fell one meter?

b. 100 kg?

c. 1,000,000 kg?

3. Predict the temperature rise of water falling 50 meters over Niagara Falls. Show your work!

4. Why don't you think the water at the bottom of Niagara Falls changes temperature by this much?