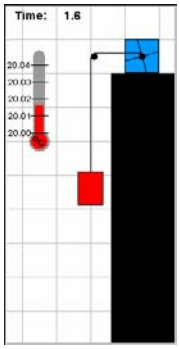
Worksheet for Exploration 19.1: Mechanical Equivalent of Heat



As the 100-kg red mass drops, the paddle turns in the liquid and the liquid heats up. Joule used a version of this device to determine the equivalence between heat and work. You will run the animation to do the same **(position is given in meters, time is given in seconds, and temperature is given in degrees Celsius)**. The temperature of the liquid is given by the thermometer shown. Restart.

The dimension of the container that holds the blue liquid that you cannot see (into the screen) is 0.1 m. The density of the liquid is 13,600 kg/m^3.

a. What is the volume of the liquid?

V=_____

b. What is the mass of the liquid?

m=_____

c. During the animation, what is the change in temperature of the liquid?

ΔT=_____

d. If it takes 33 calories to raise 1 kg of the liquid 1^oC, how much heat goes into the liquid?

Change in Thermal Energy=_____

e. What is the change in kinetic energy of the falling red mass?

ΔKE=_____

f. What is the work done by gravity on the mass (in joules)?

$Work_{gravity}$=_____

g. The work in (f) goes into frictional heating of the liquid (as the paddles turn through the liquid). Therefore, how many calories are equal to 1 Joule?

1 Joule =_____ calories