Relation between heat & temp

$$E = m C \Delta t$$

- E: Energy "heat"
- m: mass
- C: specific heat capacity
- Δt: change in temp

How much Energy is needed to change the temp of an object by 1 °k (°c)

Ex

How much energy is needed to reach boiling temp for 0.3kg of water from 20°c, Specific heat capacity of water is 4700 J/kg°K

$E = ?$ $t_2 = 100°c$ $m = 0.3\ kg$

$c = 4700$ $t_1 = 20°c$

$\Delta t = 100 - 20 = 80°c$

$$E = m c \Delta t$$

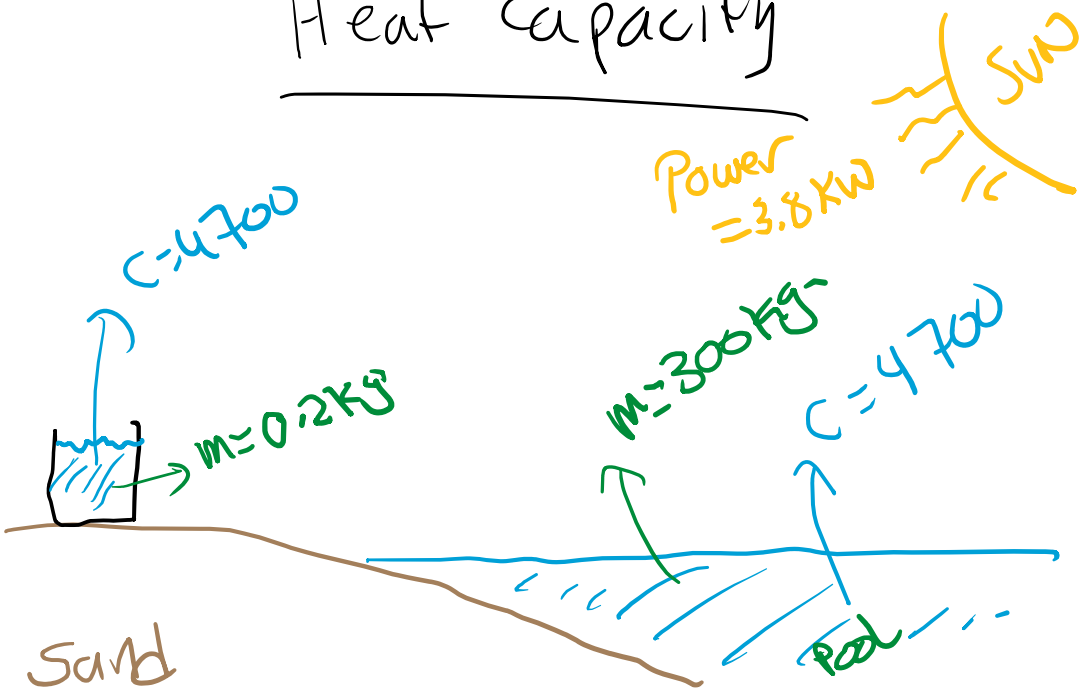
$$= 0.3 \times 4700 \times 80 = 113\ kJ$$

what if we were trying to raise the temp of mercury from 20° → 100°c where $C_{mercury} = 140$ J/kg°c

$$E = mC\Delta t = 0.3 \times 140 \times 80$$

$$= 3.3\ kJ$$

Heat Capacity



Sand
c = 1
m = 300 kg

$E = mc\Delta t$

$\Delta t = \frac{E}{mc}$

$$\text{Power} = \frac{\text{Energy}}{\text{time}} = 3800\ J/s$$

time = 60 mins

Total $E = Pxt = 3800 \times 60 \times 60$

$= 13.7\ GJ\ (10^6)$

$$\Delta t\ \text{pool} = \frac{13.7 \times 10^6}{300 \times 4700} = 9.7^\circ C$$

$$\Delta t\ \text{cup} = \frac{13.7 \times 10^6}{0.2 \times 4700} = 1455^\circ C$$

$$\Delta t\ \text{sand} = \frac{13.7 \times 10^6}{300 \times 1} = 45000^\circ C$$

$$\downarrow \uparrow \Delta t = \frac{E \uparrow\downarrow}{m \downarrow\uparrow c \downarrow\uparrow}$$

CAR Engine

body = metal ↓C
heats up quick
cools down quick

Coolant = water
heats up slowly but
absorbs lots of heat.