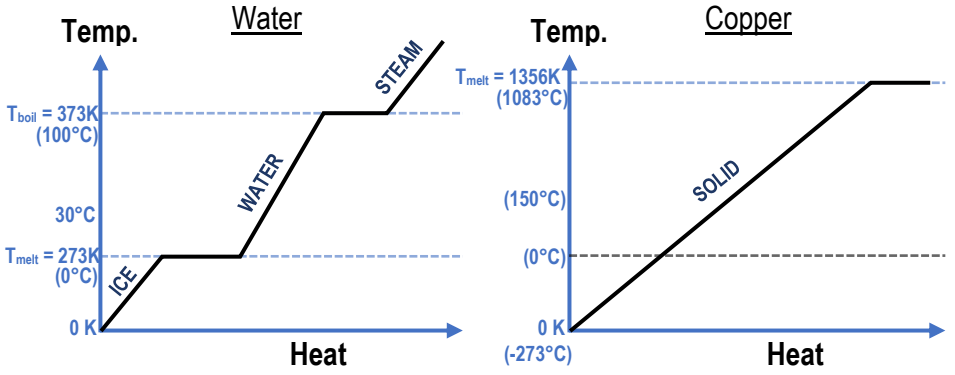
CONCEPT: EQUILIBRIUM TEMPERATURE IN CALORIMETRY PROBLEMS WITH PHASE CHANGES

- In some calorimetry problems with temperature & phase changes, you'll have to calculate the equilibrium temperature.
  - In these problems, you'll have to *figure out* # of **mcΔT** OR **mL** terms in the $Q_A = -Q_B$.

EXAMPLE: A 2kg pot made of copper is initially at 150°C. You pour 0.1kg of 30°C water into the pot, then close the lid to prevent steam from escaping. **a)** Calculate the final temperature of the pot & water. **b)** Calculate how much (if any) water turned into steam.



CALORIMETRY

0) Draw **T** vs. **Q** diagram, identify **T_i's & T_f's**
1) Write $Q_A = -Q_B$
2) Calculate **T_f**, assume no phase change
(IF $T_f < T_{ph.change}$, skip step 3 and Solve)
(IF $T_f > T_{ph.change}$, write Q_A=-Q_B with Q=mL term)
3) Compare $|Q_A|$ & $|Q_B|$, assume $T_f = T_{ph.change}$
(IF $|Q_A| > |Q_B|$, $T_f = T_{ph.change}$, solve for Target)
*(IF $|Q_A| < |Q_B|$, add **$Q=mc\Delta T$** term to Q_A)*
4) Solve for Target

SPECIFIC & LATENT HEATS

$Q = mc\Delta T$
$Q = mL$
c_{water} = 4186 J/(kg·K)
c_{copper} = 390 J/(kg·K)
$L_{v,water}$ = 2.256×10⁶ J/kg (liq→gas)
$T_f = \frac{m_1c_1T_{1i}+m_2c_2T_{2i}+\cdots}{m_1c_1+m_2c_2+\cdots}$