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# Unit 3 Worksheet 4 Quantitative Energy Problems Part 2 

## Energy constants ( $\mathbf{H}_{2} \mathrm{O}$ )

$334 \mathrm{~J} / \mathrm{g} \quad$ Heat of fusion (melting or freezing) $\mathrm{H}_{\mathrm{f}}$
$2260 \mathrm{~J} / \mathrm{g} \quad$ Heat of vaporization (evaporating or condensing) $\mathrm{H}_{\mathrm{V}}$
$2.1 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C} \quad$ Heat capacity (c) of solid water
$4.18 \mathrm{~J} / \mathrm{g}^{\circ} \mathrm{C} \quad$ Heat capacity (c) of liquid water
For each of the problems sketch a warming or cooling curve to help you decide which equation(s) to use to solve the problem. Keep a reasonable number of sig figs in your answers.

1. How much energy must be absorbed by a 150 g sample of ice at $0.0^{\circ} \mathrm{C}$ that melts and then warms to $25.0^{\circ} \mathrm{C}$ ?
2. Suppose in the Icy Hot lab that the burner transfers 325 kJ of energy to 450 g of liquid water at $20 .{ }^{\circ} \mathrm{C}$. What mass of the water would be boiled away?
3. A 12 oz can of soft drink (assume $\mathrm{m}=340 \mathrm{~g}$ ) at $25^{\circ} \mathrm{C}$ is placed in a freezer where the temperature is $-12{ }^{\circ} \mathrm{C}$. How much energy must be removed from the soft drink for it to reach this temperature?
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4. 65.0 kilojoules of energy are added to 150 g of ice at $0.0^{\circ} \mathrm{C}$. What is the final temperature of the water?
5. 250 kJ of energy are removed from a $4.00 \times 10^{2} \mathrm{~g}$ sample of water at $60^{\circ} \mathrm{C}$. Will the sample of water completely freeze? Explain.
6. An ice cube tray full of ice $(235 \mathrm{~g})$ at $-7.0^{\circ} \mathrm{C}$ is allowed to warm up to room temperature $\left(22^{\circ} \mathrm{C}\right)$. How much energy must be absorbed by the contents of the tray in order for this to happen?
7. If this same quantity of energy were removed from 40.0 g of water vapor at $100^{\circ} \mathrm{C}$, what would be the final temperature of the water?
