

### Phase Changes and Energy

1. Assume you have 1 cup of ice (237 ml) at 0.0°C. How much heat is required to melt the ice and then warm the resulting water to 25°C?
2. If you want to melt 1 pound of lead (1 pound = 453.6 g) how many joules of heat energy would be required to raise the temperature of the lead from room temperature (25°C) to its melting point, 327°C, and then melt the lead at 327°C? (The specific heat capacity of lead is .159 J/g°C, and the metal requires 5.11kJ/mol to convert the solid to a liquid.)
3. The hydrocarbon benzene, C<sub>6</sub>H<sub>6</sub>, boils at 80.1°C. How many joules of heat energy are required to heat 1.00 kg of this liquid from 20°C to the boiling point and then change the liquid completely to a vapor at that temperature? (The specific heat of benzene is 1.74J/g°C and the enthalpy of vaporization is 30.8kJ/mol)
4. Calculate the quantity of heat required to convert the water in four ice cubes (60.1 g) from ice at -10.0°C to steam at 110.0°C. The heat of fusion of ice at 0.0°C is 6.00kJ/mol and the heat of vaporization of liquid water is 40.6kJ/mol.

Answers: 1) 104kJ 2) 33.0kJ 3)  $5.00 \times 10^2$ kJ 4) 183 kJ

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