**Answer Bank**

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| 3006 J | 167,000 J | 418.14 J | Exothermic |
| 376.2 J | 2.179 kJ | 20,340 J | 51,980 J |
| 370.8 J | Endothermic | -41.382 J | 961,400 J |
| 7682 J | 668 J | 3762 J | 6780 J |

**Questions**

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| An ice cube tray of negligible mass contains 0.45 kg of water at 22 oC. How much heat must be removed to cool the water to 0 oC (C = 4.18 J/g· oC) | Calculate the energy to melt 2 kg ice at 0 oC to water at 0 oC. (ΔHfusion of ice = 334 J/g) | Calculate the energy to melt 500 g of ice at 0 oC. (ΔHfusion of ice = 334 J/g) | Calculate the energy needed to boil 3 kg of water at 100 oC. (ΔHvaporization of water = 2260 J/g) |
| Calculate the energy needed to change 9 g of ice at -20oC to ice at 0 oC. (specific heat for ice = 2.06 J/g· oC) | Calculate the energy needed to change 9 g of ice from 0 oC to liquid water at 0 oC (ΔHfusion of ice = 334 J/g) | Calculate the energy needed to change 9 g of water from 0 oC to 100 oC (cs for water is 4.18 J/g· oC)  | Calculate the energy needed to change 9 g of water from 100 oC liquid to 100 oC steam (ΔHvaporization of water = 2260 J/g) |
| You have a sample of H2O with a mass 23.0 grams at a temperature of -46.0 °C. How many kilojoules of heat energy are necessary to heat the ice to 0.0 °C? (specific heat for ice = 2.06 J/g· oC) | You have a sample of H2O with a mass 23.0 grams at a temperature of 0 oC. How much energy is required to melt the ice? (ΔHfusion of ice = 334 J/g) | You have a sample of H2O with a mass 23.0 grams at a temperature of 0 oC. How much energy is required to heat it to 100 oC? (cs for water is 4.18 J/g· oC)  | Calculate the energy needed to change 23 g of water from 100 oC liquid to 100 oC steam (ΔHvaporization of water = 2260 J/g) |
| You have a sample of H2O with a mass 23.0 grams at a temperature of 100 oC. How much energy is required to heat it to 109 oC? (C for steam = 2.02 J/g· oC) | A reaction that releases energy during the reaction. | A reaction that requires energy in order to proceed. |  How much energy is required to raise the temperature of 1 kg of water from 10 °C to boiling point (100 °C)? (C = 4.18 J/g· oC) |