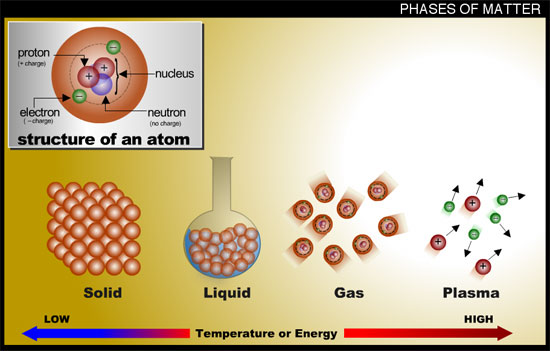
**Kinetics, Heat, & Equilibrium Test Review Answers**

**Station 1: Chemistry Word Wall**

Reaction Rate: The speed at which a reaction takes place

Kinetic Molecular Theory: describes the motions of molecules in solids, liquids, gases, and plasmas



Sublimation: solid becoming a gas without being a liquid in between (ex. Dry ice)

Deposition: a gas becoming a solid without being a liquid in between (ex. Frost forming on a car windshield in winter)

Melting: a solid becoming a liquid

Freezing: a liquid becoming a solid

Vaporizing: a liquid becoming a gas

Condensing: a gas becoming a liquid

Solid: a state of matter characterized by having particles very close together, so close that they are unable to move freely. Instead they vibrate around fixed positions. They have the lowest kinetic energy of all the states. They have defined shapes and volumes.

Liquid: a state of matter characterized by have particles that are close but have enough room to slide past each other. They take the shape of the container they are in and have fixed volumes. They have higher kinetic energy than solids.

Gas: a state of matter characterized by molecules that are far apart and moving fast and freely in random paths. They have no fixed shape or volume and have higher kinetic energy that liquids.

Plasma: a state of matter characterized by molecules that have become ionized, or charged. The particles move faster than in a gas and are farther apart from each other. They have the highest kinetic energy of the 4 states of matter

Heat: flow of energy due to a difference in temperature

Specific Heat Capacity: the amount of heat needed to raise the temperature of 1 gram of a substance by 1 degree Celsius

Endothermic: heat/energy enters into the system

Exothermic: heat/energy leaves the system

Activation Energy: the amount of energy needed for reactants to react and become products

ΔHr: heat (enthalpy) of the reactants

ΔHp: heat (enthalpy) of the products

ΔHrxn: heat (enthalpy) of the reaction

Catalyst: a substance, whose mere presence, speeds up the rate of a reaction without being used up as a reactant in the reactions. It lowers the amount of activation energy needed to make products

Forward Reaction: reactants becoming products

Reverse Reaction: products becoming reactants

Dynamic Equilibrium: state in which the rate (speed) of the forward reaction is EQUAL to the rate of the reverse reaction.

**Station 2: Endothermic vs. Exothermic**

1. 1. An ice cube melting in your hand.



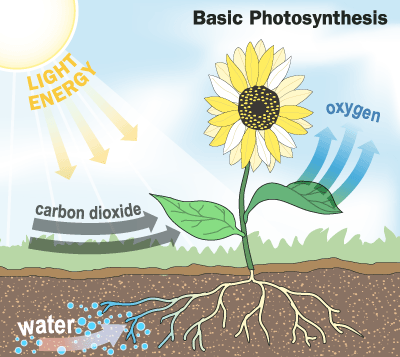
System: ice cubes – endothermic or System: hand - exothermic

1. Roasting marshmallows



System: marshmallow – endothermic or System: fire - exothermic

1. Photosynthesis 6CO2 (g) + 6 H2O (l) --> C6H12O6 (l) + 6O2 (g)



System: flower- endothermic or System: Sun - exothermic

1. Car engine burning gasoline for fuel



System: car engine – endothermic or gasoline - exothermic

1. Using a Glowstick – Remember light is a form of energy too!



System: chemical inside glowstick – exothermic

1. It’s a hot summer day so you and your friends decide to go swimming. After playing in the water for a while, you decide to get out and relax on your lounge chair. Even though it’s hot outside, you get chilled as the water evaporates off your skin.



System: water on your skin- endothermic or System: your skin – exothermic

**Station 3: Heat Review**

Directions: Use the Specific Heat Capacity chart below and the equation to solve these problems!

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | Heat Capacity (J/g°C) |  | Substance | Heat Capacity (J/g°C) |
| Aluminum | 0.90 |  | Iron | 0.45 |
| Copper | 0.38 |  | Lead | 0.13 |
| Gold | 0.13 |  | Water (g) | 1.87 |
| Water (s) | 2.09 |  | Water (l) | 4.184 |

**q = mCΔT**

1. How much heat is needed to raise the temperature of 8.00g of lead from 31.0°C to 39.4°C?

q = mC**Δ**T **=** (8.00g) (013J/g°C) (8.4°C) = **8.7J Δ**T = 39.4°C – 31.0°C = 8.4°C

1. 1462.5J of energy was added to an iron ball to increase the temperature from 19.0°C to 32.0°C. What is the mass of the iron ball?

m = q/C**Δ**T = 1462.5J / (0.45J/g°C × 13.0°C) = **250g Δ**T = 32.0°C – 19.0°C = 13.0°C

1. A 100.0g block of ice releases 618J of energy as it is cooled. What is the change in temperature of the ice?

**Δ**T = q/mC = -618J/ (100.0g × 2.09J/g°C) = **-2.96°C**

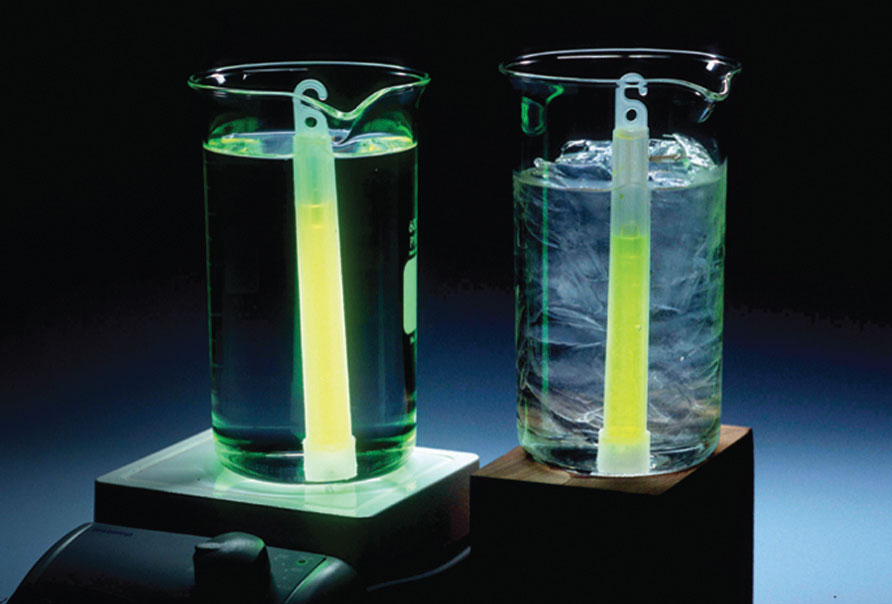
1. How much heat is released when a 505.0g copper pot is cooled from 100°C to 20°C after boiling some water?

q = mC**Δ**T = (505.0g) (0.38J/g°C) (-80°C) = **-15,000J Δ**T = 20°C – 100°C = -80°C

**Station 4: Reaction Rates**

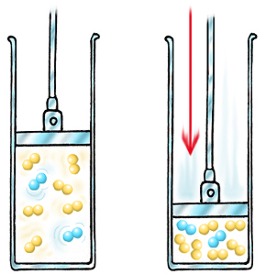
Directions: Answer each question completely. Explain your answers.

1. Glow sticks in hot water “shine” more brightly than glow sticks in cold water.



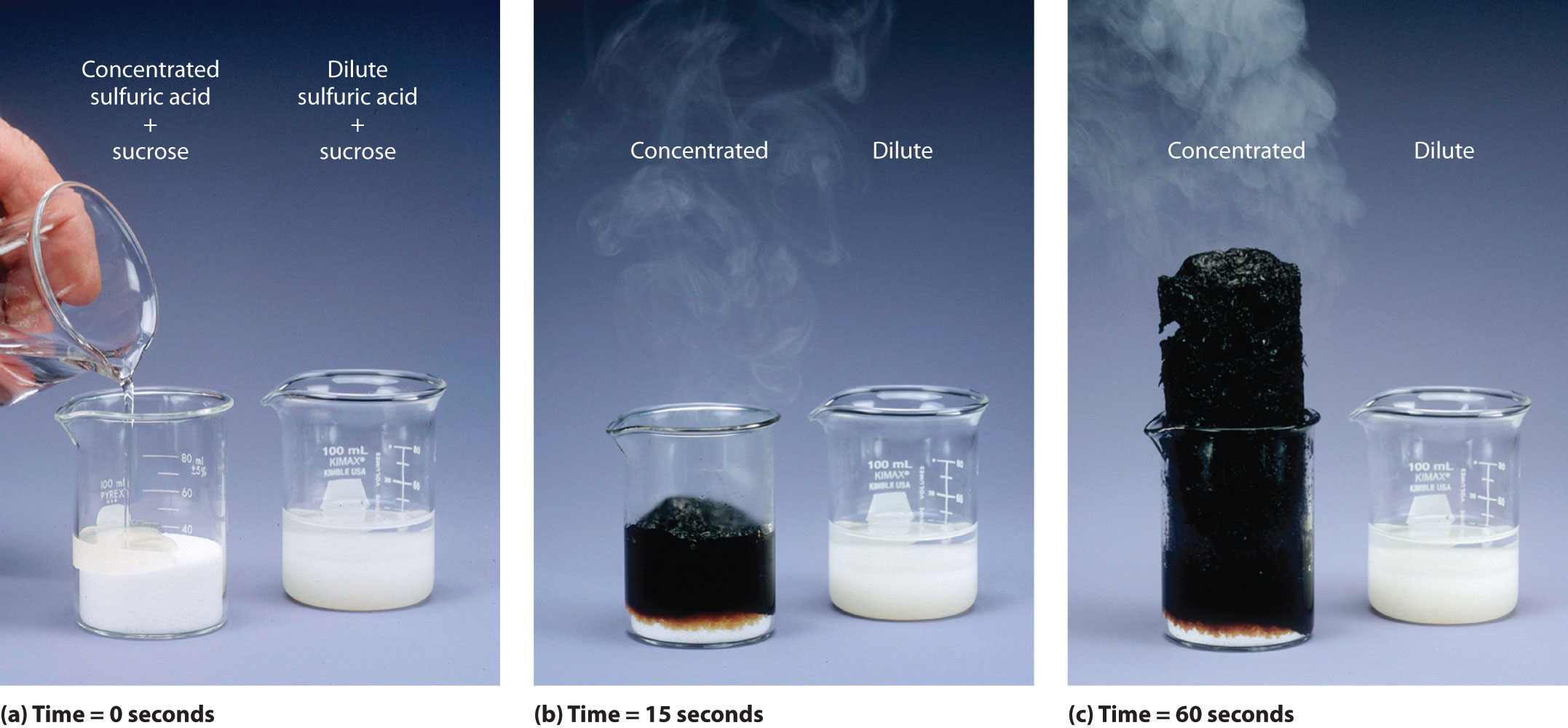
The warmer glow stick’s reaction occurs faster because the higher temperature gives the molecules more kinetic energy so they move faster and react quicker

1. Increasing the pressure in the container increases the rate of the reaction.



Increasing the pressure means that the particles are forced to be closer together, which increases their chances of colliding and reacting.

1. Concentrated sulfuric acid reacting with sucrose (table sugar).



The higher concentration of sulfuric acid in the reaction on the left means that there are more molecules of sulfuric acid to react so the reaction occurs much more quickly.

**Station 5: Equilibrium: LeChatelier’s Principle**

Explain how the following changes in reaction conditions will affect the position of the equilibrium below, and explain your reasoning.

**A(g)** + **B(aq) 🡨🡪 C(s) ΔHrxn= -453 kJ/mol**

1) The pressure of A in the reaction chamber is increased.

**The reaction is pushed toward products.**

2) The temperature of the reaction is increased by 200 C.

**Because heat can be thought of as being a product, the reaction will be pushed toward reactants.**

3) A catalyst is added to the system.

**No change. A catalyst doesn’t change the equilibrium position, it only changes how quickly equilibrium is reached.**

4) As the reaction progresses, more of compound B is steadily added to the reaction chamber.

**The reaction is pushed toward products.**

5) An inhibitor is added to the reaction chamber.

**No change, though the reaction will move more slowly.**

6) Argon gas is added to the reaction chamber, doubling the pressure.

**No change. If the partial pressure of gaseous comopunds is changed, the equilibrium will shift position. However, adding argon gas doesn’t change the partial pressures of A, so the equilibrium position is unaffected.**