(Key)

Unit 2- Energy and Heat Review Stations RC

Station 1: Energy Changes, Temperature, and Heat Transfer

1. For each of the following chemical or physical changes, check off whether the change is endothermic or exothermic.

Change	Endothermic	Exothermic
a. Burning of charcoal		✓
b. Boiling of water	✓	
c. Formation of frost on a window		✓
d. Production of sugar by plants	✓	
e. Evaporation of water	✓	
f. Sublimation of dry ice	✓	
g. Condensation of water to form dew drops		✓

2. Describe how temperature and heat are different.

measure of avg kinetic energy — transfer of energy from a warmer body to a cooler one

3. Convert between the following temperatures:
   a. 50°C to K — 323 K
   b. 456 K to °C — 183°C
   c. 43°C to K — 316 K

4. If a substance changes from 45°C to 65°C, how many Kelvin degrees will the temperature change? 20 K (*) For every 1°C change, there is a 1 K change

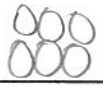
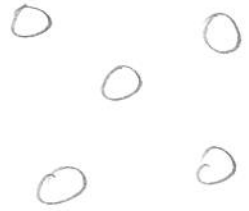
5. Which of the following substances contains molecules with the highest average kinetic energy? → highest temp.
   a) He(g) at 0°C
   b) CO_2(g) at 20°C
   c) HCl(g) at 40°C
   d) N_2(g) at 60°C

6. Describe the transfer of heat that occurs when an ice cube is placed into a mug of hot tea.

Heat transfers from the hot tea to the ice cube.

Station 2: Phases of Matter and Phase Changes

1. Fill out the following chart regarding the phases of matter:

Phase	Particle Diagram (show at least 5 particles)	Spacing between particles	Particle Movement	Kinetic Energy	Strength of Intermolecular Forces
Solid (s)		tight together	vibrating in place/ low movement	low	strong
Liquid (l)		moderate	moderate movement	moderate	moderate
Gas (g)		far apart	fast movement	high	weak

2. Name the six phase changes, say what phases they transition between, and classify them as endothermic or exothermic. The first is done for you.

Endothermic Phase Changes	**Exothermic Phase Changes**
Ex) melting: s → l	freezing: l → s
vaporizing: l → g	Condensing: g → l
sublimation: s → g	deposition: g → s

3. In order to complete the **endothermic** phase changes, what has to be accomplished in terms of a) spacing between particles, b) kinetic energy, and c) strength of intermolecular forces?

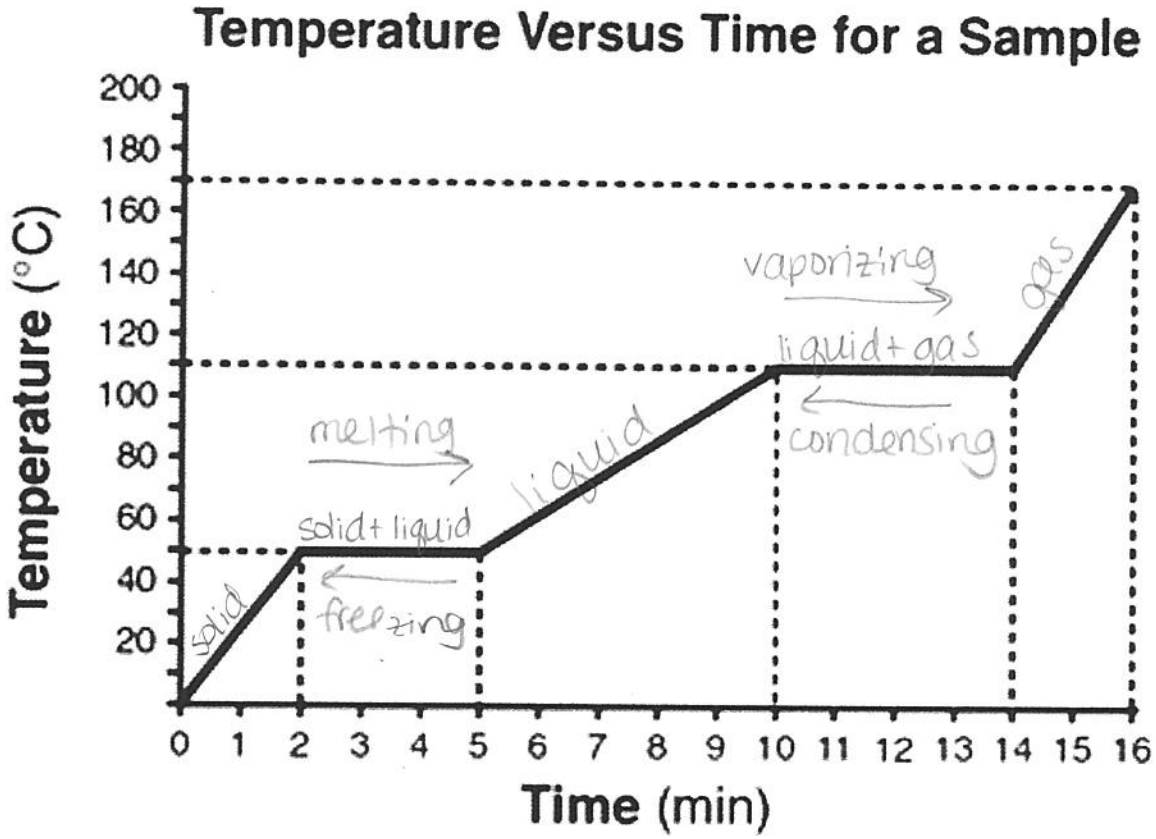
a) must increase space between particles
b) must increase KE
c) must decrease strength of IMF

4. In order to complete the **exothermic** phase changes, what has to be accomplished in terms of: a) spacing between particles, b) kinetic energy, and c) strength of intermolecular forces?

a) must decrease space between particles
b) must decrease KE
c) must increase strength of IMF

Station 3: Heating/Cooling Curve Review

1. On the heating curve below, label the phase(s) present at each segment. Then, label the phase changes that occur.



2. Describe the changes in both kinetic and potential energy that occur along each segment of the graph.
   - Along slopes: KE ↑, PE stays the same
   - Along plateaus: KE stays the same, PE ↑
3. Why does the temperature of a substance stay constant during a phase change?
   All added heat energy is being converted into PE & used to overcome the IMF.
4. Use the graph to determine the freezing point and melting point of this substance.
   a. Freezing point: 50°C
   b. Boiling point: 110°C
5. Compare the strength of intermolecular forces in the substance represented in the graph to those in water. Give evidence from the graph to support your answer.
   The substance in the graph has stronger IMF than water, since it has a higher melting pt & boiling pt
6. Why does the segment from 10-14 minutes stay at a constant temperature longer than the segment from 2-5 minutes?
   - 10-14 mins represents vaporizing, in which more IMF need to be overcome than when melting, which occurs from 2-5 min.

Station 4: Heat Formulas Review

1. Under each heat formula, list some key phrases or words from the problem that would signal the need to use the specific formula.

$q = m c \Delta T$	$q = m H_f$	$q = m H_v$
-temp change -2 temps given -asked to find specific heat, Tf, or Ti	-freezing -melting -solid → liquid -liquid → solid	-vaporizing / boiling -condensing -liquid → gas -gas → liquid

Solve the following problems using the heat formulas above.

2. How many joules of heat are needed to vaporize 100 grams of water at 100°C?

$q = m H_v$
$= (100g)(2260\ J/g)$
$= \boxed{226,000\ J}$

3. How much heat energy is required to raise the temperature of 8.0g of aluminum from 293K to 298K? [specific heat of aluminum is 0.90J/gK]

$q = mC\Delta T$
$= (8.0)(0.90)(298-293)$
$= \boxed{36\ J}$

4. How much heat is needed to melt 35.0 g of water at 0.00°C?

$q = m H_f$
$= (35.0)(334)$
$= \boxed{11690\ J}$

5. How much heat is required to raise the temperature of 854 g of water from 23.5 °C to 85.0 °C?

$q = mC\Delta T$
$= (854)(4.18)(85.0-23.5)$
$= \boxed{219537.78\ J}$

Station 5: Homework Check

At this station, you will use the answer keys provided to check over the Heating and Cooling Curve review packet you completed over the weekend.