**Unit 4 Review Name:**

**Thermodynamics and Kinetics Date: Per:**

**Format:**

25 selected response NO BCR

**Things you will be given:**

* a periodic table (it will NOT have the oxidation numbers listed)
* a common ion sheet
* all formulas and conversion factors

**Objectives:**

* identify endothermic and exothermic reactions by enthalpy value and movement of energy
* calculate the overall enthalpy change for a reaction using Hess’s Law
* identify increases and decreses in entropy
* use enthalpy and entropy changes to predict free energy changes
* calculate free energy given values for enthalpy, temperature, and entropy
* calculate the amount of heat released or absorbed given the specific heat
* define specific heat
* define activation energy
* state the first and second laws of thermodynamics
* describe the effects of surface area, temperature and concentration on the frequency of molecular collisions
* discuss how collisions effect reaction rates

1. Define energy.
2. List some characteristics of endothermic reactions.
3. List some characteristics of exothermic reaction.
4. What physical and chemical changes would be assosciated with increased enthalpy? With decrease enthalpy?
5. How does the amount of order and disorder in a system relate to entropy?
6. What physical and chemical changes would be associated with decreased enntropy? With decreased entropy?
7. Predict whether the following reactions take place with an increase or decrease in entropy. Will the value for ΔS be positive or negative?
   1. 2H2 (g) + O2 (g) → 2H2O(l)
   2. CaCO3 (s) → CaO (s) + CO2 (g)
   3. NH3 (g) + HCl (g)→NH4Cl (s)
8. What two values does Gibb’s Free Energy combine?
9. How does the value for Gibb’s Free Energy related to reaction spontaneity?
10. What conditions regarding enthalpy and entropy must be true for a reaction to always be spontaneous?
11. What conditions regarding enthalpy and entropy must be true for a reaction to never be spontaneous?
12. Define specific heat.
13. Use the data in the table to answer items A-G.

|  |  |  |
| --- | --- | --- |
|  | Trial 1 | Trial 2 |
| Mass of test tube and metal | 113.25g | 110.20g |
| Mass of test tube | 67.92g | 62.88g |
| Mass of metal | 45.33g | 47.32g |
| Mass of calorimeter | 6.568g | 5.243g |
| Mass of calorimeter and water | 44.494g | 42.198g |
| Mass of water | 37.926g | 36.955g |
| Initial temperature of metal | 100.0°C | 100.0°C |
| Initial Temperature of water | 23.0°C | 24.0°C |
| Final Temperature of water and metal | 28.0°C | 28.5°C |

* 1. Calculate the final temperature of the metal for each trial.
  2. Calculate the ΔT for the metal for each trial.
  3. Calculate the ΔT for water for each trial.
  4. Calculate the heat change for water (cwater= 4.18J/g°C)
  5. Calculate the heat change of the metal.
  6. Calculate the specific heat of the metal.
  7. Of these four choices, Al, Fe, Ag, Hg, which metal might this have been? (use your handout “specific heat problems” or the internet to find the specific heat values for the metals)

1. Sketch a curve for an exothermic reaction. Plot reaction progress on the x-axis and energy on the y-axis. Identify the reactants, products, activation energy, and free energy in your diagram.
2. Sketch a curve for an endothermic reaction. Plot reaction progress on the x-axis and energy on the y-axis. Identify the reactants, products, activation energy, and free energy in your diagram.
3. List some factors that can affect the rate of reactions and identify how changes in each will affect the rate.
4. Use the information provided to calculate the enthalpy change in kJ for the reaction:

H2O (s) →H2 (g) + ½O2 (g)

H2 (g) + ½O2 (g) →H2O (l) ΔH= -285.9kJ

H2O (s) →H2O (l) ΔH= 6.0kJ

1. Use the information provided to calculate the enthalpy change in kJ for the following reaction:

NO (g) + ½O2 (g) →NO2 (g)

½ N2 (g) + ½ O2 (g) →NO (g) ΔH= 90.4kJ

½ N2 (g) + O2 (g) →NO2 (g) ΔH= 33.6kJ