Spring Benchmark #2 Review Questions – C8-Thermochemistry and C9-Kinetics  
Directions: Show all work on p. \_\_\_\_\_\_\_\_\_\_. Remember: all work must be shown including all units! No work, no units, no credit. If there is no math to be shown, then give a written answer in sentence form.

1. The amount of energy needed to heat 10 g of a material from 20.0oC to 180.0oC is 175.26 J. What is the specific heat capacity of this sample?
2. The amount of energy needed to heat 25 g of a material from 10.0oC to 75.0oC is 43 J. What is the specific heat capacity of this sample?
3. The amount of energy needed to heat 60 g of a material from 90.0oC to 160.0oC is 230 J. What is the specific heat capacity of this sample?
4. Identify each as either endothermic or exothermic. Give a brief explanation of why.
   1. An ice cube melting
   2. Water freezing
   3. A piece of wood burning
   4. Water boiling
5. What is the definition of specific heat?
6. How much energy is required to melt 20 grams of ice at -30oC to liquid water at 50oC?
7. How much energy is required to melt 40 grams of ice to steam at 130oC?
8. How much energy is required to melt 3 grams of ice at -15C to steam at 150oC?
9. How much energy is released when 12 grams of steam at 137C is cooled to steam at 125oC?
10. How much energy is released when 20 grams of ice at 0C is cooled to -15oC?
11. What is collision theory?
12. How does collision theory explain why reaction rates change when you change concentration and temperature?
13. Sketch a reaction diagram for an endothermic reaction and for an exothermic reaction. Then label each diagram with activation energy, transition state, products, and reactants
14. What factors can speed up or slow down a reaction?
15. What is a catalyst, and how does it work? Sketch a graph to show how it works.
16. Balance the equations and write rate expressions for them:
    1. \_\_\_\_ N2 + \_\_\_\_ H2 → \_\_\_\_ NH3
    2. \_\_\_\_ KClO3 → \_\_\_\_ KCl + \_\_\_\_ O2
    3. \_\_\_\_ Pb(OH)2 + \_\_\_\_ HCl →\_\_\_\_ H2O + \_\_\_\_ PbCl2
    4. Aluminum bromide and chlorine gas react to form aluminum chloride and bromine gas.
    5. Sodium phosphate and calcium chloride react to form calcium phosphate and sodium chloride.
    6. Potassium metal and chlorine gas combine to form potassium chloride.
17. An solution of NaOH contains 37 g of NaOH dissolved in 120 g of water. Find the molarity.
18. How many grams of HCl are present in 750 mL of 0.25 M HCl acid?
19. What is the molarity of a 3L solution containing 23 g of Na2CO3 dissolved in H2O?
20. How many grams of Al(OH)3 are in 425 ml of a 0.58 M solution?
21. How many liters of a 0.25 M solution can be made by using 95 grams of C3H8O?

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| 2 ClO → Cl2 + O2 | |
| Time (s) | [ClO] |
| 1.2 | 0.849 |
| 9.6 | 0.710 |
| 22.4 | 0.579 |
| 32.0 | 0.520 |
| 40.0 | 0.477 |

1. Using the equation and data table below, answer the following questions:
   1. What is the average rate of the reaction between times 1.2 and 9.6?
   2. What is the rate of disappearance of ClO between times 22.4 and 40.0?
   3. What is the rate of appearance of Cl2 between times 9.6 and 32.0?
2. Using the graph below, answer the following questions:   
     
   \_\_\_Fe(OH)3 🡪\_\_\_\_ Fe2O3 +\_\_\_H2O
   1. What is the average rate of the reaction between 3 seconds and 7 seconds?
   2. What is the rate of disappearance of Fe(OH)3 between 0 seconds and 11 seconds?
   3. What is the rate of appearance of Fe2O3 between 3 seconds and 9 seconds?