When it comes to equilibrium, I can...

1. I can define effective collision and collision theory. (state it)
2. I can state and apply the relationship between temperature and reaction rate in terms of collision theory. (state it)

   As the temperature _____, the reaction rate for most chemical reactions _____ because there are _____ effective collisions between particles.

   Given the reaction: $2Mg_{(S)} + O_{2(G)} \rightarrow 2MgO_{(S)}$ At which temperature would the reaction occur at the greatest rate? 0°C 15°C 95°C 273K

3. I can state and apply the relationship between surface area and reaction rate in terms of collision theory. (state it)

   As the surface area _____, the reaction rate _____ because there are _____ effective collisions between particles.

   At STP, which 4.0 g sample of Zn(s) will react most quickly with dilute hydrochloric acid? When the zinc is: a lump or a bar or a powder or sheet metal

4. I can state and apply the relationship between concentration and reaction rate in terms of collision theory.

   As the concentration _____, the reaction rate _____ because there are _____ effective collisions between particles.

   At 20°C, a reaction between powdered $Zn_{(S)}$ and hydrochloric acid will occur most quickly if the concentration of the $HCl_{(AQ)}$ is 1.0 M 1.5 M 2.5 M 2.8 M

5. I can state the unit used to measure energy. Energy is measure in _____

6. Based on the location of the energy term in a balanced thermochemical equation, I can determine if the reaction is exothermic or endothermic.
   Given the following chemical equation: $I + I \rightarrow I_2 + 146.3\ kJ$

   This reaction is exothermic or endothermic? Justify your answer.

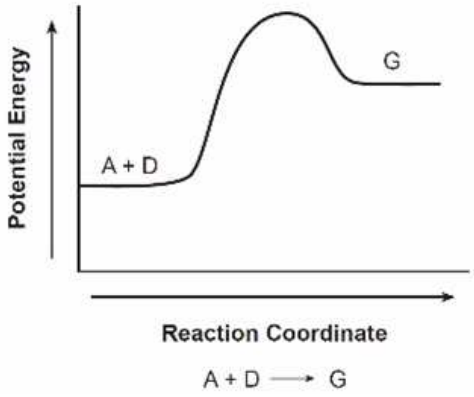
7. I can use Table I to determine if a reaction is exothermic or endothermic.
   (the boxed question is from an old regents exam)

Which balanced equation represents an endothermic reaction?

A) $C(s) + O_2(g) \rightarrow CO_2(g)$
B) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(\ell)$
C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
D) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

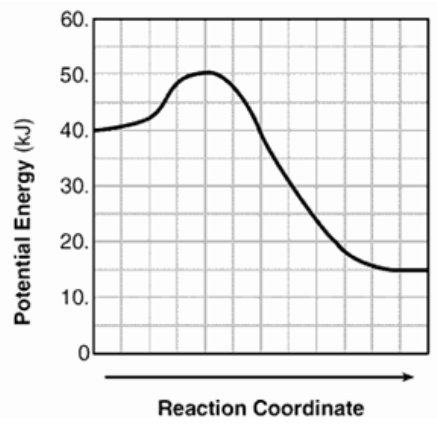
8. I can define potential energy diagram, reaction coordinate, PE reactants, PE products, heat of reaction (ΔH), activation energy (AE), catalyst affect, and entropy.

9. Given a potential energy diagram, I can determine if the reaction is exothermic or endothermic.



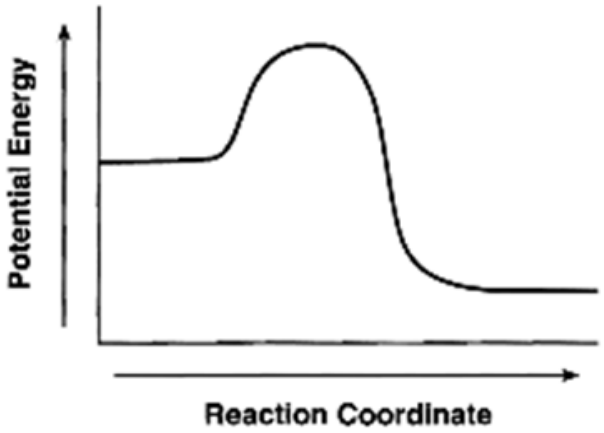
10. Given a potential energy diagram, I can determine the
    PE of the reactants
    PE of the products
    ΔH
    Activation energy (AE)

    All with proper units.



11. Given a potential energy diagram for an uncatalyzed reaction diagram, I can how the diagram will change when a catalyst is been added.

Draw a dotted line on this potential energy diagram indicating how it will change if a catalyst is added.



12. I can rank the three phases of matter from least entropy to most entropy.

Least entropy Most entropy

_____ < _____ < _____

13. skip this one, of course!

14. I can state the trends in nature for entropy and energy. In nature most systems in nature tend to undergo reactions that have an increase/a decrease (circle one) in entropy, and an increase/a decrease (circle one) in energy.

15. Given a balanced equation, I can determine if the reaction results in an overall increase or decrease in entropy. These questions are from old regents exams.

15A . Which reaction results in an decrease in entropy?

A. $CO_{2(G)} \rightarrow CO_{2(S)}$

B. $H_2O_{(L)} \rightarrow H_2O_{(S)}$

C. $Ca_{(S)} + 2H_2O_{(L)} \rightarrow Ca(OH)_{2(AQ)} + H_{2(G)}$

D. $NaCl_{(AQ)} + AgNO_{3(AQ)} \rightarrow AgCl_{(S)} + NaNO_{3(AQ)}$

15B. Which equation shows an increase in entropy?

A. $CO_{2(G)} \rightarrow CO_{2(S)}$

B. $CO_{2(L)} \rightarrow CO_{2(G)}$

C. $CH_3OH_{(L)} \rightarrow CH_3OH_{(S)}$

D. $CH_3OH_{(G)} \rightarrow CH_3OH_{(L)}$

16. I can define forward reaction, reverse reaction, reversible reaction, and closed system.

17. I can state two conditions that apply to all systems at equilibrium.
    In a system at dynamic equilibrium the _____ ….

    And, the _____ of the reactants and the ___ of the products will remain _____.

18. In terms of saturation, I can describe a solution that is at equilibrium. In terms of saturation, a solution that is at equilibrium must be _____.

19. I can state LeChatelier's Principle. It is: _____

20. Given a balanced equation at equilibrium, I can predict the direction of shift in the equilibrium when the temperature, concentration, or pressure is changed or if a catalyst is added.
    Given the reaction at equilibrium: $2SO_{2(G)} + O_{2(G)} \text{ <-----> } 2SO_{3(G)} + 392kJ$

    Predict the direction of shift in the equilibrium (forward, reverse, or no shift) when the following changes are made to the system.

Change	**Direction of Shift**
Increase concentration of SO_2	
Increase concentration of SO_3	
Increase temperature	
Increase pressure	
Add a catalyst	