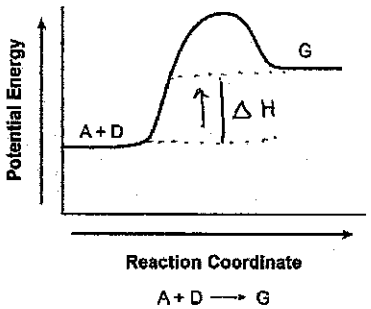
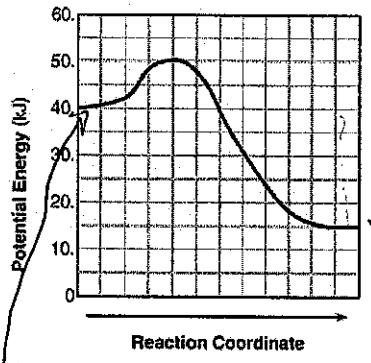
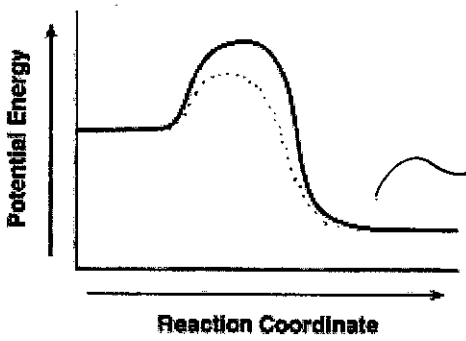
Name Key **Unit 10: I Can Statements Kinetics and EQ**

If you can do all the things listed below, you are ready for the Unit 12 test.

Place a checkmark next to each item that you can do! If a sample problem is given, complete it as evidence.

____**1. I can define effective collision and collision theory**	**Definition:** effective collision : produce a rxn when ① proper energy ② proper orientation collision theory : The theory that describes what is needed for an effective collision
____**2. I can state and apply the relationship between temperature and reaction rate in terms of collision theory.**	As the temperature ↑, the reaction rate for most chemical reactions ↑ because there are more effective collisions between particles. Given the reaction: $2Mg(s) + O_2(g) \text{ -----> } 2MgO(s)$ At which temperature would the reaction occur at the greatest rate? → highest temp A) 0°C B) 15°C C) 95°C 308K D) 273K
____**3. I can state and apply the relationship between surface area and reaction rate in terms of collision theory.**	As the surface area ↑, the reaction rate ↑ because there are more effective collisions between particles. At STP, which 4.0 g sample of Zn(s) will react most quickly with dilute hydrochloric acid? A) lump B) bar C) powdered D) 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 more 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 is A) 1.0 M B) 1.5 M C) 2.5 M D) 2.8 M

____5. Based on the location of the energy term, I can determine if the reaction is exothermic or endothermic.	Given the following balanced equation: $I + I \text{ -----> } I_2 + \boxed{146.3 \text{ kJ}}$ Is this reaction exothermic or endothermic? Justify your answer. exo : heat is produced
____6. I can use Table I to determine if a reaction is exothermic or endothermic.	Which balanced equation represents an endothermic reaction? → $+\Delta H$ A) $C(s) + O_2(g) \rightarrow CO_2(g)$ $-\Delta H$ B) $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(\ell)$ $-\Delta H$ C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ $-\Delta H$ D) $N_2(g) + O_2(g) \rightarrow 2NO(g)$ $+\Delta H$
____7. I can define potential energy diagram, reaction coordinate, $PE_{reactant}$, $PE_{product}$, heat of reaction (ΔH), activation energy, catalyst.	potential energy diagram : The curve showing change in PE reaction coordinate : time of rxn $PE_{reactant}$: start point $PE_{product}$: end point heat of reaction (ΔH) = $PE_P - PE_R$ activation energy = Energy to get up to peak catalyst : increases rate entropy : disorder, chaos
____8. Given a potential energy diagram, I can determine if the reaction is exothermic or endothermic.	Give the potential energy diagram below, determine if the reaction is exothermic or endothermic. Justify your answer.  this is endothermic $+\Delta H$

____9. Given a potential energy diagram, I can determine the $PE_{reactant}$, $PE_{product}$, ΔH, and activation energy.	Given the potential energy diagram below, determine the $PE_{reactant}$, $PE_{product}$, ΔH, and the activation energy.  $PE_{reactant}$ = 40 $PE_{product}$ = 15 ΔH = -25 kJ activation energy = 10 Forward
____10. 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 the potential energy diagram shown below to indicate how it will change if a catalyst is added.  start + end at the same place!
____11. I can rank the three phases of matter from least entropy to most entropy.	Least entropy Most entropy S < l < gas
____12. I can state the trends in nature for entropy and energy.	In nature most systems in nature tend to undergo reactions that have a(n) ↑ in entropy and a(n) ↓ in energy. nature is like a teenager ---- lazy and messy!

↓

Lazy + Crazy!

___13. Given a balanced equation, I can determine if the reaction results in an overall increase or decrease in entropy.	Which equation shows an increase in entropy? A) $CO_2(g) \rightarrow CO_2(s)$ B) $CO_2(\ell) \rightarrow CO_2(g)$ C) $CH_3OH(\ell) \rightarrow CH_3OH(s)$ D) $CH_3OH(g) \rightarrow CH_3OH(\ell)$ --- Which reaction has the greatest increase in entropy? A) $2\ H_2O(\ell) \rightarrow 2\ H_2(g) + O_2(g)$ B) $2\ H_2O(g) \rightarrow 2\ H_2(g) + O_2(g)$ C) $H_2O(g) \rightarrow H_2O(\ell)$ D) $H_2O(\ell) \rightarrow H_2O(s)$
___14. I can define forward reaction, reverse reaction, reversible reaction, and closed system	**Definitions:** forward reaction : goes to the right → reverse reaction : from right to left ← reversible reaction : ⇌ can proceed in both directions closed system : Nothing in or out.
___15. I can state the three types of equilibrium.	The three types of equilibrium are: chemical equilibrium phase equilibrium and solution equilibrium
___16. I can state two conditions that apply to all systems at equilibrium. ★	In a system at equilibrium the rate of the forward and reverse reaction must be equal and the concentration of the reactants and products must be constant. ★
___17. Given a list of reactions, I can identify reactions that show equilibrium (chemical, phase, or solution).	Which balanced equation represents phase equilibrium? A) $H_2(g) + I_2(s) \text{ <-----> } 2HI(g)$ B) $I_2(s) \text{ <-----> } I_2(g)$ (H_2O) Which balanced equation represents solution equilibrium? A) $H_2(g) + I_2(s) \text{ <-----> } 2HI(g)$ B) $I_2(s) \text{ <-----> } I_2(g)$ (H_2O) C) $KCl(s) \text{ <-----> } KCl(aq)$ D) $2KCl(s) + 3O_2(g) \text{ -----> } 2KClO_3$

	Which balanced equation represents chemical equilibrium? A) $H_2(g) + I_2(s) \rightleftharpoons 2HI(g)$ B) $I_2(s) \xrightarrow{} I_2(g)$ phase C) $KCl(s) \xrightarrow{H_2O} KCl(aq)$ solution D) $2KCl(s) + 3O_2(g) \xrightarrow{} 2KClO_3$ Not EQ
____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 saturated.
____19. I can state LeChatelier's Principle.	LeChatelier's Principle states How systems will respond to stress
____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: $2SO_2(g) + O_2(g) \xrightarrow{} 2SO_3(g) + 392kJ$ Predict the direction of shift in the equilibrium (right, left, no shift) when the following changes are made to the system.

Change	Direction of Shift
Increase concentration of SO_2 →	~~AA~~ Right
Increase concentration of SO_3 ←	~~AA~~ left
Increase temperature ←	~~AA~~ left
Increase pressure → (Towards ↓ moles)	Right
Add a catalyst	No change