

1) Which of the following processes is exothermic:

- a) Ice cube melting
- b) Steam condensing
- c) Water evaporating
- d) Dry ice subliming (going from solid to a gas)

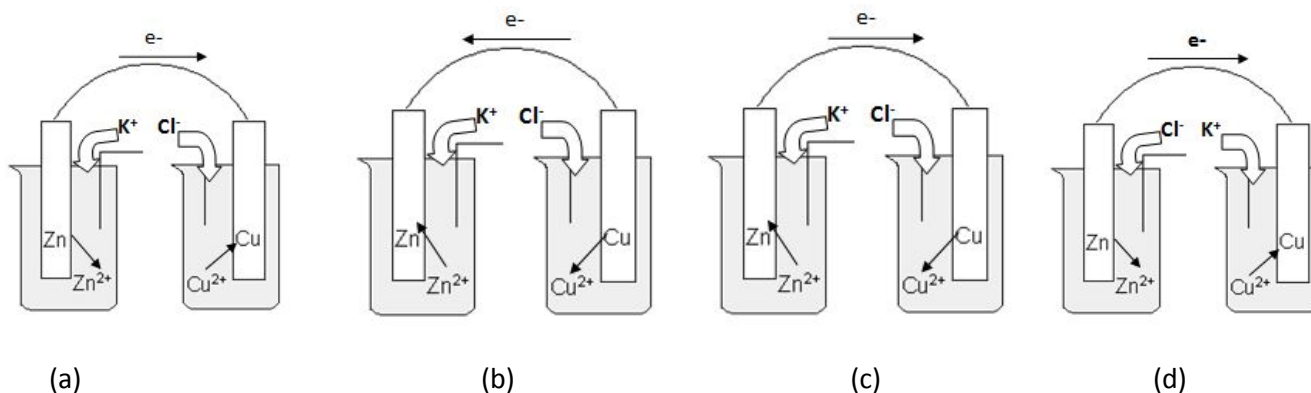
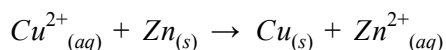
2) Which term best describes the given reaction:  $2\text{SO}_3 \rightarrow 2\text{SO}_2 + \text{O}_2$   $\Delta H = +198 \text{ kJ}$

- a) Synthesis Reaction
- b) Exothermic Reaction
- c) Single Replacement
- d) Endothermic Reaction

3) A student noticed that a solution increased in temperature during a reaction. How should the reaction be classified?

- a) As a single-replacement
- b) As a double-replacement
- c) As exothermic
- d) As endothermic

4) Which picture shows the correct electrochemical process for the following reaction:



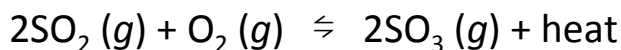
5) After the reaction:  $\text{CO}_2(\text{g}) + \text{H}_2(\text{g}) \rightleftharpoons \text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g})$  has reached equilibrium, how would adding more  $\text{CO}_2$  affect the equilibrium?

- A. Equilibrium would shift to the right
- B. Equilibrium would shift to the left
- C. Equilibrium would remain constant
- D. Equilibrium would increase

6) After the reaction:  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) + 92 \text{ kJ}$  has reached equilibrium, which of the following would cause the equilibrium to shift to the left?

- A. Increasing the amount of  $\text{N}_2$
- B. Increasing the amount of  $\text{NH}_3$
- C. Reducing the amount of  $\text{NH}_3$
- D. Learning the skill of force lightning

Use this equation to answer the next three questions:



- 7) Using the equation above, what effect would adding heat have on the reaction?
- A. It would stay the same
  - B. It would move toward the reactants
  - C. It would move towards the product
  - D. It would increase both product and reactant
- 8) In the above equation, how would decreasing the temperature of the system affect the reaction?
- A. It would move towards the reactants
  - B. It would move toward the products
  - C. It would stay the same
  - D. It would increase both product and reactant
- 9) If the reaction were at equilibrium, how would the addition of  $\text{SO}_3$  affect the reaction?
- A. It would move towards the product
  - B. It would move toward the reactants
  - C. It would stay the same
  - D. It would decrease both product and reactant

The next 5 questions will state a stress applied to a system at equilibrium, please indicate what will happen after the stress is applied.

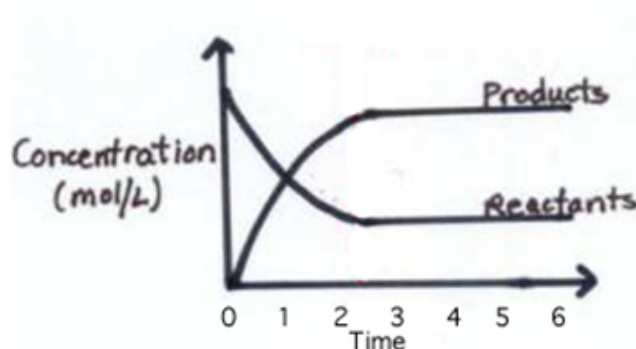


- 10) Heat is added to the system.  
11) C is removed from the system.  
12) Additional B and A are added to the system.  
13) The temperature of the system is reduced.  
14) B is removed from the system.

- A. Moves to the left (reactants)
- B. Moves to the right (products)
- C. Moves to the center (middle)
- D. Moves with the force (Jedi)

- 15). In the graph on the right, at what time is equilibrium achieved?

- A. 1.0
- B. 6.1
- C. 4.7
- D. 2.5



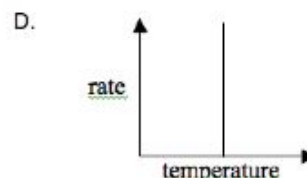
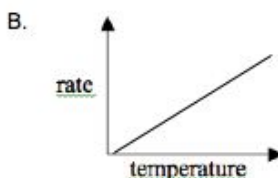
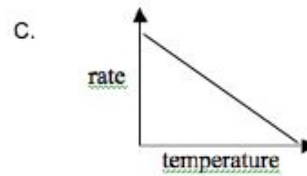
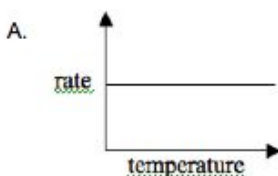
- 16) True(A) or False(B): Net/Overall concentrations of products and reactants change when a system reaches equilibrium.

- 17) Which statement most accurately describes when dynamic equilibrium is reached?
- A. When all of the reactants are converted to products
  - B. When the concentration of the products is equal to the concentration of the reactants
  - C. When the rate of the forward reaction equals the rate of the reverse reaction
  - D. When the reverse reaction has completely occurred and only reactants remain

18) Which of the following statements about reaction rates best explains why refrigerators prevent food from spoiling?

- A. Refrigerator's seal out bacteria and preventing reactions from occurring
- B. Refrigerators kill enzymes, without enzymes the spoiling reaction occurs very slowly
- C. Refrigerators create a constant internal environment, keeping the food in equilibrium
- D. Refrigerators have low temperatures, which usually slows down reaction rates

19) Which of the following graphs most correctly illustrates the typical relationship between reaction rate and temperature?



20) Which of the following statements about collisions and reaction rate is most correct?

- A. More energy causes fewer collisions and increases the reaction rate
- B. Less energy causes particles to collide with more force and decreases reaction rate
- C. More energy causes more collisions and increases the reaction rate
- D. Neither energy nor collisions affects the reaction rate

21) Why do carbon and oxygen not react to form carbon dioxide at room temperature?

- A. They are not attracted to one another
- B. They do not have enough activation energy
- C. They form carbon dioxide but it decomposes quickly
- D. They are not found together under normal circumstances

22) In a chemical reaction, what does increasing the number collisions of atoms and the amount of energy in each collision correlate to?

- A. An endothermic reaction.
- B. An increase in amount of reactant
- C. A larger product molecule
- D. A higher rate of reaction

23) Why does increasing the concentration of reactants often increase the rate of the reaction?

- A. The temperature will rise
- B. The activation energy is increased
- C. The number of collisions increases
- D. The products stop reverting back into reactants

24) Why do catalysts not appear as reactants or products in chemical equations?

- A. they are both reactants and products
- B. they are consumed by the reaction
- C. they do not react with the other atoms
- D. they cannot be measured

Remember to write in  
COMPLETE sentences!

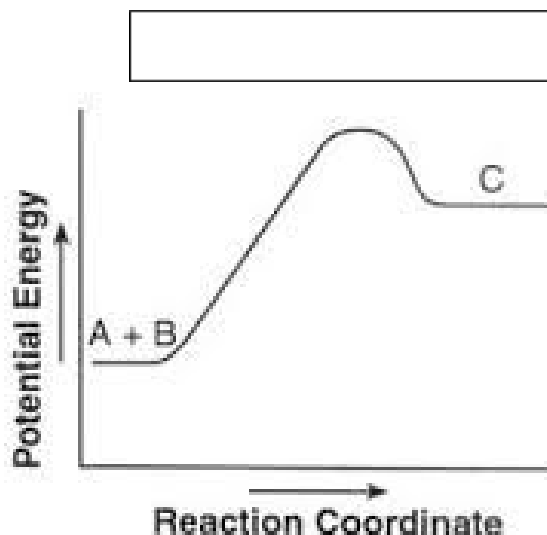
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Chemistry Unit 5 Test: Free response

25. For the potential energy graph: (4pts)

- Label: reactants and products
- Label as exothermic or endothermic.
- Draw the activation energy
- Draw the how the graph would change if a **catalyst** were added.



26. A student performs an experiment where two colorless solutions are mixed to make a blue solution. The student measures the time it takes for the solutions to change color. The results of the student's experiment are given below (3 pts):

|         | Amount of Solution A | Amount of Solution B | Temperature of solutions | Time for color to change (s) |
|---------|----------------------|----------------------|--------------------------|------------------------------|
| Control | 50mL                 | 50 mL                | 25°C                     | 22                           |

The student repeats the experiment but increases the concentration of A, predict what the student's results will be and explain your prediction [3 pts]

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27. Define the term dynamic equilibrium (3 pts):

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28. What is a catalyst and why is it useful (3pts)?

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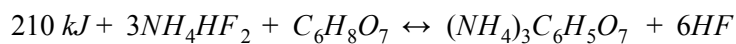
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Use the equation below to answer questions the next 2 questions:



29. If you have 1.5g of  $\text{NH}_4\text{HF}_2$  and 1.5g of  $\text{C}_6\text{H}_8\text{O}_7$ , what is the theoretical yield of HF in grams? [4 pts]

Answer:

30. Give 3 different stresses that could be applied to the equilibrium system above to increase the amount of HF (shift to the right): [3 pts]

a)

b)

c)

31. Describe **three ways** you could try to make Zinc react more quickly with hydrochloric acid. Explain at the molecular level why each method would be help: [3 pts]

1) \_\_\_\_\_  
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2) \_\_\_\_\_  
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3) \_\_\_\_\_  
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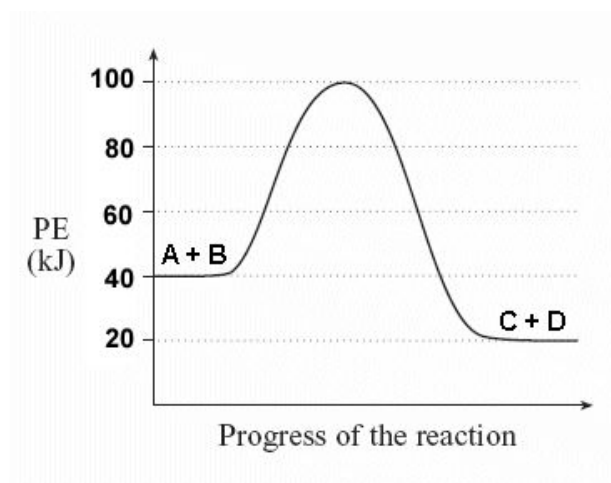
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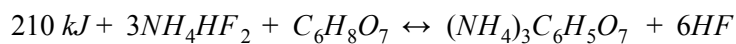
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3) \_\_\_\_\_

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