

CHEMISTRY 12

SAMPLE MULTIPLE-CHOICE QUESTIONS

The following are examples of the cognitive levels: K (*Knowledge*), U (*Understanding and Application*) and H (*Higher Mental Processes*).

It should be noted that cognitive level does not necessarily reflect “level of difficulty.” For example, a certain K level question might be considered to be difficult by some and similarly an H level question may be considered to be easy.

Reaction Kinetics

Knowledge

1. The statement, *the minimum energy needed to achieve a successful collision*, defines
 - A. entropy.
 - * B. activation energy.
 - C. the ΔH of reaction.
 - D. the activated complex.

Understanding and Application

2. Consider the following reaction mechanism:

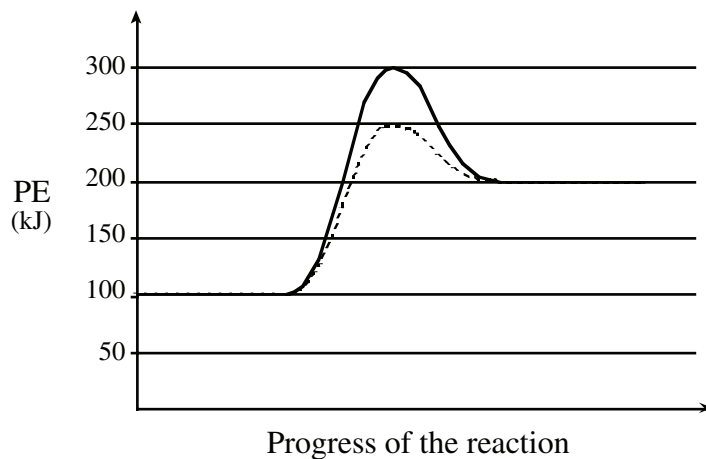
Step 1	$\text{Cl}_2 \rightarrow 2\text{Cl}$
Step 2	$\text{CHCl}_3 + \text{Cl} \rightarrow \text{HCl} + \text{CCl}_3$
Step 3	$\text{CCl}_3 + \text{Cl} \rightarrow \text{CCl}_4$

Which of the following is a reactant in the overall reaction?

- A. Cl
- B. HCl
- C. CCl_3
- * D. CHCl_3

Higher Mental Processes

3. Consider the following PE diagram for a catalyzed and uncatalyzed reaction:



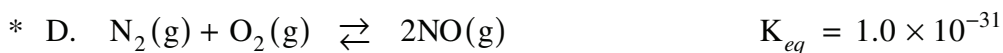
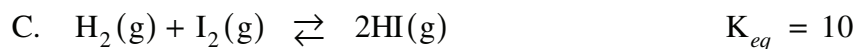
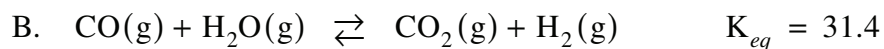
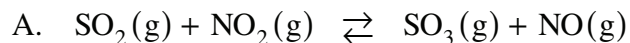
Which of the following describes the **reverse** reaction?

	Reverse Reaction	Activation Energy (kJ)	ΔH (kJ)
* A.	catalyzed	50	-100
B.	uncatalyzed	50	-100
C.	catalyzed	50	+100
D.	uncatalyzed	50	+100

Dynamic Equilibrium

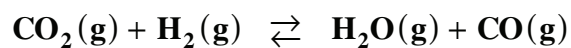
Knowledge

4. Starting with equal moles of reactants, which of the following equilibrium systems most favours the reactants?



Understanding and Application

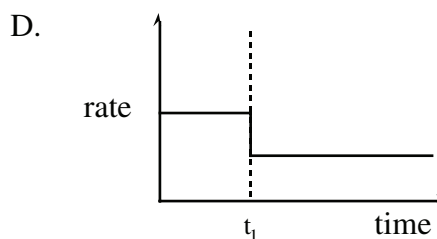
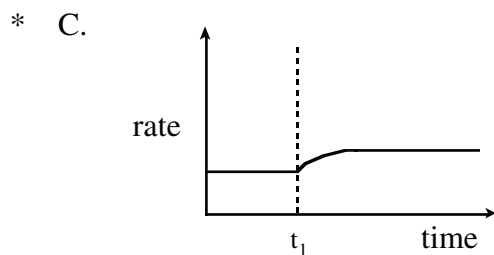
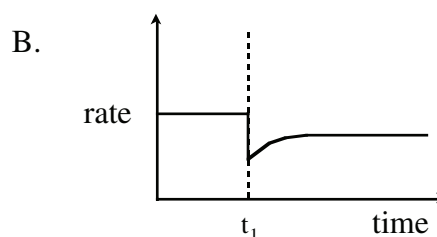
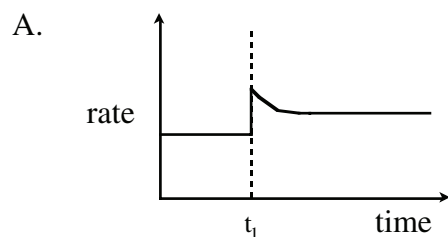
Use the following equilibrium equation to answer questions 5 and 6.



5. Which two stresses will each cause the equilibrium to shift to the left?
- A. increase $[\text{H}_2]$, increase $[\text{CO}]$
 - * B. decrease $[\text{H}_2]$, increase $[\text{H}_2\text{O}]$
 - C. increase $[\text{CO}_2]$, decrease $[\text{CO}]$
 - D. decrease $[\text{CO}_2]$, decrease $[\text{H}_2\text{O}]$

Higher Mental Processes

6. Which of the following graphs represents the rate of the forward reaction when $\text{H}_2\text{O}(\text{g})$ is added to the above equilibrium at time = t_1 ?



Solubility Equilibria

Knowledge

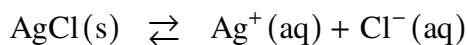
7. In every solubility equilibrium system, the rate of dissolving is
- A. equal to zero.
 - * B. equal to the rate of crystallization.
 - C. less than the rate of crystallization.
 - D. greater than the rate of crystallization.

Understanding and Application

8. A 3.0L solution of BaCl_2 has a chloride ion concentration of 0.20 M. The barium ion concentration in this solution is
- A. 0.067 M
 - * B. 0.10 M
 - C. 0.20 M
 - D. 0.60 M

Higher Mental Processes

9. Consider the following solubility equilibrium:



Some $\text{NaCl}(s)$ is added to the equilibrium. When equilibrium is reestablished, how have the ion concentrations changed from the original equilibrium?

	$[\text{Ag}^+]$	$[\text{Cl}^-]$
* A.	decreased	increased
B.	decreased	decreased
C.	increased	decreased
D.	increased	increased

Acids, Bases and Salts

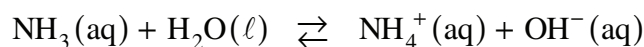
Knowledge

10. A basic solution can be defined as one in which

- A. $[\text{H}_3\text{O}^+]$ is not present
- B. $[\text{H}_3\text{O}^+]$ is equal to $[\text{OH}^-]$
- * C. $[\text{H}_3\text{O}^+]$ is less than $[\text{OH}^-]$
- D. $[\text{H}_3\text{O}^+]$ is greater than $[\text{OH}^-]$

Understanding and Application

11. Write the K_b expression for



- A. $K_b = \frac{[\text{NH}_3]}{[\text{NH}_4^+][\text{OH}^-]}$
- * B. $K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]}$
- C. $K_b = \frac{[\text{NH}_3][\text{H}_2\text{O}]}{[\text{NH}_4^+][\text{OH}^-]}$
- D. $K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3][\text{H}_2\text{O}]}$

Higher Mental Processes

12. A chemical indicator has a transition point at a $\text{pOH} = 8.0$. Calculate its K_a value and identify the indicator.

- A. $K_a = 1 \times 10^{-8}$, phenol red
- B. $K_a = 1 \times 10^{-6}$, methyl red
- C. $K_a = 1 \times 10^{-8}$, thymol blue
- * D. $K_a = 1 \times 10^{-6}$, chlorophenol red

Oxidation-Reduction

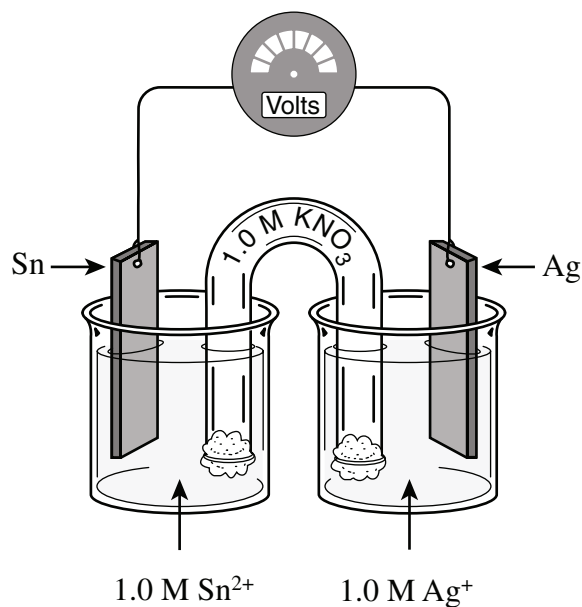
Knowledge

13. A reducing agent
- A. loses electrons and is reduced.
 - B. gains electrons and is reduced.
 - * C. loses electrons and is oxidized.
 - D. gains electrons and is oxidized.

Understanding and Application

14. Which of the following will react spontaneously with Br_2 but not with I_2 ?
- A. F^-
 - B. Cr^{2+}
 - * C. Fe^{2+}
 - D. Mn^{2+}

Use the following diagram to answer question 15.



15. In the above electrochemical cell, how do the mass of the anode and the $[Ag^+]$ change as the cell operates?

	Mass of the Anode	$[Ag^+]$
A.	decreases	increases
B.	increases	increases
* C.	decreases	decreases
D.	no change	decreases