

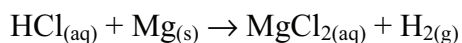
**Assessment****Chapter 6****BLM 6-5****Chapter 6 Test**

**Goal** Assess your understanding of the concepts you studied in Chapter 6.

**Procedure** Answer the following questions directly on the test paper.

**Multiple Choice** Circle the letter of the best answer for each of the following questions.

1. A chemist wants to study the rate of the following reaction:



Which method(s) would be suited to monitoring the reaction rate?

- i conductometric (measuring conductivity)
- ii spectrometric (measuring light absorbance)
- iii monitoring change in mass due to escaping gas
- iv monitoring pH
- v monitoring pressure change

(a) iii and v only

(b) iii, iv, and v only

(c) ii, iii, and iv only

(d) i, iii, iv, and v only

(e) all methods can be used

2. For the bimolecular elementary reaction  $\text{A} + \text{B} \rightarrow \text{C}$ , the rate law expression is:

(a)  $\text{rate} = k[\text{A}]^2$

(b)  $\text{rate} = k[\text{C}]$

(c)  $\text{rate} = k[\text{A}][\text{B}]$

(d)  $\text{rate} = k[\text{B}]$

(e) impossible to determine without experiment

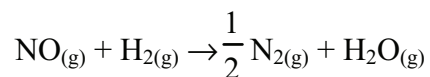
3. A reaction has the following rate law equation:  $\text{rate} = k[\text{A}][\text{B}]^2$ . What is the overall order of the reaction?
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) 0.5
4. A catalyst
- (a) changes the rate and  $\Delta H$  of a reaction.
  - (b) is formed and then consumed in a reaction.
  - (c) never appears in the rate law equation for a reaction.
  - (d) provides an alternative mechanism for a reaction.
  - (e) is a biological enzyme.

**Short Answer**

5. Compare and contrast the following terms:
- (a) activation energy and activated complex

(b) homogeneous and heterogeneous catalysts.

6. The following reaction was studied to determine the effect of changing the concentrations of hydrogen gas and nitric oxide on the rate of reaction. The reaction was carried out at a constant temperature and the rate was measured in terms of a pressure decrease. Use the equation and the information in the table to answer the questions below.



Initial Concentration [H <sub>2</sub> ] mol/L	Initial Concentration [NO] mol/L	Initial Rate (mol/(L • min))
0.0015	0.0040	2.50
0.0030	0.0040	5.00
0.0040	0.0020	0.33
0.0040	0.0040	1.33

- (a) Write the rate law expression for the forward reaction. Do not include a value for  $k$  yet. Explain your answer.

- (b) Determine  $k$  in units of mol/(L • s).

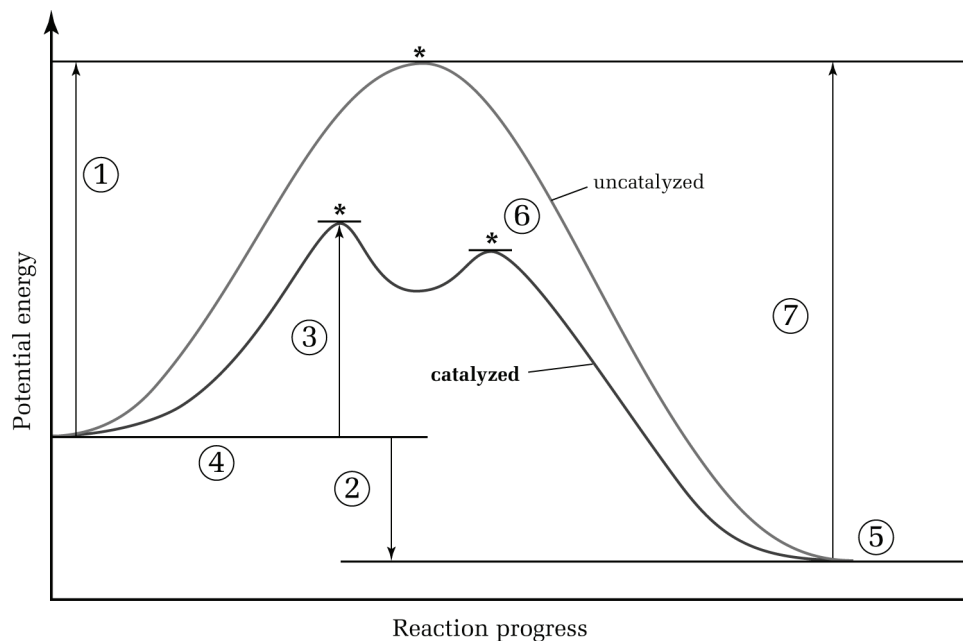
- (c) Is this reaction homogeneous or heterogeneous? Explain your answer.

**(d)** The chemist carries out another trial with  $[\text{H}_2] = 0.0025 \text{ mol/L}$  and  $[\text{NO}] = 0.0035 \text{ mol/L}$ . Predict the initial rate of the reaction.

**(e)** Why were the trials carried out at a constant temperature?

**(f)** Why was it possible in this reaction to monitor the change in rate by measuring a decrease in pressure?

7. The graph below shows the energy changes involved in an uncatalyzed and a catalyzed reversible reaction. Match the following descriptions to the numbers on the graph. **Note:** There are more numbers than descriptions—some numbers do not have matching descriptions.



- (a) \_\_\_\_\_ activation energy of the first step of the forward catalyzed reaction.  
 (b) \_\_\_\_\_ enthalpy change for the reaction.  
 (c) \_\_\_\_\_ activation energy of the forward uncatalyzed reaction.  
 (d) \_\_\_\_\_ transition state.  
 (e) \_\_\_\_\_ activation energy of the reverse uncatalyzed reaction.