# Chemistry 12

## Unit I Kinetics

### Prescribed Learning Outcomes

The following grid contains all the prescribed learning outcomes (2007 / 2008) for the Kinetics unit of Chemistry 12. Use this in conjunction with the Kinetics Study Guide to determine your level of competence and understanding of each learning outcome. Once you are confident that you completely understand each learning outcome, place a check mark in the square provided.

**Please Note: The Chemistry 12 Study Guides are based on the OLD PLO's. Use the "Study Guide Equivalent" column to match up the old PLO's to the new ones.**

| Prescribed Learning Outcomes | Achievement Indicators | Study Guide Equivalent | Status |
|---|---|---|---|
| **A1** demonstrate awareness that reactions occur at differing rates | Give examples of reactions proceeding at different rates | A1 | ❑ |
| | Recognize that rate is described in terms of some quantity (produced or consumed) per unit time | A2 | ❑ |
| **A2** experimentally determine rate of a reaction | Identify properties that could be monitored in order to determine a reaction rate | A4 | ❑ |
| | Recognize some of the factors that control reaction rates | A5 | ❑ |
| | Compare and contrast factors affecting the rates of both homogeneous and heterogeneous reactions | A6 | ❑ |
| | Describe situations in which the rate of reaction must be controlled | A7 | ❑ |
| | Calculate the rate of reaction using experimental data | A3 | ❑ |
| **A3** demonstrate knowledge of collision theory | Identify the following principles as aspects of collision theory<br>- Reactions are the result of collisions between reactant particles<br>- Not all collisions are successful<br>- Sufficient kinetic energy (KE) and favourable geometry are required<br>- To increase the rate of a reaction, one must increase the frequency of successful collisions<br>- Energy changes are involved in reactions as bonds are broken and formed<br>- A KE distribution curve can explain how changing temperature or adding a catalyst changes the rate | B1 | ❑ |
| **A4** describe the energies associated with reactants becoming products | Describe the activated complex in terms of its potential energy (PE), stability and structure | B2 | ❑ |
| | Define *activation energy* | B3 | ❑ |
| | Correctly describe the relationship between activation energy and rate of reaction | B4 | ❑ |
| | Describe the changes in KE and PE as reactant molecules approach each other | B5 | ❑ |
| | Draw and label PE diagrams for both exothermic and endothermic reactions, including $\Delta H$, activation energy and the energy of the activated complex | B6 | ❑ |
| | Relate the sign of $\Delta H$ to whether the reaction is exothermic or endothermic | B7 | ❑ |

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|---|---|---|---|
| **A4** describe the energies associated with reactants becoming products (*continues…)* | Write chemical equations that describe energy effects in two ways:<br>- A chemical equation that includes the energy term (thermochemical equation)<br>- A chemical equation using ΔH notation | B8 | ❑ |
| **A5** apply collision theory to explain how reaction rates can be changed | Use collision theory to explain the effects of the following factors on reaction rate:<br>- Nature of reactants<br>- Concentration<br>- Temperature<br>- Surface Area | B9 | ❑ |
| **A6** analyse the reaction mechanism for a reacting system | Explain why most reactions involve more than one step | C1 | ❑ |
| | Describe a reaction mechanism as the series of steps (collisions) that result in the overall reaction and describe the role of the rate-determining step | C2 | ❑ |
| | Explain the significance and role of a catalyst | C3 | ❑ |
| | Identify reactant, product, reaction intermediate, activated complex, and catalyst from a given reaction mechanism | C5 | ❑ |
| **A7** represent graphically the energy changes associated with catalyzed and uncatalyzed reactions | Compare the PE diagrams for a catalyzed and uncatalyzed reaction in terms of<br>- Reactants<br>- Products<br>- Activated complex<br>- Reaction intermediate<br>- Reaction mechanism<br>- ΔH<br>- Activation energy | C4 | ❑ |
| **A8** describe the uses of specific catalysts in a variety of situations | Identify platinum in automobile catalytic converters as a catalyst | N/A | ❑ |
| | Describe the effect of a catalyst on a number of reactions, such as<br>- Decomposition of hydrogen peroxide (catalysts: manganese (IV) oxide, raw liver, raw potato)<br>- The reaction of the oxalate ion with acidified potassium permanganate solution (catalyst: $Mn^{2+}$)<br>- The decomposition of bleach (catalyst: cobalt (II) chloride) | C6<br>(Not 100%) | ❑ |