# *Optional*
# Green Chemistry – What is It?

**Background:** Without chemical products, our standard of living would drop significantly. Can society have the advantages of chemical products without the potential harm to the environment and human health? The answer is yes. Green chemistry is the name given to the effort to change or reinvent these processes in order to ensure a safer, cleaner environment in the 21st century.

Green chemistry aims to eliminate pollution by preventing it from happening in the first place and by using resources for chemical products that are renewable. The other key component of green chemistry is to close the cycle in chemical production so that there is little to no waste product. In designing a reaction according to green chemistry principles, chemists pay close attention to whatever is known about the possible hazards a chemical presents to health or the environment before using that chemical in a reaction or creating it as a product. In other words, they treat the hazard posed by a substance as a property that must be considered along with other chemical and physical properties and select substances that minimize harm.
Thus green chemistry processes are *benign by design.*

*REFER TO THE 12 PRINCIPLES OF GREEN CHEMISTRY IN THE FRONT OF YOUR CURRICULUM BINDER FOR ADDITIONAL INFORMATION.*

**Goal:** To provide students with a basic understanding of the concepts of green chemistry.

**Objectives:** Students will…
- Become familiar with the 12 Principles of Green Chemistry.

**Materials (for a class of 32):**
- 32 Green Chemistry – What is It? Student Sheets
- Pencils or pens
- Computer with projection system
- PowerPoint presentation "Introduction to Green Chemistry"

**Time Required:** 45–60 minute class period

**Standards Met:** S3, S6, S7, LA6

**Green Chemistry Principles Addressed:** 1–12

**Procedure:**
PREP
- Read the background information above.
- Review the PowerPoint and notes page so you feel comfortable with the material.

IN CLASS

- Pass out the Green Chemistry – What is It? Student Sheets.
- Discuss the concept behind green chemistry.
- Show the PowerPoint presentation on green chemistry.
    - Be sure to give students ample time to complete the Green Chemistry – What is It? Student Sheet on a given slide.
- Have the students do Activity 2.
- After the students have finished Activity 2, have them share their "translation" of the 12 steps.

**Assessment:**

- Completion of the Green Chemistry – What is It? Student Sheet

# Green Chemistry – What is It?
# Student Sheet

Name: _____ Date: _____

_____

**Directions:** While viewing the PowerPoint in class, please answer the questions below.

**Slides 1–4:** Give two examples of how "Chemistry has an important role to play in achieving a sustainable civilization on Earth."

**Slides 5–11:** Use the chart below to fill in an example of how chemistry positively impacts the environment, human health, and economics. Also give one example of how chemistry negatively impacts the environment, human health, and economics.

| | Chemistry – Positive Impacts | Chemistry – Negative Impacts |
|---|---|---|
| Environment | | |
| Human health | | |
| Economics | | |

**Slides 11–13:** Brainstorm three benefits that you have experienced because of chemistry.

**Slides 14–16:** Brainstorm one or two environmental pollution or human health problems you have heard about.

**Slides 17–23:** What laws or protocols exist in your country that help prevent mistakes like the ones in slides 15 and 16?

**Slides 24–29:** Brainstorm one way that green chemistry could positively affect your life.

**Slides 30–end:** How would you define green chemistry?

# Green Chemistry – What is It?
# Teacher Key

Name: _____ Date: _____

_____

**Directions:** While viewing the PowerPoint in class, please answer the questions below.

**Slides 1–4:** Give two examples of how "Chemistry has an important role to play in achieving a sustainable civilization on Earth."
*Answers will vary, but could include the following:*
1. *Medicine helps people stay healthy.*
2. *Chemicals kill bugs.*

**Slides 5–11:** Use the chart below to fill in an example of how chemistry positively impacts the environment, human health, and economics. Also give one example of how chemistry negatively impacts the environment, human health, and economics. *Answers will vary, but could include the following:*

| | Chemistry – Positive Impacts | Chemistry – Negative Impacts |
|---|---|---|
| Environment | *Clean up oil spills* | *Chemical spills* |
| Human health | *Medicine for sick people* | *People ingest chemicals that they shouldn't – like cleaning products* |
| Economics | *People buy chemical products* | *The above costs everyone money* |

**Slides 11–13:** Brainstorm three benefits that you have experienced because of chemistry.
*Answers will vary, but could include the following:*
1. *I take a pill everyday so I can breathe. I have allergies.*
2. *My dad uses chemicals to clean our house.*
3. *I listen to CDs on my stereo.*
4. *My house doesn't have bugs.*

**Slides 14–16:** Brainstorm one or two environmental pollution or human health problems you have heard about.
*Answers will vary, but could include the following:*
*My nephew swallowed bleach.*
*Emissions are causing climate change.*
*My town had a big chemical spill, and the animals all died.*
*Love Canal in NY made a lot of people sick.*

**Slides 17–23:** What laws or protocols exist in your country that help prevent mistakes like the ones in slides 15 and 16?
*Answers will vary, but could include the following:*
*There are laws that make companies be careful.*
*The EPA makes and enforces laws for companies.*
*Labels say that people shouldn't drink certain products.*

**Slides 24–29:** Brainstorm one way that green chemistry could positively affect your life.
*Answers will vary, but could include the following:*
*It could save us money if they use more efficient processes.*
*There could be fewer spills.*
*There might be more resources for me when I grow up.*

**Slides 30–end:** How would you define green chemistry?

*Answers will vary.*