

Glass Factory Lab

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Grade Level (Req.): 8th	Content Area (Req.): Chemistry	Unit (Opt.):
Connections to Other Disciplines (Opt.):		
<ul style="list-style-type: none"> • Economics • Geography/ Environmental Education • 		
Time Frame (Req.): 2-3 45 min. class periods	Goal (Req.): Students will learn about the properties of mixtures (physical changes). Students will apply this knowledge to think critically about the economics and environmental responsibility of a factory in a community.	
	Objective (Req.): Students will develop a plan to separate mixtures that are waste products from a glass factory. Students will separate these recycled products on a small scale in the lab and apply the results to a large scale factory plan that is economically and environmentally responsible.	
Materials Needed (Req.):	New Vocabulary (Opt.):	
<ul style="list-style-type: none"> • Mixture of iron filing, marble chips, sand, iodine, and copper sulfate • Tweezers, magnet, alcohol, water • Beakers and graduated cylinders • Funnel, stir rod and filter paper (paper towel) • • • 	<ul style="list-style-type: none"> • • • • • 	
Anticipatory Set/Introduction [Inquiry Question is required] (Req.): SCENERIO: Acme Glass Company has a mixture of chemical waste that has been dumped into the river for years. Company officials have decided to try to reduce pollution and save money. In fact, if the company does not reduce the waste they will be forced to shut down. The company will try to recycle the chemicals that are normally wasted. Chemists have analyzed the waste products and collected data that they feel will be helpful in devising a plan to recover the waste chemicals. It is your job (students) to devise a plan to separate each component of the mixture so that it can be used to again rather than wasted (dumped in a landfill).		
Instructional Sequence/Procedure (Req.):		
<ol style="list-style-type: none"> 1. DAY 1: Read introductions and ask students why a glass factory is best located near a river. 2. Discuss the components of the waste product from the factory (mixture) and what they might be used for in the glassmaking process. 3. Give students (individually or in groups) time to study the table on the pre lab sheet. 4. Have students write on the second data table the sequence and method they will use. 5. DAY 2: Students will share their plans on how to separate the mixture. 6. Ask question as to why it might be best to remove the marble chips first. 7. How do they plan on preventing the iron filings from getting stuck on the permanent 		

magnet?

8. Why should they filter alcohol first and then use water second?
9. DAY 3: Separate the mixture using the instructions on the second sheet.
10. As an assessment have students design a factory, machine or Rube Goldberg devise to separate the mixture on a larger scale.
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- 20.

Formative Evaluation (Req.): Observe students using a number of lab techniques common in the chemistry lab. Numerous critical thinking skills are developed as the students propose economically efficient and environmentally friendly method to solve a problem.

Assessment (Req.): Have students design a factory, machine, or Rube Goldberg device to separate the mixture on a larger scale.

Iowa Core Curriculum Standards Used (Req.):

- Economics 1., Grades 6-8: Understand the role of scarcity and economic trade-offs and how economic conditions impact people's lives.
- Geography 4., Grades 6-8: Understand how physical processes and human actions modify the environment and how the environment affects humans.
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Common Core Curriculum Standards Used (Opt.):

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NGS Standards Used (Req.):

- 4. The physical and human characteristics of places.
- 14. How human actions modify the physical environment.
- 15. How physical systems affect human systems.
- 16. The changes that occur in the meaning, use, distribution, and importance of resources.
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Five Themes of Geography Used (Req.): <ul style="list-style-type: none">• Location• Place• Human-Environmental Interaction••	School District Standards and Benchmarks (Opt.): <ul style="list-style-type: none">•••
21 st Century Universal Constructs (Opt.):	
Other Disciplinary Standards (Opt.): <ul style="list-style-type: none">• Next Generation Science Standards Used:• The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter 1.A•••	
Other Essential Information (Opt.):	
Other Resources (Opt.): <ul style="list-style-type: none">••••	

Acme Recycling Project

Name _____

Hour _____

Acme Glass Company has a mixture of chemical waste that have been dumped into the river for years. Company officials have decided to try to reduce pollution and save money. In fact if the company does not reduce the waste they will be forced to shut down. The company will try to recycle the chemicals that are normally wasted. Chemists have analyzed the waste products and collected data that they feel will be helpful in devising a plan to recover the waste chemicals. It is your job to devise a plan to separate each component of the mixture so that it can be used to again rather than wasted.

	Appearance	Dissolves in Alcohol	Dissolves in Water	Attracts to a Magnet
Iodine	Small dark brown crystals	Yes	Yes	No
Sand	Small brown particles	No	No	No
Iron	Dark Particles	No	No	Yes
Marble Chips	Large gray Rocks	No	No	No
Copper Sulfate	Small Blue Crystals	No	Yes	no

Study the data table above and devise a plan to separate each component for the mixture. Describe a plan in separate steps below for each component.

Step 1	
Step 2	
Step 3	
Step 4	
Step 5	

Separating a Mixture

A mixture is formed when substances combine without changing chemically. Each component or ingredient of a mixture keeps its own identity and properties. Physical changes are used to separate the components of a mixture.

Data table 2

Component	physical properties
Iodine	dissolve in alcohol (purplish brown color)
Sand	does not dissolve in water or alcohol
Iron	attracts to a magnet (metallic)
Marble chips	large gray rock pieces
Copper sulfate	dissolves in water (blue when dissolves)

PROCEDURE

1. Place a spoon full of mixture on paper towel
2. Use tweezers to remove the largest pieces from the mixture. Place the large pieces in the container marked Marble Chips.
3. Use a magnet wrapped in a plastic bag to separate the metal fillings from the mixture. Remove the magnet from the bag to release the metal fillings. Place them in the container marked metal filings.
4. Place the remaining mixture in the beaker (jar) and add 10 mL of alcohol. Use a stirring rod to dissolve one of the components. Filter the mixture and catch the liquid in a second beaker (jar). Place the liquid in the container marked Iodine.

Transfer the mixture remaining in the filter paper to a clean beaker. Add 20 mL of water and catch the liquid in a separate container. Place this liquid in the container marked copper sulfate.

Sand is left over in the filter paper. Place it in the sand container.