

CHAPTER 6, LESSON 12, ACTIVITY SHEET ANSWERS

1. If you trace what something is made of far back enough, you will find that all of the substances used to make that product come from our world. They may originally come from plants, animals, or the earth.
2. Synthetic products are made by people who change natural resources chemically to produce a new substance with different characteristics.
3. If there is some reason you cannot get the compound from a natural source, it may be helpful to use a synthetic, yet identical, version. If harvesting the item from nature or over-harvesting could damage the environment or destroy habitat, it might be better to synthesize the compound.
4. Students will either choose or be assigned a synthetic product, such as one of the following, to research.
 - Plastic bag
 - Plastic bottle
 - Disposable diaper
 - Synthetic fiber/cloth (polyester, nylon, or rayon)
 - Kevlar
 - Artificial sweetener
 - Synthetic fuel (Synfuel)
 - Synthetic rubber
 - Chloroquine (Malaria drug)
 - Taxol(Cancer drug)
 - Physostigmine(Glaucoma drug)
 - Aspirin

5.

Natural resources used to make the gel worm		
	Sodium Alginate	Calcium Chloride
What natural resource is this chemical made from?	A brown seaweed called kelp	Calcium chloride is made from limestone which is a common rock that is mined.
How is the natural resource processed to make this chemical?	The seaweed is cut up, mixed with water and filtered. The water evaporates off and the sodium alginate powder is left.	The limestone is reacted with hydrochloric acid or sodium chloride to make calcium chloride.

6. The calcium chloride solution was clear and colorless. It looked pretty much like water. The sodium alginate solution was also clear and colorless but it seemed thicker. 3

7. Instead of flowing like a liquid, the chemical reaction made a gel which you could pull up.

8. The gel worm is a synthetic product because it was changed chemically by people.

9. The calcium ions replace the positive sodium ions and connect sodium alginate polymers chains together. This is called crosslinking and makes the sodium alginate thicken to become a gel.

10.

Renewable and Nonrenewable Natural Resources Used to Make Each Snack			
	Main ingredient(s)	Natural resources used to make each	Renewable? Why or why not?
Gel worm	Sodium alginate	Brown Seaweed	Renewable, because seaweed reproduces within a few years.
	Calcium chloride	Limestone	Not renewable, because limestone is a rock that took millions of years to form.
Fresh fruit slices	Fruit	Fruit tree, water, and soil nutrients	Renewable, because new trees can be planted, rain provides water, and good farming practices can replenish soil nutrients.

11.

Impacts to society and the environment		
	Synthetic gel worm	Fresh fruit slices
Impact of harvesting, mining, or collecting the natural resources	<p>Brown seaweed is harvested from the ocean and is food and shelter for many sea creatures. This could affect the entire ecosystem. Processing seaweed into sodium alginate takes energy and produces waste.</p> <p>Limestone must be mined. This takes equipment which uses energy and pollutes.</p> <p>Processing limestone to make calcium chloride produces waste which has to be controlled.</p>	<p>Prepare the land using large equipment. This uses energy and adds to pollution.</p> <p>Fertilize and water the trees. Some fertilizers can be pollutants if they get into lakes and rivers. In some areas, water may be less available than in others. Use of pesticides can be a possible pollutant.</p> <p>Harvesting by hand is not polluting but harvesting by machine uses energy and adds to pollution.</p>
Processing the natural resources to make the final product?	<p>Mass-production of the gel worms in a factory takes equipment and uses energy.</p>	<p>Cutting up the fruit into snack-size pieces would probably be done by machine which uses energy and adds to pollution.</p>
Usefulness of the product?	<p>People (kids mostly) like eating them.</p>	<p>People like eating sliced fruit. Fresh fruit contains vitamins and nutrients essential for good health.</p>

12. Real fruit is probably healthier and might have fewer negative impacts. But if synthetic fruit snacks could be made with vitamins, other nutrients, and not too much sugar, they might be a possible alternative to real fruit slices.