

## Activity Sheet Answers

### Chapter 6, Lesson 12

#### Natural Resources & Synthetic Materials

1. Both natural products and synthetic products come from natural resources. Explain why this statement is true.

“Natural” products are made from natural resources, like wood and sand.

“Synthetic” products are also made from natural resources. For example, the synthetic material plastic is made from petroleum. Petroleum is pumped out of the earth so petroleum is a natural resource.

2. What does it mean if a product is “synthetic”?

A “synthetic” material is one in which the starting substances are changed chemically to produce a material with different characteristics.

3. Some synthetic substances are exactly the same as substances found in nature. Why would scientists synthesize something that already exists?

HINT: YouTube Video, “Professor Dave Explains: Will Synthetic Vitamins Make Me Explode?”

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 is too expensive or over-harvesting could damage the environment or destroy habitat, it might be better to synthesize the compound.

4. Which synthetic product will you do research on?

Answers will vary.

#### **ACTIVITY**

5. What were the calcium chloride and sodium alginate solutions like before you added the calcium chloride solution to the sodium alginate solution?

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.

6. After you added the calcium chloride solution to the sodium alginate solution and began pulling from the center, how did the solutions change?

Instead of flowing like a liquid, the chemical reaction made it come out of the cup like a gel.

7. Why is the gel worm considered to be a synthetic product?

The gel worm is a synthetic product because it was changed chemically and now has very different properties than the sodium alginate and calcium chloride solutions that were used to make it.

## **EXPLAIN IT WITH ATOMS & MOLECULES**

8. Describe what the calcium ions from the calcium chloride do to help make the sodium alginate polymer become a gel.

When the sodium alginate solution and the calcium chloride solution are mixed, the positive calcium ions replace the positive sodium ions. Since the calcium ions have two positive charges, the calcium ions bond with the negative area on two sodium alginate molecules and create a “crosslink” between the two chains. Many crosslinking chemical reactions cause the sodium alginate to thicken and become a gel.

## **TAKE IT FURTHER**

9. Are the natural resources used to make the synthetic gel worm renewable or nonrenewable?

For sodium alginate, the brown seaweed is a renewable resource.  
The calcium chloride is non-renewable.

10. If gel worms were made and sold on a large scale as a synthetic snack item for kids, what are some of the impacts to society of producing and using them compared to producing and using fresh fruit slices?

Impacts of producing real fruit is mostly water for trees, possibly some runoff of fertilizer and use of energy in slicing fruit.

Impacts of gel worms is mostly harvesting and processing seaweed, mining and processing calcium chloride, and energy used in producing gel worms.

11. Which do you think is better, the gel worm snack or fresh fruit slices? Why do you think so?

Answers will vary but if 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.