ANTIOXIDANT FARE AT THE SCIENCE FAIR

Jan's teacher had been nagging her about a science fair project for ages.

Jan thought...

If I have to do a project, it might as well be something I'm interested in.

Jan liked spending time in the kitchen with her grandma, and she thought about something that grandma had said about blueberries.

"Jan, blueberries are superfoods! They contain antioxidants and can stop all sorts of diseases."

JAN WONDERED IF THIS COULD BE A GOOD TOPIC FOR HER SCIENCE FAIR PROJECT. JAN SEARCHED FOR "SUPERFOODS" ONLINE AND CLICKED ON SEVERAL LINKS.

Google

superfoods

Superfood is a marketing term used to describe foods with supposed health benefits. Blueberries, a so-called '**superfood**' that actually does not have unusually dense nutrient content.

Superfood - Wikipedia, the free encycl...
en.wikipedia.org/wiki/**Superfood** Wikipedia

ON SOME WEBSITES, BLUEBERRIES WERE DESCRIBED AS "SUPERFOODS."

OTHER WEBSITES SAID THAT "SUPERFOOD" WAS JUST MARKETING HYPE, AND THAT SCIENTISTS DIDN'T USE THAT TERM.

Organic Superfoods
www.optimallyorganic.com/
Fulvic, Chaga, Essiac, Supergreens, Acai, Cacao, Maca, Maqui, & More!

Jan also read about the antioxidant content of blueberries. Jan saw that something called *ORAC was used to describe the antioxidant content of foods. The ORAC value is found by measuring how much a food reacts with chemicals called oxygen radicals. Jan read that the ORAC values were controversial because they were measured in a test tube. In the body, the antioxidants in food are changed during digestion and have different values.

*ORAC = OXYGEN RADICAL ABSORBANCE CAPACITY

Jan was interested in testing whether blueberries had antioxidants. She didn't have the materials for the ORAC test, but she wondered if there was some other way to measure the antioxidants.

She read about a way that other students had measured vitamin C (a good antioxidant) in orange juice. They added drops of a brown iodine solution to orange juice and looked for a color change.

Jan thought...

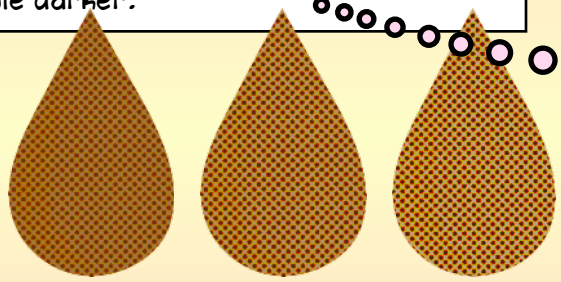
Would this test work for blueberry juice?

JAN DECIDED TO ADD BROWN IODINE SOLUTION TO BLUEBERRY JUICE AND LOOK FOR A COLOR CHANGE.

*WHAT IS JAN'S FIRST TESTABLE QUESTION?

*A TESTABLE QUESTION CAN BE ANSWERED WITH AN SCIENCE INVESTIGATION

Jan added several drops of brown iodine solution to the blueberry juice. The juice was still a red-purple color, maybe a little darker.



Jan wondered ...

Is this slightly darker juice the color change I am looking for?

Jan thought that knowing how orange juice changed color when iodine solution was added would help her find out what to look for in the blueberry juice.

WHAT IS JAN'S SECOND TESTABLE QUESTION?

Jan added brown iodine solution to some orange juice. The orange juice was still orange, maybe a bit gold-brown plus orange. But, the basic orange color of the juice did not change.

Jan was a bit stumped. She knew that other people had talked about seeing a color change when adding brown iodine to orange juice. Then, Jan got an idea.

She thought ...

Since the color of the orange juice did not change, maybe it is the color of brown iodine that changes!

Jan searched online to find out more about reactions between iodine and vitamin C.

She read that the brown iodine (I_2) reacts with colorless vitamin C and is converted to the colorless iodide ion (I^-).

JAN NOW KNEW THAT THE COLOR CHANGE TO LOOK FOR WHEN SHE ADDED BROWN IODINE SOLUTION TO JUICE WAS THE DISAPPEARANCE OF THE BROWN IODINE COLOR.

WHAT IS JAN'S THIRD TESTABLE QUESTION?

Once again, Jan added a drop of brown iodine solution to blueberry juice. Now that Jan knew what to look for, she could tell that with the first drop of iodine, the brown color did not last. After a few drops, the brown color begin to darken the juice. But, the color change was really hard to see.

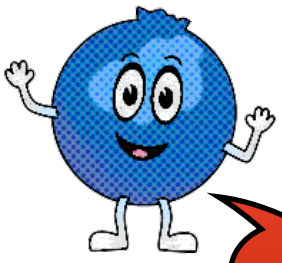
Jan wondered ...

If I added the blueberry juice to the brown iodine solution, would the iodine color change be more visible?

WHAT IS JAN'S FOURTH TESTABLE QUESTION?

This time, Jan added blueberry juice to the iodine solution. The first drops of juice lightened the brown color of the iodine. After several drops of blueberry juice, all the brown color was gone.

The blueberry juice did add some red purple color to the iodine solution, but the drops of juice were diluted in the iodine, so the loss of brown color was still easy to see.



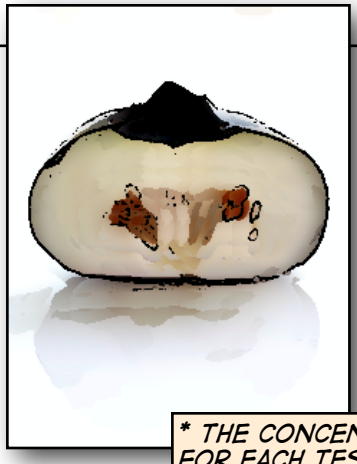
What can Jan claim after the four tests she did with juice and brown iodine solution?

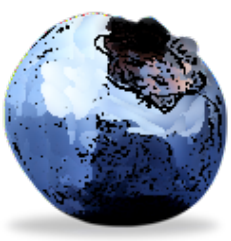
How does each result from a testable question help Jan understand how blueberry juice reacts with brown iodine solution?

Even though Jan had done a lot of reading and four tests on juice and iodine solution, her teacher said she did not have a science fair project question.

Do you agree with Jan's teacher? Why or Why not?

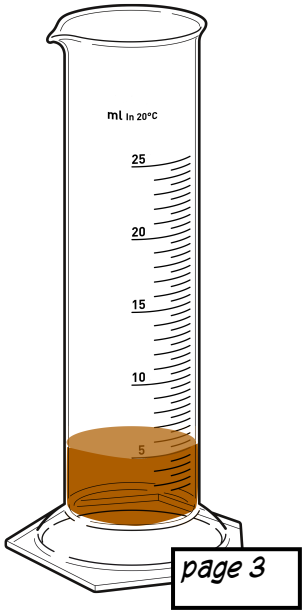
Jan noticed that fresh blueberries have dark blue skins with lighter fruit pulp inside the berry. Jan wondered which contained more antioxidants – the lighter inside of the fruit or the dark skins of the fruit.





Jan decided to compare the juice of 3 whole blueberries to the same amount of juice from the just the skins of 9 blueberries.

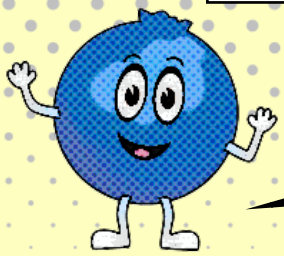
Jan tested to see how many drops of each juice would cause exactly 5 ml of *brown iodine solution to become colorless.



* THE CONCENTRATION OF BROWN IODINE SOLUTION FOR EACH TEST WAS EXACTLY THE SAME.

JAN FOUND THE RESULTS BELOW.

Juice type	Juice drops to turn 5 mL iodine solution colorless
Whole berries	6
Skin of berries	2



What claim can Jan make about which part of the blueberry contains more antioxidants?

What evidence and reasoning supports this claim?

THE AFTERNOON BEFORE THE SCIENCE FAIR, JAN PRACTICED EXPLAINING HER PROJECT TO HER FRIENDS TONYA, KARRI, AND BOB.

JAN SAID

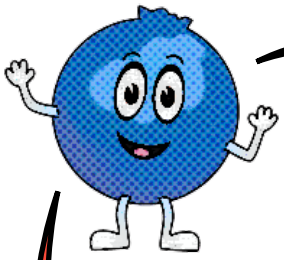
In our bodies, oxygen is a oxidant. That means oxygen takes electrons from chemical substances in our cells.

This oxidation can cause cell damage.

An antioxidant in the body reacts with oxygen before it can react with other substances and cause damage.

So, antioxidants protect our cells.

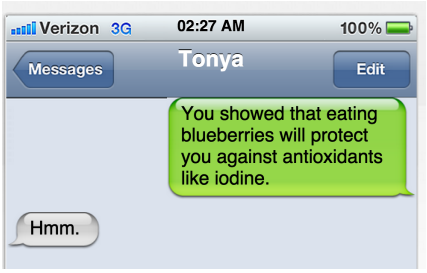
JAN USED IODINE AS AN OXIDANT IN HER EXPERIMENTS INSTEAD OF OXYGEN BECAUSE THE IODINE COLOR CHANGE IS EASY TO OBSERVE AND IODINE SOLUTION IS AVAILABLE AT THE DRUG STORE.

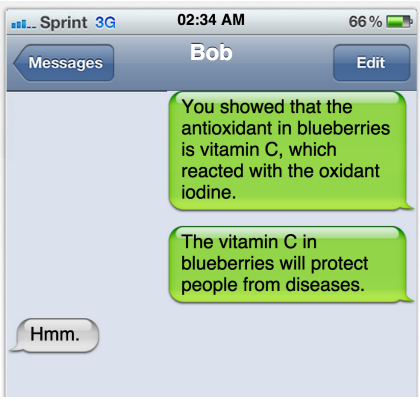


Do you agree with Jan's description of oxidation, why or why not?

LATER

EACH FRIEND TEXTED JAN TO EXPLAIN WHAT HE OR SHE THOUGHT THE PROJECT HAD SHOWN.





Which of the friends did the best job of explaining Jan's science fair project?

Give reasons to support your answer.

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