



**Reading Supports**

**Teacher’s Guide:**

**“What’s Sunless Tanner?”**

*February/March 2019*

<http://www.acs.org/chemmatters>



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# Reading Supports

The pages that follow include reading supports in the form of an Anticipation Guide, a Graphic Organizer, and Student Reading Comprehension Questions. These resources are designed to help students prepare to read the article and then locate and analyze information from the article.

* **Anticipation Guide (p. 5):** The Anticipation Guide helps to engage students by activating prior knowledge and stimulating student interest before reading. If class time permits, discuss students’ responses to each statement before reading each article. As they read, students should look for evidence supporting or refuting their initial responses.

**Or** consider the following ideas to engage your students in reading:

**What’s Sunless Tanner?**

* Before reading, ask students why people might use a sunless tanner, and what questions they have about sunless tanners.
* As they read, students should record information they find interesting and look for answers to their questions.
* **Graphic Organizer (p. 6):** The Graphic Organizer is provided to help students locate and analyze information from the article. Student understanding will be enhanced when they explore and evaluate the information themselves, with input from the teacher, if students are struggling. Encourage students to use their own words and avoid copying entire sentences from the article. The use of bullets helps them do this.

If you use the aforementioned organizers to evaluate student performance, you may want to develop a grading rubric such as the one below.

|  |  |  |
| --- | --- | --- |
| **Score** | **Description** | **Evidence** |
| 4 | Excellent | Complete; details provided; demonstrates deep understanding. |
| 3 | Good | Complete; few details provided; demonstrates some understanding. |
| 2 | Fair | Incomplete; few details provided; some misconceptions evident. |
| 1 | Poor | Very incomplete; no details provided; many misconceptions evident. |
| 0 | Not acceptable | So incomplete that no judgment can be made about student understanding |

* **Student Reading Comprehension Questions (p. 7):** The Student Reading Comprehension Questions are designed to encourage students to read the article (and graphics) for comprehension and attention to detail, to provide the teacher with a mechanism for assessing how well students understand the article and/or whether they have read the assignment, and, possibly, to help direct follow-up, in-class discussion, or additional, deeper assignments.

Some of the articles in this issue provide opportunities, references, and suggestions for students to do further research on their own about topics that interest them.

To help students engage with the text, ask students which article **engaged** them most and why, or what **questions** they still have about the articles. The “Web Resources for More Information” section of the Teacher’s Guide: Tools and Resources provide sources for additional information that might help you answer these questions.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Anticipation Guide

**Directions: *Before reading the article*,** in the first column, write “A” or “D,” indicating your agreement or disagreement with each statement. As you read, compare your opinions with information from the article. In the space under each statement, cite information from the article that supports or refutes your original ideas.

|  |  |  |
| --- | --- | --- |
| **Me** | **Text** | **Statement** |
|  |  | 1. Sunless tanner was discovered by a dermatologist. |
|  |  | 1. Sunless tanner reacts with the skin chemically. |
|  |  | 1. According to the U.S. Centers for Disease Control and Prevention, only UV-B radiation causes skin cancer. |
|  |  | 1. Dihydroxyacetone, found in many sunless tanners, is unstable so additives are used to lower the pH. |
|  |  | 1. Dihydroxyacetone is often produced from glycerol in an enzymatic process. |
|  |  | 1. A new sunless tanner promotes melanin production in people. |
|  |  | 1. Sunless tanning is less safe than sunbathing outdoors. |
|  |  | 1. Sunless-tanning pills contain the same chemical as sunless tanners that are applied to the skin. |
|  |  | 1. Mineral sunblocks contain nanoparticles. |
|  |  | 1. The effects of sunless-tanning products on people has been well-studied. |

## Graphic Organizer

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Directions**: As you read the article, complete the graphic organizer below to describe dihydroxyacetone.

|  |  |
| --- | --- |
|  | **Dihydroxyacetone** |
| **How was it discovered?** |  |
| **How does it work to produce a tan?** |  |
| **What are some problems in manufacturing it?** |  |
| **Is it safe to use? What studies have been done?** |  |
| **What are some alternatives to dihydroxyacetone? How do they work?** | |

**Summary:** On the back of this paper, write a short email (a few sentences) to a friend who wants to use sunless tanner summarizing what you learned in the article.

## Student Reading Comprehension Questions

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Directions**: Use the article to answer the questions below.

* 1. (a) What did Dr. Wittgenstein discover? (b) What was she studying?
  2. In addition to bronzing skin rapidly, list three characteristics of dihydroxyacetone.
  3. Draw (a) the molecular formula for dihydroxyacetone, and (b) its structural formula.

a. Molecular formula b. Structural formula

* 1. (a) What was accidentally discovered in vomit, and (b) how was it discovered?
  2. How did Dr. Wittgenstein prove that dihydroxyacetone reacts with skin?
  3. What is the Maillard reaction?

**Student Reading Comprehension Questions, cont.**

* 1. What was the myth, and what is the truth, about UV exposure?
  2. (a) Why do cosmetic companies need to change the formulation of dihydroxyacetone, and (b) how do they do this?
  3. How can pure dihydroxyacetone be produced?
  4. (a) How does Bronzyl work, (b) what is its active ingredient, and (c) how can it offer safety advantages?
  5. Why is it difficult to study the effects of sunless tanner on healthy skin cells?

**Critical-Thinking Question**

***Write your answer on another piece of paper, if needed.***

Why do cooks prefer to brown a roast before putting it into the stew pot?

## Answers to Reading Comprehension Questions

1. **What did Dr. Wittgenstein discover, and (b) what was she studying?**

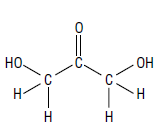
Dr. Wittgenstein discovered a chemical that could bronze skin rapidly.

She was studying children who had a rare metabolic disease and examining the effects of treating them with dihydroxyacetone.

1. **In addition to bronzing skin rapidly, list three characteristics of dihydroxyacetone.**

In addition to bronzing skin rapidly, three characteristics of dihydroxyacetone are that it is

1. a plant-derived,
2. sugar-like molecule,
3. shaped like the letter “m”.
4. **Draw (a) the molecular formula for dihydroxyacetone, and (b) its structural formula.**



a. Molecular formula b. Structural formula

C3H6O3

1. **What was accidentally discovered in vomit, and (b) how was it discovered?**
2. The browning abilities of dihydroxyacetone were discovered in children’s vomit.
3. When patients spit up dihydroxyacetone on themselves, it left strange brown spots on their skin, but their clothes remained unstained.
4. **How did Dr. Wittgenstein prove that dihydroxyacetone reacts with skin?**

To prove that dihydroxyacetone reacts with skin, Dr. Wittgenstein poured a solution of dihydroxyacetone on her own skin and it turned her skin brown, too.

1. **What is the Maillard reaction?**

In the Maillard reaction, sugars and amino acids react when heated to form many molecules, including some that are brownish.

1. **What was the myth; what is the truth about UV exposure?**

*Safe* UV exposure was a myth; the truth is that melanomas are caused by both types of UVradiation.

1. **Why do cosmetic companies need to change the formulation of dihydroxyacetone, and (b) how do they do this?**
   1. Cosmetic companies need to change the formulation of dihydroxyacetone because the molecule is unstable and could cause the skin to be yellow colored.
   2. Cosmetic companies now use different solvents and additives to lower the pH and stabilize dihydroxyacetone.
2. **How can pure dihydroxyacetone be produced?**

Pure dihydroxyacetone can be produced using an enzymatic process with glycerol as the starting material.

1. **How does Bronzyl work, (b) what is its active ingredient, and (c) how can it offer safety advantages?**
2. Bronzyl works by enhancing a person’s melanin production.
3. Bronzyl’s active ingredient is dihydroxymethylchromonyl palmitate.
4. Bronzyl’s safety advantage is that it promotes the production of melanin, which dissipates UV light.
5. **Why is it difficult to study the effects of sunless tanner on healthy skin cells?**

It is difficult to study the effects of dihydroxyacetone on healthy cells due to the problems involved in estimating exposure levels, such as the amount of sunless tanner applied and how long it stays active on the skin.

**Critical-Thinking Question**

**Why do cooks prefer to brown a roast before putting it into the stew pot?**

Browning the roast causes a reaction between the amino acids (in proteins) and the carbohydrates (reducing sugars) in meat to combine in the Maillard reaction, producing browning—plus delicious flavors, color, and aroma. If the meat is put directly into the boiling water in the stew pot, the temperature can only reach approximately the temperature of boiling water (100 oC), a temperature too low to initiate the Maillard reactions that occur at approximately 140 to 165 °C.