



# A Case of Skin Cancer

## Teacher Information

### Summary

Follow the case of a young woman who has an unusual mole on her shoulder. Students use the “ABCDE” characteristics of skin cancer to determine that the mole should be biopsied. They analyze a simulated biopsy and determine that the mole is melanoma, a particularly dangerous type of skin cancer. They use materials provided to design and conduct an experiment to test one way to reduce outdoor ultraviolet (UV) light exposure. They use graphic cutouts to create a Skin Cancer and Sun Safety infographic.

### Core Concepts

- Observations of skin abnormalities and biopsies can be used to diagnose skin cancer.
- Melanoma is a particularly dangerous type of skin cancer.
- UV radiation is the main environmental risk factor for skin cancer.
- There are many ways to reduce exposure to environmental factors related to skin cancer.

### Time Required

Two 40-minute class periods + homework.

### Kit contains

- Photo of Sofia’s mole
- Photos of biopsies
- **Skin Cancer Fact Sheet**
- **Skin Cancer and Sun Safety** sheet
- Pictures and captions for **Skin Cancer and Sun Safety** infographic
- 15 UV color changing beads
- 3 bowls for beads
- 3 pieces of black paper to cover bowls
- Package of sunscreen
- Cotton pad
- Piece of fabric
- Paper umbrella and piece of clay to support the umbrella

### Teacher Provides

- An outdoor area or window sill
- Tap water
- Scissors
- Glue or tape
- Clock or timer
- Paper towels for clean up

### Warning: Choking Hazard

This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

## Teacher Suggestions

- For Part 3, you may wish to assign different research questions to different student groups.
- If you do not have access to an outdoor area or a window that opens, you can try putting the bowls with UV beads next to a closed window. You should try this before class to be sure that the window glass does not block UV light. A UV lamp could also be used.
- If Part 4 is done for homework, you may make additional copies of the pictures and captions for the infographic so that each student has a copy.

## Suggested Supplementary Resources

- **Spot Skin Cancer** website by the American Academy of Dermatology provides a wide variety of free education resources and information on skin cancer.  
<https://www.aad.org/spot-skin-cancer>
- **Cancer and the Environment** – This booklet from the National Institute of Environmental Health Sciences addresses concerns about the connection between cancer and exposure to toxic substances in the environment. It contains information about substances that are known to cause cancer or likely to cause cancer, and what can be done to reduce exposures.  
[http://www.niehs.nih.gov/health/materials/cancer\\_and\\_the\\_environment\\_508.pdf](http://www.niehs.nih.gov/health/materials/cancer_and_the_environment_508.pdf)
- **UV Radiation & Skin Cancer: The Science Behind Age Restrictions for Tanning Beds** – Article from the journal, *Environmental Health Perspectives*  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3440095/pdf/ehp.120-a308.pdf>

## Reusing *A Case of Skin Cancer*

Teachers will need to instruct students on how to handle clean-up and return of the reusable kit materials. For example, teachers might provide the following information for students:

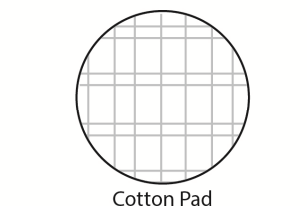
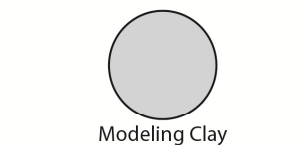
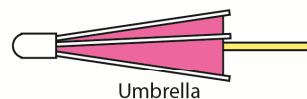
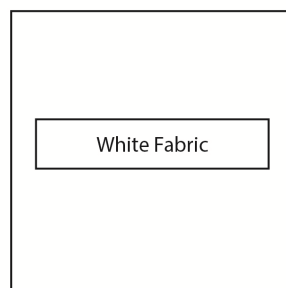
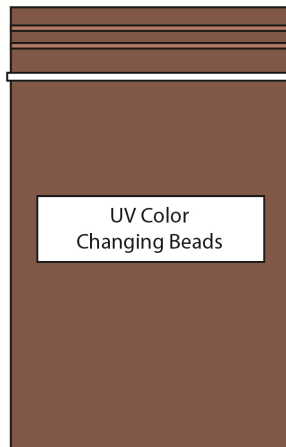
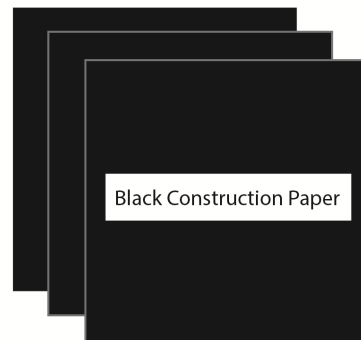
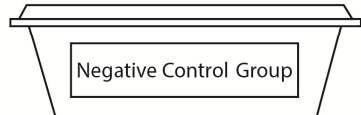
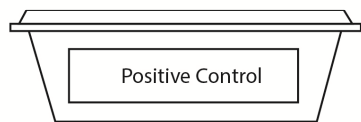
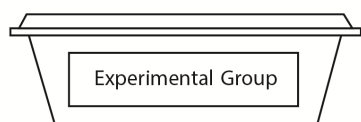
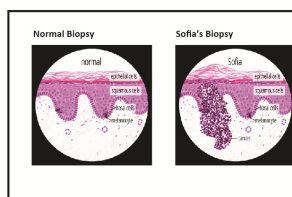
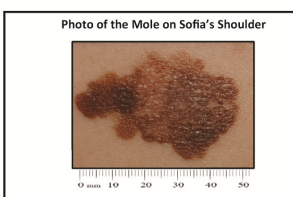
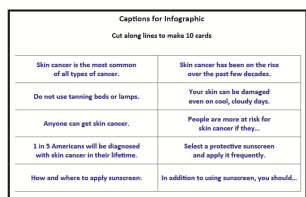
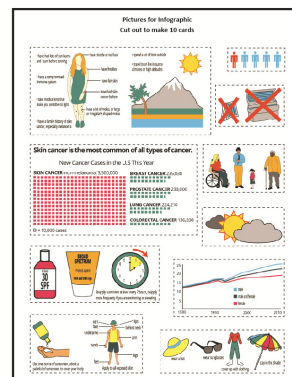
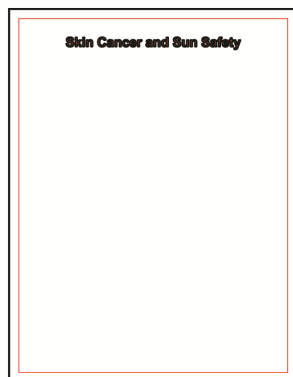
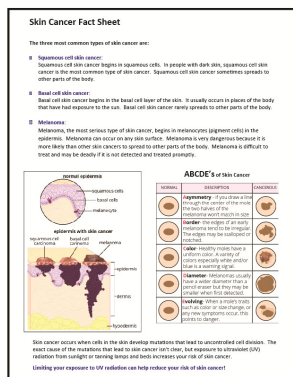
| Discard                                                                                                                               | Return to kit                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Sunscreen package</li><li>• Cotton pad</li><li>• UV sensitive beads</li><li>• Bowls</li></ul> | <ul style="list-style-type: none"><li>• Photo Sofia's mole</li><li>• Photo of biopsies</li><li>• Skin Cancer Fact Sheet</li><li>• Clay (put back into plastic bag)</li><li>• Fabric</li><li>• Black paper</li></ul> |

Note: Consider laminating printed parts of the kits that will be reused

Refills for *A Case of Skin Cancer* kits are available at [www.sciencetakeout.com](http://www.sciencetakeout.com). The **10 Kit Refill Pack** includes the following materials:

- 30 bowls
- 150 UV beads
- 10 sheets of **Pictures for Infographic**
- 10 sheet of **Captions for Infographic**
- 10 **Skin Cancer and Sun Safety** infographic sheets
- 10 sunscreen packages
- 10 cotton pads
- 10 paper umbrellas

# Kit Contents Quick Guide



## Read these instructions before using Science Take-Out kits

### Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

### Safety Goggles and Gloves Strongly Recommended

We encourage students to adopt safe lab practices, and wear safety goggles and gloves when performing laboratory activities involving chemicals. Safety goggles and gloves are not provided in Science Take-Out kits. They may be purchased from a local hardware store or pharmacy.

### Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components. Safety Data Sheets (SDS) provide specific safety information regarding the chemical contents of the kits. SDS information for each kit is provided in the accompanying teacher instructions.

### Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk.

### General Safety Precautions

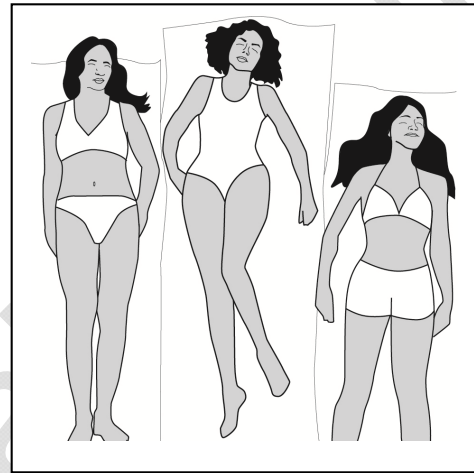
1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
2. Read and follow all instructions carefully.
3. Pay particular attention to following the specific safety precautions included in the kit activity instructions.
4. Goggles and gloves should be worn while performing experiments using chemicals.
5. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
6. Do not leave experiment parts or kits where they could be used inappropriately by others.
7. Never taste or ingest any chemicals provided in the kit – they may be toxic.
8. Do not eat, drink, or apply make-up or contact lenses while performing experiments.
9. Wash your hands before and after performing experiments.
10. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
11. At the end of the experiment, return ALL kit components to the kit plastic bag. Dispose of the plastic bag and contents in your regular household trash.

*No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.*

## A Case of Skin Cancer

### Part I: Sofia's mole

Sofia, Camilla, and Zoey were enjoying a sunny first day of summer at the beach. Camilla noticed a mole on Sofia's shoulder. She told Sofia that she should get the mole checked by a dermatologist (a skin doctor) to be sure it wasn't skin cancer. Sofia laughed because she was young and had dark skin. She thought that skin cancer only happened on the faces of older people with light skin who did not use sunscreen when they were in bright sun.



1. What do you know about skin cancer?

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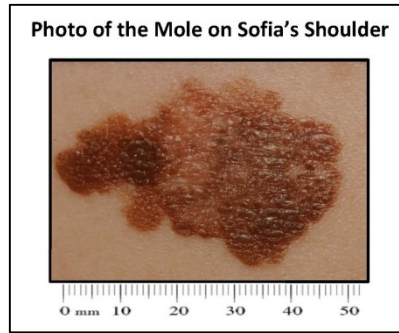
2. What additional information might help you decide whether Sofia's mole is skin cancer?

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Your lab kit contains a photo of the mole on Sofia's shoulder and a **Skin Cancer Fact Sheet**. Use the **ABCDE's of Skin Cancer** designed to help people recognize the characteristics of moles that might be skin cancer.



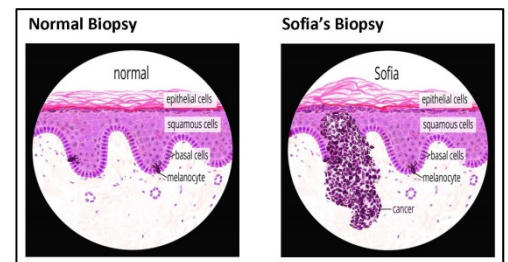
| ABCDE's of Skin Cancer |                                                                                                                              |           |
|------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------|
| NORMAL                 | DESCRIPTION                                                                                                                  | CANCEROUS |
|                        | <b>A</b> symmetry - if you draw a line through the center of the mole the two halves of the melanoma won't match in size.    |           |
|                        | <b>B</b> order - the edges of an early melanoma tend to be irregular. The edges may be scalloped or notched.                 |           |
|                        | <b>C</b> olor - Healthy moles have a uniform color. A variety of colors especially white and/or blue is a warning signal.    |           |
|                        | <b>D</b> iameter - Melanomas usually have a wider diameter than a pencil eraser but they may be smaller when first detected. |           |
|                        | <b>E</b> volving - When a mole's traits such as color or size change, or any new symptoms occur, this points to danger.      |           |

3. Do you think that Sofia should have her mole checked by a dermatologist? \_\_\_\_\_

Support your answer with at least three evidences from the **ABCDE's of Skin Cancer**.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Sofia decided to have the mole removed. The dermatologist who removed the mole sent a sample of the mole to a lab for a biopsy (a lab test to determine if a tissue is cancerous). Your lab kit contains photos of a normal skin biopsy and the skin biopsy from Sofia's mole.



4. Do you think Sofia has skin cancer? \_\_\_\_\_

If you answered "yes," identify which kind of skin cancer she has. Support your answer with information from the skin biopsy and the **Skin Cancer Fact Sheet**.

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5. What should the doctor tell Sofia about this kind of skin cancer?

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\_\_\_\_\_

\_\_\_\_\_

## Part 2: Sofia Tells Her Story

**Disaster Day!** I just found out that I have melanoma. Melanoma is the most dangerous form of skin cancer. How could this possibly happen to me? I'm only 16. I thought skin cancer was for older people. I can't find the words to tell my best friends that I have melanoma.

1. List at least two questions that you would have about skin cancer if you found out that one of your friends had melanoma, a potentially deadly form of skin cancer.

- \_\_\_\_\_
- \_\_\_\_\_

**Week Two** I had my surgery and they removed the mole. They also removed a big chunk of skin around the mole so that they could check the lymph nodes near the mole to see if the melanoma cells had spread. Lymph nodes act as "filters" to trap germs and cancer cells to keep them from spreading throughout the body.

2. Why did the surgeon remove some of the skin around Sofia's mole?

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**Week 3** When I went for a follow-up visit I thought they would tell me that I was fine. Instead, the oncologist (the cancer doctor) told me that two of the lymph nodes around the mole contained melanoma cells. This means my melanoma has metastasized (spread to other parts of my body). I need another surgery so they can remove other lymph nodes and check them to see how far the cancer has spread. As soon as I recover from the lymph node removal, my oncologist wants me to start chemotherapy.

3. What does it mean when they say that cancer has metastasized?

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**Week 7** I just finished my first month of chemotherapy. I had to go to the cancer center three days a week for five weeks. Each time, they hooked me up to an IV for an hour and a half. The side effects of the chemotherapy made me feel really horrible. I can't help wondering if the melanoma is because I used indoor tanning beds and because I did not use sunscreen when I was outside.

4. List two things Sofia could have done to help prevent melanoma?

- \_\_\_\_\_
- \_\_\_\_\_

**Six Months Later** YAY!!! My chemo is done. But I can't be sure that the chemo killed all the cancer cells. Will I be one of the lucky ones who remains cancer free or will my melanoma reoccur in the future? Only time will tell.

5. What does a cancer reoccurrence mean?

\_\_\_\_\_

## Part 3: Sun Safety Research

The list below describes three things that some people say will work as well as using sunscreen to reduce exposure to UV radiation from the sun. **You will design and conduct an experiment to compare the effectiveness of ONE of these to the effectiveness of sunscreen.**

1. **Research Question:** Does (*circle the one you will be testing below*) work as well as or better than sunscreen for protecting your skin from harmful UV light that may cause skin cancer?
  - a) Going into the water (for example a swimming pool or lake)
  - b) Wearing long pants and long-sleeved shirts
  - c) Sitting in the shade of an umbrella

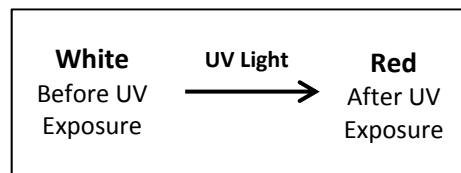
You have these items in your lab kit that you can use for your experiment:

- 15 UV color changing beads in a brown plastic bag
- 3 bowls for the beads, labeled “Negative Control Group,” “Positive Control Group,” and “Experimental Group”
- A cotton pad for applying sunscreen to the beads
- 3 sheets of black paper to cover the beads in the bowls until you expose them to light
- A package of sunscreen (you may pour the sunscreen onto the cotton pad and use it to wipe sunscreen onto some of the beads)
- A piece of white fabric to simulate long pants or a long-sleeved shirt
- A paper umbrella and a small piece of clay to support the umbrella

You can also use tap water for your experiment (to simulate swimming pool or lake water).

**To model the effect of UV light on skin, you will use the special UV color changing beads that turn from white to pink to red when exposed to UV light.**

These UV color changing beads appear white while indoors, but when you take them outside the ultraviolet-sensitive pigment will change to pink and then to red. You can even make a color scale from white to pink to red to measure low, medium, and high UV light intensity.



2. What is the **Hypothesis** that you will be testing in your experiment?

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**Experimental Group**

*What I Changed*

**Positive Control Group**

*The group where an effect is expected. For example, where a treatment is known to prevent sun damage.*

**Negative Control Group**

*The group where no effect is expected. For example, where no treatment to prevent sun damage is used.*

3. How should the **Experimental Group** be treated?

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4. How should the **Positive Control Group** be treated?

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5. How should the **Negative Control Group** be treated?

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6. For a fair comparison, list two ways that the two control groups and the experimental group should be the same.

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- ance Take-Out

- [illegible]

9. What is the **Independent Variable** in your experiment?

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10. What is the **Dependent Variable** in your experiment?

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11. What are two **Controlled Variables** in your experiment?

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12. Conduct your experiment (set it up and collect data). You will need to take your experiment outside, place it next to an open window, or use a UV lamp to expose the beads to UV light.

13. Make a data table below to summarize the results of your experiment.

**Independent Variable**

*What I Changed*

**Dependent Variable**

*What I observed*

**Controlled Variables**

*What I kept the same*

14. Do the results of your experiment support or refute the hypothesis that you were testing?  
*Refer to your hypothesis in question 2.* Provide evidence from your experiment.

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15. Describe two changes that you might make to improve the design (set up and/or data collection) for your experiment.

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## Part 4: Sofia's Story Continued - Preventing Melanoma

I hope my story will help people change the way they think about tanning. Camilla, Zoey, and I decided we should do something to make people aware of the dangers of tanning and the importance of sun safety.

I made a list of things people should know about skin cancer. Zoey said that my list was boring. She suggested that an infographic would be a more interesting way to get information across to our friends. Zoey explained that an infographic takes a large amount of information and condenses it into pictures and brief text so that viewers can quickly grasp information.

1. Your kit contains a sheet of pictures and captions for you to use to make an infographic. Cut along the lines to cut out the 10 pictures and 10 captions.
2. Match each of the 10 pictures with the appropriate caption.
3. Select the five most important pictures and captions that you would use to make your friends aware of things that they should do to avoid skin cancer.
4. Your kit also has a **Skin Cancer and Sun Safety** sheet. Use glue or tape to attach the five pictures and captions that you selected to the **Skin Cancer and Sun Safety** sheet to make a "Skin Cancer and Sun Safety" infographic.