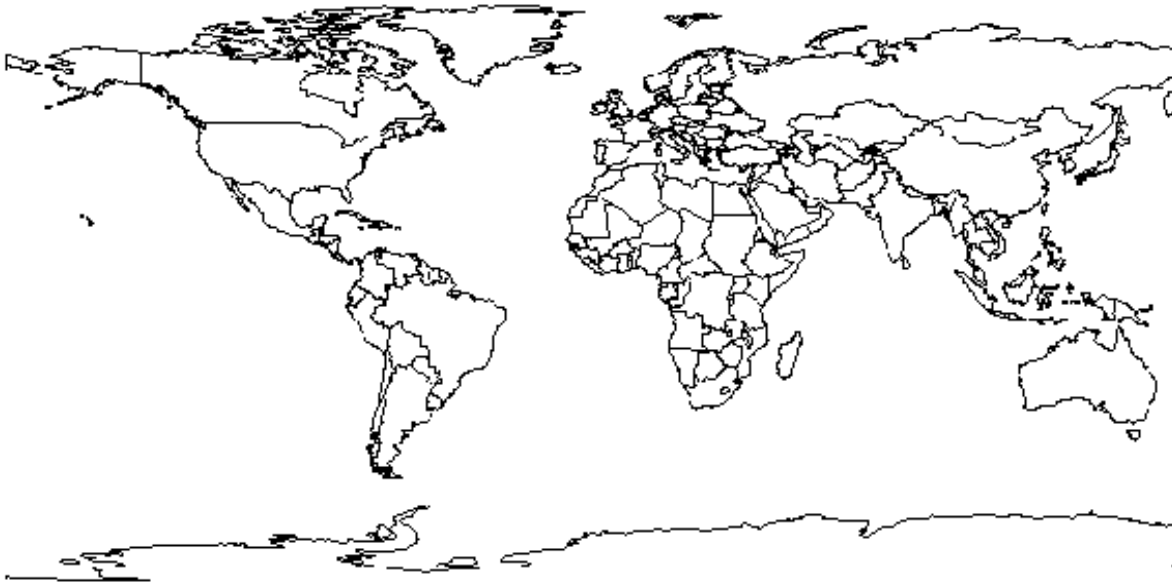
Name:	Date:	Class:

Image Directions Student Activity Sheet

Directions: Explore the information in the images for ultraviolet light intensity and skin pigmentation of indigenous peoples. Skin pigmentation values are rated according to the amount of light reflected off the skin of the underside of the forearm. Begin by investigating what information the various buttons open. Keep track of your findings by writing or coloring on the map provided below. After exploring the database for a couple of minutes, find and write answers to the following questions.



Credit: SETI Institute

1. What is the relationship between latitude and ultraviolet light intensity?

2. What is the relationship between latitude and the level of skin pigmentation? Make note of any irregularities.

3. Write a paragraph that describes the relationship between average UV intensity and skin pigmentation. Your paragraph should refer to the data on the maps you have explored and the notes you have made.

Name:	Date:	Class:

UV Light and Reproductive Success Student Activity Sheet

While Nina Jablonski and George Chaplin had found a *correlation* between ultraviolet intensity and skin reflectance, they knew more evidence was needed to show a *cause and effect relationship.* They asked the questions: What would be the reproductive advantage of having more darkly pigmented skin where UV intensity is higher? What would be the reproductive advantage of having more lightly pigmented skin where UV intensity is lower? Jablonski and Chaplin collected more evidence (facts) from other scientists' work to answer these questions. Assemble the evidence they found to discover some answers.

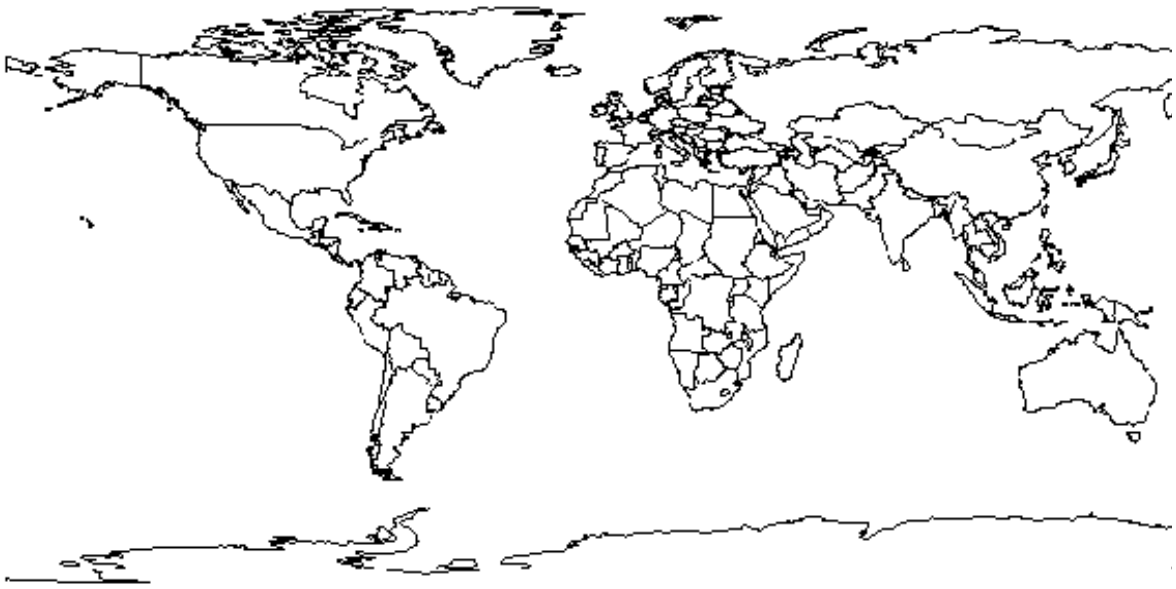
Directions:

1. You may want to cut the facts apart or take notes on a separate sheet of paper.
2. Select the facts that have to do with advantages of darkly pigmented skin.
3. Organize this group of facts into a logical explanation about how skin pigmentation contributes to reproductive success.
4. In a short paragraph (about 100 words), write out your explanation. You can use the wording of the facts where appropriate, but you must make the connections.
5. Repeat the process for the group of facts that have to do with advantages of lightly pigmented skin. (Some facts are used in both groups.)

The skin pigment melanin filters out UV light.	Folate is essential in the production of sperm.	The body changes the folic acid from foods into folate.
Folate is essential in the production of sperm.	Pregnant and nursing women need extra vitamin D.	The body uses folate to make DNA.
Lack of folate in Africans and African Americans is uncommon.	Folate is photosensitive. Sunlight, especially UV radiation, breaks it down.	UV radiation changes a substance in the skin into vitamin D.
Deeply pigmented skin must be exposed to the sun five times longer than lightly pigmented skin to make vitamin D.	Pregnant women who do not have enough folate miscarry or have babies with brain and spinal cord defects.	Above 40 degrees north latitude there is not enough UV for skin cells to make vitamin D during the winter months.
Melanin absorbs toxic substances produced by light acting on the body.	Vitamin D is abundant in fish, seals, and whales.	Vitamin D is required for the normal growth, development, and health of the skeleton.

Image Directions Teacher Answer Key

Directions: Explore the information in the images for ultraviolet light intensity and skin pigmentation of indigenous peoples. Skin pigmentation values are rated according to the amount of light reflected off the skin of the underside of the forearm. Begin by investigating what information the various buttons open. Keep track of your findings by writing or coloring on the map provided below. After exploring the database for a couple of minutes, find and write answers to the following questions.



Credit: SETI Institute

1. What is the relationship between latitude and ultraviolet light intensity?

UV light intensity lessens as you move away from the equator.

2. What is the relationship between latitude and the level of skin pigmentation? Make note of any irregularities. *The closer the population is to the equator, the more deeply pigmented their skin. The population of Greenland presents an irregularity in that it is above 60 degrees latitude, yet has the same skin reflectance rating of populations at 30 degrees latitude.*

3. Write a paragraph that describes the relationship between average UV intensity and skin pigmentation. Your paragraph should refer to the data on the maps you have explored and the notes you have made. *Skin pigmentation tends to be darker where UV intensity is higher and lighter where UV intensity is lower. This doesn't always hold true; for example, skin pigmentation is darker in southern Greenland.*

UV Light and Reproductive Success Teacher Answer Key

While Nina Jablonski and George Chaplin had found a *correlation* between ultraviolet intensity and skin reflectance, they knew more evidence was needed to show a *cause and effect relationship.* They asked the questions: What would be the reproductive advantage of having more darkly pigmented skin where UV intensity is higher? What would be the reproductive advantage of having more lightly pigmented skin where UV intensity is lower? Jablonski and Chaplin collected more evidence (facts) from other scientists' work to answer these questions. Assemble the evidence they found to discover some answers.

Directions:

1. You may want to cut the facts apart or take notes on a separate sheet of paper.
2. Select the facts that have to do with advantages of darkly pigmented skin.
3. Organize this group of facts into a logical explanation about how skin pigmentation contributes to reproductive success.
4. In a short paragraph (about 100 words), write out your explanation. You can use the wording of the facts where appropriate, but you must make the connections.
5. Repeat the process for the group of facts that have to do with advantages of lightly pigmented skin. (Some facts are used in both groups.)

Students will arrange their facts and state their conclusions in various ways. Here are some possible answers.

Selective Advantage of Darkly Pigmented Skin

The body changes the folic acid from foods into folate.
(AND)
The body uses folate to make DNA.
(AND)
Pregnant women who do not have enough folate miscarry or have babies with brain and spinal cord defects.
(AND)
Folate is essential in the production of sperm.
(BUT)
Folate is photosensitive. Sunlight, or UV radiation, will break it down.
(HOWEVER)
The skin pigment melanin filters out UV light.
(AND)
Melanin absorbs toxic substances produced by light acting on body substances.
(AND)
Lack of folate in Africans and African Americans is uncommon.
(HOWEVER)
UV radiation changes a substance in the skin into Vitamin D.
(AND)
Deeply pigmented skin must be exposed to the sun five times longer than lightly pigmented skin to make Vitamin D.

(AND)

Vitamin D is abundant in fish, seals, and whales.

(AND)

Vitamin D is required for the normal growth, development, and health of the skeleton.

The advantage of having a darkly pigmented skin in areas where average annual UV intensity is high is that the melanin protects against folate destruction. Women must have enough folate for healthy babies and men must have enough folate to produce sperm. The exposure to high UV intensity allows darkly pigmented skin to produce Vitamin D, required for normal growth and skeletal health. When the diet is rich in Vitamin D, such as fish, seals, and whales, having darkly pigmented skin in areas where average annual UV intensity is low is not a disadvantage.

Selective Advantage of Lightly Pigmented Skin

Vitamin D is required for the normal growth, development, and health of the skeleton.

(AND)

Pregnant and nursing women need extra vitamin D.

(AND)

UV radiation changes a substance in the skin into Vitamin D.

(AND)

The body changes the folic acid from foods into folate.

(AND)

The body uses folate to make DNA.

(AND)

Pregnant women who do not have enough folate miscarry or have babies with brain and spinal cord defects.

(AND)

Folate is essential in the production of sperm.

(BUT)

Folate is photosensitive. Sunlight, or UV radiation, will break it down.

(HOWEVER)

The skin pigment melanin filters out UV light.

(BUT)

Above 40 degrees north latitude there is not enough UV for skin cells to make vitamin D during the winter months.

The advantage of having a lightly pigmented skin in areas where average annual UV intensity is low is that Vitamin D is produced more readily. Without sufficient Vitamin D, the skeleton will not develop normally in the womb or during childhood, nor will it remain healthy. In areas where there is not enough UV for the skin cells to generate Vitamin D, the diet must make up for the insufficiency. Sufficient melanin is present to prevent folate from being destroyed due to low UV intensity. Folate is essential for reproduction.