

Survival: Desert Island

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| Essential Knowledge 2.A.1 | All living systems require constant input of free energy. |
| Challenge Area 2.3 | You can predict how changes in free energy availability affect organisms, populations and/or ecosystems. |
| Science Practice 6.4 | You can make claims and predictions about natural phenomena based on scientific theories and models. |

Goal of tasks

Target concept: You can predict how free energy availability at different trophic levels would affect the survival of a population in a particular ecosystem.

For this task you will be evaluated on your ability to

- Activate your knowledge about photosynthesis and energy transfer in an ecosystem
- Connect this knowledge to the concept of free energy in an ecosystem
- Apply this knowledge to make and justify a prediction about efficiency of energy use in a scenario

Task summary

During this task you will decide about which food source is best for each organism in a scenario and which choice benefits the greatest number of organisms. You will then work with your peers to make a prediction that is supported with sufficient evidence and the principles of free energy.

Task 1: Make a prediction (Individual)

A group of people has been stranded on a desert island with a cow and 500 bushels of corn. The people need to make a decision about the best way to survive for an extended period of time. Their choice is to feed the cow the corn and drink its milk or eat the corn themselves. Which source of food, the milk or the corn, will best support the people stranded on the island? Consider the options for survival on the desert island and answer the following questions:

1. Which choice is best for the cow? For the people?

2. Which choice will benefit the greatest number of organisms in this scenario?

3. Can you think of another option?

4. Record your decisions in a chart of your own making.

Check your understanding

Consider the items below as you review your work:

- Did you include more than one option for survival?
- When making decisions, did you consider the pros and cons for each choice?

Task 2: Conference (Pairs)

1. Working with a partner, answer the questions below:
 - a. How many energy transfers are involved if the people eat the corn?

- b. How many energy transfers are involved if the cow eats the corn and the people drink the cow's milk?
 - c. Is all the energy in one trophic level transferred to the next trophic level? Explain why or why not.
 - d. Does whether the people or the cow eat the corn make a difference in how long the people can survive?
2. Identify any assumptions you made when answering questions a through d.
3. Write out your prediction regarding which food source will best support the people stranded on the island. Include evidence from scientific models and other information you used to support your prediction.

Check your understanding

Does your prediction in Task 2 include each of the items below?

- A description of how energy transfer aligns with your choice of food source
- An explanation of how free energy is captured, used and stored in your chosen scenario.

6. Look back at your answers to the questions from Task 1. What prior knowledge did you use in order to make your prediction?

Check your understanding

After completing this task, are you able to

- Explain why the energy obtained by the cow from the corn is not available to those who consume the cow's milk?