

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

7th Gr. Science MS 890

Mr. Ali

### Here, Eat This Vaccine

Munching on bacteria could be a good way to stimulate your immune system. Biologist Simon Cutting of the Royal Holloway University of London has transformed bacterial spores into an edible vaccine. He and his collaborators genetically altered the common bacterium *Bacillus subtilis* so that it produced harmless fragments of the toxin produced by tetanus. Then his team starved the bacterium so that it turned into a spore — a desiccated [dehydrated] packet tough enough to survive a trip through the digestive tract and into the bloodstream. Most of the mice that inhaled or ate the modified spores were then able to survive a lethal dose of tetanus.

“We selected tetanus because the immunology regarding this disease is well understood,” Cutting says. But engineered bacteria could be similarly tailored to train the immune system to fight anthrax, traveler’s diarrhea, and other illnesses. Edible vaccines would eliminate the need for needles and sterilizing equipment. Moreover, spores can withstand extreme heat and dryness, remaining viable [alive] for thousands of years. Cutting plans to start clinical trials in about two years. If the results measure up, spore vaccines could slash the cost of immunization programs, especially in poor countries where refrigeration is unreliable and transportation can be slow.

Source: <http://discovermagazine.com/2003/aug/breakeat/>  
Here, Eat This Vaccine, by Zara Hershkovits August 1, 2003

Describe *one* way the immune system could respond when it is exposed to the genetically altered *Bacillus subtilis*. [1]

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Will individuals who have taken the vaccine be protected against future tetanus infections? Support your answer. [1]

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State *one* advantage of using edible modified spores as vaccines. [1]

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A class carried out an experiment to test the effect of rest time after exercise on the breathing rate. Each member of the class ran up and down stairs for 60 seconds. After exercising, they rested. The students then measured their rate of respiration by counting the number of inhaled and exhaled per minute for 7 minutes. The class then averaged their data.

Provide a biological explanation for why the breathing rate *decreases* several minutes after physical activity has stopped. [1]

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### Canada Lynx

- Found in the colder climates of Canada and Alaska
- Thick, dense fur
- Preys on small animals, such as the snowshoe hare
- Large spaces between teeth so that bite enters prey as deeply as possible
- Wide feet to walk better over snow and ice

1) Explain why the Canada lynx is classified as a carnivore. [1]

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1) Choose *one* characteristic from the list that helps the Canada lynx carry out the life process of locomotion. [1]

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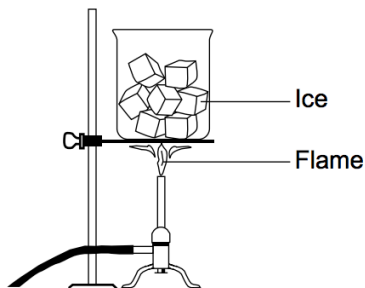
1) Explain why the population of the Canada lynx in one area may decrease if the population of snowshoe hares decreased in that same area. [1]

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The diagram below shows a beaker of ice placed over an open flame.



Describe what happens to the molecules in the ice as the temperature of the ice increases. [1]

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### Ultraviolet Radiation

The Sun's radiation comes to Earth as many different wavelengths of electromagnetic energy. One form of energy is ultraviolet radiation. A person's overexposure to the Sun's ultraviolet radiation (UV rays) is the biggest risk factor for skin cancer. Some ultraviolet radiation is absorbed by the ozone layer, which is located in Earth's atmosphere. This ozone layer provides a natural protection for living organisms.

State *one* reason why all of the ultraviolet radiation coming toward Earth does *not* reach Earth's surface. [1]

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Describe *one* action a person can take to avoid overexposure to UV radiation. [1]

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Four students participated in an experiment to determine the effect of exercise on heart rate. Four students measured their heart rates while at rest. After exercising for 10 minutes, they measured their heart rates again. Data for these students are shown in the table below. Heart rate is measured in beats per minute (bpm).

**The Effect of Exercise on Heart Rate**

Student	Heart Rate (bpm)	
	At Rest	After Exercising for 10 Minutes
1	60	90
2	86	122
3	72	112
4	75	115

Based on the data table, describe the effect of exercising for 10 minutes on the heart rates of the four students. [1]

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Describe *one* way to determine a person's heart rate. [1]

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**Data Table**

Time (hours)	Number of Bacteria A in Sample	Number of Bacteria B in Sample
0	1	1
0.5	2	1
1.0	4	2
1.5	8	2
2.0	16	4
2.5	32	4
3.0	64	8
3.5	128	8
4.0	256	16
4.5	512	16
5.0	1024	32

Based on the pattern in the data table, predict the number of bacteria *B* at 6 hours. [1]

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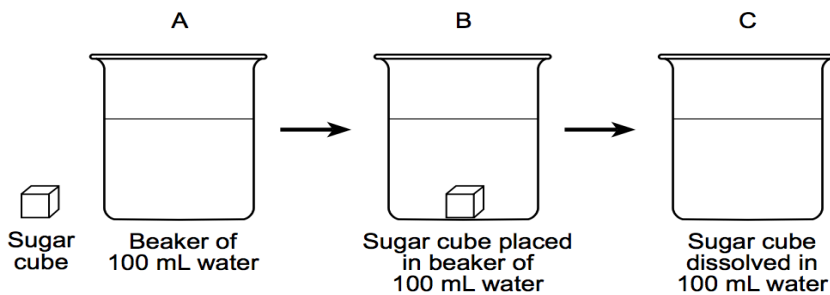
Describe how the reproductive rates for bacteria *A* and bacteria *B* differ. [1]

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A sugar cube was placed into a beaker containing 100 mL of water at room temperature and completely dissolved into the water. This process is represented by the series of diagrams labeled *A*, *B*, and *C* below.



Describe *one* way to make the sugar cube dissolve faster in the 100 mL of water. [1]

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Describe *one* way that the dissolved sugar at *C* could be separated from the water. [1]

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