The Sizzling Southwest

Living with the Desert

a lesson on adaptations and environmental change

INTRODUCTION: In order to survive in a desert environment, which is found in much of the Southwest, plants, animals, and people must be adapted. What kinds of problems must each organism overcome? _____

_____

_____

PART ONE: Research

1. You have been assigned a particular desert plant or animal to research. You need to concentrate on its adaptations to desert survival. Use at least two different sources (encyclopedias, books on desert life, acceptable internet websites). In the spaces below jot down information you found from these sources. These are notes, so *don't* copy your source!

_____

_____

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_____

List your references here: _____

_____

_____

2. After getting approval from your teacher, write a short report (1-2 paragraphs in length) about the strategies your plant or animal uses to survive in the desert. It should be in your own words! Word processing is recommended, so you can make corrections more easily.

3. When all the reports have been completed, each class member will read their paragraphs to the class. You need to listen carefully! You need to make a table of survival strategies, concentrating on three problems that must be overcome: water, dealing with the heat, shelter/ protection.

On the next page, there is a chart for you to record this information. Make sure you have both physical adaptations (like watertight skin) and behavioral adaptations (like being nocturnal). The chart is divided into three sections: plants, animals, native people. The last part will be done by a class discussion. How do you think native people survive in the desert without modern conveniences of air conditioning, running water, and automobiles?

TABLE OF DESERT SURVIVAL

ORGANISM	PROBLEM OF CONSERVING WATER	PROBLEM OF HEAT AVOIDANCE	SHELTER & PROTECTION
PLANTS			
ANIMALS			
NATIVE PEOPLE			

PART TWO: *The **Perfect** Desert Creature*

Now you get to use your imagination. Using the information on the chart above, you will design a plant or animal of your choice that you believe is perfectly adapted to the desert.
It must be a realistic living organism – no robots, extraterrestrials, or machines of any kind.

List your adaptations here: _____

_____

_____

_____

Either make a drawing of your desert creature, or a 3-D model. Beprepared to describe it to the class and to defend your design decisions!

PART THREE: *What is a Heat Island?*

The Southwest is one of the fastest growing regions of the United States. People moving there are bringing modern technology, so the desert is becoming urbanized. Cities like Las Vegas, Phoenix, El Paso, and Albuquerque have changed the landscape forever. Can you think of some of these changes?

_____

_____

_____

_____

We will be concentrating now on the absorption of heat, a form of energy. Every material has a different specific heat. Define that term: _____

_____

Now we will try to find the specific heat of a building material, like concrete, brick, or stone. (Wood is not used much in the desert, due to termites).

Step 1:

Find the mass of the building material _____ grams.

Place it in boiling water, which has a temperature of _____ °C.

After a few minutes the building material will warm up to that temperature also.

Step 2:

Put 100 g of cold water into a beaker. Measure its temperature: _____°C

Quickly pick up the hot building material with tongs and drop it into the beaker of cold water. Try to insulate the beaker, so little heat is lost to the air. When the thermometer stops rising, record the new temperature of the water: _____°C.

That means the water temperature rose _____ °C.

Step 3:

Now you can determine the specific heat of the building material. This is an important principle to remember!

The heat lost by the _____ is equal to the heat _____.

So first we determine the heat gained by the cold water. What is the formula?

_____

Substitute! **H =**

Answer: **H =** _____ calories

This means that the building material lost _____. Plug this into the formula, only this time you are solving for specific heat. Do your work here:

PROBLEMS ON DESERT HEAT:

1. Suppose you built a sidewalk at a home in Phoenix, Arizona. It is made of the same material you used on the previous page. Its specific heat is _____. Let's say the mass of the sidewalk 100,000 grams. On a summer afternoon this sidewalk absorbs 500,000 calories of solar heat.

What would the temperature rise be for this sidewalk? Show your work here:

2. Nearby there is a desert garden with cacti, desert shrubs, and wildflowers. Since they are mostly water by weight, let's say their specific heat is 0.9. Suppose they also absorb five hundred thousand calories of solar heat. If they also have a mass of 100,000 grams, what would be the temperature rise in this garden?

3. **CONCLUSION:** Suppose both the sidewalk and the garden start the day off at 10°C. After absorbing all that heat, what would be the temperature of both locations?

sidewalk _____ °C; garden _____ °C

What you have created is a mini heat island. Urban areas, with many sidewalks and buildings, will end up at a higher temperature than places with water and vegetation. The difference is caused by _____
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SATELLITE IMAGERY:
Using satellites that can use thermal photography, scientists can measure temperature differences in urban areas. Look at the satellite thermal image of Salt Lake City, Utah. It is a heat island. What do the colors represent? _____

_____

Take a transparency that has a square drawn it representing one square mile on the satellite image. Estimate the percent of red/orange coloration in one square mile of downtown Salt Lake City: ____

Do the same for an area with more vegetation and water: _____.

Estimate the temperature for both regions: _____°C downtown, _____°C outside the city

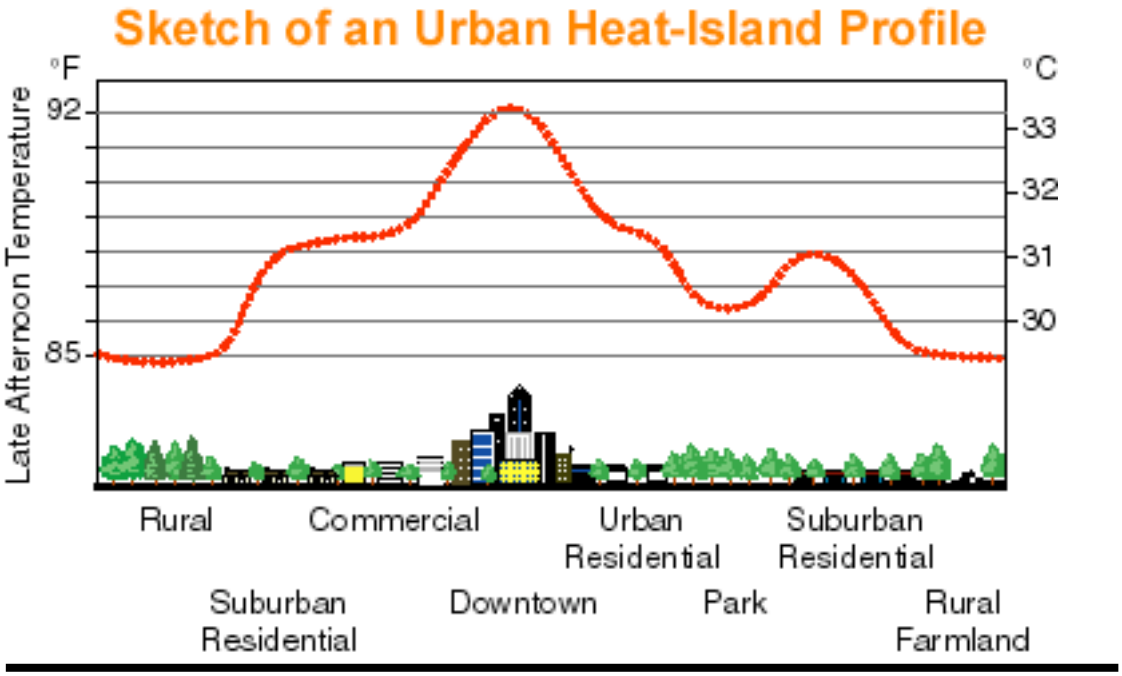
The artificial environment of the city has created a heat island.

Look at this diagram below. Describe what it tells us: _____

_____

_____

_____



Read over the short article about heat islands from NASA.List here the consequences of having heat islands: _____

_____

_____

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_____

What are city planners doing to decrease the temperatures of their communities? _____

_____

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