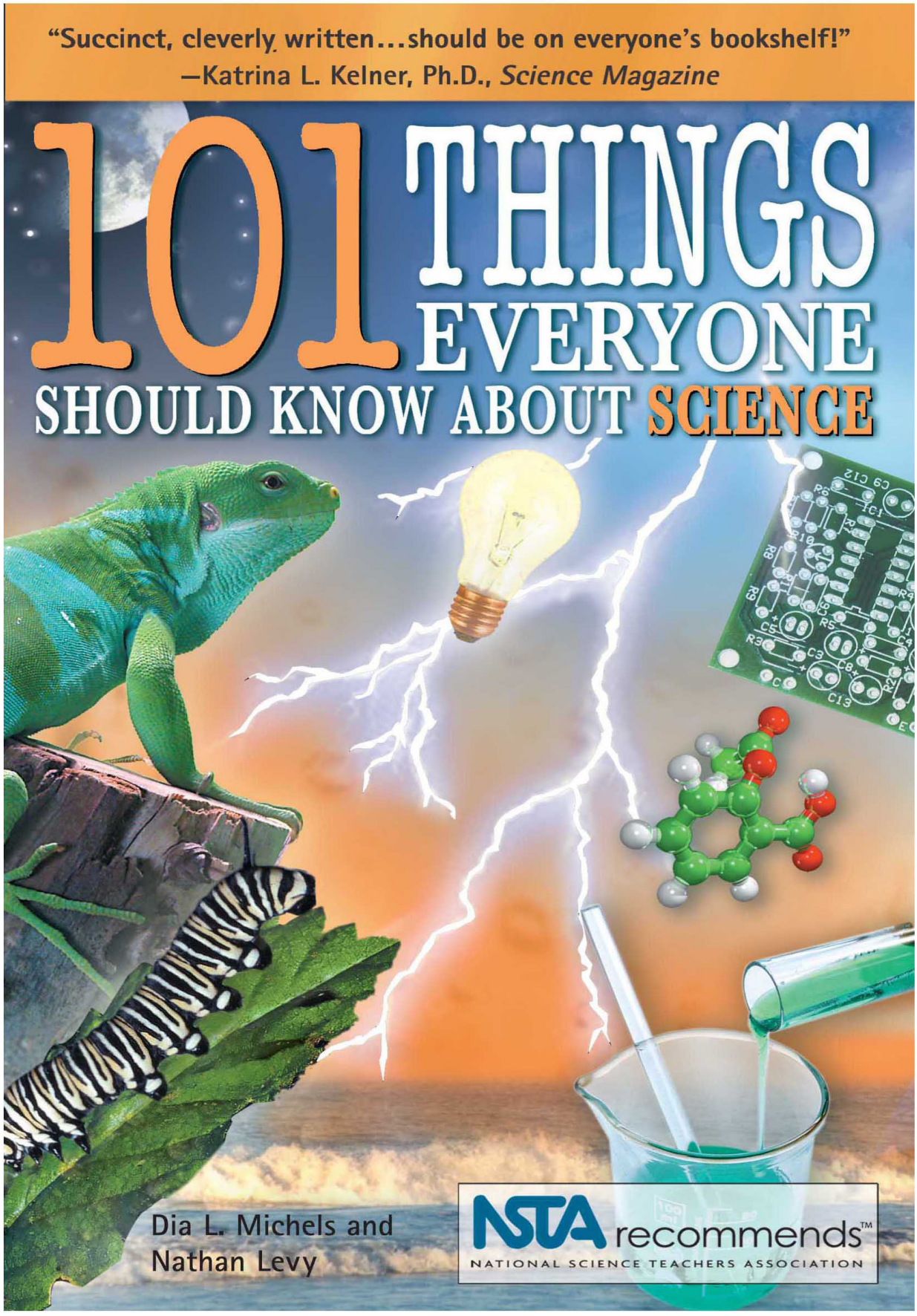

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WHEN SCIENCE CATCHES UP TO SPORTS

18. If someone's body temperature falls abnormally low, he may be suffering from:

a) hypothermia. **c) dysthermia.**
b) hyperthermia.

Hypothermia occurs when the human body's core temperature is less than its normal level; severe hypothermia sets in at 92°F (33.3°C). Between 86°F-98.6°F (30°C-37°C), a person will experience waves of violent shivering, dilated pupils, and muscular rigidity. At 86°F (30°C), the person is in a state called "metabolic icebox," where he appears icy and dead but is actually alive. The body loses heat in water about 30 times faster than in air, which is why boating accidents can be so dangerous in cold weather. If such an accident occurs, it is important to get out of the water (on top of an overturned boat or wreckage), instead of hanging onto the boat while submerged in the water. Because the body loses heat in water so quickly, it is important to get out of the water as soon as possible.

Hyperthermia describes what happens when the body's temperature rises above 98.6°F (37°C). The two most common kinds of hyperthermia are heat exhaustion and heat stroke.

Dysthermia is a disorder with symptoms such as body tremors, much like those suffered by people with epilepsy.

34. Diamonds are made of:

a) carbon. **c) iron.**
b) water. **d) oxalates.**

Diamonds are a form of carbon valued for their beauty in jewelry and for their hardness in industrial use. They are transparent crystals of super-bonded carbon atoms. Most diamonds are mined from volcanic pipes (part of a deep volcano structure). Here, intense pressure and heat are suitable for diamond formation. Diamonds may be ejected from their formation region within lava flows and other volcanic activity.

Diamonds are famous for being the hardest known natural substance because they are made of sturdy, interlocking pyramids of carbon atoms. The pyramid is among the strongest structures in nature, which is what gives the diamond its hardness and indestructibility. Their structure (especially once cut into a multifaceted stone) is ideally suited for dispersing visible white light into its component colors. The sparkle or brilliance of diamonds makes them prized jewelry. Diamonds are also commonly used to make blades for cutting and drilling.

Water is made up of hydrogen and oxygen atoms and contains no carbon. (See earth science bonus question.)

Iron is a heavy metallic element used in construction, tools, and armament.

Oxalates are organic (or carbon-containing) chemicals found in certain plant foods that can combine with calcium to form calcium oxalate, a mildly toxic chemical that the body does not use.

56. Why is walking on ice or driving on wet roads so difficult?

There is very little friction.

Friction is the resistance to motion when one surface comes into contact with and rubs against another surface. Although two objects might look smooth, they are actually rough and jagged when viewed with a microscope. As they slide against each other, they grind and drag against the roughness of each other's surfaces, creating friction and preventing slipping. Friction also creates heat and can wear down surfaces or slow down engines. To reduce the effects of friction, substances like oil or silicone can be used as lubrication, making the parts slippery. For example, when you oil a squeaky hinge, the oil works to reduce the surface roughness by filling in the tiny cracks so that the pieces stop rubbing together as much, and the noise lessens.

Ice, rain, or oil on a surface reduce friction, causing you to slip when walking, climbing, or driving. When sand is spread on an icy road, it adds friction by making the surface rougher, making it less slippery for tires.

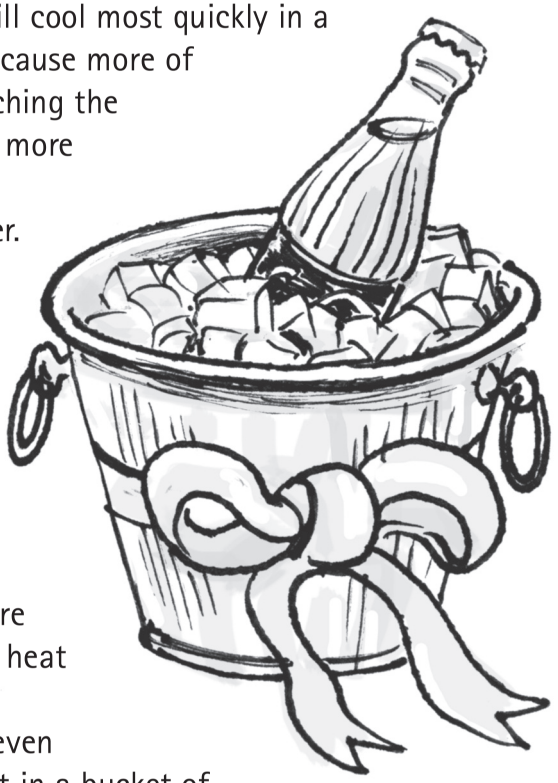
65. The quickest way to cool a bottle of soda is to place it:

a) in a bucket of ice.

b) in a bucket of ice water.

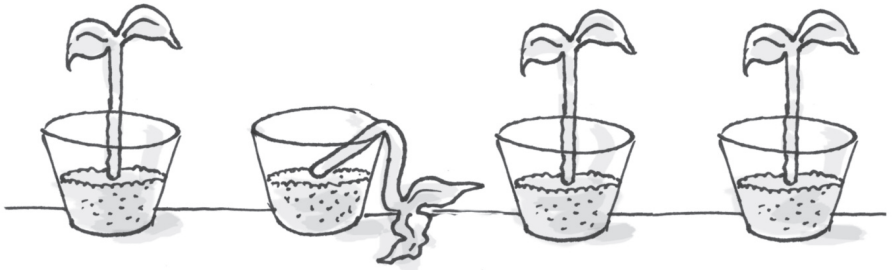
c) in a bucket of extremely cold water with no ice.

d) outside on the porch when it is very cold.



A bottle of soda will cool most quickly in a bucket of ice water because more of its surface area is touching the colder liquid, allowing more heat to leave the soda and enter the ice water. If the bottle were just in a bucket of ice, less of the bottle would touch the ice, and the cooling would not be as fast. It will also cool faster than if it were outside because water is a more effective conductor of heat than air.

To make the soda even colder, you could put it in a bucket of iced salt water. Iced fresh water cools to about 32°F (0°C). Salt lowers the freezing temperature of water, so iced salt water can be colder than 32°F without freezing solid. The saltier the water is, the lower its freezing temperature will be.



96. When scientists are performing an experiment, they make changes to the conditions that brought about a particular phenomenon to see how those changes affect what they are studying. How many things do scientists change at a time?

One.

When a scientist is investigating a phenomenon, two things are very important: recording each result as accurately as possible and maintaining appropriate laboratory conditions. A scientist must carefully document what happens when each new activity or item is brought into the experiment. For example, if she is trying to discover the effect that light has on a plant, she will introduce the same amount of light and the same kind of light each time she exposes the plant to light. The soil, moisture, type of container, etc., must all be kept as similar as possible because a change in any one of these could affect the plant, too. When she tests a new scenario, she must only change one variable at a time, such as the duration of light, the intensity of light, or the color of light. Laboratory equipment is highly specialized to aid in experiments and to help the scientist create reliable, uncontaminated conditions for their experiments.

However, not all science experiments lend themselves to single changes. Sometimes scientists cannot control all the variables; in these cases, repeating the experiment multiple times helps reduce the effect of random error.

Biology

What percentage of all mammals are carnivores?

Six percent.

A true carnivore is an animal that subsists primarily on a diet of flesh. There are approximately 4,200 known species of mammals, of which about 250 are meat-eaters. That puts carnivores at about 6 percent of the total number of mammals. Of course, many of these species do not exclusively eat meat—many also eat plant foods and honey. Some examples of carnivores are polar bears, lions, foxes, and walruses.

Even though carnivores are flesh-eaters by definition, there are some whose diets are made up of more plant matter than flesh. The giant panda, for example, is categorized as a carnivore, but bamboo makes up 99 percent of its diet. What an animal eats also has a lot to do with what is available. For instance, there are several species, like mice and rats, that are categorized as herbivores but will eat meat in some situations.

Since carnivores are meat-eaters, they must have claws, teeth, or sharp beaks to tear into their food. They also have eyes which face forward, helping them judge the distance to their prey when they are hunting.

Herbivores are animals whose diets consist mostly of plants. They have flat teeth suited to chewing tough plant material, feet made for running, and eyes that point towards the side. A good way to remember the difference between carnivores and hebivores is this rhyme: Eyes to the front, likes to hunt. Eyes to the side, likes to hide.

Earth Science

Throughout history, people have fought wars over natural resources such as salt, land, and oil. Scientists are concerned that another resource will be the reason for the next global conflict. What resource is it?

Water.

Water is essential to all forms of life. Fresh water has become scarce because of the world's growing population, increased contamination through pollution, and global warming. While the amount of salt water on the planet is enormous, continuing availability of clean, fresh water is a major social and economic concern.

Water is a strategic resource for many countries. Many battles and wars have been fought to gain access to it. UNESCO (United Nation's Educational, Scientific, and Cultural Organization) has a World Water Development Program which predicts that in the next 20 years the quantity of fresh water available to everyone will decrease, leaving one-third of the world's inhabitants without enough fresh water for minimal hygiene. Already there have been many situations in which the lack of safe drinking-water supplies have affected large populations. For example, in 2000, more than 2.2 million people died from diseases related to the consumption of contaminated water or drought. In 2004, the British charitable organization WaterAid reported that a child dies every 15 seconds due to easily preventable water-related diseases. Some have predicted that clean water will become the next oil, making Canada, with this resource in abundance, possibly the richest country in the world. (See questions 24 and 81.)

General Science

What is the source of all energy on Earth?

The sun.

The energy source for all life on our planet is the sun. The sun, the closest star to Earth, is a huge ball of molten (glowing) gas that provides energy in many ways.

The most obvious are light and heat, which keep us warm. The sun also provides energy that allows green plants to grow. Green plants use the sun's energy to split water into hydrogen and oxygen through a process known as photosynthesis, the ultimate source of all food on Earth. By using the sun's energy this way, green plants give animals the food they need to survive. Animals eat plants and other animals, in turn, eat the plant-eaters. When an animal or plant dies, its energy goes back into the earth, converting from flesh and plant material back into soil with the help of special microbes that continue the never-ending energy cycle.

Additionally, solar energy, including radio waves, x-rays, and light, can also be used to power our cars and homes. Fossil fuels, such as gasoline and coal are derived from animals and small plants that were dependent on the sun's energy millions of years ago. Hydroelectrical energy and even wind energy are made possible by the sun. The sun evaporates water from the oceans, lakes, and rivers, and this water vapor forms clouds. The rain falls back to the ground and flows in rivers. We build dams to harness that energy and use it as electricity. Wind energy also comes from the sun's power. Because the sun heats our planet unevenly, air flows from colder to warmer areas, creating wind. (See questions 57 and 71.)