

CHAPTER MYSTERY

UV LIGHT

"Put on your sunscreen!" This familiar phrase can be heard at most beaches on a sunny day. It's an important directive, though, because sunlight — for all its beneficial effects — can readily damage the skin. The most dangerous wavelengths of sunlight are the ones we can't see: the ultraviolet (UV) region of the electromagnetic spectrum. Not only can excess exposure to UV light damage skin cells, it can cause a deadly form of skin cancer that kills nearly 10,000 Americans each year. Why is UV light so dangerous? How can these particular wavelengths of light damage our cells to the point of causing cell death and cancer? As you read this chapter, look for clues to help you solve the question of why UV light is so damaging to skin cells. Then, solve the mystery.



MYSTERY CLUE

The energy from UV light can excite electrons in the absorbing substance to the point where the electrons cause chemical changes. What chemical changes might occur in the nitrogenous bases of DNA?

MYSTERY CLUE

Our skin cells are exposed to UV light whenever they are in direct sunlight. How might this exposure affect base pairing in the DNA of our skin cells?

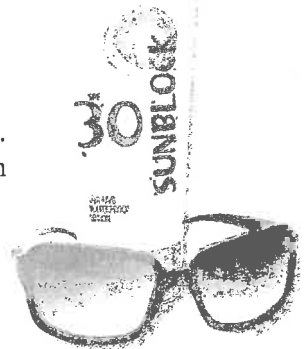
MYSTERY CLUE

How might UV-induced chemical changes in bases affect the process of DNA replication?

solve the CHAPTER MYSTERY

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The nucleotides in DNA include the nitrogenous bases adenine, cytosine, guanine, and thymine (A, C, G, and T). The energy from UV light can produce chemical changes in these bases, damaging the DNA molecule and producing errors when DNA is replicated.



- 1. Predict** Use your understanding of the structure of DNA to predict what sorts of problems excessive UV light might produce in the DNA molecule. How might these changes affect the functions of DNA?
- 2. Infer** All cells have systems of enzymes that repair UV-induced damage to their DNA. Some cellular systems block DNA replication if there are base pairing problems in the double helix. Why are these systems important? How might they work?
- 3. Relate Cause and Effect** Analyze the effects that UV light might have on skin cells. Why is UV light so dangerous? Why is the skin particularly vulnerable to it?
- 4. Connect to the Big Idea** Among humans who inherit genetic defects in their DNA-repair systems, the incidence of skin cancer is as much as 1000 times greater than average. Based on this information, what can you infer about the effect of UV light on DNA?