ANSWER KEY.

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Does Window Glass Protect DNA?

Biology | ANSWER KEY

Sample answers and data. Accept answers that match the group's own data and reasoning.

Draft lab. This lab has not been tested in a classroom yet. Your teacher may change some steps, times or amounts.

The Puzzle

Ultraviolet (UV) light in sunlight can damage DNA. Most cells can repair some of that damage. The yeast in this lab cannot, because their DNA repair genes do not work. If UV reaches them, many die and cannot grow into colonies. That makes them a living UV detector. Is sitting next to a window a DNA risk?

Question

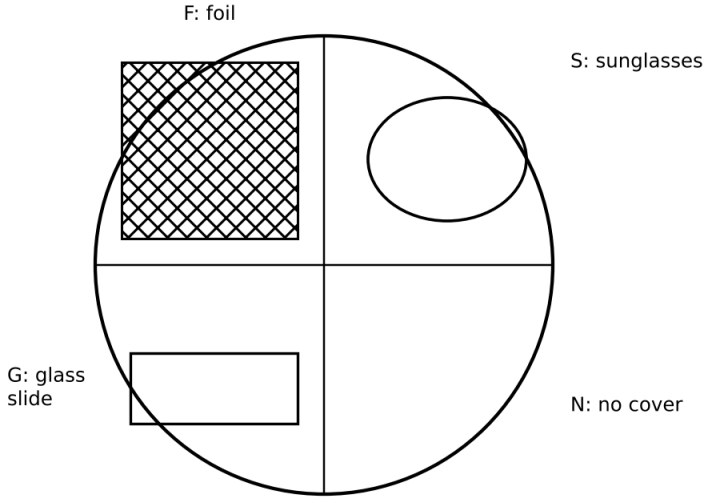
How well do window glass and other everyday materials block the UV light that damages DNA?

Safety

- Never look at the sun. Keep sun exposure to the time your teacher sets.
- Handle glass slides by the edges. Tell your teacher about any chips or cracks.
- Keep plate lids closed except during exposure. Your teacher will bleach the plates before disposal.

Materials (per group)

- 2 agar plates spread with UV-sensitive yeast (prepared by your teacher)
- Plastic wrap, marker, timer
- Covers: a glass microscope slide, a sunglasses lens (labeled UV protection), and a foil square



Each plate is divided into four sections, each under a different cover.

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Before the Lab

1. Predict the percent of yeast that will survive under each cover, compared with foil. Explain your reasoning for glass.

   Answers vary. Expected: foil 100%, sunglasses close to 100%, glass fairly high, no cover very low. Glass blocks much of the UV that damages DNA.

Procedure

1. Draw lines on the bottom of each plate to divide it into four sections. Label them F (foil), S (sunglasses), G (glass), and N (no cover).
2. Take the lid off and stretch one layer of plastic wrap over the plate.
3. Place the foil, sunglasses lens, and glass slide over their sections. Leave section N uncovered.
4. Carry the plates outside (or to a sunny window that opens) and set them flat in direct sun for the time your teacher gives, about 20 to 60 seconds.
5. Remove the covers and plastic wrap, replace the lids, and store the plates upside down at room temperature.
6. After 2 to 3 days, count the colonies in each section.

Data

Table 1. Colony counts

Cover	Colonies, plate 1	Colonies, plate 2	Average	Percent survival
Foil (dark control)	**58**	**62**	**60**	100%
Sunglasses lens	**55**	**59**	**57**	**95%**
Glass slide	**46**	**50**	**48**	**80%**
No cover (plastic wrap only)	**2**	**4**	**3**	**5%**

Percent survival = average colonies in a section ÷ average colonies under foil × 100

Analysis

2. Why do we need the foil section?

   It shows how many colonies grow with no UV at all, so every other section can be compared with it.

3. Show your percent survival calculation for the glass slide.

   48 ÷ 60 × 100 = 80% (sample).

4. What happened to the DNA of yeast in section N that did not grow?

   UV light damaged their DNA, causing mutations the cells could not repair. With too much damage, the cells could not copy their DNA or divide, so they did not form colonies.

5. Some yeast in section N did grow. Could their DNA still be changed? How would you know?

   Yes. Some may have survived with mutations that are not lethal. Their daughter cells inherit those mutations, which might show up as colonies that look or grow differently.

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6. Glass blocks most of the UV that causes sunburn (UVB) but lets through some longer-wavelength UV (UVA). Is sitting by a window completely safe for your skin's DNA? Explain.

Not completely. Glass gave much more protection than no cover (80% vs 5% survival in the sample), but some UVA passes through, and UVA can still affect skin cells over long exposures.

7. Claim, evidence, reasoning: Can an environmental factor cause mutations that are passed to new cells?

Claim

Yes. UV light can damage DNA and cause mutations, and surviving cells pass those changes to their daughter cells.

Evidence

Only about 5% of yeast survived uncovered UV exposure, compared with 80% under glass and 100% under foil (sample).

Reasoning

UV energy damages DNA bases. These yeast cannot repair the damage, so UV killed most of them. Cells that survive with changed DNA copy that DNA when they divide, so the mutation is inherited by their offspring cells.

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