TEACHER PREPARATION GUIDE.

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Does Window Glass Protect DNA?

Biology | TEACHER GUIDE

Planning notes for teachers: materials, setup, expected results, and what to watch for.

Not yet classroom-tested. This is a new lab design that has not been tested in a classroom yet. Expected results, times and costs are estimates, not measured values. Run the full lab yourself before you use it with students or grade it, and adjust amounts to match your materials.

Item	Details
Unit and lessons	Unit 9: DNA and Gene Expression. Lessons: Mutations, DNA Replication
Class time	One 50-minute period, then a 20-minute count 2 to 3 days later
Groups	3 to 4 students
Cost	About $5 to $8 per group in the first year (yeast and plates)
Standards	HS-LS3-2. SEP: Engaging in Argument from Evidence; Analyzing and Interpreting Data. CCC: Cause and Effect.

Big Idea

Environmental factors can cause heritable mutations (HS-LS3-2, part 3). **Credit:** this lab uses the UV-sensitive yeast method from the University of Utah Genetic Science Learning Center's "Does Sunscreen Protect My DNA?" lab. The new question here is about everyday barriers such as window glass and sunglasses.

Materials for 8 Groups

Item	Amount	Notes
UV-sensitive yeast strain	1 culture or kit	From a biological supply company. Order 2 weeks ahead.
YED (yeast extract dextrose) agar plates	20	Buy prepared or pour your own.
Glass microscope slides	8	Plain soda-lime glass, like a window.
Sunglasses lenses	8	Old pairs labeled UV400 or 100% UV protection; pop out a lens.
Foil, plastic wrap, sterile spreaders or glass beads		
Household bleach	Small amount	For disposal.

Advance Preparation

1. Grow the yeast on a plate for 2 days. Mix a small dab in sterile water until slightly cloudy.
2. The day of the lab, spread 0.1 mL of the suspension evenly on each plate. Aim for about 50 to 150 colonies per quarter.
3. Pilot the exposure time on a sunny day. Choose a time that leaves under 10% survival in the uncovered section. UV strength varies with season, cloud cover, and time of day, so late fall in Illinois may need longer times.

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Expected Results

Foil and UV400 sunglasses should give survival close to 100%. Glass should give much higher survival than no cover, because it blocks most UVB. The key's numbers are sample values. Plastic wrap transmits much of the UV, so section N acts as the full-exposure section.

What Can Go Wrong

- Cloudy day: have a backup day, or use a UV lamp with proper eye protection (follow your school's rules).
- Contamination: keep lids on except during exposure and spreading.
- Too many colonies to count: dilute the suspension more.

Misconceptions to Listen For

- "All mutations are inherited from parents." Environmental factors cause new ones.
- "Indoors means no UV." Glass reduces UV but does not block all of it.
- "Every mutation is harmful." Many have no effect; these yeast just show the harmful ones.

Differentiation and Extensions

- Support: a worked percent survival example. Sentence frame: "Under ___, ___% of the yeast survived, so ___ blocked most of the UV."
- Extension: test a car window sample, a clear plastic CD case, or sunscreen on plastic wrap.
- Extension: vary exposure time to make a survival curve.

Safety and Disposal

- Short sun exposure only. Never look at the sun.
- Flood plates with 10% bleach for 20 minutes before trash. Treat yeast as you would any culture.

Standards

This lab builds toward these NGSS performance expectations:

- **HS-LS3-2:** Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Disciplinary core ideas: LS3.B Variation of Traits

Science and engineering practices: Engaging in Argument from Evidence; Analyzing and Interpreting Data

Crosscutting concepts: Cause and Effect

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