Saving the Colors

Use wave behavior to evaluate a display plan.

P.7.c "Obtain, evaluate, and communicate information to explain the properties and behavior of electromagnetic waves."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two statements that explain how electromagnetic waves make the poster visible. Circle two statements that explain how the archive could reduce fading, then number the measurements staff would use to evaluate a cover.

Light on an Old Poster

1. At a local archive, a red-and-blue concert poster hangs where visitors can see it. The archive wants its bright colors to remain for years. Sunlight carries electromagnetic waves with a range of wavelengths. Visible waves reach our eyes after reflecting from the poster, so we see its colors. Ultraviolet (UV) waves have shorter wavelengths and higher frequencies than visible waves. Because energy per photon rises with frequency, UV photons carry more energy than visible photons. When pigments in ink, paint, or dyed fabric absorb UV, chemical changes can make their colors fade over time.

2. Staff consider putting a clear UV-filtering acrylic sheet in front of the poster. Clear does not mean every wavelength passes through. The sheet transmits much of the visible light but absorbs or reflects much of the UV, depending on its coating and material. Visible light can still travel to the poster and reflect back through the sheet to visitors. Some UV can still pass through, so the sheet lowers exposure rather than removing all risk. Ordinary glass can also block some UV, but different materials and coatings block different amounts. A label saying "clear" alone cannot tell staff how well a sheet filters UV.

3. To compare two covers, staff could place a UV meter behind each cover under the same lamp, at the same distance. They would also measure visible light behind each cover, since a cover that blocks everything would hide the poster. They could record both readings with no cover as a baseline. Keeping the lamp and distance fixed makes the readings more useful for judging the covers. Even with a good filter, leaving the poster under strong light all day increases its total exposure. Staff can also shorten display hours or use a dimmer lamp while keeping the poster readable.

2 ANSWER WITH EVIDENCE

Use the passage

1. Explain how visible light travels to and from the poster so a visitor can see its colors.

2. A visitor says, “The sheet is clear, so it cannot block UV.” Evaluate this claim using evidence from the passage.

3. What two meter results, compared with no cover, would support choosing a cover for this poster? Explain why both matter.

4. Why should staff use the same lamp and distance when testing both covers, and why take readings with no cover?

3 YOUR TURN

Your own words

A museum wants to display an old dyed fabric flag without hiding its colors. Write a short recommendation with two ways to reduce fading, explain how electromagnetic waves behave in your plan, and name a measurement that would help test it.

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PART 1 · READ AND MARK

Underline two statements that explain how electromagnetic waves make the poster visible. Circle two statements that explain how the archive could reduce fading, then number the measurements staff would use to evaluate a cover. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Explain how visible light travels to and from the poster so a visitor can see its colors.	**Visible light travels to the poster, reflects from it, and passes back through the clear sheet to the visitor's eyes.**
2	A visitor says, "The sheet is clear, so it cannot block UV." Evaluate this claim using evidence from the passage.	**The claim is incorrect. A clear UV-filtering sheet transmits much visible light but absorbs or reflects much UV. Its appearance does not show how well it filters UV.**
3	What two meter results, compared with no cover, would support choosing a cover for this poster? Explain why both matter.	**A lower UV reading would show reduced exposure that can fade the pigments. A visible-light reading high enough to keep the poster readable would show that visitors can still see it.**
4	Why should staff use the same lamp and distance when testing both covers, and why take readings with no cover?	**The same lamp and distance make the cover tests comparable. Readings with no cover provide a baseline for judging how much light each cover blocks.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Display the dyed fabric flag behind UV-filtering acrylic and use a dim lamp instead of direct sunlight. The acrylic lets much visible light pass, so visitors can see light reflected from the flag, while it reduces the UV that can fade dyes. The dim lamp also lowers the flag's total light exposure. Measure UV and visible light behind the acrylic to check that the flag stays readable with less UV.

Accept other plans that keep the flag visible while reducing UV or total light exposure. Explanations should connect the plan to wave transmission, reflection, or absorption and name a relevant light measurement.