

James turns on a flashlight in his bedroom and shines it on his wall one meter away to produce a small circle of light. He then shines the flashlight on his ceiling two meters away to produce a larger circle of light.

a) Does more light reach the ceiling than the wall?

(Check one)

Yes

No

b) Explain your answer.

# Amount of light on wall and ceiling

P02

| Content Category | Performance Expectation                    | Item Key | Score Points | International Average Percentage of 8th Grade Students Responding Correctly | Used in 1995 |
|------------------|--|----------|--------------|---|--------------|
| Physics          | Theorizing, Analyzing and Solving Problems | Rubric   | 1            | 24  | N            |

James turns on a flashlight in his bedroom and shines it on his wall one meter away to produce a small circle of light. He then shines the flashlight on his ceiling two meters away to produce a larger circle of light.

a) Does more light reach the ceiling than the wall?  
(Check one)

Yes

No

b) Explain your answer.

**Note:** A correct response is based on the same amount of light reaching both the ceiling and the wall but being more spread out (less bright) on the ceiling. Correct responses must identify **NO** and include an explanation that states that the light is the **same** (Code 10) or that indicates that the light is just more spread out (less bright) on the ceiling **without** explicitly stating **same** (Code 11). If the explanation merely repeats information that is in the stem, it is scored as incorrect (Code 71) even if **NO** is checked. If a response indicates that there is **less** light on the ceiling, the explanation must include a correct reason based on more air absorption/scattering at a greater distance to receive the correct Code 12. Responses that indicate **less** light at a greater distance **without** further explanation should receive Code 70.

| Code                      | Response  | Item: S022043 |
|---------------------------|---|---------------|
| <b>Correct Response</b>   |   |               |
| 10                        | No. Explains that the <b>same</b> amount of light reaches the wall and ceiling. (May also refer to light being more spread out on the ceiling or less concentrated/focused/bright).<br><i>Examples: No. It is going to be the same amount of light because James is using the same flashlight.<br/>No. The light might be bigger but will not be as bright. They are equal.<br/>No. The same amount of light hits the ceiling but is more spread out.</i> |               |
| 11                        | No. Explains (or shows in a diagram) that light is (only) more spread out (less bright) at a greater distance. (Does <b>not</b> explicitly state that the light is the same.)<br><i>Example: No. It only looks bigger because it spreads out more as it gets farther away.</i>  |               |
| 12                        | No. Explains that <b>less</b> light reaches the ceiling because of more air absorption/scattering at a greater distance.<br><i>Example: No. The ceiling is further away, and a little bit more of the light is soaked up by the air.</i>  |               |
| 19                        | No. Other correct explanation.  |               |
| <b>Incorrect Response</b> |   |               |
| 70                        | No. States that <b>less</b> light reaches the ceiling with inadequate explanation related to distance from source. (Does not include explanation of less light due to air absorption or scattering as in Code 12).<br><i>Examples: No. Because the flashlight is closer to the wall, the wall will receive more light.<br/>No. The ceiling is further than the wall is so there is less light.</i>  |               |
| 71                        | No. Other incorrect/inadequate or no explanation. (Includes explanations that merely paraphrase the stem).<br><i>Example: No. When it is close its a smaller circle.</i>  |               |
| 72                        | Yes. Explanation based on light being bigger or more spread out.<br><i>Examples: Yes. Because the light makes a bigger circle.<br/>Yes. Because if you move back it makes a large circle on the wall and if you move close it makes a small circle.<br/>Yes. The further it goes, the bigger it gets.</i>   |               |
| 73                        | Yes. Other incorrect/inadequate or no explanation.  |               |
| 79                        | Other incorrect (including crossed out/erased, stray marks, illegible, or off task).  |               |
| <b>Nonresponse</b>        |   |               |
| 99                        | BLANK   |               |