

Test for **Light Matter Interactions** Activity

Name: _____ Teacher: _____

Date _____ Class _____

Choose one:

Pretest

Posttest

1. A blue laser is shown to pass through gaseous atoms without being absorbed. Which of the following could be done to test if photon absorption might occur at a lower energy?
 - a. use an orange laser
 - b. use a less intense blue laser
 - c. use a violet laser
 - d. use an ultraviolet laser
 - e. both a and b

Answers A	1
Other	0

2. In chemistry class one day, you learn that excited mercury atoms emit ultraviolet light. Upon hearing this, you set out to build a new type of light bulb that takes advantage of this phenomenon in order to generate visible light, too. You eventually develop a system that allows you to produce excited mercury atoms within a glass tube. The only problem is that the light produced is still ultraviolet. Speculate on how you might alter your new bulb in order to convert the ultraviolet light to visible light. Explain your choice.

Response includes...	
Shield the tube or coat the inside of the bulb with a substance that will absorb the high-energy ultraviolet photons and emit less-energetic visible photons and/or heat. These photons will escape the bulb, providing visible light.	3
Shield the tube or coat the inside of the bulb so the ultraviolet light is converted to the less energetic visible light. (Response doesn't mention photons.)	2
Shield the tube or coat the bulb to keep UV from passing through the tube.	1
No answer or completely wrong	0

3. You read on a NASA website that the Sun is composed of the following elements: hydrogen, helium, oxygen, carbon, nitrogen, silicon, magnesium, neon, iron, and sulfur. Suggest how it is possible for astronomers to know that these specific elements exist in the Sun.

Response includes...	
Each element has different excited states and, therefore, a unique emission or absorption spectrum. By looking at the sun's spectra and comparing it to the spectra from these elements, scientists can figure out what elements are present.	2
Response explains that scientists can compare spectrum to visible light spectrum, but doesn't discuss individual unique emission absorption.	1
No answer or completely wrong	0

4. Yellow light from a sodium lamp makes blue objects appear black. This is because the atoms in the blue object:
- reflect all the light from the lamp.
 - cannot absorb the yellow light.
 - absorb all the yellow light.
 - convert the light into heat.
 - reflect blue light.

Answers c	1
Other	0

Explain your choice.

Response includes...	
Because a blue substance absorbs most of the visible photons falling on it <u>except</u> blue photons. Thus, yellow photons will be absorbed. If the sodium light emits yellow photons, all the light from the lamp will be absorbed. This is what a black substance does, too.	2
Flawed reasoning: e.g blue object absorbs yellow light <u>reflecting all others.</u>	1
No answer or completely wrong	0

5. Glass is transparent because: _____
- Visible light is not absorbed by glass.
 - Light bounces off all the atoms in glass.
 - Light waves are much longer than the molecules in glass.
 - Light waves are much smaller than the atoms in glass.
 - Glass molecules line up to create channels that pass light.

Answers A	1
Other	0

Explain your choice.

Response includes...	
Visible photons can go straight through a substance if the atoms and molecules that make up the substance do not have energy gaps that equal excited states of visible photons. Given that visible light does go through glass, this must be the case—there are no excited states of the atoms and molecules that make up glass that have energy gaps equal to any visible photon.	2
Because no light is absorbed.	1
No answer or completely wrong	0

6. Light consists of particles called photons that (circle T or F in each case):
have mass T or F

Answers False	1
Other	0

have charge T or F

Answers False	1
Other	0

carry energy T or F

Answers True	1
Other	0

travel at various speeds T or F

Answers False	1
Other	0

travel in straight lines T or F

Answers True	1
Other	0