Ultraviolet Light and Molecular Change

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

In this worksheet's model, a molecule can undergo a change when it absorbs one photon whose energy meets a stated threshold.

1 Which statement applies to the model when every photon has energy below the threshold?

(1) Each individual photon falls short of the threshold.

(2) Increasing the number of photons makes each photon more energetic.

(3) Any photon can drive the change regardless of its energy.

(4) Photon energy equals the number of molecules.

2 Explain why a shorter wavelength corresponds to more energy per photon in a vacuum. [1]

Answer and work

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3 Which has the higher frequency according to the electromagnetic spectrum in the 2025 tables?

(1) Ultraviolet light

(2) Infrared light

(3) They have identical frequencies.

(4) The spectrum cannot compare them.

4 Two sources have the same wavelength but different numbers of photons per second. Explain which feature changes and which remains fixed. [1]

Answer and work

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_____

A Model Molecular Change

Use the information below to answer the questions.

A modeled molecule changes only when it absorbs a photon with at least 5.00×10^{-19} J. The table gives the wavelength and energy per photon of three sources.

Source	**Wavelength (nm)**	**Energy per photon ($\times 10^{-19}$ J)**
P	300	6.62
Q	400	4.97
R	600	3.31

5 Which source supplies photons with enough energy to meet the model threshold?

(1) P only

(2) Q only

(3) P and Q

(4) All three

6 Calculate how far below the threshold a photon from Q is. Include units. [1]

Answer and work

7 Which comparison describes P relative to R?

(1) P has shorter wavelength and higher energy per photon.

(2) P has longer wavelength and higher energy per photon.

(3) P has shorter wavelength and lower energy per photon.

(4) They have equal wavelengths and energies.

8 A student says a higher intensity of source R guarantees that every photon will meet the threshold. Use the table and the model to evaluate the claim. [1]

Answer and work