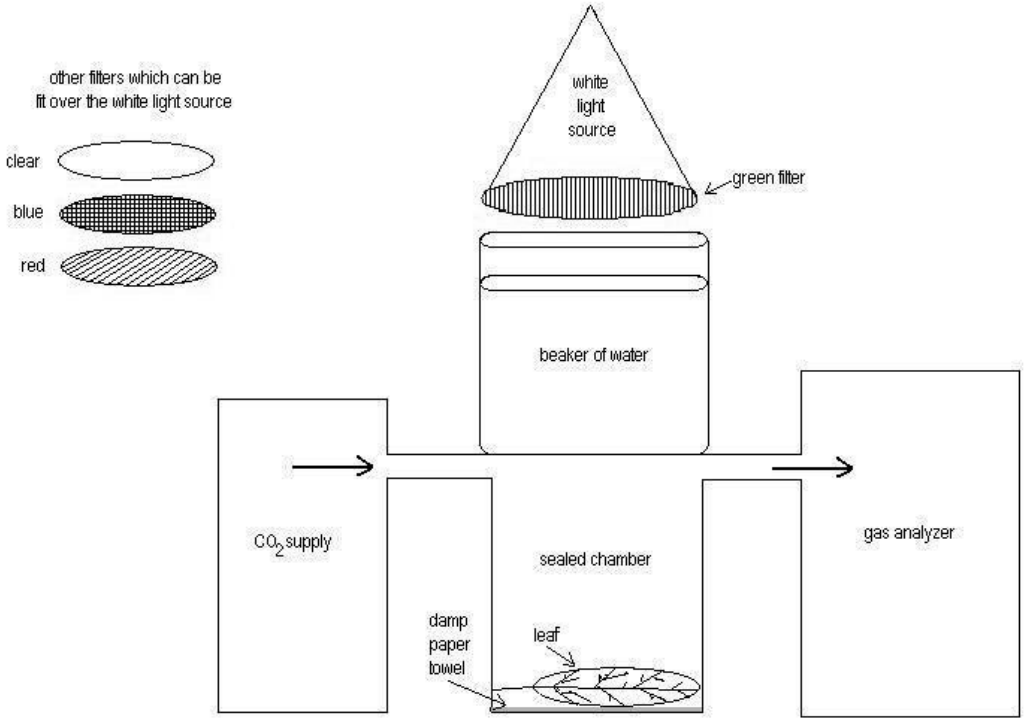
Plant Pigments and Photosynthesis Laboratory

Questions 31-35 refer to the following description and accompanying figure.

The following experiment was performed to determine how wavelength of light affects photosynthetic rate. The leaf of a tomato plant was placed on a damp paper towel in a sealed chamber connected to a CO_2 supply and a gas analyzer as shown in the diagram below. A fixed concentration of CO_2 was pumped into the chamber via an inlet. Through a separate outlet, the gaseous contents of the chamber were exhausted through the gas analyzer that measures the amounts and identities of gasses leaving the chamber. A beaker full of water was placed on top of the chamber. A light source positioned above the beaker of water provided white light. Colored filters placed between the light source and the beaker of water allowed the wavelength of light to be changed while keeping the intensity of light reaching the leaf constant. White light, blue light, red light and green light were each tested separately to determine the amount of photosynthetic activity of the leaf at 0, 5, 10, 20 and 30 minutes. Before each type of light was tested, the beaker of water was replaced and the leaf was exposed to complete darkness until the amount of CO_2 entering and leaving the chamber were equal.



EXPERIMENTAL SETUP
(example using green filter)

31. How could photosynthetic activity be measured in this experiment?

(A) Measure the amount of O_2 gas bubbles formed in the beaker of water at each time point for each type of light.
(B) Measure the amount of O_2 consumed using the gas analyzer at each time point for each type of light.
(C) Measure the amount of O_2 produced using the gas analyzer at each time point for each type of light.
(D) Measure the amount of CO_2 produced using the gas analyzer at each time point for each type of light.

32. Which of the following would represent photosynthetic activity from this experiment expressed as a rate?

(A) CO_2 input minus CO_2 output
(B) Number of photons of light hitting the leaf per second
(C) µmol CO_2 consumed per second
(D) µmol O_2 consumed per minute

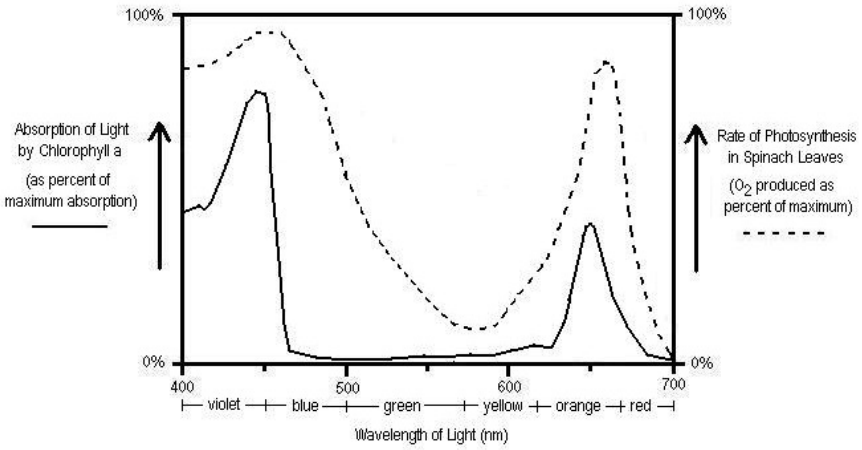
33. The function of the beaker of water in this experiment is to

(A) provide a path for the light to enter the chamber
(B) keep the temperature of the leaf constant
(C) keep the pH of the photosynthetic reactions constant at a pH of 7
(D) remove harmful UV rays that stop photosynthesis from occurring

34. A blue filter placed over the light source would

(A) absorb all the blue light coming from the light source
(B) absorb red light, but not blue light, coming from the light source
(C) allow all wavelengths of light, except blue, to strike the leaf
(D) allow light with longer wavelengths than blue light to pass through the filter

1. The quality of light influences many processes in organisms including photosynthesis in plants. The absorption spectrum for chlorophyll *a* and the action spectrum for photosynthesis in spinach leaves are shown below.



(a) Explain the relationship between the absorption spectrum of chlorophyll *a* and the action spectrum of photosynthesis.

(b) Using specific data from the absorption spectrum of chlorophyll *a*, explain why the leaves of most photosynthetic plants are green.

(c) Explain why photosynthesis in plants occurs in areas of the light spectrum where chlorophyll *a* does not absorb light.