

15 Photons and the atom – Part 1

—Answers

Answers

Work through these after you have tried the questions yourself.

2.1 $E = hf = 6.63 \times 10^{-34} \times 4.0 \times 10^{14} = 2.7 \times 10^{-19} \text{ J}.$

2.2 light and matter each behave both as a wave and as a particle, depending on the experiment.

2.3 the energy gap between the two levels (the photon energy equals that gap).

2.4 $K_{\max} = hf - \phi = (6.63 \times 10^{-34} \times 9.0 \times 10^{14}) - 4.0 \times 10^{-19} = 5.97 \times 10^{-19} - 4.0 \times 10^{-19} = 2.0 \times 10^{-19} \text{ J}.$

2.5 each blue photon has a higher frequency, so more energy than the metal's work function, and can free an electron; red photons are below the threshold, so however many arrive (however bright), none has enough energy alone.