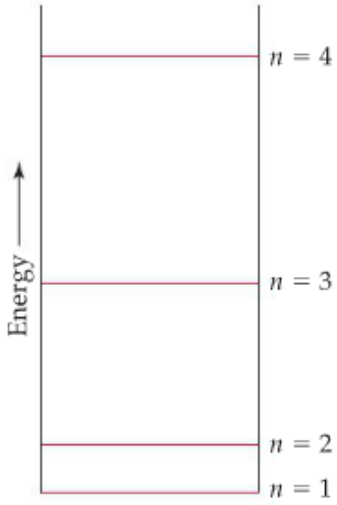
6.6 A certain quantum mechanical system has the energy levels shown in the diagram below. The energy levels are indexed by a single quantum number n that is an integer. **(a)** As drawn, which quantum numbers are involved in the transition that requires the most energy? **(b)** Which quantum numbers are involved in the transition that requires the least energy? **(c)** Based on the drawing, put the following in order of increasing wavelength of the light absorbed or emitted during the transition: (*i*) $n = 1$ to $n = 2$; (*ii*) $n = 3$ to $n = 2$; (*iii*) $n = 2$ to $n = 4$; (*iv*) $n = 3$ to $n = 1$. [Section 6.3]



6.19 An argon ion laser emits light at 532 nm. What is the frequency of this radiation? Using Figure 6.4, predict the color associated with this wavelength.

Practice Exercise 6.3

(**a**) A laser emits light that has a frequency of $4.69 \times 10^{14} s^{-1}$. What is the energy of one photon of this radiation? (**b**) If the laser emits a pulse containing 5.0×10^{17} photons of this radiation, what is the total energy of that pulse? (**c**) If the laser emits 1.3×10^{-2} J of energy during a pulse, how many photons are emitted?

Answers: (**a**) 3.11×10^{-19} J, (**b**) 0.16 J, (**c**) 4.2×10^{16} photons

6.28 The energy from radiation can be used to cause the rupture of chemical bonds. A minimum energy of 941 kJ/mol is required to break the nitrogen–nitrogen bond in N_2. What is the longest wavelength of radiation that possesses the necessary energy to break the bond? What type of electromagnetic radiation is this?

6.32 Sodium metal requires a photon with a minimum energy of 4.41×10^{-19} J to emit electrons. (**a**) What is the minimum frequency of light necessary to emit electrons from sodium via the photoelectric effect? (**b**) What is the wavelength of this light? (**c**) If sodium is irradiated with light of 405 nm, what is the maximum possible kinetic energy of the emitted electrons? (**d**) What is the maximum number of electrons that can be freed by a burst of light whose total energy is 1.00 μJ ?

6.69 Write the condensed electron configurations for the following atoms, using the appropriate noble-gas core abbreviations: (**a**) Cs, (**b**) Ni, (**c**) Se, (**d**) Cd, (**e**) U, (**f**) Pb.