

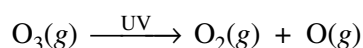
2007 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS (Form B)

2. Answer the following problems about gases.

- (a) The average atomic mass of naturally occurring neon is 20.18 amu. There are two common isotopes of naturally occurring neon as indicated in the table below.

Isotope	Mass (amu)
Ne-20	19.99
Ne-22	21.99

- (i) Using the information above, calculate the percent abundance of each isotope.
- (ii) Calculate the number of Ne-22 atoms in a 12.55 g sample of naturally occurring neon.
- (b) A major line in the emission spectrum of neon corresponds to a frequency of $4.34 \times 10^{14} \text{ s}^{-1}$. Calculate the wavelength, in nanometers, of light that corresponds to this line.
- (c) In the upper atmosphere, ozone molecules decompose as they absorb ultraviolet (UV) radiation, as shown by the equation below. Ozone serves to block harmful ultraviolet radiation that comes from the Sun.



A molecule of $\text{O}_3(g)$ absorbs a photon with a frequency of $1.00 \times 10^{15} \text{ s}^{-1}$.

- (i) How much energy, in joules, does the $\text{O}_3(g)$ molecule absorb per photon?
- (ii) The minimum energy needed to break an oxygen-oxygen bond in ozone is 387 kJ mol^{-1} . Does a photon with a frequency of $1.00 \times 10^{15} \text{ s}^{-1}$ have enough energy to break this bond? Support your answer with a calculation.