

1. Find the number of protons, electrons, and neutrons in a neutral atom of oxygen-16, atomic number 8.

[1] \_\_\_\_\_

2. Find the atomic number and atomic mass of an atom containing 22 protons, 22 electrons, and 22 neutrons.

[2] \_\_\_\_\_

3. Find the average atomic mass for a fictitious element, X, if 14.5% of its atoms have an atomic mass of 140.959 and 85.5% have an atomic mass of 137.869.

[3] \_\_\_\_\_

4. Find the energy in a quantum of light that has a frequency of  $2.0 \times 10^{14}$  Hz.

[4] \_\_\_\_\_

5. Find the wavelength of a photon of light with energy 4.10 eV. Express your answer in meters. ( $h = 6.63 \times 10^{-34}$  J·s;  $c = 3 \times 10^8$  m/s; 1 eV =  $1.6 \times 10^{-19}$  J)

[5] \_\_\_\_\_

6. An electron in the  $n = 4$  state in an atom of hydrogen jumps to the  $n = 7$  state. What energy in eV is needed to make the transition?

[6] \_\_\_\_\_

7. An electron in an excited hydrogen atom falls from the  $n = 6$  state to the  $n = 1$  state. Find the wavelength (in meters) of the light produced. ( $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$ ;  $c = 3 \times 10^8 \text{ m/s}$ ;  
 $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$ )

[7] \_\_\_\_\_

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Key Sheet

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[1] 8 protons, 8 electrons, 8 neutrons

[2] atomic number = 22  
atomic mass = 44 u

[3] 138 u

[4]  $1.3 \times 10^{-19}$  J

[5]  $3.03 \times 10^{-7}$  m

[6] 0.572 eV

[7]  $9.33 \times 10^{-8}$  m