Names:

Activity 2: Atoms

1. a. Given that the mass of the neutron is 1.674954×10^{-27} kg, the mass of a proton is $1.6726430 \times 10^{-27}$ kg and the mass of an electron is $9.1093897 \times 10^{-31}$ kg, what is the **mass** (in kg) of a single carbon-12 atom based on the particles it contains? **Pay attention to sig figs!**

b. Based on the definition of an amu, what is the **mass** (in amu) of a single carbon-12 atom?

c. 1 atomic mass unit has a mass of 1.66054×10^{-27} kg. Use this factor to convert your answer to part b into kg and **compare** it to the answer in part a.

d. Calculate the **difference** in the mass from part a and the mass from part c.

e. This difference in mass is the amount of matter that is converted to energy which holds the nucleus together (**nuclear binding energy**). Convert this mass to energy (joules) using Einstein's famous equation $E=mc^2$. One joule = 1 kg m^2/s^2 and $c = 3.00 \times 10^8$ m/s.

2. Write the chemical **symbol** for an **isotope** which has 8 protons, 10 neutrons and 10 electrons. Hint: is this isotope also an **ion**?

3. Describe the **subatomic structure** of phosphorus-32, a commonly used "tracer" isotope, indicating the **number** and **location** of each type of subatomic particle, and the **electron configuration**.

4. The following table shows various properties of chlorine and iodine molecules:

	Molecular formula	Boiling point (K)	Freezing point (K)
Chlorine	Cl_2	239	172
Bromine			
Iodine	I_2	457	386.5

Predict the information for the missing line of bromine, given that bromine is between chlorine and iodine in group VIIA. **Do not look up these values in a reference.**

5. Unlike the text's treatment of electromagnetic (EM) radiation, there is a formula to calculate the number of joules of energy a **photon** of a particular **wavelength** of light contains. The formula is $E = hc/\lambda$, where E is the **energy** of the photon in joules, h is Planck's constant = 6.626×10^{-34} Js (that is, joules times seconds), c is speed of light = 3.00×10^{8} m/s and λ (the Greek letter *lambda*) is the wavelength of the photon in meters.

The text mentions in Ch. 11 that visible light wavelengths range from 4×10^{-7} m (blue) to 7×10^{-7} m (red). **Calculate** the energy of one photon of blue light and one photon of red light and indicate which is the **more energetic** color.