

ChemActivity 1

The Nuclear Atom

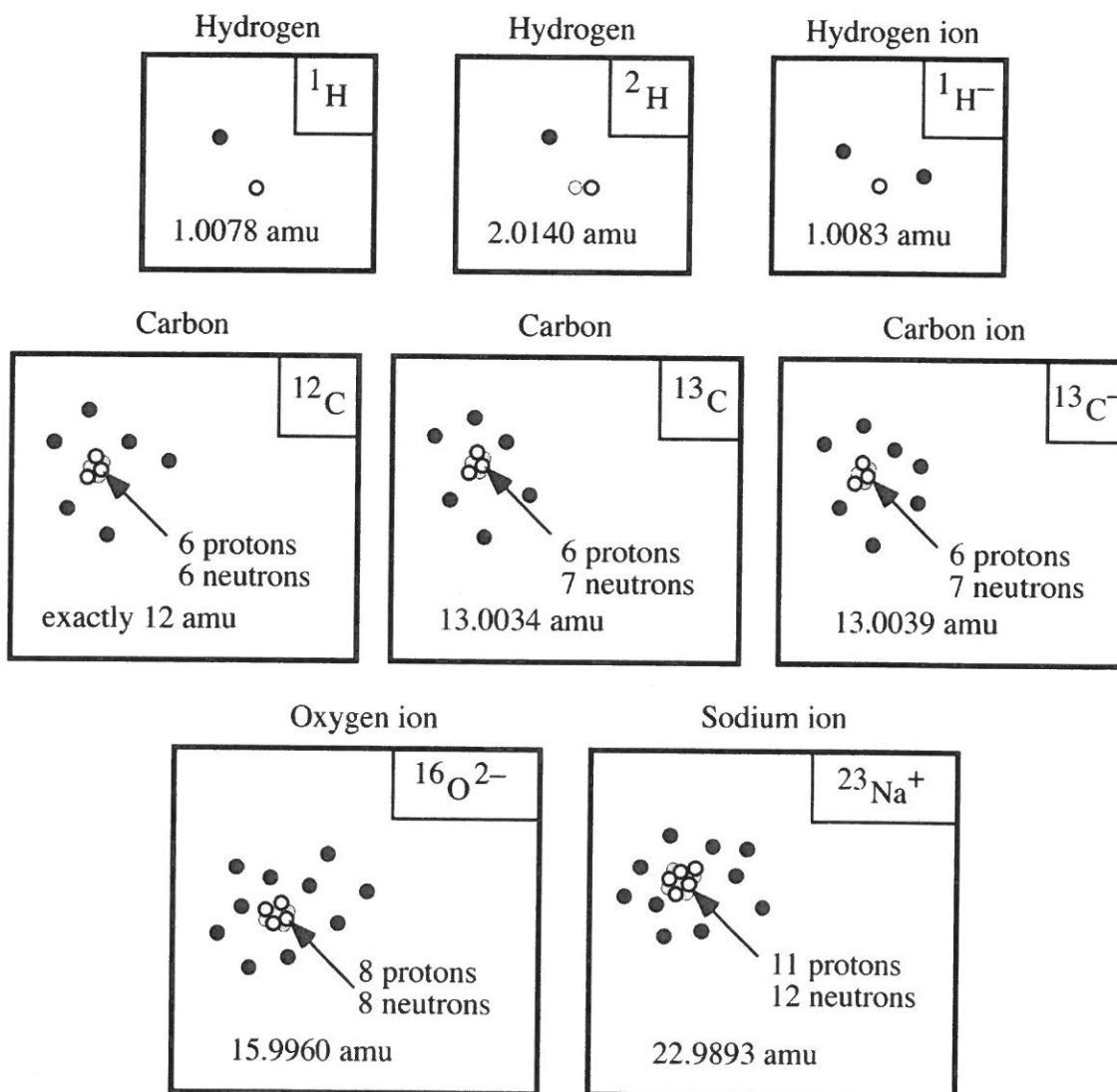
(What Is an Atom?)

Model: Schematic Diagrams for Various Atoms.

- electron (-)
- proton (+)
- neutron (no charge)

$$1 \text{ amu} = 1.6606 \times 10^{-24} \text{ g}$$

The **nucleus** of an atom contains the protons and the neutrons.



^1H and ^2H are **isotopes** of hydrogen.

^{12}C and ^{13}C are **isotopes** of carbon.

Critical Thinking Questions

1. How many protons are found in ^{12}C ? ^{13}C ? $^{13}\text{C}^-$?
2. How many neutrons are found in ^{12}C ? ^{13}C ? $^{13}\text{C}^-$?
3. How many electrons are found in ^{12}C ? ^{13}C ? $^{13}\text{C}^-$?
4. Based on your answers to CTQs 1-3, what do all carbon atoms (and ions) have in common?
5. Based on the model, what do all hydrogen atoms (and ions) have in common?
6. Based on your answers to CTQs 4 and 5, what is the significance of the atomic number, Z , above each atomic symbol in the periodic table?
7. Based on your answer to CTQ 6, what do all nickel (Ni) atoms have in common?
8. In terms of the numbers of protons, neutrons and electrons:
 - a) Why does the notation $^{13}\text{C}^-$ have a negative sign in the upper right hand corner?
 - b) What feature distinguishes a neutral atom from an ion?
 - c) Provide an expression for calculating the charge on an ion.

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9. Determine the number of protons, neutrons, and electrons in one ${}^1\text{H}^+$ ion. Explain how you found your answer.

10. What structural feature is different in isotopes of a particular element?

11. How is the mass number, A , (left-hand superscript next to the atomic symbol as shown in the Model) determined (from the structure of the atom)?

12. Show that the mass number and charge given for ${}^{16}\text{O}^{2-}$ and ${}^{23}\text{Na}^+$ are correct in Model 1.

13. Based on the information in Model 1, where is most of the mass of an atom, within the nucleus or outside of the nucleus? Explain your reasoning using grammatically correct sentences.