

## Cycle 2 Chemistry I Lesson 4

Protons and Neutrons

**LAB TOMORROW BE PREPARED!**

Agenda:

**Warmup:** Draw a model of a Nitrogen atom, with protons in the nucleus and electrons in shells

**Vocab:** Atomic Number, Mass Number

**Homework:**

“Atoms”

“Protons Neutrons and Electrons”.

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### Atomic Number and Mass Number

#### Atomic Number Is the Number of Protons of the Nucleus

- The number of protons that an atom has is known as the atom's **atomic number**.
  - The atomic number is the same for all atoms of an element.
  - Because each element has a unique number of protons in its atoms, no two elements have the same atomic number.
    - **Example:** the atomic number of hydrogen is 1 because the nucleus of each hydrogen atom has one proton. The atomic number of oxygen is 8.





### Atomic Number and Mass Number, *continued* Atomic Number Is the Number of Protons of the Nucleus, *continued*

- Atomic numbers are always whole numbers.
- The atomic number also reveals the number of electrons in an atom of an element.
  - For atoms to be neutral, the number of negatively charged electrons must equal the number of positively charged protons.



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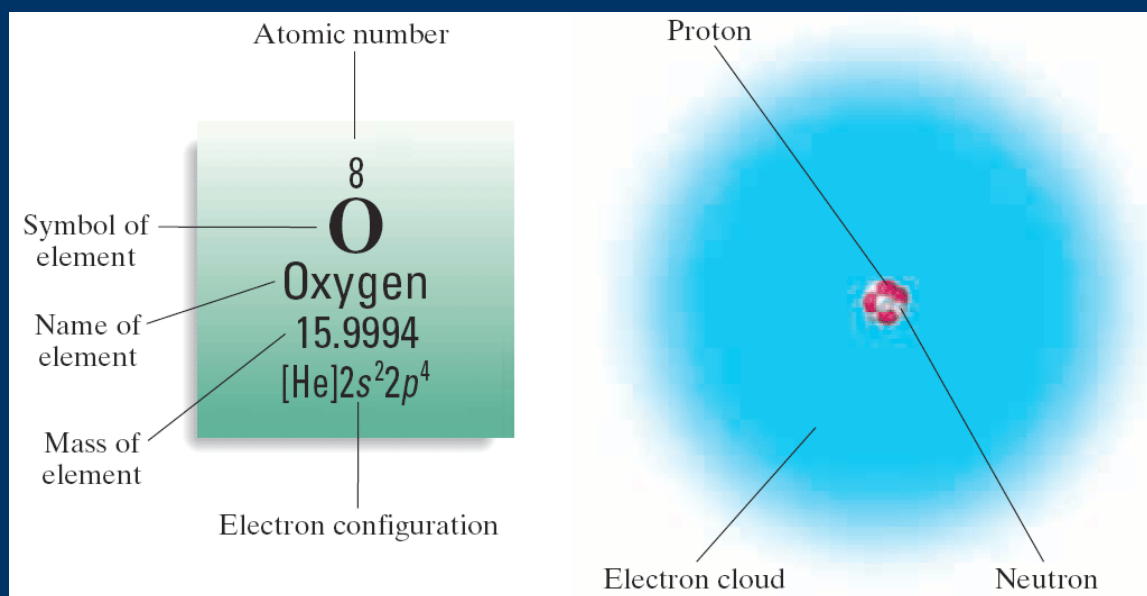
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## Atomic Number and Mass Number, *continued*

### Atomic Number Is the Number of Protons of the Nucleus, *continued*



- The atomic number for oxygen tells you that the oxygen atom has 8 protons and 8 electrons.





### Atomic Number

Oxygen atom

8 Protons

8 Neutrons

8 Electrons

|                                     |
|-------------------------------------|
| 8                                   |
| O                                   |
| Oxygen                              |
| 15.9994                             |
| [He]2s <sup>2</sup> 2p <sup>4</sup> |

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Of  
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### Atomic Number and Mass Number, *continued* Mass Number Is the Number of Particles of the Nucleus, *continued*

- The **mass number** is the sum of the number of protons and neutrons in the nucleus of an atom.
- You can calculate the number of neutrons in an atom by subtracting the atomic number (the number of protons) from the mass number (the number of protons and neutrons).

*mass number – atomic number = number of neutrons*

- Unlike the atomic number, the mass number can vary among atoms of a single element.



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## Atomic Number and Mass Number, *continued*

### Mass Number Is the Number of Particles of the Nucleus, *continued*

- **Example:** a particular atom of neon has a mass number of 20.
  - Because the atomic number for an atom of neon is 10, neon has 10 protons.

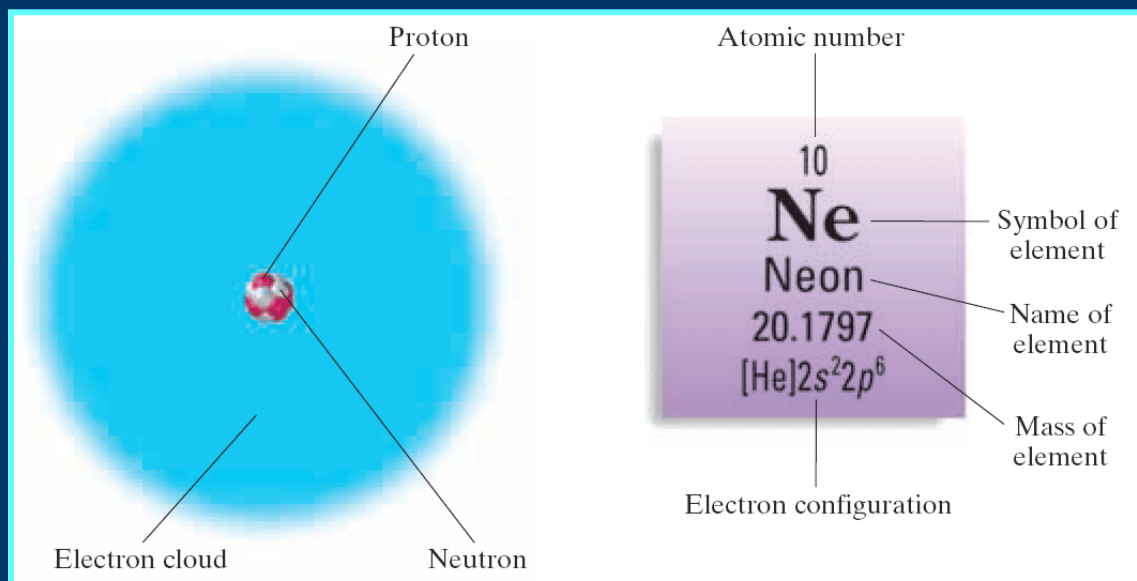
$$\begin{array}{r} \text{number of protons and neutrons (mass number)} = 20 \\ \underline{\text{– number of protons (atomic number) = 10}} \\ \text{number of neutrons} = 10 \end{array}$$





## Atomic Number and Mass Number, *continued*

### Mass Number Is the Number of Particles of the Nucleus, *continued*



- The neon atom has 10 protons, 10 electrons, and 10 neutrons. The mass number is 20.







### Mass Number

Oxygen atom

8 Protons

8 Neutrons

8 Electrons

|                                     |
|-------------------------------------|
| 8                                   |
| <b>O</b>                            |
| Oxygen                              |
| 15.9994                             |
| [He]2s <sup>2</sup> 2p <sup>4</sup> |



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### Determining the Number of Particle In An Atom

#### Sample Problem A

How many protons, electrons, and neutrons are present in an atom of copper whose atomic number is 29 and whose mass number is 64?



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## Sample Problem A Solution

- The atomic number indicates the number of protons in the nucleus of a copper atom.

$$\text{atomic number (29)} = \text{number of protons} = 29$$

- A copper atom must be electrically neutral, so the number of electrons equals the number of protons.

$$\text{number of protons} = \text{number of electrons} = 29$$

- The mass number indicates the total number of protons and neutrons

$$\text{mass number (64)} - \text{atomic number (29)} =$$

$$\text{number of neutrons} = 35$$

