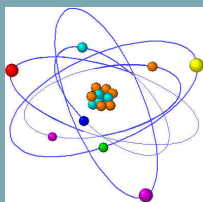


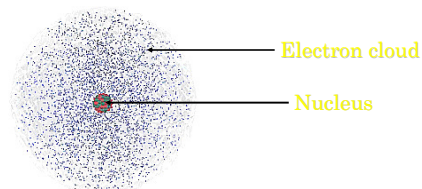
# The ATOM and the Periodic Table



## The Atom

An atom consists of a

- nucleus
  - (of protons and neutrons)
- electrons in space about the nucleus.



### SUBATOMIC PARTICLES

- Protons have a positive charge
- Electrons have a negative charge.
- Neutrons have no charge.
- Protons and neutrons have essentially the same mass.
- The mass of an electron is so small we ignore it.

Particle	Charge	Mass (amu)
Proton	Positive (1+)	1.0073
Neutron	None (neutral)	1.0087
Electron	Negative (1-)	$5.486 \times 10^{-4}$

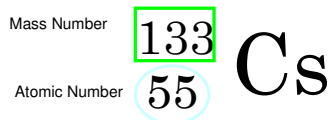
Atomic Mass

Atomic Number

# Symbol

### EXAMPLE

How many protons, neutrons and electrons are found in an atom of



Atomic number = protons and electrons  
There are 55 protons and 55 electrons

Mass number = sum of protons + neutrons  
Mass number - atomic number = neutrons  
 $133 - 55 = 78$   
There are 78 neutrons

### MODEL OF THE ATOM: BOHR-RUTHERFORD DIAGRAM

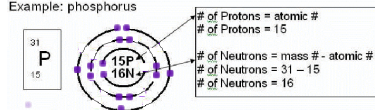
To draw Bohr-Rutherford Diagrams:

1. Draw the nucleus as a solid circle.
2. Put the number of protons (atomic number) in the nucleus with the number of neutrons (atomic mass - atomic number) under it.
3. Place the number of electrons (same as protons) in orbits around the nucleus in prescribed pattern

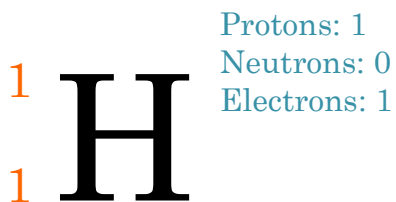
RULE:

- 1<sup>st</sup> shell - 2 electrons
- 2<sup>nd</sup> shell - 8 electrons (4 groups of 2)
- 3<sup>rd</sup> shell - 8 electrons (4 groups of 2)

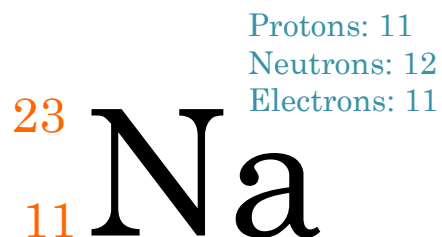
Example: phosphorus



### Hydrogen



### Sodium



Draw the Bohr Rutherford Diagrams for the First 20 elements

### Analysis of Bohr Rutherford Diagrams

1. What does the period number tell you about the Bohr Rutherford diagram of the atom?
2. What does the group number tell you about the Bohr Rutherford Diagram?
  - Eg. How many Valence Electrons (outer electrons) does any element in group 7 have?
3. Draw the Lewis dot diagram for the first 20 elements.

### READING THE PERIODIC TABLE: CLASSIFICATION

- Nonmetals, Metals, Metalloids, Noble gases

- Nonmetals
- Metals
- Metalloids
- Noble gases

The metals, nonmetals, and metalloids

Rare earth elements

Lanthanides

Actinides

Copyright © 2000 Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.

GROUPS

© 2004 Pearson Education, publishing as Addison Wesley.

### SOME MORE TRENDS ....

- Sizes of the atoms decrease as we move from left to right across a period
- This is due to the increasing number of protons in the nucleus, so the electrical attraction between the nucleus and the orbiting electrons gets stronger and pulls the electrons closer to the nucleus

