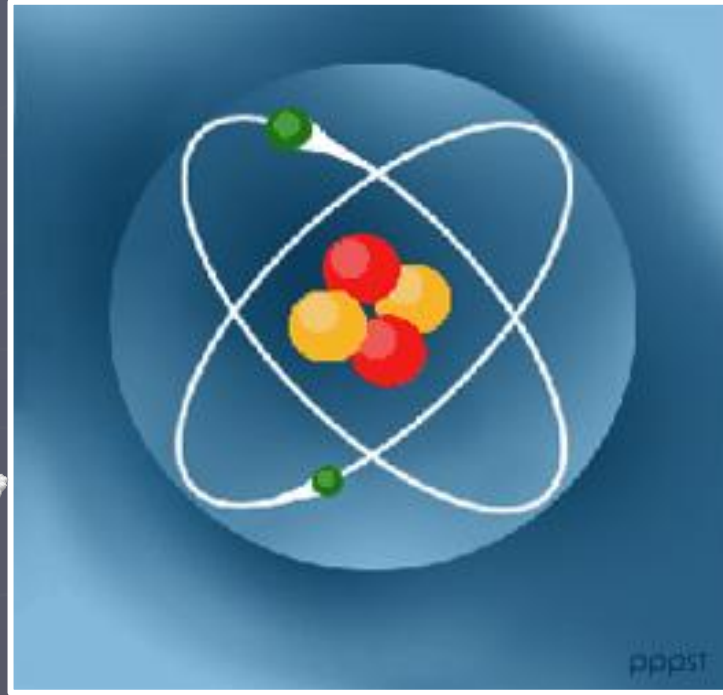


Atomic Structure

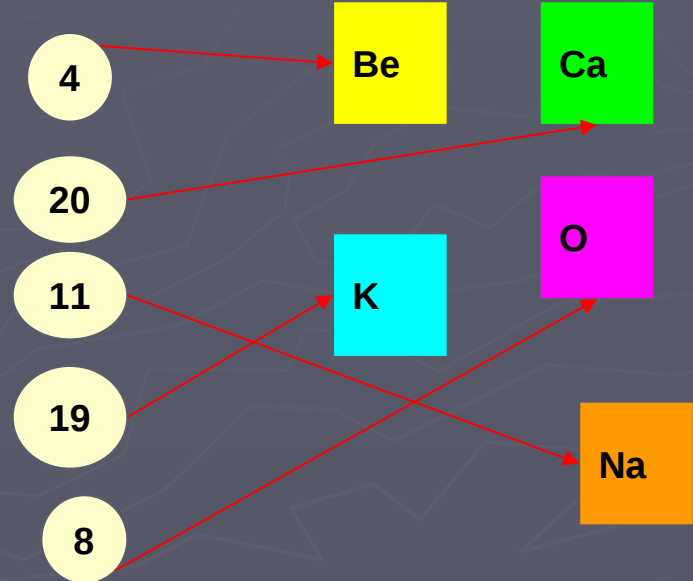


1. Recall the first 20 elements

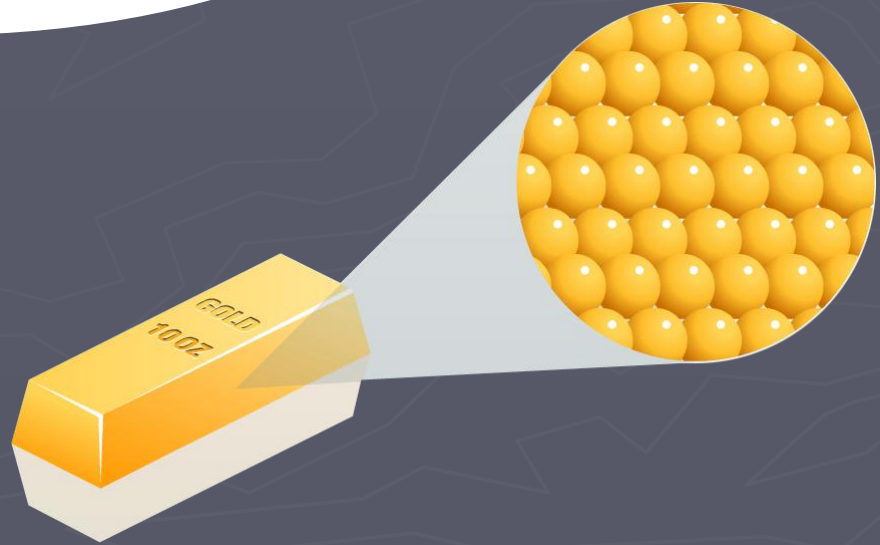


LET'S GO

2. Match the Elements to their correct atomic numbers



**What do you call the
smallest particle into
which an element can
be divided?**



Objectives

By the end of this lesson students should be able to:

1. State the parts of an atom.
2. Differentiate between the subatomic particles in terms of their position in atom, relative mass and charge
3. Calculate the number of subatomic particles of given elements.

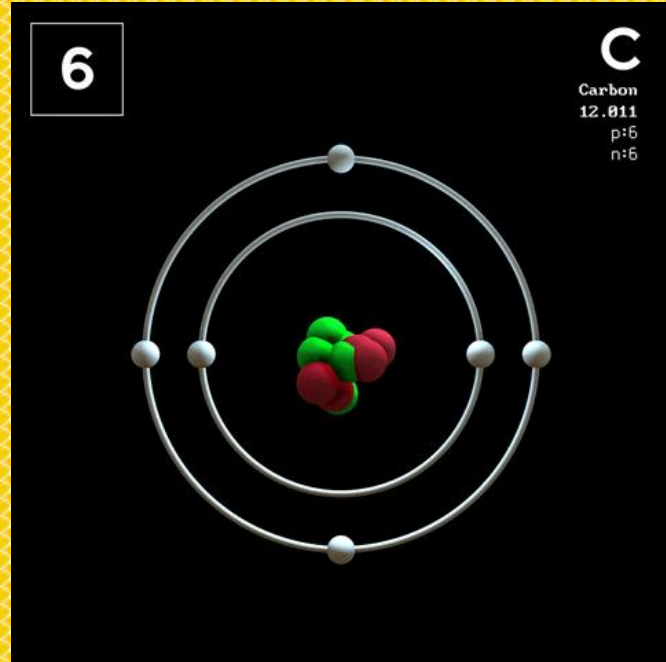
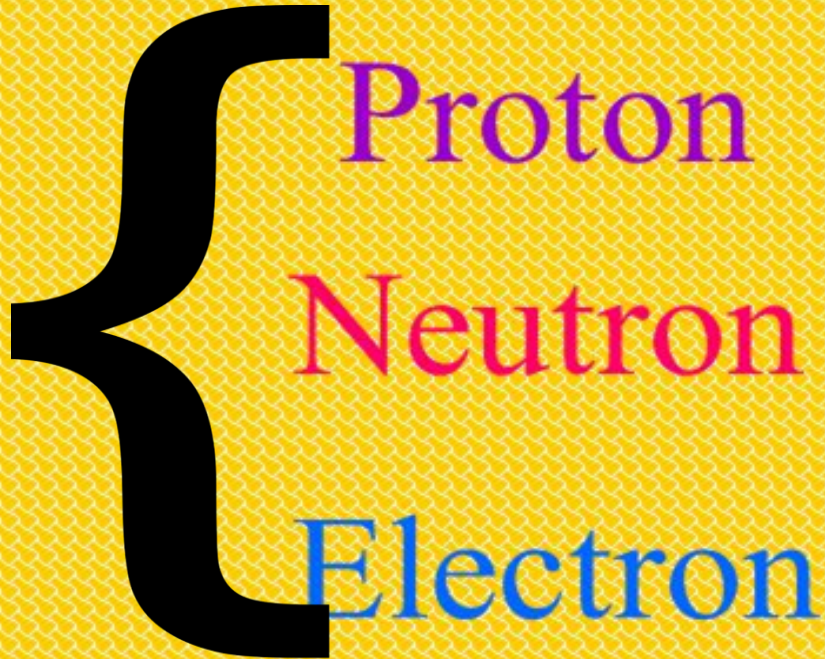


What is an atom?

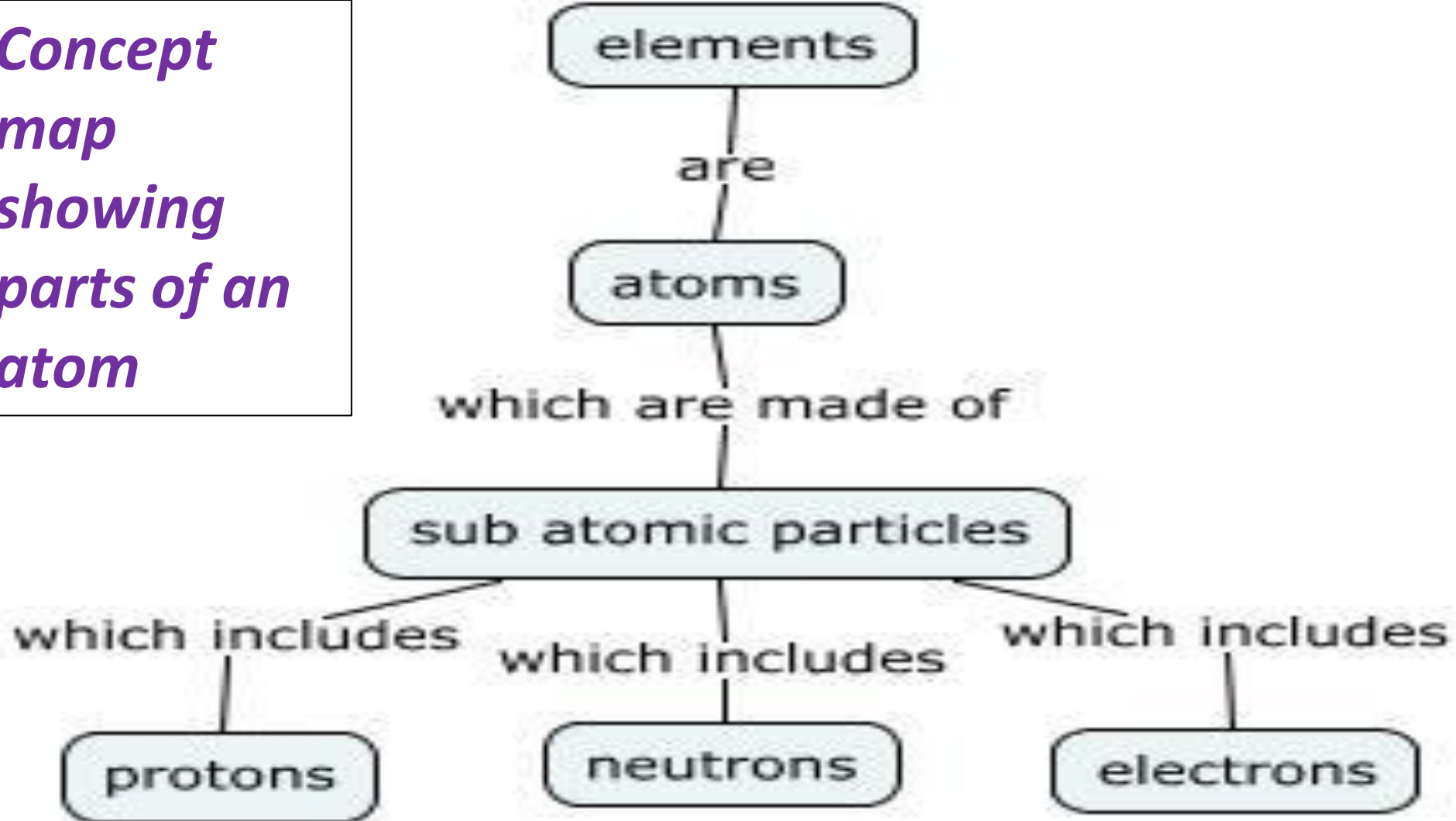
- ▶ An atom is the smallest particle of an element that can exist and still have the properties of that element.
- ▶ An atom is the basic building block of chemistry.
- ▶ It is also the smallest particle of an element that can take part in a chemical reaction.

Three fundamental particles in an atom

Subatomic Particles



*Concept
map
showing
parts of an
atom*



Structure of the Atom

- ▶ Atom – smallest particle of an element that can exist alone

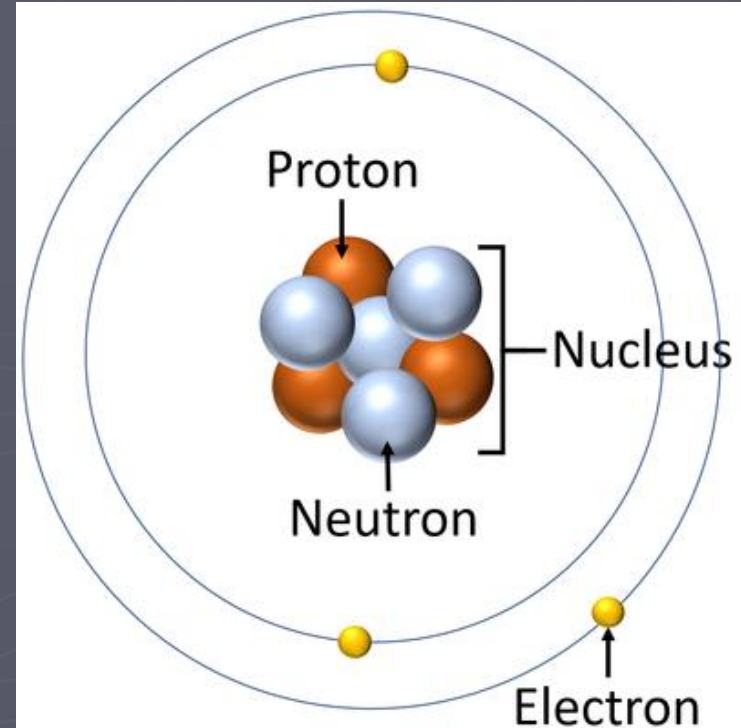
- Two regions of an atom

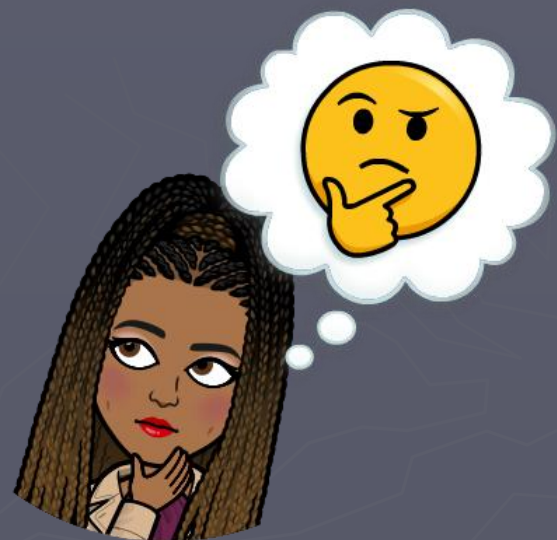
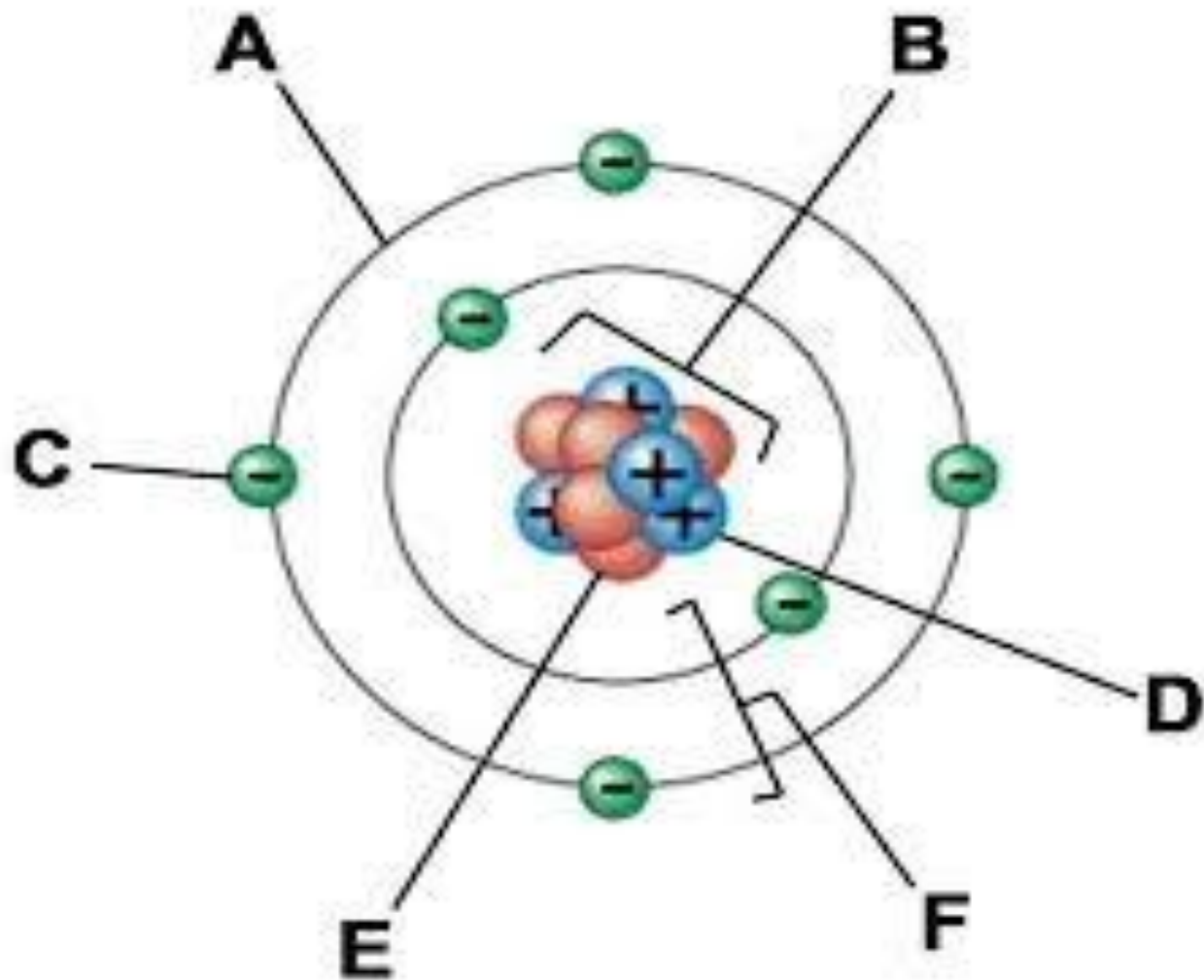
- ▶ Nucleus

- Center of atom
 - Protons and neutrons

- ▶ Shells

- Area surrounding nucleus containing electrons





Structure of the Atom

- ▶ **Proton** – Positive charge (+), **1** atomic mass unit (amu); found in the nucleus
 - amu -Approximate mass of a proton or a neutron
- ▶ **Neutron** – Neutral charge (0), **1** amu; found in the nucleus
- ▶ **Electron** – Negative charge (-), mass is VERY small ($1/1836$)



Properties of the three sub-atomic particles

What do you remember?

Particle	Relative mass	Relative charge	Location
Protons			
Neutrons			
Electrons			

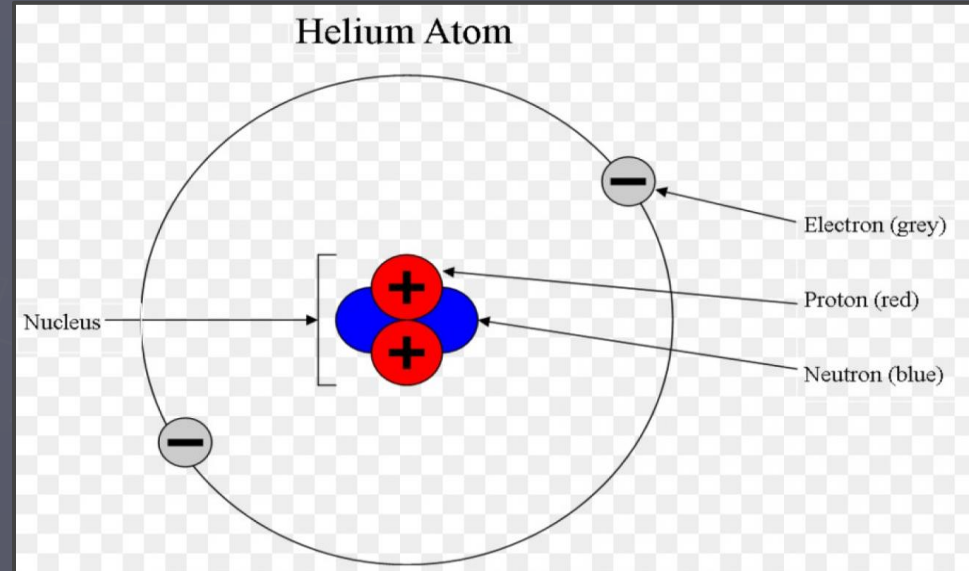
Properties of the three sub-atomic particles



Particle	Relative mass	Relative charge	Location
Protons	1	+1	Inside the nucleus
Neutrons	1	0	Inside the nucleus
Electrons	$1/1836$	-1	Outside the nucleus in shells or orbits

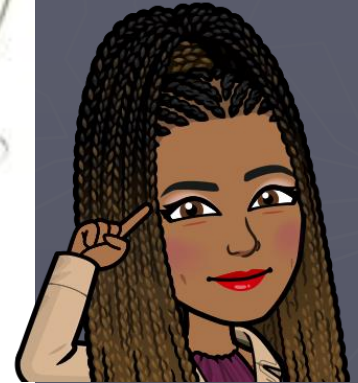
Charge of Atoms

- ▶ Protons have a positive (+) charge and electrons have a negative (-) charge
- ▶ In a neutral atom, the number of protons equals the number of electrons, so the overall charge is zero (0)
 - Example/ Helium, with an atomic number of 2, has 2 protons and 2 electrons when stable



Recap

1. What is an atom?
2. Name the three (3) sub-atomic particles found in an atom
3. What type of charge does a proton have?
4. What type of charge does a neutron have?

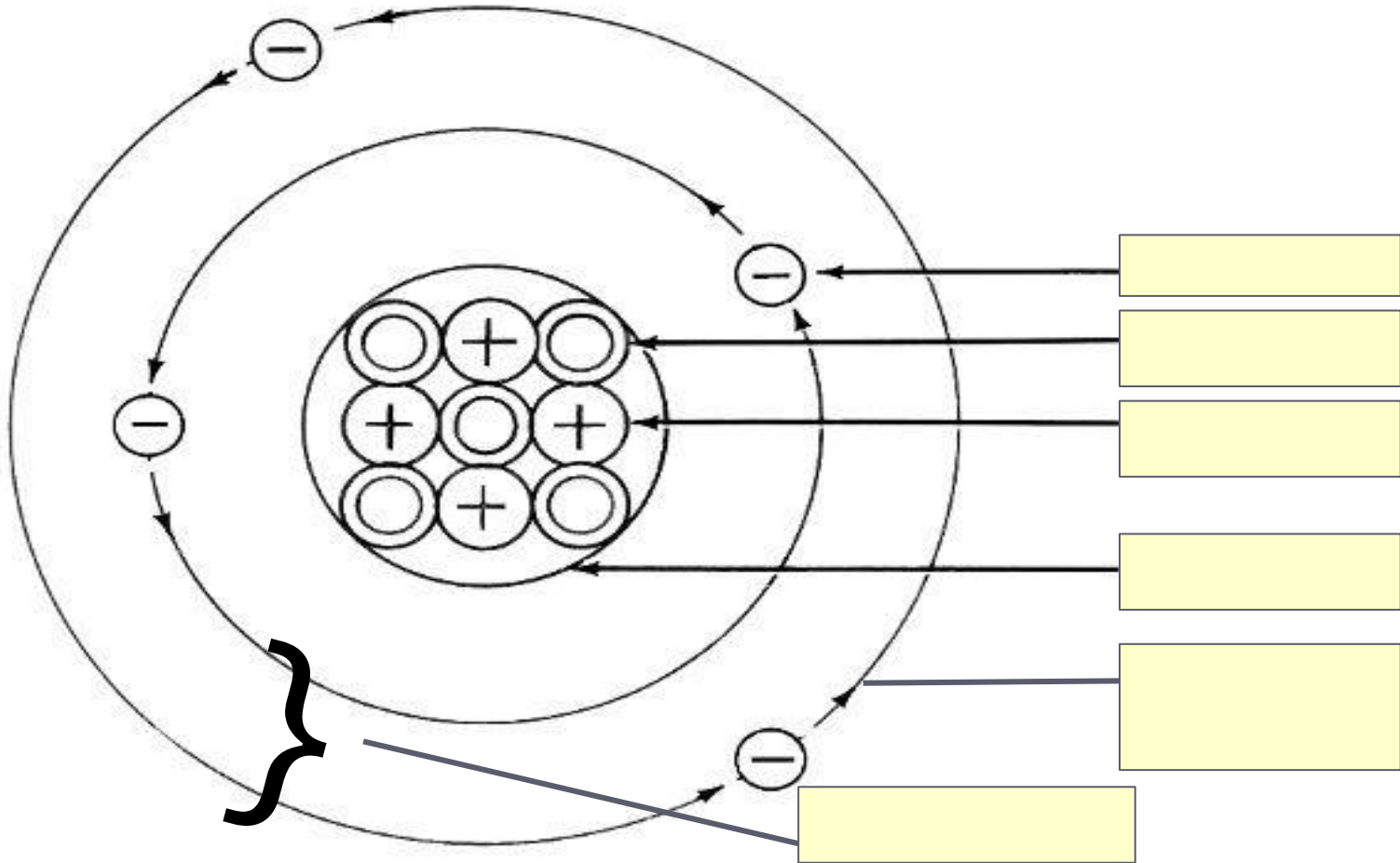


Recap cont'd



5. What type of charge does an electron have?
 6. Which two subatomic particles are located in the nucleus of an atom?
 7. What is the overall charge of an atom? Explain your answer.
- 

Label the atom



Chemical Symbol of Elements

- ❖ Each element is given the chemical symbol of its atom. For example, H is the symbol of the hydrogen atom O for oxygen.
- ❖ Chemical symbols are usually one or two letters long.
- ❖ Every chemical symbol starts with a capital letter, with the second letter written in lower case. For example, Mg is the correct symbol for magnesium, but mg, mG and MG are wrong.

Identify the correct symbol for each element below:

Potassium	Po	K	po	k
Fluorine	Fl	f	FL	F
Sulphur	s	Su	S	SU

Chemical Symbol of Elements

Each chemical symbol has 2 numbers:

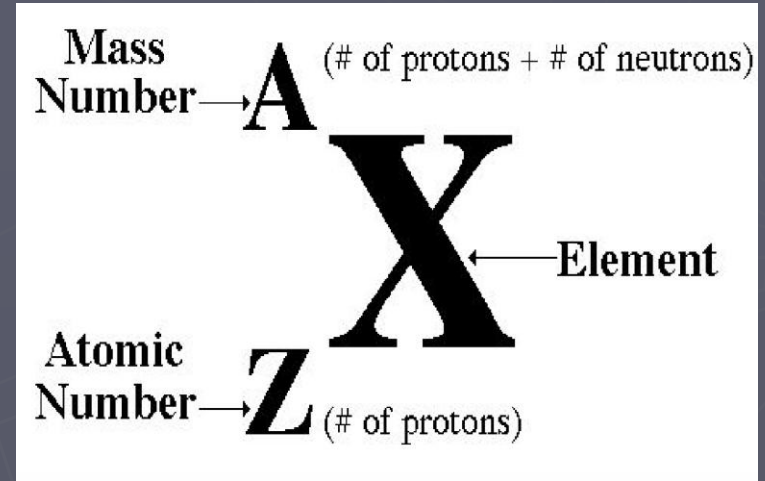
► Atomic Number

- Number of **protons** in nucleus
- The number of protons determines identity of the element!!

► Mass Number

- Number of protons + neutrons

■ Chemical Notation



❖ **REMEMBER THE FORMULAE** $A = Z + N$

❖ **WHERE:**

A - MASS NUMBER

Z = PROTON NUMBER

N = NEUTRON NUMBER

Practice questions

atomic mass:
protons + neutrons

A

number of
protons

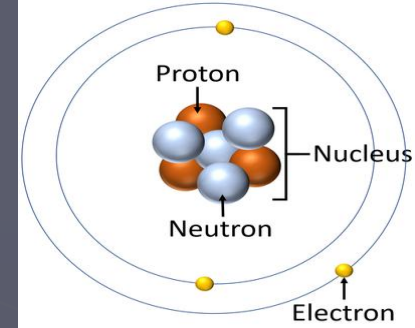
Z

chemical symbol

X

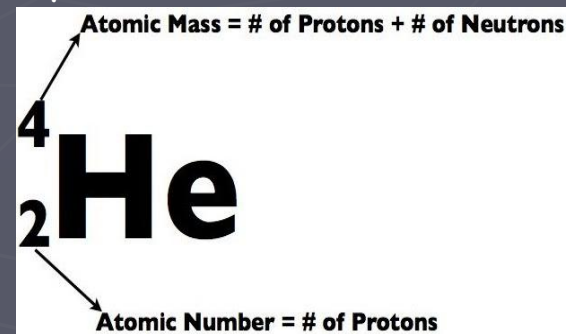
Number of sub-atomic particles

The number of each **sub-atomic** particle in each atom is different. As a result, each atom has a unique set of characteristics.



Number of protons - An atom is classified according to the number of protons in its nucleus. Each element has a particular number of protons and no other element has that same number of protons.

The atomic number characterizes the atom and is the number of protons that an atom has. The atomic number is the number placed at the bottom left hand corner of the symbol:
Example: helium ${}_2\text{He}$ has two protons etc.

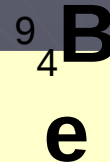
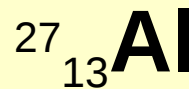
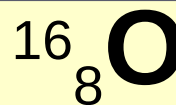
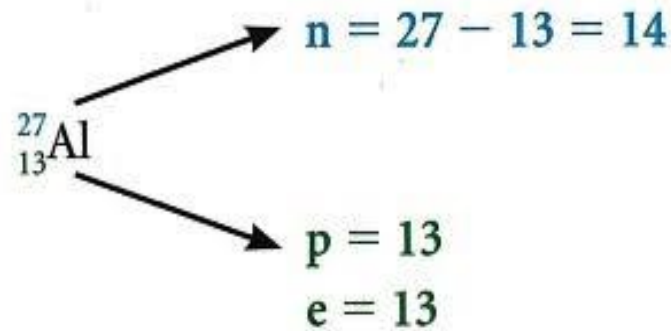


- ❖ **Number of electrons** - The number of electrons is the same as the number of protons. Atoms are electrically neutral and have the same number of positive particles (protons) and negative particles (electrons). Hydrogen has one proton therefore it must have one electron. Helium has two protons and two electrons.

- ❖ **Mass number** - The mass number of an atom equals the sum of protons and neutrons. The mass number is the number placed at the top left hand corner of the symbol. e.g. ^1_1H , ^4_2He .

- ❖ **Number of Neutrons** - To calculate the number of neutrons in an atom, simply subtract the number of protons from the mass number.

- ❖ **Number of neutrons** = **mass number** - **number of protons**



Protons=
Electrons=
Neutrons =

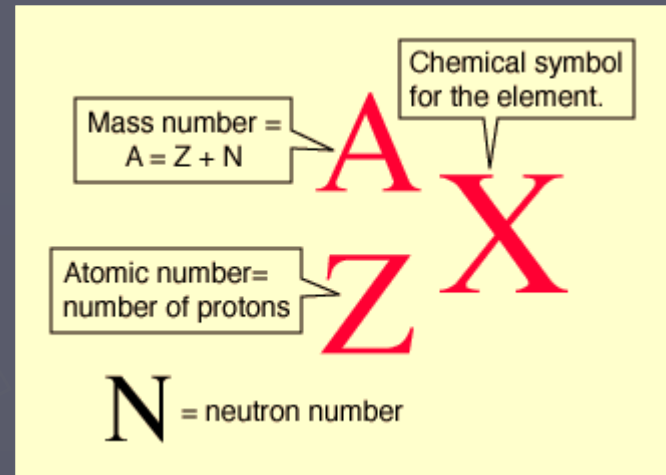
❖ **REMEMBER THE FORMULAE** $A = Z + N$

❖ **WHERE:**

A - MASS NUMBER

Z = ATOMIC NUMBER (PROTON NUMBER)

N = NEUTRON NUMBER



Let's Practice

► $(A=Z+N)$

- Neutrons = 61
- Atomic Number/
Protons=
- Atomic Mass = 108



$$\begin{aligned} A &= Z + N \\ 108 &= Z + 61 \end{aligned}$$

$$Z = 108 - 61$$

$$Z = 47$$

Let's Practice

► Aluminum (Al)

- Protons = 13
- Electrons =
- Neutrons = 14
- Atomic Number =
- Atomic Mass =



Let's Practice

► Sodium (Na)

- Protons =
- Electrons =
- Neutrons =
- Atomic Number = 11
- Atomic Mass = 23



Let's Practice

► Magnesium (Mg)

- Protons =
- Electrons = 12
- Neutrons =
- Atomic Number =
- Atomic Mass = 24



Activity

Complete the table below:

Elements	#Protons	# neutrons	# electrons	Mass #	Atomic #
Calcium				40	
Phosphorus				31	
Silicon				28	
Argon				40	
Neon				20	
Nitrogen				14	
Hydrogen				1	

1. Which element has a greater number of protons – Potassium (K) or Sulphur (S)?
2. Which element has a smaller number of electrons – Boron (B) or Helium (He)?
3. Which element has a greater number of neutrons – Magnesium (Mg) or Neon (Ne)?

Activity

Complete the table below:

Elements	#Protons	# neutrons	# electrons	Mass #	Atomic #
Calcium	20	20	20	40	20
Phosphorus	15	16	15	31	15
Silicon	14	14	14	28	14
Argon	18	22	18	40	18
Neon	10	10	10	20	10
Nitrogen	7	7	7	14	7
Hydrogen	1	0	1	1	1

1. Which element has a greater number of protons – Potassium (K) or Sulphur (S)? **S**
2. Which element has a smaller number of electrons – Boron (B) or Helium (He)? **He**
3. Which element has a greater number of neutrons – Magnesium (Mg) or Neon (Ne)? **Ne**

Recap!!



Use your notes on atoms to help you to complete the activity given below.

1. There are two main parts of an atom, the _____ and the _____. The _____ has a _____ charge due to the presence of the protons.

The _____ has a negative charge, due to the presence of the _____.

The _____ is lighter than the other particles and can be found outside of the _____, which is another name for the center of the atom.

In the center, there are _____ and _____. The _____ have no charge but weigh a lot compared to the _____. The proton has a _____ charge. The charge of the atom is _____, because there are _____ numbers of _____ and _____ in an atom.

In order to get the atomic mass of an element, add the number of _____ and _____ together. (19mks)

2. The atomic number tells you the number of _____
in one atom of an element. It also tells you the number of _____
_____ in a neutral atom of that element. The atomic number
gives the “identity “of an element as well as its location on the
Periodic Table. No two different elements will have the _____
_____ atomic number. (3mks)