

# Key - Study Guide - Unit 1 Test

## 1. Atomic Theory

A. Democritus - 1<sup>st</sup> person to develop the idea that all substances are made of tiny, indivisible particles, called atoms.

B. John Dalton - developed the Atomic Theory, which states:

(1) All matter is made of tiny, indivisible particles called atoms.

(2) All atoms of a given element are identical

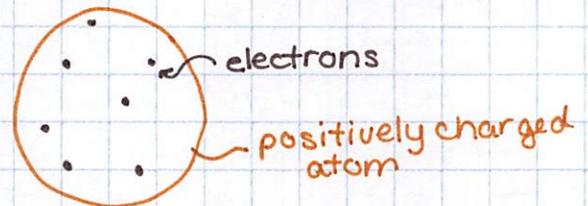
(3) Atoms of 1 element are different from atoms of another element

(4) Atoms combine in simple, whole number ratios to form compounds

(5) Atoms cannot be created or destroyed, only rearranged, in chemical reactions.

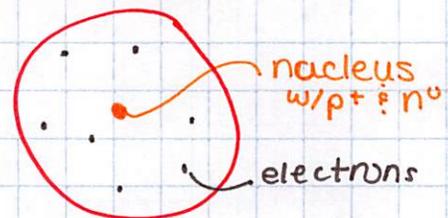
C. JJ Thomson - conducted the cathode ray experiment to show that there are tiny, negative particles, called electrons, inside the atom.

Plum Pudding Model



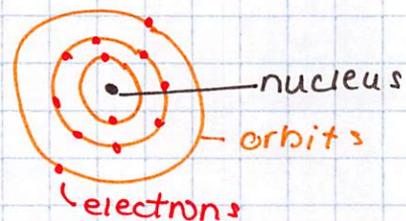
D. Ernest Rutherford - conducted the gold foil experiment to show that the positive charge in the atom is concentrated in the nucleus of the atom, which is in the center. He later discovered protons and neutrons in the atom

Rutherford's Atomic Model

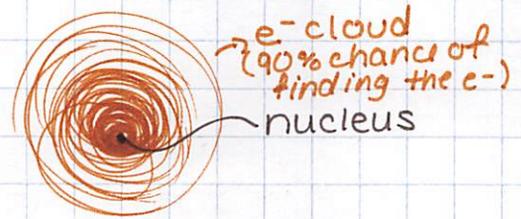


E. Neils Bohr - developed the planetary model of the atom, where the electrons move in orbits around the nucleus. In order for the electron to exist in an orbit, it must have a specific amount of energy

Bohr's Planetary Model



## F. Wave-mechanical model



## 2. Atomic Structure

- A. proton - in the nucleus      electron - in the e<sup>-</sup> cloud  
 neutron - in the nucleus
- B. **atomic number** - number of protons  
**mass number** - sum of the protons and neutrons
- C. **isotope** - atoms of the same element that have different numbers (amounts) of neutrons
- D.

name	symbol	atomic #	mass #	# p <sup>+</sup>	# e <sup>-</sup>	# n <sup>0</sup>	Isotopic symbol
beryllium	Be	4	9	4	4	9-4 = 5	<sup>9</sup> <sub>4</sub> Be
manganese	Mn	25	56	25	25	56-25 = 31	<sup>56</sup> <sub>25</sub> Mn
cadmium	Cd	48	48+62 = 110	48	48	62	<sup>110</sup> <sub>48</sub> Cd
arsenic	As	33	75	33	33	75-33 = 42	<sup>75</sup> <sub>33</sub> As

$$E.A.M. = (23.98504 \cdot .7870) + (24.98584 \cdot .1013) + (25.98259 \cdot .1117)$$

$$A.M. = 24.30954738 \text{ amu}$$

## 3. Electron Configurations

- A. O (8e<sup>-</sup>) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>4</sup> or [He]2s<sup>2</sup>2p<sup>4</sup>
- B. Mo (42e<sup>-</sup>) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>4s<sup>2</sup>3d<sup>10</sup>4p<sup>6</sup>5s<sup>2</sup>4d<sup>4</sup> or [Kr]5s<sup>2</sup>4d<sup>4</sup>
- C. As (33e<sup>-</sup>) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>4s<sup>2</sup>3d<sup>10</sup>4p<sup>3</sup> or [Ar]4s<sup>2</sup>3d<sup>10</sup>4p<sup>3</sup>
- D. Tc (43e<sup>-</sup>) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>4s<sup>2</sup>3d<sup>10</sup>4p<sup>6</sup>5s<sup>2</sup>4d<sup>5</sup> or [Kr]5s<sup>2</sup>4d<sup>5</sup>

## 4. Electrons & Light

- A. when elements are heated, their valence electrons absorb specific amounts of energy and become excited, move to a higher orbital. In order to go back to their favored, original "ground" state, they release a quantum of energy as photons in frequencies our eyes see as colored light (e)

- B. i. Blue light has a lower wavelength than orange light.  
 ii. Red light has a higher frequency than infrared energy.  
 iii. Violot light has more energy than indigo light

## 5. Nuclear chemistry

A. All elements are created in stars through the process of fusion.

### The Periodic Table



6. group - vertical column on the PT

7. period - horizontal row on the PT

8. metals — nonmetals —  
 metalloids —

9. A. transition metals  
 B. noble gases  
 C. inner transition metals  
 D. halogens  
 E. alkaline earth metals  
 F. alkali metals

10. The PT is arranged in order of increasing atomic number.

11.

	atomic radius	1 <sup>st</sup> ionization energy	electronegativity
down a group	increases	decreases	decreases
across a period	decreases	increases	increases

FIVE STAR.  
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FIVE STAR.  
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FIVE STAR.  
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12.

A.  $Cr > Cu$

B.  $Cr > W$

C.

i.  $Si < Pb < Fe$

ii.  $Sb < Ag < Mo$

D.

i.  $Si > Pb > Fe$

ii.  $Sb > Ag > Mo$

E.

i.  $Fe < Pb < Fe$

ii.  $Mo < Ag < Sb$