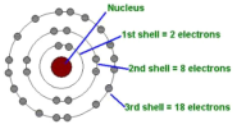
# 7.2 notes

January 20, 2020 10:38 AM

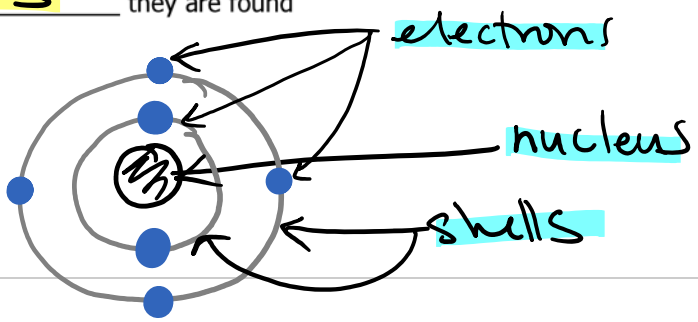
## 7.2: Bohr's Theory of the Atom

- When atoms absorb electrical or heat energy, they are able to re-emit this energy in the form of light
- Each element will emit a very specific pattern and colour of light, which is called the emission spectrum
- You are able to see the emission spectrum of an element when that element is heated in a flame
- Rutherford's former student, Neils Bohr, used this specific property of elements in conjunction with other discoveries made at the time to help solve the problems that Rutherford's model of the atom had created.

### Bohr's Contribution to Atomic Theory!




- A previous scientist, Albert Einstein, had already shown that atoms can only absorb and emit light energy in specific amounts
- Bohr used this observation to explain why electrons orbiting the nucleus do not continuously give off energy
- He proposed a theory of the atom which stated that electrons could only be located at specific energy levels (orbitals), or shells which surround the nucleus, and the amount of energy an electron has is related to its distance from the nucleus; the farther away from the nucleus, the more energy an electron has
- Bohr won the Nobel Prize in 1922 for his model of the atom! (Quantum Physics...)
- The main points of Bohr's model of the atom are:
  - Electrons are only found in shells, which are located at specific distances from the nucleus
  - Electrons will not be found between defined shells
  - Electrons can gain or lose energy, by moving up or down by a shell
  - Electrons are more stable, and have less energy, the closer to the nucleus they are found
  - Picture:



**The Atomic Theory of Matter!**

- As the world's access to modern technology improved, new discoveries about the atom were made.
- In the 1920s and later, atomic theory was modified again to account for new discoveries that had been made about the behaviour of electrons in atoms
- It was found that there was a maximum number of electrons that could be in any one shell
- It was also discovered that electrons will fill the shells starting with the innermost shell, and moving outwards

**The Number of Shells for an Element**

- The number of shells that an element will need is directly related to its location on the periodic table
  - Period 1 = One shell (1=1)
  - Period 3 = Three shells (3=3)
  - Period 7 = Seven shells (7=7)
- There is a limit to the number of electrons which can fit into each shell:
  - Shell 1 = 2 electrons max.
  - Shell 2 = 8 electrons max
  - Shell 3 = 8 electrons max
  - Shell 4 = 18 electrons max
  - Shell 5 = 18 electrons max
- Here is a summary of the Atomic Theory of Matter:
  - All matter is made of ATOMS
  - Atoms are the smallest piece of an element
  - elements will combine to form compounds, which are held together by electrical attractions
  - An atom is composed of a nucleus surrounded by electrons
  - The nucleus contains only protons and neutrons
  - All of the atoms of an element will have the same number of protons
  - The nucleus makes up most of the mass of an atom, as well as all of its positive charge

we follow this now!

- There is only empty space between electrons and the nucleus
- Electrons have a negative charge and very little mass
- Electrons orbit the nucleus but only in specific shells
- There is a maximum number of electrons which are allowed in each shell (see above)
- Electrons will absorb or emit energy in order to change shells

STOP HERE

**Standard Atomic Notation**

- We are already aware that the elements on the Periodic Table have their own unique mass, this is called the _____
- When the table was organized in order of increasing mass (with a few exceptions), it became clear that a characteristic energy peak also increased…this led to each element being given a specific _____
- We now know that the _____ of an element will always be equal to the _____ that element has in its _____
- It is actually _____ that now _____ the periodic table, not atomic mass…
- The _____ of an element is always equal to the total number of _____ found in the nucleus of an element
  - Equation:

  - Standard notation always looks like this:

**What about IONS!!??**

- Normally an atom will have the same number of _____, making it a _____, and therefore not an _____
- An atom will _____ (either positive of negative) when it has an _____ protons and electrons. This occurs when atoms gain or lose _____.
- Any _____ is then called an ion, and we know that specific elements on the periodic table will always form _____
- If an atom has more _____ than electrons, the atom will have an overall _____ charge, and be referred to as a _____
  - EX:
- If an atom has more _____ than protons, the atom will have an overall _____ charge, and be referred to as a _____
  - EX:
- The overall charge of an ion, whether positive of negative, is always called its _____
- In standard atomic notation the charge is always written _____ and to the _____ of the _____
  - We normally don't write the number one, _____
  - EX: An element has 34 protons and 36 electrons. Identify the element.
  - EX: An element has 41 protons and 36 electrons. Identify the element.

**DO: CYU's p. 212 # 1-12**

HW for Fri. Jan 24
# 1-4, 7, 8, 9, 12