Chem 11 final review #5 Atomic theory /Enthapy

1. How many protons, neutrons and electron in:
   1. An oxygen-16 atom

8 protons, 8 neutrons, 8 electrons

* 1. An oxygen-19 ion

8 protons, 11 neutrons, 10 electrons

* 1. A calcium-40 ion

20 protons, 20 neutrons, 18 electrons

* 1. A calcium-42 atom

20 protons, 22 neutrons, 20 electrons

1. What is the electron configuration for the following atoms/ions
   1. Nitride ion

1s2 2s2 2p6

* 1. Strontium atom

1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p6 5s2

* 1. Magnesium ion

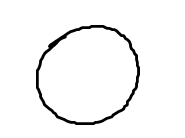
1s2 2s2 2p6 (notice that it has the same electron configuration as the Nitride ion… we call things that have the same electron configuration “isoelectric.”)

* 1. Barium atom

1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p6 5s2 4d10 5p6 6s2  (note: you will occasionally find them grouped by principle quantum number [ie. …3s2 3p6 3d10…] as this grouping has electrons of the same energy level together. The way I chose to do it, has them grouped together in the order they are filled.)

1. Draw and describe the Dalton, Thomson, Rutherford, and Bohr models of the atom.

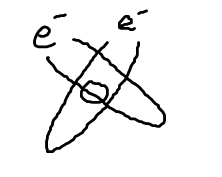
Dalton’s model looked like an “indivisible billiard ball.” Different atoms would differ in mass. This theory explained why certain gases bonded together in fixed ratios (twice as much hydrogen by volume as oxygen to make water for instance… remember **AVOGADRO’S HYPOTHESIS**: *Equal numbers of particles of gas will take up the same volume under the same temperature and pressure regardless of the size of the particles. This is because there is SO much space between particles in a gas*.)

The Dalton atom

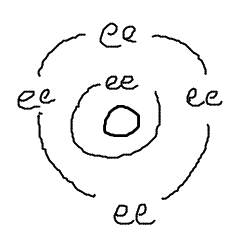
Thomson’s model looked like a plum pudding. In his cathode ray tube experiment, he was able to divide the atom and prove that there were negative particles in it (electrons,) by applying an electric/magnetic field to the resulting beam, he found that it bent, showing that it had a negative charge. Since the overall atom was neutral, he decided that the electron was like a positive matrix (the bread-ey bits) with negative particles inside it (the plums.)

The Thomson model

Rutherford proved in his gold foil experiment that the atom was mostly empty space. As a result of this, he hypothesized that the nucleus was a very small dense and positive mass in the middle of the atom, with negative electrons orbiting around the outside.

The Rutherford model

Bohr was looking to explain why the negative electron does not fall into the positive nucleus. He hypothesized that the electron must live in fixed orbits. The electron may be in one orbit or the other but not in between. This model explains why we see colour, and calculations using his formulas still work for one electron systems. Bohr’s model is the starting point for Quantum Chemistry.

The Bohr model

1. Briefly explain how Thomson’s experiment helped him create his model of the atom.

See linked videos.

1. Briefly explain how Rutherford’s experiment helped him create his model of the atom.

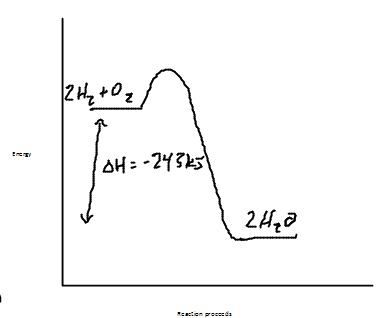
See linked videos.

1. Briefly explain how the Bohr model explains how we see colours.

See linked videos.

1. Draw a labeled reaction diagram for the exothermic reaction:

2H2 + O2 🡪 2H2O ∆H = - 243



∆H is negative so exothermic

Did I mention you should check out the linked videos? These ones are found on the Enthalpy page.