Science 10
Monday, April 23/18

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1. FA - Digits (Certain, Uncertain and Significant), Certainty Rule and Precision Rule

2. Rearranging Equations - Continue

3. Worksheets - Rearranging Equations

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4. Metric Conversions

5. Worksheet - Metric Conversions

6. SA - Physics #1
   - Topics (See Next Page)
   - Friday, April 27/18

7. Review - SA - Physics #1

SA - Physics #1 - Topics

1. definitions: physics, linear motion, physical quantity, significant digits, certainty, exact value, defined value, rounding digit, defining equation

2. SI System - International System of Units
   - know the SI base units for length, time and mass
   - be able to identify a derived unit

3. certainty - identify certain and uncertain digits in a measurement
   - determine the certainty of a measurement by stating its number of significant digits

4. scientific notation - be able to write a measurement in scientific notation

5. SDs and operation rules - Certainty Rule
   - -> multiply and divide
   - -> count total # of significant digits
   - -> round product or quotient to same # of SDs as original measurement with the fewest SDs

   - Precision Rule
     - -> add and subtract
     - -> count # of digits after the decimal
     - -> round sum or diffrrence to the same # of digits after the deciaml as the original measurement with the fewest digits after the decimal

6. rearrange an equation for a specified variable

7. perform metric conversions using conversion factors

Physics 112

Monday, April 23/18

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Midterm - Monday, April 30

1. FA - 1st Law Problem -> Submit Justifications

2. Check
   Worksheets - 1st and 2nd Law Problems

3. Newton's Third Law of Motion - Law of Action and Reaction

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4. FA - Newton's Laws of Motion

5. Concepts: U2 S3 - Introduction to Momentum

6. Momentum

7. Impulse

8. Worksheet: C5 - Momentum -> Page 197: PP #29
   C5 - Impulse -> Page 200: PP #30-32

9. Impulse-Mometum Theorem

10. Worksheets:
    C5 - Impulse-Momentum Page 203: PP #33-35
    C5 - Momentum and Impulse-Momentum Page 209: PFU #37-45

Physics 122

Monday, April 23/18

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Midterm - Thursday, April 26/18

1. FA - Electrostatics

2. Check:
   Worksheet - Current -> Textbook - C15 - Page 696, PP #4-10
   Worksheet - Resistance -> Textbook: C15, Page 708, #16-20

3. Ohm's Law - Continue

4. Worksheet - Ohm's Law -> Textbook: C15, Page 714, #21-25

5. Power - To Be Continued

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6. Worksheet - Textbook: Page 737, #40-42
   Page 744, #46-50

7. Series Circuits

8. The VIR Chart

9. Worksheet - (Series) Textbook: Page 719, #27-31

10. Parallel Circuits

11. Worksheet - (Parallel) Textbook: Page 724, C15 - PP#32-35

12. Combination/Complex Circuits

13. Worksheet - (Complex) Textbook: Page 728, #36-37
    Textbook: Page 749, #33-34

14. Worksheets - Circuit #1
    Circuit #2

Physics 122

Midterm Problems

Push/Pull **OR** Incline Plane

Static Torque

Relative Velocity - Boat/Plane

2D Collision/Explosion

Columb's Law - 3 Charges

Electric Field Strength

Science 122

Monday, April 23/18

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Midterm - April 30/18

1. Check
   Worksheet -Worksheet - Energy of Photons, Work Function, de Broglie Wavelength, Etc.

2. Bohr and Atomic Structure

3. Energy Level Diagrams

4. Worksheet - Energy Levels

5. FA - Photoelectric Effect and Energy Levels

6. Two More Types of Nuclear Reactions: Fission and Fusion

See the following pages for notes and last worksheet.

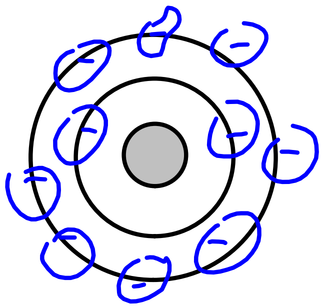
Niels Bohr and Atomic Structure

Bohr reached the following conclusions about atomic structure:

1. Within the atom there are certain allowed orbits (energy levels) around the nucleus, in which the electrons can move without giving off energy (ie/ the energy of the electron in an atom is quantized).

2. For the electron to occupy any one of the allowed orbits, it must possess the energy allowed for that orbit.

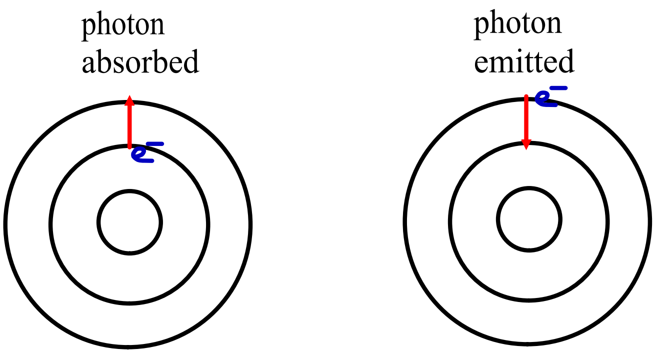
Bohr Atom



2e⁻
8e⁻

This model allows the electrons to move from one orbit to another.

"quantum jump"



Photons of only certain frequencies can be emitted or absorbed.

$$\Delta E = E_f - E_i$$

* energy levels

ΔE { positive when a photon is absorbed
negative when a photon is emitted

$$|\Delta E| = hf$$

Energy Level Diagrams

Energy level diagrams can be used to analyze the transitions of electrons from one level to another.

The diagrams consist of a series of lines running up the page representing energy levels from the ground state (n=1) through all the excited states (n = 2, 3, ...∞).

energy level 2 → n=2

1st excited state → n=2

The energy necessary to free an electron from state n is $-E_n$. This energy is known as the binding energy of state n. The closer to the nucleus the electron is, the less energy it has.

(n = ∞ is assigned a value of 0 eV)

Using the Bohr model, the energy levels, E_n (in eV), are calculated with the formula below where Z represents the atomic number of an atom:

$$E_n = -13.6\left(\frac{Z^2}{n^2}\right)$$

*

For hydrogen where Z = 1,

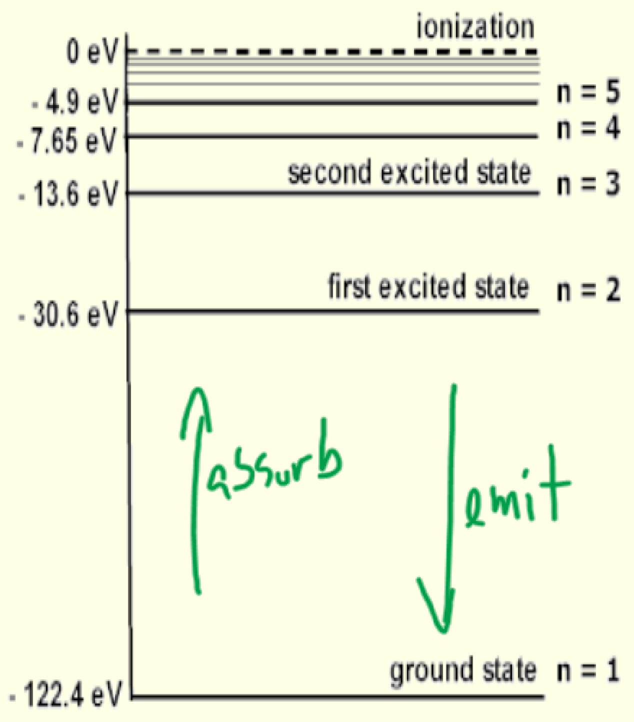
$$E_n = \frac{-13.6}{n^2}$$

NOTES: 1. As the value of n increases, the spacing between the adjacent levels decreases.

2. When the electron reaches n = ∞, it has been set free from the atom altogether and the atom is said to be ionized.

Example: **Energy Level Diagram**

Using Bohr's formula, a hypothetical, doubly-ionized atom with Z = 3 could have the following energy level diagram.



Example: $E_n = \frac{-13.6}{n^2}$ $\Delta E = E_f - E_i$ $|\Delta E| = hf$

An electron undergoes a transition from the 3rd level to the 2nd energy level in a hydrogen atom. What is the wavelength of the light that is emitted? (6.54×10^{-7} m)

$(1\text{nm} = 10^{-9}\text{m})$

$E_3 \rightarrow E_2$

energy emitted

$\Delta E = E_2 - E_3$

$E_2 = \frac{-13.6}{(2)^2}$

$E_2 = -3.40$ eV

$E_3 = \frac{-13.6}{(3)^2}$

$E_3 = -1.51$ eV

$\Delta E = -3.40 - (-1.51)$

$\Delta E = -1.89$ eV

lost E

$|\Delta E| = hf$

$* \; c = f\lambda$

$|\Delta E| = \frac{hc}{\lambda}$

$\lambda = \frac{hc}{|\Delta E|}$

$\frac{\text{eV s} \cdot \frac{m}{s}}{\text{eV}}$

$\lambda = \frac{(4.14 \times 10^{-15})(3.00 \times 10^{8})}{1.89}$

$\lambda = 6.54 \times 10^{-7}$ m.

Science 122

Worksheet - Energy Levels

1. Calculate the energy of the 2nd energy level of the hydrogen atom. (-3.40 eV)

2. An electron undergoes a transition from the 1st energy level to the 3rd energy level in a hydrogen atom. What is the wavelength of the radiation absorbed? (1.03×10^{-7} m)

3. An electron undergoes a transition from the 6th energy level to the 2nd energy level in a hydrogen atom. What is the frequency of the light emitted? (7.30×10^{14} Hz)

4. Calculate the energy require to ionize a hydrogen atom in which the electron is in the ground state. (13.6 eV)

5. An unexcited hydrogen atom (electron in the ground state) absorbed a photon of light that had a frequency of 3.09×10^{15} Hz. Through what transition did the electron in this atom undergo? (1 to 4)

6. A photon of light with a wavelength of 433 nm is emitted from an excited hydrogen atom in the 5th energy level. Through what transition did the electron in this atom undergo? (5 to 2)

FA - Photoelectric Effect and Energy Levels

1. One energy level in a helium atom has a value of -6.04 eV.
   a) Which excited state has this amount of energy?
   b) Calculate the wavelength, in nm, of the radiation emitted in the transition of an electron from this level to the ground state in the helium atom.

2. When light of frequency 8.6×10^{14} Hz is incident on a metal surface, the maximum kinetic energy of the photoelectrons is 0.500 eV. What is the work function of the metal?

3. If an electron has a speed of 1.0×10^{4} m/s, what potential difference must be applied to stop the electron?

4. A photon with a wavelength of 1.5×10^{-8} m is emitted from an ultraviolet source. Calculate the wavelength of an electron with kinetic energy equal to the energy of the photon.