

### Chapter 1

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- Significant Digits
  - Definition
  - Addition
  - Multiplication
- Density = Mass/Volume
- Conversions
- Metric Prefixes

### Chapter 2

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- Velocity = Distance/Time
- Acceleration = Velocity/Time
- Free Fall = Distance =  $\frac{1}{2}gt^2$
- Vector vs Scalar

### Chapter 3

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- Newton's three laws
  1. Inertia
  2. Force = mass \* acceleration
  3. Force = -Force
- Force is measured in Newtons
- Newton = N = kg\*m/s<sup>2</sup>
- Weight vs Mass
- Archimedes Buoyancy
- Conservation of momentum
- $M_1V_1=M_2V_2$  ( $W_1V_1=W_2V_2$ )

### Chapter 4

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- Work = Force \* Distance
- Work is measured in Joules
- Kinetic Energy =  $\frac{1}{2}mv^2$
- Potential Energy = mgh
- Total Energy = Kinetic Energy + Potential Energy
- Conservation of Energy
- Energy is measured in Joules
- Power = Work / time
- Power is measured in Watts
- Free Fall = velocity =  $\sqrt{2gh}$

### Chapter 5

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- Temperature is measured in
  - Fahrenheit
  - Celsius
  - Kelvin
- Temperature Kelvin = Temperature Celsius + 273
- Temperature Fahrenheit = 1.8(Temperature Celsius) + 32
- Temperature Celsius = (Temperature Fahrenheit - 32)/1.8
- Specific Heat = heat / (mass \* temperature change)

- Heat = mass \* specific heat \* temperature change =  $mc\Delta T$
- Heat = mass \* Latent Heat = mL
- Phase changes
- Energy Transfer = Conduction, Convection and Radiation
- Gas Laws
  - Boyle's Law
  - Charles' Law
  - Gay-Lussac Law
  - Combined gas equation
  - Ideal Gas law

### Chapter 6

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- Longitudinal Waves
- Transverse Waves
- Wavelength
- Period
- Amplitude
- Frequency
- Wave speed
- Electromagnetic Radiation
- Loudness / Decibel
- Doppler Effect

### Chapter 7

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- Reflection
- Refraction
- Law of Reflection
- Index of refraction =  $C/C_m$
- Spherical Mirrors
  - Convex
  - Concave
- Lenses
  - Convex
  - Concave
- Image characteristics
  - Real/Imagery
  - Upright/Inverted
  - Larger/Smaller
- Polarization
- Diffraction
- Interference
  - Constructive
  - Destructive

### Chapter 8

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- Mass and Charge
  - Proton: 1 AMU & +1
  - Neutron: 1 AMU & 0
  - Electron: 0 AMU & -1

- Law of Charges
  - + & + repel each other
  - - & - repel each other
  - + & - attract each other
  - - & + attract each other
- Inverse Square Law
- Coulomb's Law = Force =  $kq_1q_2/r^2$
- Current = Amperes = I
- Voltage = Volts = V
- Resistance = Ohms = R =  $\Omega$
- Ohm's Law = V = IR
- Power = P = Watts = VI
- Series Circuits =  $R_T = R_1 + R_2 + R...$
- Parallel Circuits =  $1/R_T = 1/R_1 + 1/R_2 + 1/R...$
- Magnetism
- Earth's magnetic field

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#### Chapter 9

- The Atom
  - Democritus
  - Dalton
  - JJ Thompson
  - Rutherford
- Photoelectric Effect
- Planck's Constant
- Thermal Radiation = Wein's Law
- Duality of Light
  - Particle
  - Wave
- Bohr Model of the atom
- Bright line / Emission Spectra
- Dark line / Absorption Spectra
- Quantum mechanics
- Lasers

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#### Chapter 10

- Common element names and symbols
- Atomic Number = Z
- Mass Number = A
- Neutrons = N
- Protons = P
- Electrons = E
- Isotopes
- Radioactivity
- Radioactive Decay
  - Alpha =  $\alpha = {}_2^4\text{He}$
  - Beta =  $\beta = {}_{-1}^0\text{e}$
  - Gamma =  $\gamma$
- Carbon Dating
- Nuclear Fusion

- Nuclear Fission

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#### Chapter 11

- Unsaturated Solutions
- Saturated Solutions
- Super Saturated Solutions
- Pure Substances
- Compounds
- Homogeneous Mixtures
- Heterogeneous Mixtures
- Allotropes
- Periodic Table
  - Electronegativity Trends
  - Ionization Energy Trends
  - Metal and Non Metal elements
  - Valence Electrons
  - Atomic Size Trends
- Chemical Formulas
- Naming binary compounds
- Types of elements

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#### Chapter 12

- Conservation of mass
- Ionic Compounds
- Formula Mass
- Law of Definite Proportions
- Mass Percent
- Limiting and Excess reactants
- Bonding
  - Ionic
  - Covalent
  - Pure Covalent
- Valence Electrons

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#### Chapter 13

- Chemical Reactions
- Chemical Equations
- Balancing Rules
- Types of Reactions
- Exothermic Reactions
- Endothermic Reactions
- Acids and Bases
- pH =  $-\log[\text{H}^+]$

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#### Chapter 14

- Astronomy
- There is a lot...