Name: _____

AP Physics C
Unit 1 Kinematics

1.1 Scalars and Vectors
1.2 Displacement, Velocity, and Acceleration
1.3 Representing Motion
1.4 Reference Frames and Relative Motion
1.5 Motion in Two or Three Dimensions

- Scalar
- Vector
- Quantity
- Magnitude
- Vector notation $\hat{r} = A\hat{\imath} + B\hat{\jmath} + C\hat{k}$
- Resultant vector $\vec{C} = \vec{A} + \vec{B} = (A_x + B_x)\hat{\imath} + \left(A_y + B_y\right)\hat{\jmath}$
- Position
- Direction
- Distance
- Displacement
- Speed
- Average speed
- Instantaneous speed
- Velocity
- Average velocity
- Instantaneous velocity
- Acceleration
- Instantaneous acceleration
- *suvat* equations
- Slope of a *displacement vs. time* graph
- Slope of a *velocity vs. time* graph
- Area under a *velocity vs. time* graph
- Area under an *acceleration vs. time* graph
- Acceleration from the force of gravity near the center of the Earth
- Reference frame
- Inertial reference frame
- Parallel
- Perpendicular
- Component
- SOH-CAH-TOA
- Pythagorean theorem
- Zero dimensions

- One dimension (x)
- Two dimensions (x, y)
- Three dimensions (x, y, z)
- Four dimensions (x, y, z, t)

Name: _____

AP Physics C
Unit 2 Force and Translational Dynamics

2.1 Systems and Center of Mass
2.2 Forces and Free-Body Diagrams
2.3 Newton's Third Law
2.4 Newton's First Law
2.5 Newton's Second Law
2.6 Gravitational Force
2.7 Kinetic and Static Friction
2.8 Spring Forces
2.9 Resistive Forces
2.10 Circular Motion

- Center of mass
- Center of mass with symmetrical mass distributions
- Center of mass for a nonuniform solid
- Linear mass density
- Force
    - Force of gravity (weight)
    - Normal force
    - Force of tension
    - Buoyant force
    - Drag force (force of friction)
    - Applied force
    - Spring force
- Contact forces
- Action at a distance forces
- Free body diagram
- Inertia
- Newton's first law of motion
- Newton's second law of motion
- Newton's third law of motion
- Ideal string
- Ideal spring
- Ideal pulley
- Static equilibrium
- Dynamic/Translational equilibrium
- Newton's universal law of gravitation
- Gravitational field strength
- Apparent weight

- Weightlessness
- Inertial mass
- Gravitational mass
- Newton's shell theorem
    - Net gravitational force inside a thin spherical shell
    - Net gravitational force outside a thin spherical shell
- Force of gravity
    - Force of gravity inside a solid sphere
    - Force of gravity outside a solid sphere
- Static friction
- Kinetic friction
- Coefficient of static friction
- Coefficient of dynamic friction
- Simplifying springs in parallel
- Simplifying springs in series
- Hooke's law
- Resistive force
- Integrating using separation of variables
- Terminal speed/velocity
- Circular motion
- Centripetal acceleration
- Radial acceleration
- Tangential acceleration
- Banked road with and without friction
- Centripetal force
- Centrifugal force
- Period
- Frequency
- Kepler's third law

Name: _____

AP Physics C
Unit 3 Work, Energy, and Power

3.1 Translational Kinetic Energy
3.2 Work
3.3 Potential Energy
3.4 Conservation of Energy
3.5 Power

- Translational kinetic energy
- Work
- Work done by a conservative force
- Work done by a nonconservative force
- Relationship between work and force
- Dot product
- Work-energy theorem
- Area under a *force vs. displacement* graph
- Potential energy
- Relationship between potential energy and force
- Analyzing graphs of *potential energy vs. position*
- Stable equilibrium
- Unstable equilibrium
- Elastic potential energy of an ideal spring
- To stretch
- To compress
- Equilibrium length
- General form of gravitational potential energy
- Law of conservation of energy
- Mechanical energy
- Power
- Average power
- Instantaneous power

Name: _____

AP Physics C
Unit 4 Linear Momentum

4.1 Linear Momentum
4.2 Change in Momentum and Impulse
4.3 Conservation of Linear Momentum
4.4 Elastic and Inelastic Collisions

- Linear momentum in one dimension
- Momentum in two dimensions
- Collision
- Explosion
- Relationship between momentum and force
- Relationship between force and impulse
- Rate of change of momentum
- Change in momentum
- Impulse
- Area under a *force vs. time* curve tells us impulse
- Slope of a *momentum vs. time* curve tells us force
- Impulse-momentum theorem
- Relationship between force, impulse, and change in momentum
- Law of conservation of linear momentum
- Center of mass velocity
- Elastic collision
- Inelastic collision
- Perfectly inelastic collision

Name: _____

AP Physics C
Unit 5 Torque and Rotational Dynamics

5.1 Rotational Kinematics
5.2 Connecting Linear and Rotational Motion
5.3 Torque
5.4 Rotational Inertia
5.5 Rotational Equilibrium and Newton's First Law in Rotational Form
5.6 Newton's Second Law in Rotational Form

- Angular position
- Angular displacement
- Angular velocity
- Angular acceleration
- Radians and degrees
- Rigid system
- Axis of rotation
- Clockwise
- Counterclockwise
- Average angular velocity
- Average angular acceleration
- Torque
- Lever arm
- Force diagram
- Cross product and right hand rule
- Rotational inertia
- Integrating to solve for rotational inertia
- Parallel axis theorem
- Rotational equilibrium
- Newton's first law in rotational form
- Newton's second law in rotational form

Name: _____

AP Physics C
Unit 6 Energy and Momentum of Rotating Systems

6.1 Rotational Kinetic Energy
6.2 Torque and Work
6.3 Angular Momentum and Angular Impulse
6.4 Conservation of Angular Momentum
6.5 Rolling
6.6 Motion of Orbiting Satellites

- Rotational kinetic energy
- Total kinetic energy includes both translational kinetic energy and rotational kinetic energy
- Equation relating work done and applied torque
- Area under a *torque vs. angular position* graph tells us work done
- Equation for angular momentum
- Equation for angular impulse
- Area under a *torque vs. time* graph tells us angular impulse
- Equation relating applied torque and angular impulse
- Change in angular momentum tells us angular impulse
- Equation relating applied torque and change in angular momentum
- Rotational form of impulse-momentum theorem
- Slope of an *angular momentum vs. time* graph tells us torque
- Area under an *applied torque vs. time* graph tells us angular impulse
- Law of conservation of angular momentum
    - spinning ice skater moving hands away and towards body
    - collapsing and expanding star
- Translational motion
- Rotational motion
- Translational kinetic energy
- Rotational kinetic energy
- Rolling and slipping
- Rolling without slipping
- Satellite
- In a circular orbit the following are constant for an orbiting satellite:
    - Total mechanical energy
    - Gravitational potential energy
    - Angular momentum
    - Kinetic energy
- In an elliptical orbit the following are constant for an orbiting satellite:
    - Total mechanical energy

    - Angular momentum
- In an elliptical orbit the following are not constant for an orbiting satellite:
    - Gravitational potential energy
    - Kinetic energy
- Gravitational potential energy, kinetic energy, and total energy of a circular orbiting satellite
- Escape speed/velocity

Name: _____

AP Physics C
Unit 7 Oscillations

7.1 Defining Simple Harmonic Motion (SHM)
7.2 Frequency and Period of SHM
7.3 Representing and Analyzing SHM
7.4 Energy of Simple Harmonic Oscillators
7.5 Simple and Physical Pendulums

- Simple harmonic motion
- Periodic motion
- Equilibrium position
- Restoring force
- Frequency
- Period
- Relationship between period and frequency
- Angular frequency
- Pendulum
- Energy of a simple harmonic oscillator
- Positions of minimum and maximum distance, displacement, speed, velocity, acceleration, kinetic energy, and potential energy in a pendulum and spring-mass system
- Resonance
- Natural frequency
- Relationship between amplitude and period
- Applying the law of conservation of energy to a simple harmonic oscillator
- Properties of a physical pendulum
- Equation for the period of a physical pendulum
- Restoring torque on a physical pendulum's center of mass
- Small angle approximation
- Torsion pendulum

Name: _____

AP Physics C
Unit 8 Electric Charges, Fields, and Gauss's Law

8.1 Electric Charge and Electric Force
8.2 Conservation of Electric Charge and the Process of Charging
8.3 Electric Fields
8.4 Electric Fields of Charge Distributions
8.5 Electric Flux
8.6 Gauss's Law

- Electrostatic force
- Charge
- Charge is quantized (discrete) and not continuous
- Point charge
- Coulomb's law
- Direction and sign of electrostatic force
- Electric permittivity
- Electric polarization
- Permittivity of free space ε_0
- Electric conductor
- Electric insulator
- Conservation of electric charge
- Distribution of charge in an object
- Movement of charge from contact, friction, or induction
- Grounding
- Electric field
- Test charge
- Electric field line diagrams
- Net electric field diagrams – vector field maps
- Test charge
- Electrostatic equilibrium
- Electric fields of charge distributions
- Dot product
- Flux
- Electric flux
- Gauss's law
- Gaussian surface
- Charge density

Name: _____

AP Physics C
Unit 9 Electric Potential

9.1 Electric Potential Energy
9.2 Electric Potential
9.3 Conservation of Electric Energy

- Electric potential energy
- Electric potential
- Electric potential difference
- Principle of superposition
- Relationship between the electric potential and electric field
- Electric field vector maps and equipotential lines
- Isolines of electric potential
- Isoline map
-
- Parallel-plate capacitor
- Capacitance
- Dielectric
- Moving a charged object with different electric potentials

Name: _____

AP Physics C
Unit 10 Conductors and Capacitors

10.1 Electrostatics with Conductors
10.2 Redistribution of Charge between Conductors
10.3 Capacitors
10.4 Dielectrics

- Conductor
- Ideal conductor
- Charge distribution within a conductor
- Electrostatic equilibrium
- Charge densities on points/edges vs. planar areas
- Polarization of a conductor from an external electric field
- Electrostatic shielding
- Contact between two conductors
- Grounding
- Parallel-plate capacitor
- Capacitance
- Electric field between a parallel plate capacitor
- Electric potential energy stored in a capacitor
- Dielectric
- Dielectric constant
- Electric permittivity
- Permittivity of free space

Name: _____

AP Physics C
Unit 11 Electric Circuits

11.1 Electric Current
11.2 Simple Circuits
11.3 Resistance, Resistivity, and Ohm's Law
11.4 Electric Power
11.5 Compound Direct Current (DC) Circuits
11.6 Kirchoff's Loop Rule
11.7 Kirchoff's Junction Rule
11.8 Resistor-Capacitor (RC) Circuits

- Electric current
- Drift velocity
- Electric potential difference (electromotive force emf ε)
- Conventional current and movement of electrons
- Current density
- Circuit
- Wire
- Battery
- Resistor
- Lightbulb
- Capacitor
- Switch
- Ideal ammeter
- Nonideal ammeter
- Ideal voltmeter
- Nonideal voltmeter
- Closed loop
- Closed circuit
- Open circuit
- Short circuit
- Resistance
- Resistivity
- Resistivity and temperature
- Ohm's law
- Ohmic materials
- Graphs of current vs. potential difference
- Electric power
- Relationship between the brightness of a light bulb and power
- Equivalent resistance

- Resistors in series
- Resistors in parallel
- Ideal wire
- Wires with resistance
- Ideal battery
- Batteries with internal resistance
- Ammeter
- Ideal ammeter
- Voltmeter
- Ideal voltmeter
- emf ε
- Kirchoff's loop rule and law of conservation of energy
- Kirchoff's junction rule and law of conservation of charge
- RC circuits
- Equivalent capacitance
- Capacitors in series
- Capacitors in parallel
- Time constant τ of an RC circuit
- Charging and discharging a capacitor

Name: _____

AP Physics C
Unit 12 Magnetic Fields and Electromagnetism

12.1 Magnetic Fields
12.2 Magnetism and Moving Charges
12.3 Magnetic Fields of Current-Carrying Wires and the Biot-Savart Law
12.4 Ampere's Law

- Magnetic fields
- Magnetic dipole
- Magnetic monopole
- Magnetic field lines
- Vector field map
- Gauss's law for magnetism
- North pole and south pole
- Magnetic dipole
- Permanent magnetism
- Induced magnetism
- Relationship between magnetic field strength and distance
- Ferromagnetic materials
- Paramagnetic materials
- Diamagnetism
- Magnetic permeability of free space
- Magnetic permeability of a material
- Magnetic field produced by a moving charge
- Cross product
- Right hand rule
- Force exerted on a moving charged object from an external magnetic field
- Hall effect
- Magnetic field produced by a current carrying wire
- Biot-Savart law
- Ampere's law
- Amperian loop
- Solenoid
- Force exerted on a current carrying wire by an external magnetic field

Name: _____

AP Physics C
Unit 13 Electromagnetic Induction

13.1 Magnetic Flux
13.2 Electromagnetic Induction
13.3 Induced Currents and Magnetic Forces
13.4 Inductance
13.5 Circuits with Resistors and Inductors (LR Circuits)
13.6 Circuits with Capacitors and Inductors (LC Circuits)

- Flux
- Magnetic flux
- Induced electric potential difference from a change in magnetic flux
- Faraday's law
- Len's law and the right hand rule
- Induced emf
- Faraday's law of induction
- Induced current
- Inductor
- Inductance
- Magnetic permeability
- Energy stored by an inductor
- Time constant of an LR circuit
- Electric properties of inductors when the current is changing
- Relationship between SHM and an LC circuit
- Angular frequency of an oscillating LC circuit