Cheat Sheet: Definitions of Phenomena and Topics from Lectures

Lecture 1: Basics

- **Position**: The location of a point relative to a reference point.
- **Velocity**: The rate of change of position with respect to time. Defined as $v = \frac{\Delta x}{\Delta t}$.

Lecture 2: Kinematics

- **Kinematics**: The study of motion without considering the forces that cause it.
- **Average Velocity**: The displacement divided by the time interval over which the displacement occurs, $v_{avg} = \frac{x(t_2) - x(t_1)}{t_2 - t_1}$.
- **Motion along a Straight Line**: Example given by $x(t) = c \cdot t^2$.

Lecture 3: Laws of Dynamics

- **Classical (Galilean) Principle of Relativity**: The laws of mechanics are the same in all inertial frames of reference.
- **Inertial Mass**: A measure of an object's resistance to changes in motion.
- **Linear Momentum**: Defined as $\vec{p} = m \cdot \vec{v}$.
- **Newton's First Law**: A body remains at rest or in uniform motion unless acted upon by a net external force.
- **Newton's Second Law**: The rate of change of momentum of a body is equal to the net force acting upon it, $\frac{d\vec{p}}{dt} = \vec{F}$.
- **Newton's Third Law**: For every action, there is an equal and opposite reaction.
- **Friction**: The resistance force that opposes the motion or attempted motion of an object. It has two types, static friction (μ_s) and kinetic friction (μ_k).
- **Drag**: The resistance force experienced by objects moving through fluids.

Lecture 4: Oscillations

- **Elasticity**: The property of a material to return to its original shape after deformation.
- **Hooke's Law**: The force exerted by a spring is proportional to its extension or compression, $F = k \cdot (l - l_0)$.
- **Simple Harmonic Motion (SHM)**: Motion where the restoring force is directly

proportional to the displacement and acts in the direction opposite to that of displacement.
- **Damped Oscillations**: Oscillations where the amplitude decreases over time due to energy dissipation.
- **Forced Oscillations**: Oscillations that occur when an external force drives the system.

Lecture 5: Rotational Motion of Rigid Bodies

- **Rotational Motion**: The motion of a body about a fixed axis.
- **Moment of Inertia**: The resistance of a body to change its rotational motion, dependent on mass distribution relative to the axis of rotation.

Lecture 6: Wave Motion

- **Waves**: Disturbances that transfer energy from one point to another in a medium.
- **Transverse Waves**: Waves where the displacement is perpendicular to the direction of propagation.
- **Longitudinal Waves**: Waves where the displacement is parallel to the direction of propagation.
- **Wave Function**: Describes the position of a point in the medium as a function of time and space.
- **Harmonic Waves**: Waves described by sinusoidal functions.
- **Standing Waves**: Waves that remain in a constant position.

Lecture 7: Potential Energy and Electrostatics

- **Potential Energy**: The energy possessed by a body due to its position relative to others.
- **Conservative Force**: A force with the property that the work done in moving a particle between two points is independent of the path taken.
- **Gravitational Field**: A field representing the gravitational force exerted by a mass.
- **Electric Charge**: A fundamental property of matter that causes it to experience a force when placed in an electromagnetic field.
- **Coulomb's Law**: Describes the electrostatic force between charged particles, $F = k_e \frac{q_1 q_2}{r^2}$.
- **Electric Field**: A field around charged particles that exerts a force on other

charged particles.

- **Electric Potential Energy**: The work done to move a charge within an electric field.
- **Electric Potential**: The electric potential energy per unit charge, measured in volts (V).

This cheat sheet covers the key definitions and phenomena discussed in the provided lectures.