Summary, Part II

C9: Rotational Energy

- Radians: $\theta \equiv s/r$.
- Angular Velocity: $\omega \equiv \Delta\theta/\Delta t$.
- $v = r\omega$.
- Rotational Kinetic Energy: $K^{\text{rot}} = \frac{1}{2}I\omega^2$.
- Moment of Inertia: $I = \sum_i m_i r_i^2$.
- Rolling without slipping: $\omega = v_{\text{cm}}/R$.

C10: Thermal Energy

- Specific heat c
- Internal energy: $dU^{\text{th}} = mc\Delta T$.

C11: Energy in Bonds

- Potential Energy Diagrams
- Bonds
- Latent heat L
- Internal Energy: $\Delta U = |mL|$.

C12: Applications

- Power: $P = \Delta E/\Delta t$.
- 1 Watt = 1 Joule / second.
- One kiloWatt-hour = 3.6 MJ.

C13: Angular Momentum

- Angular momentum of a particle: $L = mrv_\perp$, where $v_\perp$ is the component of v perpendicular to r.
- Angular momentum of a particle moving in a circle of radius r: $L = mr^2\omega$.
- Angular momentum of extended object: $L = I\omega$.

N2: Acceleration

- Acceleration: $\vec{a} \equiv d\vec{v}/dt$.
- Motion Diagrams.
- Uniform Circular Motion: $a = v^2/r$.

N3: Newton's Laws

- First Law: For an isolated system, $\vec{v}_{\rm cm}$ is constant.
- Second Law: $\vec{F}_{\rm net} = m\vec{a}$.
- An interaction between two objects A and B leads to forces on them that are equal in magnitude but opposite in direction.

N4: Forces from Motion

- Kinematic Chain: $v = dx/dt$; $a = dv/dt$.
- Free-body diagrams and Net-force diagrams.

N4: Motion from Forces

- Reverse kinematic chain
- Graphical anti-derivatives