

Circular Motion/ Rotational Mechanics

- Centripetal vs. “centrifugal” force
- When normal force, friction force, and force of tension act as centripetal forces
- Tangential speed
- Period vs. Frequency
- Angular speed
- Angular acceleration
- Artificial gravity on a spinning space station
- Torque
- Balancing torques
- Rotational Inertia
- Angular Momentum
- Conservation of angular momentum
- Ice skaters
- Rotating cats
- Fidget spinner lab

Space/Gravity

- Newton’s Universal Law of Gravitation
- Orbiting speed
- Orbiting period
- Escape speed
- Gravitational potential energy
- Kinetic energy
- Satellite motion
- Kepler’s 3 Laws of planetary motion
- Exoplanet detection methods
- Eclipses and tides
- Eccentricity

Sound/Waves

- Period, frequency, Wavelength, Amplitude, crests, troughs
- Pitch and loudness, compressions and rarefactions of sound waves
- Doppler effect
- Sonic boom
- Acoustic levitation
- Resonance
- Beats
- Standing waves and harmonics
- Forced vibrations and natural frequency
- Speed of sound and wave speed
- Ultra- vs. infra- vs. super- vs. subsonic
- Interference and interferometry
- Diffraction and reflection, double slit experiment
- Simple harmonic motion and restoring force: Pendulums and springs
 - Force, acceleration, KE, PE, angular speed during SHM