Physics 20
Unit C: Circular Motion & Energy

Knowledge Checklist (Do I know?)

Concept	Example/Explanation	Follow-up Questions I want to ask.
1. Define Uniform Circular Motion	What happens to speed, velocity, displacement, distance and acceleration in uniform circular motion? What is the relationship between $v = \frac{d}{t}$ and $v = \frac{2\pi r}{T}$?	
2. Define centripetal acceleration and centripetal force.	What is the relationship between centripetal acceleration and centripetal force?	
3. Know Kepler's 3 Laws of Planetary Motion	Explain Kepler's 3 laws. Use Kepler's laws to qualitatively predict where a satellite will be moving fastest/slowest. Explain how Kepler's Laws aided in the development of Newton's Law of Universal Gravity	
4. Know how Newton's Laws of Motion & Gravitation can be applied to Satellite Motion.	Set up a Net Force Equation for an object in Uniform Circular Motion.	
5. Know the terms: • Work • Mechanical Energy • Kinetic Energy • Gravitational Potential Energy • Power • Open, Closed & Isolated Systems	Define each term. Are they vectors or scalars? What are the units? What is the Work/Energy Theorem? What is the relationship between kinetic, gravitational potential and total mechanical energy? Be able to identify when a system has maximum kinetic and maximum potential energy. Explain the difference between open, closed and isolated systems.	

Skills Checklist (Can I Do?)

Concept	Example/Explanation	Follow-up Questions I have
1. Qualitatively & quantitatively explain Uniform Circular Motion	Use the equation $v = \frac{2\pi r}{T}$ to calculate speed, radius, period or frequency of an object in uniform circular motion.	
2. Analyze horizontal and vertical circular motion using Newton's Laws.	Use the equations: • $a_c = \frac{v^2}{r} = \frac{4\pi r^2}{T^2}$ • $F_c = \frac{mv^2}{r} = \frac{4\pi r^2 m}{T^2}$ • $F_{net} = \Sigma F$ To determine the tension of a string, speed, mass or radius of string in both horizontal and vertical circular motion.	
3. Analyze Circular Motion Graphical	Construct graphs of Force vs Period or Frequency of an object in Uniform Circular Motion. Understand the relationship between the above graphs. Know how to straighten the graphs. Use area and slope to quantitatively analyze the above graphs.	
4. Quantitatively Analyze the Motion of Celestial Bodies	Use Kepler's Third Law ($k = \frac{T^2}{r^3}$) to determine period or orbital radius of celestial bodies. Use the relationship between F_g and F_c to predict the mass, orbital radius, speed, or period of a celestial body.	
5. Apply the Work-Energy Theorem	Determine the amount of Work done on an object (W = Fd) Determine the change in kinetic energy (or speed) of an object if work is done on the object ($W = \Delta E$)	
6. Quantitatively Analyze the motion of an object using Conservation of Energy	Understand how to apply the equations: • $E_p = mgh$ • $E_p = \frac{1}{2}kx^2$ • $E_k = \frac{1}{2}mv^2$ Can you determine the Kinetic Energy or speed of an object based on its maximum potential energy? Can you determine the potential energy (or position) of an object based on its maximum kinetic energy?	
7. Quantitatively Analyze a system based on Energy and Power Considerations	Can you determine the Power Output of a System ($P = \frac{W}{t}$)? Can you use the equation above to calculate the energy used, change in height or speed, or the time required to move an object?	