

Physics 172 – Recitation 08

Spring 2012

Purpose: The purpose of this recitation is to allow you to gain further experience working with the Energy Principle as applied to bound systems. You will gain more experience with potential energy and energy graphs.

Readings: Sections 6.10-6.14, 7.1-7.5

General Instructions:

- Identify your system
- State which objects are interacting with the system
- State the fundamental principle(s) you use to solve the problems
- State the approximations and simplifying assumptions you use.

Problem 1. Consider a satellite with a mass of 200 kg in a circular, low-Earth orbit, one just above the Earth's atmosphere which is about 50 km thick.

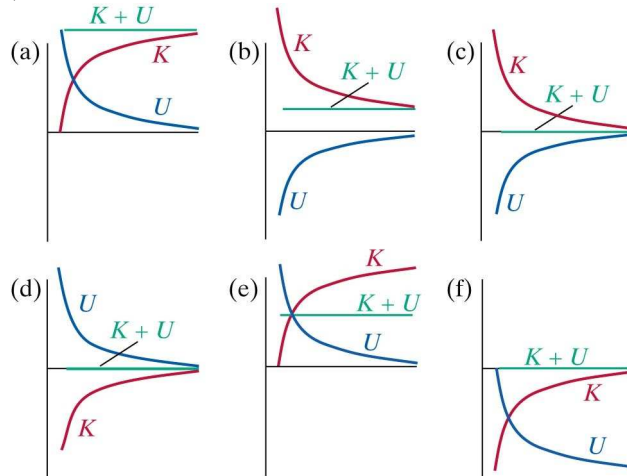
- a) What is the speed of the satellite?
- b) NASA scientists plan to put this satellite into a final orbit in which it will function as a communication satellite that relays messages between two ground stations. To do this, the satellite's final circular orbit must run above the equator and be geosynchronous, that is, its orbital period must be 24 hours so that the satellite is always visible from both ground stations. What is the radius of such an orbit?

Checkpoint 1

- c) How much energy must be expended to boost the satellite from low-Earth to geosynchronous orbit?

Checkpoint 2

Problem 2. Consider the following energy graphs of two particles that start out far apart, moving toward each other (that is, their initial velocities are nonzero and they are heading straight at each other)



a) Which of these diagrams corresponds to a system of two electrons that start out far apart, moving toward each other? Explain why you chose the one you did.

b) Which of the diagrams corresponds to a system of a proton and an electron that start out far apart, moving towards each other? Explain why you chose the one you did.

Checkpoint 3