

Review for Test #3

□ Responsible for:

- Chapter 4 (4.11, 4.12, 4.17), Chapter 5 (5.1-5.8, 5.10), Chapter 6 (6.1-6.9, 6.17-6.19), Chapter 7 (7.1-7.2), also chapters 1-4
- Notes from class
- Problems worked in class; Homework assignments

□ Test format: 4 problems (15 points each)

- 1 problem (30 points)
- 1 set of conceptual questions (10 points)
- Time: 75 minutes

□ Test materials: Pencil, eraser, and non-programmable calculator; No formulae sheet or paper (provided); closed textbook and notes

Rules for the Test

- ❑ One empty seat between each student
- ❑ No talking during test, except to proctor or instructor
- ❑ Put name and 811 number on test (first page)
- ❑ Bring Student ID
- ❑ All electronics turned **off** (phones, tablets, computers, etc.), except simple calculator
- ❑ Proctor is watching!

Material Covered

□ Chapter 4: Contact Interactions

- spring-mass system, simple ODEs
- simple harmonic motion, frequency, period
- pendulums, spring model of solids

□ Chapter 5: Curvilinear Motion

- uniform circular motion (UCM), radial acceleration
- applications of Newton's 2nd law: curved roads
- orbital motion of satellites: velocity and period
- rotational kinematics (displacement, velocity, accel)
- tangential velocity and acceleration
- general curvilinear motion (\parallel and \perp forces)
- scalar product of vectors

Material Covered (Cont'd)

Chapter 6: The Energy Principle

- non-relativistic kinetic energy, work
- work-kinetic energy theorem
- total relativistic energy, rest energy (single particle)
- general energy principle with rest energy
- potential energy of multiple particles
- gravitational potential energy
- Coulomb potential energy
- Conservative and non-conservative forces
- Work done by non-conservative forces
- Energy problems with non-conservative work

☐ Chapter 7: Internal Energy

- Potential energy for the spring,
- Power, potential energy of the strong force

Example Problem

The electric company bills you in “kilowatt hours”, abbreviated kWh.

- a) Is this energy, power, or force?
- b) Monthly electric use of a typical household is 500 kWh. What is this in basic SI units?
- c) What is the average power usage?

Example Problem

A non-constant force acts on an object of mass m displacing it a certain distance. If $\mathbf{F} = \langle 3x^2 - x, y, -z^{-3} \rangle$ N from $\mathbf{r}_i = \langle 0, 0, 1.00 \rangle$ m to $\mathbf{r}_f = \langle 3.00, 2.00, 2.00 \rangle$ m, what is the total work done by the external force?