

## **Physics 50 Lecture Final Review**

### **1. MOTION IN 1-D**

- a) Understand the terms and concepts required to describe the motion of a particle moving in one dimension.
- b) Know how to use the kinematic equations to describe the motion of an object moving with constant acceleration
- c) Know how to use the graphs of  $x$  vs.  $t$ ,  $v$  vs.  $t$ , and  $a$  vs.  $t$  to find the position, velocity, and acceleration of a particle moving with constant or non-constant acceleration.
- d) Know how to apply the kinematic equations to object in free-fall motion.
- e) Understand and know how to define the following terms:
  - Position
  - Displacement
  - Average velocity
  - Instantaneous velocity
  - Average speed
  - Average acceleration
  - Instantaneous acceleration
  - Free-fall Motion
  - Acceleration of gravity

### **2. VECTORS**

- a) What is a vector quantity?
- b) What is a scalar quantity?
- c) Know how to add vectors graphically (geometrically) and using component method.
- d) What are unit vectors? What are they used for?
- e) Know how to calculate displacement, velocity (average), and acceleration (average) vectors.
- f) How do you draw the velocity vector given the path of the particle?
- g) Vector properties (equality of vectors, commutative law, associative law, vector subtraction, negative of a vector, scalar multiplication)
- h) Scalar component of a vector.
- i) Vector components of a vector.
- j) Magnitude and direction of a vector.
- k) Know how to sketch vectors graphically.

### **3. MOTION IN 2-D**

- a) Motion in 2D can be analyzed by treating the  $x$  and  $y$  motion separately. The two motions are independent, each with constant acceleration.
- b) Kinematic equations can be used to describe motion in 2-D since it's motion with constant acceleration.
- c) Calculate the maximum height of a projectile.
- d) Calculate the range of a projectile. What is the maximum range?
- e) What is the path (trajectory) of a projectile moving in 2-D?
- f) What is uniform circular motion (UCM)?
- g) What is the magnitude and direction of the acceleration of a particle moving in UCM?
- h) What equations can I use to calculate radial (centripetal) acceleration?
- i) What is the circumference of a circle?

**4. NEWTON'S LAWS OF MOTION (VERY IMPORTANT!!!!!!)**

- a) Make sure you're able to write down Newton's 3 laws of motion and be able to explain conceptually and practically each one of them.
- b) Know how to apply Newton's Laws of Motion to describe the motion of a system in equilibrium or moving with constant acceleration. See " STEPS IN USING NEWTON'S LAWS OF MOTION" on notes on homepage.
- c) ALWAYS define your system when applying Newton's Laws.
- d) Define a convenient SYSTEM and use a convenient coordinate system to apply Newton's Laws.
- e) ALWAYS draw a FREE-BODY diagram when applying Newton's Laws making sure to include ALL external forces acting on system !!!!!
- f) Newton's Laws fail when applied to particles moving near the speed of light and when applied to the subatomic scale.
- g) What is an inertial reference frame?
- h) What are the 4 fundamental forces of nature?
- i) Give examples of different types of forces.
- j) Know how to apply Newton's Laws to a system moving in Uniform Circular Motion.
- k) Kinetic and static frictional forces.
- l) Coefficients of friction.
- m) What is the maximum value of static frictional force? How can you calculate it?
- n) Is there a maximum value of kinetic frictional force?
- o) Understand and know how to define the following terms:
  - Equilibrium
  - Conditions for equilibrium
  - Net (resultant) force
  - External forces
  - Internal forces
  - System
  - Free-Body Diagram (very important)
  - Mass
  - Inertia
  - Weight

**5. WORK**

- a) Know the definition of the scalar (dot) product.
- b) Know how to compute the scalar product.
- c) Definition of work  $W = \vec{F} \bullet \vec{s}$
- d) Work is a scalar quantity NOT a vector quantity.
- e) What is the physical interpretation of work?
- f) How do you compute the net work on a system?
- g) What does negative work mean?