

EXAM-1

PHYS 201 (Fall 2011), 09/23/11

Name:

Lab-Sect. no.:

Signature:

Duration: 50 minutes

Show all your work for full/partial credit!

Include the correct units in your final answers for full credit!

Unless otherwise stated, quote your results in SI units!

1.) *Multiple Choice**(18 pts.)*

For each statement below, circle the correct answer (TRUE or FALSE, no reasoning required).

- (a) In projectile motion, the acceleration of the object at the highest point of its trajectory is zero.
TRUE FALSE
- (b) In uniform circular motion, the velocity of the object is constant.
TRUE FALSE
- (c) The inside of an accelerating train is an inertial reference frame.
TRUE FALSE
- (d) The normal force on an object resting on a horizontal surface is always equal and opposite to the object's weight force.
TRUE FALSE
- (e) At the microscopic level, most of the forces around us are due to the electromagnetic force.
TRUE FALSE
- (f) The static friction force on an object depends on the externally applied force, both in direction and magnitude.
TRUE FALSE

No.	Points
1	
2	
3	
4	
5	
Sum	

2.) *Relative Motion*

(20 pts.)

The captain of a Mississippi ferry boat aims his vessel straight across the river which is $235m$ wide. The still-water speed of the vessel is $2.8m/s$. The boat arrives at the opposite shore being deflected by $180m$ relative to the path straight across.

- (a) Calculate the time it takes the ferry to cross the river.
- (b) Draw the velocity addition diagram and calculate the speed of the river current and the speed of the ferry relative to the ground.

3.) *Projectile Motion*

(20 pts.)

A kid throws a baseball toward a tall building at a horizontal distance of 23m away. Upon impact, the ball smashes a window, which the kid measures to happen 1.9s after launch. The kid also knows that he launches the ball with a speed of 35mph. ($1m/s = 2.25mph$)

- (a) Calculate the launch angle above the horizontal.
- (b) How high above the launch point does the ball strike the building?

4.) *Equilibrium*

(20 pts.)

Two boxes are connected via an ideal string passing over a frictionless pulley. One box (mass 35kg) is resting on an inclined frictionless plane with inclination angle 25° above the horizontal, the other is hanging freely.

- (a) Draw a free-body diagram of each box including nontrivial angles.
- (b) Calculate the mass of the freely hanging box for the system to be in equilibrium.

5.) *Newton's Law and Friction*

(8+6+8 pts.)

A junkyard worker is pulling a car hood (mass 120kg) on a horizontal dirt road using an ideal rope. The rope makes an angle of 20° with the road and is under a tension of 350N . The car hood is accelerating at a rate of 0.4m/s^2 .

- (a) Draw a free-body diagram of the hood including all forces acting on it.
- (b) Calculate the normal force on the hood.
- (c) Calculate the kinetic friction coefficient between road and hood.