

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.