

MIDTERM EXAM-1

PHYS 201 (Spring 2014), 02/10/14

Name:

Lab-Sect. no.:

Signature:

In taking this exam you confirm to adhere to the Aggie Honor Code:  
"An Aggie does not lie, cheat, steal or tolerate those who do."

*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) If a projectile is thrown vertically upward, the time to return to the launch point is twice as long as the time to reach the maximal height.  
TRUE                      FALSE
- (b) In projectile motion, the acceleration at the highest point of the motion is not zero.  
TRUE                      FALSE
- (c) Since the speed in uniform circular motion is constant, the acceleration is zero.  
TRUE                      FALSE
- (d) If a person exerts a force on an object, that object exerts an equal-opposite force on the person.  
TRUE                      FALSE
- (e) The normal force on an object is always equal-opposite to its weight force.  
TRUE                      FALSE
- (f) The static friction force on an object acts in the same direction as the normal force on that object.  
TRUE                      FALSE

No.	Points
1	
2	
3	
4	
5	
Sum	

2.) *Relative Motion*

(20 pts.)

An airplane is scheduled to fly due west from Houston to San Antonio. However, a strong north wind is blowing at a speed of 50 *mph*. The cruising speed of the plane in still air is 350 *mph*.

- (a) Draw a diagram of the how the velocities add up to the total.
- (b) At what angle relative to west does the pilot have to aim the plane to make sure to fly straight west relative to the ground?

3.) *Projectile Motion*

(20 pts.)

On an indoor court, a tennis player hits a ball with the rim of his racket, launching it at a speed of 45 *mph* and an angle of  $60^\circ$  above the horizontal. After 1.4 *s*, the ball hits the ceiling. ( $1 \text{ m/s} = 2.25 \text{ mph}$ )

- (a) What is the speed of the ball when it hits the ceiling?
- (b) How high above the launch point is the ceiling?

4.) *Tension Force*

(4+8+8 pts.)

The 50 cars of a freight train are connected with cables which can safely withstand a tension of up to half of a car's weight force. Assume each car to have the same mass, which, however, is not known. Neglect friction. (1 m/s = 2.25 mph)

- (a) If the train is accelerating, which of the 50 cables bears the maximum tension?
- (b) How large is the maximal (safe) acceleration of the train?
- (c) Under maximal acceleration, how much distance is required to reach a speed of 55 mph when starting from rest?

5.) *Inclined Plane with Friction*

(8+8+6 pts.)

A box is released from rest, sliding down a plane inclined at an angle of  $28^\circ$  above the horizontal. The starting point of the box is at a vertical height of  $1.7\text{ m}$  above ground level, and the kinetic friction coefficient between box and plane surface is 0.15.

- (a) Draw the free-body diagram of the box.
- (b) Calculate the acceleration of the box.
- (c) How long (in  $s$ ) does it take the box to reach the ground level at the end of the plane?