

EXAM-1 – v1

PHYS 201 (Spring 2007), 02/13/06

Name:

Lab-Sect. no.:

Signature:

Duration: 75 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) When adding two vectors \vec{A} and \vec{B} , the magnitude of the resultant vector is equal to the sum of the magnitudes of \vec{A} and \vec{B} .
TRUE FALSE
- (b) In 1-D motion with constant (positive) acceleration, the velocity vs. time graph, $v(t)$, is a straight line.
TRUE FALSE
- (c) The normal force on an object in contact with a horizontal surface is always equal in magnitude to its weight force.
TRUE FALSE
- (d) If a driver takes a turn with his car, Newton's 2. law of motion implies that the driver experiences a centrifugal force.
TRUE FALSE
- (e) If an object is in a uniform circular motion, the net acceleration of that object is zero.
TRUE FALSE
- (f) Two books in a bookshelf attract each other by a small gravitational force.
TRUE FALSE

No.	Points
1	
2	
3	
4	
5	
6	
Sum	

2.) *1-D Motion*

(18 pts.)

At time $t_0 = 0s$, a block, initially at rest, starts sliding down a plane with constant acceleration. During the time interval from $t_1 = 6s$ to $t_2 = 10s$ it moves a distance of $2m$.

- (a) What is the average speed of the block between t_1 and t_2 ?
- (b) Sketch a graph of the blocks speed as a function of time, $v(t)$, for $t = 0 - 10s$. Indicate on the graph the speed at time $t = 8s$.
- (c) What is the acceleration of the block?

3.) *Projectile Motion*

(18 pts.)

A kid throws a stone toward a tall (vertical) building wall without windows. He launches the stone with initial speed $v_0 = 45\text{mph}$ at an angle of 40° above the horizontal, and records the time of impact at the wall at 2.4s after launch. ($1\text{m/s} = 2.25\text{mph}$)

- (a) How far from the building's base is the the kid's position?
- (b) At what height above the ground does the stone hit the building?
- (c) What is the angle of the stone's velocity relative to the horizontal immediately before hitting the wall?

4.) *Newton's Law and Friction*

(18 pts.)

A factory worker applies a horizontal force to a box which is initially at rest on a horizontal surface. When the force reaches $260N$ the box starts moving. The worker then maintains this force. The static friction coefficient between box and floor surface are $\mu_s = 0.35$.

- (a) Draw a free-body diagram of the box.
- (b) What is the mass of the box?
- (c) After the box starts moving, it reaches a speed of $1.5m/s$ after a distance of $2m$. What is the kinetic friction coefficient between box and floor surface?

5.) *Circular Motion and Tension*

(18 pts.)

A bowling ball of mass 45kg is attached to the ceiling via a massless rope of length 2.5m . The ball is pulled to the side and released, resulting in a swinging motion which describes the arc of a circle. As the ball swings through the lowest point, its speed is 3.2m/s .

- (a) Draw a free-body diagram for the ball at the lowest point.
- (b) What is the net acceleration of the ball at the lowest point?
- (c) What is the tension force in the rope at the lowest point?

6.) *Gravitation on the Moon*

(10 pts.)

The Moon's mass and radius are $M_M = 7.35 \cdot 10^{22} kg$ and $R_M = 1740 km$. Use Newton's universal law of gravitation (as well as Newton's 2. Law of motion) to calculate the acceleration due to gravity, g_M , on the Moon's surface. What percentage of $g = 9.8 m/s^2$ does this correspond to?