

MIDTERM EXAM-1 – v1

PHYS 201 (Spring 2016), 02/15/16

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) The stopping distance of a car doubles if the speed of the car doubles (assume a constant deceleration).
TRUE FALSE
- (b) The magnitude of the centripetal acceleration in uniform circular motion is constant.
TRUE FALSE
- (c) The velocity vector in uniform circular motion is constant.
TRUE FALSE
- (d) The gravitational acceleration of a feather is equal to that of a metal block.
TRUE FALSE
- (e) Newton's three laws of motion are valid in accelerating reference frames.
TRUE FALSE
- (f) If a truck is accelerating horizontally in positive x -direction, a box which rests on its loading bed is accelerated by the static friction force between box and bed.
TRUE FALSE

No.	Points
1	
2	
3	
4	
5	
Sum	

2.) *Free Fall*

(21 pts.)

A construction worker on top of a building wonders how tall the building is. He drops a brick from rest and measures the time until impact on the ground to be 3.7 s (neglect air resistance).

- (a) How tall is the building?
- (b) How fast is the brick moving just before it hits the ground?
- (c) Sketch the graphs for the brick's speed and height as a function of time.

3.) *Projectile Launch*

(21 pts.)

A projectile, starting from rest, is accelerated along a 120 m long ramp at a rate of 10.4 m/s^2 . The ramp is inclined at an angle of 40° above the horizontal. After leaving the ramp, only gravity is acting.

- (a) Calculate the speed of the projectile when leaving the ramp.
- (b) Calculate the maximal height reached by the projectile (relative to the exit point from the ramp).
- (c) Calculate the horizontal displacement of the projectile (relative to the exit point from the ramp) when reaching the maximal height.

4.) *Tension Force*

(5+10 pts.)

A uniform metal chain with a total mass of 150 kg can sustain a maximal tension of 4000 N in each of its identical links. The chain is deployed to lift a boulder of ore (mass 220 kg) attached to its end out of a quarry straight up.

- (a) Which link along the chain experiences the maximal tension?
- (b) What is the maximal acceleration with which the boulder can be lifted?

5.) *Friction and Normal Forces*

(5+10+10 pts.)

A dock worker pulls on a box (mass 85 kg) with force of 300 N at an angle of 10° above the horizontal. The static and kinetic friction coefficients between the box and the horizontal ground of the dockyard are 0.45 and 0.25 , respectively.

- (a) Draw the free-body diagram of the box.
- (b) If the box is initially at rest, can the worker overcome the static friction force?
- (c) If the box is moving, what is its acceleration?