

**Mock Exam #1 Answer Sheet**

Name: \_\_\_\_\_

Section: 9am 10am

**Please write all responses (and show all work) on this answer sheet. Nothing you write on the exam itself will be graded.**

*Multiple Choice Problems are worth 4 points each.*

1. a b c d
2. a b c d e
3. a b c d e
4. a b c d
5. a b c d

*Short Answer questions are worth 5 points. Please show all of your work, and clearly designate your answer. Partial credit may be given.*

**6: Don't Drink and Drive**

**7: Apple Doesn't Fall Far From the Tree**

**8: Bee Problem**

**9: Stop on a Dime**

*Long Answer Problem is worth 10 points. Please show your work, and clearly designate your answer. Partial credit may be given.*

**10: Usain Bolt**

# PHYSICS 2010 Mock Exam #1

## Professor Chisholm

- Please legibly write your name on the **answer sheet**.
- You are allowed the use of **one** 3"x5" note card with inscriptions of your choosing.
- You are allowed the use of a free-standing calculator.
- Clearly designate all answers on the **answer sheet**. You may write on the back, but if your answer(s) appear(s) there, please indicate that.
- You may write on this exam copy, but nothing on it will be graded.
- All books, notes, cell phones, cameras, and other such devices are to be securely stowed away.
- Exam is out of 50 points, and there are 50 minutes for the exam. Pace appropriately.

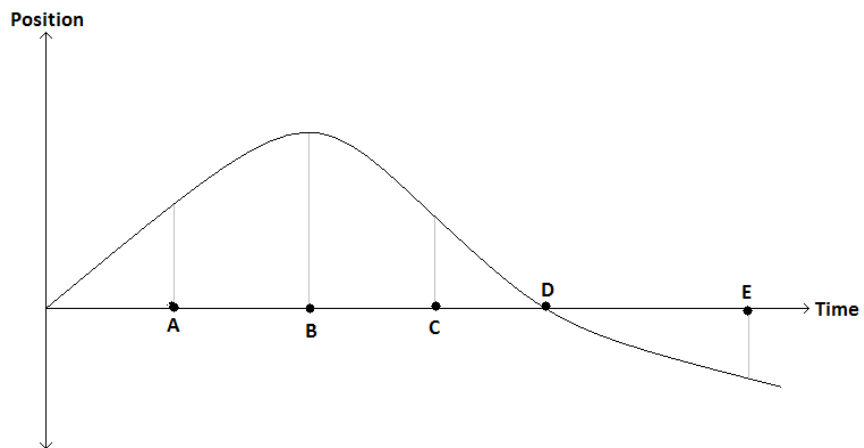
Some possibly useful data:

Magnitude of acceleration due to gravity:

**Multiple Choice Problems are worth 4 points each.** Clearly designate your answer on the **answer sheet**. Don't circle it here -- it won't be graded.

1. A stone is dropped from rest into a pit, and free-falls (ignore air resistance) to the bottom of the pit in 5 seconds. A coin is then dropped from rest into a second pit, and hits the bottom in 10 seconds. How much deeper is the second pit, compared to the first pit?
  - a. Twice as deep
  - b. Three times deeper
  - c. Four times deeper
  - d. Five times deeper
2. Two bullets are fired simultaneously parallel to a horizontal surface. The bullets have different masses and different initial speeds. Which one will strike the surface first?
  - a. The fastest one
  - b. The slowest one
  - c. The heaviest one
  - d. The lightest one
  - e. They strike the surface at the same time.

3. The plot below shows the position of an object as a function of time. The letters A-E represent particular moments of time. At which moment of time is the speed of the object equal to zero?
  - a. A
  - b. B
  - c. C
  - d. D
  - e. E

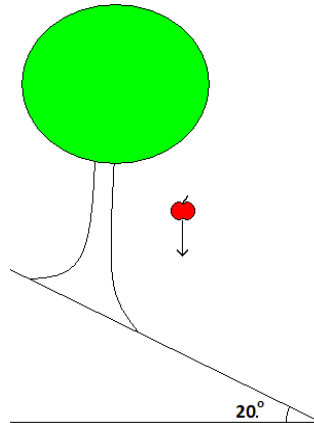


4. Two identical stones are dropped from a tall building one second apart (neglect air resistance). While both stones are falling, what will happen to the vertical distance between them?
  - a. It will remain the same.
  - b. It will decrease.
  - c. It will increase.
  - d. It will first increase and then remain constant.

5. A stone is thrown vertically upwards, reaches a highest point, and returns to the ground. When the stone is at the **top** of its path, its acceleration
- is zero.
  - is directed downwards.
  - is directed upwards.
  - changes direction from upwards to downwards.

**Short Answer questions are worth 5 points. Please show all of your work, and clearly designate your answer. Partial credit may be given.**

6. Human reaction times are worsened by alcohol (typically, by drinking it). How much farther would a drunk driver's car travel before they hit the brakes than a sober driver's car? Assume both cars are initially traveling at 21.9 m/s, the sober driver takes 0.33 s and the drunk driver takes 1.00 s to hit the brakes in a crisis.
7. An apple falls straight down from a tree growing on a 20.° slope. The apple impacts the slope with a speed of 16.2 m/s. What is the component of the apple's impact velocity parallel to the slope?



8. A bee starts flying due south at 0.080 m/s (with respect to the air) away from its beehive. However, the bee is flying with a wind moving at a velocity of 0.060 m/s due west (with respect to the ground). After 10.0 s, how far is the bee from its starting place?
9. Sometimes a car is said to "stop on a dime". Let us assume that that means the stopping distance of a car is the diameter of a dime (17.91 mm). If a car is initially moving at 27 m/s, what acceleration is needed to stop on a dime?

**Long Answer Question is worth 10 points.** Please show all of your work and clearly designate your answer **on the answer sheet**. Partial credit may be given.

- 10.** Usain Bolt's run in the final of the 100.0 m dash during the 2008 Beijing Summer Olympics can be modeled as three distinct stages:

*First Stage:* Accelerating from rest at  $3.10 \text{ m/s}^2$  for the first 4.00 seconds

*Second Stage:* Running at a constant speed for another 5.00 seconds

*Third Stage:* Slowing down at  $3.00 \text{ m/s}^2$  for the rest of the distance (but still moving when he crosses the finish line)

- a. Sketch a velocity vs. time graph for Usain during the race. (you need not have units, but need the general shape to be correct)
- b. How much distance does Usain cover in the first stage?
- c. How fast is Usain running during the second stage?
- d. How much distance does Usain cover in the second stage?
- e. How fast is Usain running as he crosses the finish line (at the end of the third stage)?