

PHY 201: Space, Time and Motion
Spring 2019, Test 2
Exam time: 50 min.
no electronic devices
Exam, Form: **A**

Name: _____

Student Number: _____

TA: _____

Date: _____

Section 1. Matching of scientific terms and concepts (4 pts.)

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|-------------------|--|
| _____ fallacious | (a) too many to be counted (often used hyperbolically) |
| _____ chimerical | (b) heavily loaded or weighed down |
| _____ cubit | (c) relating or devoted to that which is not sacred or biblical; secular rather than religious |
| _____ invincible | (d) a former measure of distance by land, usually about three miles |
| _____ unity | (e) a thing that is hoped or wished for but in fact is illusory or impossible to achieve |
| _____ indignity | (f) too powerful to be defeated or overcome |
| _____ discourse | (g) based on a mistaken belief |
| _____ aperture | (h) a symmetrical open plane curve formed by the intersection of a cone with a plane parallel to its side |
| _____ digression | (i) written or spoken communication or debate |
| _____ plumbline | (j) a string with a weight attached to it, used for finding the depth of water or determining the vertical on an upright surface |
| _____ laden | (k) treatment or circumstances that cause one to feel shame |
| _____ parabola | (l) a temporary departure from the main subject in speech or writing |
| _____ league | (m) an opening, hole, or gap |
| _____ profane | (n) having no particular interest or sympathy; unconcerned |
| _____ innumerable | (o) the number one |
| _____ indifferent | (p) an ancient measure of length, approximately equal to the length of a forearm. It was typically about 18 inches or 44 cm, though there was a long cubit of about 21 inches or 52 cm |

Section 2. Multiple choice (11 pts.)

1. The two arms of a u-tube are not identical, one having twice the diameter of the other. A cork plugging the narrow arm requires a force of 16 Newtons to remove it. The tube is filled with water and the wide arm is fitted with a sliding piston. The minimum force that must be applied to the piston to push the cork out is
 - (a) 4 N
 - (b) 8 N
 - (c) 16 N
 - (d) 32 N
 - (e) 64 N
2. In a physics laboratory, a student suspends a wheeled cart vertically from a string. He discovers that it takes a force of one newton to suspend the cart in this way. He now sets up an inclined ramp and places the cart on the ramp. To hold the cart stationary on the ramp, he again ties a string to the back of the cart. He finds that it now takes a force of just half a newton to hold the cart stationary. If the string is cut, the acceleration of the cart down the ramp will be approximately:
 - (a) 1 m/s²
 - (b) 2 m/s²
 - (c) 5 m/s²
 - (d) 10 m/s²
 - (e) 20 m/s²
3. Which of the following is *not* a conic section?
 - (a) a circle
 - (b) an ellipse
 - (c) a hypocycloid
 - (d) a parabola
 - (e) a hyperbola
4. Suppose you toss a softball straight up into the air and catch it one second later in your hand. (You may ignore any drag effects.) When the ball is at the peak of its flight, its
 - (a) acceleration is zero
 - (b) velocity is zero
 - (c) height is 2.5 meters
 - (d) all of the above
 - (e) none of the above
5. A solid copper coin and a solid aluminum coin have the same apparent weight underwater. When they are weighed in the air
 - (a) they weigh the same
 - (b) the copper coin is heavier
 - (c) the aluminum coin is heavier
 - (d) both weigh less than they did in water
 - (e) it depends on their shape

6. In Galileo's *Dialogues*, which of the following arguments did Sagredo and Simplicio use to argue *against* Salviati's theory that dropped bodies undergo uniform acceleration?
- (a) a dropped ball cannot experience uniform acceleration because it clearly acquires considerable speed immediately when dropped
 - (b) a dropped ball cannot experience uniform acceleration because that would imply that it must travel through an infinite number of degrees of speed, which is clearly impossible
 - (c) the speed of a dropped ball seems to acquire a speed which is proportional to the distance of its fall, not the time of its fall
 - (d) all of the above
 - (e) none of the above
7. Lying belly-down on a dock on a warm sunny summer afternoon, you stretch out your arm and dip the tip of a thin stick into the lazy river flowing gently beneath the dock. You notice that the flow around the stick is smooth and laminar. In order to generate turbulent flow around the stick, instead, you should perhaps
- (a) quickly move the tip of the stick downstream
 - (b) quickly move the tip of the stick upstream
 - (c) use a narrower stick
 - (d) all of the above
 - (e) none of the above
8. A 10-cm long straight glass tube is filled halfway with mercury and halfway with water. What is the pressure (expressed in centimeters of water) at the bottom of the tube (ignoring atmospheric pressure)?
- (a) 75
 - (b) 50
 - (c) 10
 - (d) 5
 - (e) 1
9. A block of wood weights 160 Newtons and has a specific gravity of 0.60. To sink it in fresh water requires an additional downward force of
- (a) 54 N
 - (b) 64 N
 - (c) 96 N
 - (d) 110 N
 - (e) 240 N
10. According to Pascal,
- (a) both man and animals are continually improving because they learn from their ancestors
 - (b) the use of our reason is always more important than the testimony of ancient authorities
 - (c) we may sometimes assert the opposite of ancient authorities without contradicting them
 - (d) all of the above
 - (e) none of the above

11. The atmospheric pressure on the surface of Mars is about 100 times smaller than on the surface of Earth. What would be the maximum height that a Martian could draw mercury up into a tube using a syringe (like you did in lab)?

- (a) less than 2 cm
- (b) 7 or 8 cm
- (c) 14 or 15 cm
- (d) 76 or 77 cm
- (e) more than 100 cm

Section 3. Martian gravity (3 pts.)

While exploring the surface of Mars, you are grievously injured during a violent sandstorm. Thinking you to be dead, the rest of your crew regretfully leaves you behind on the hostile, red planet. After you wake up and apply salve to your minor wounds, you begin to carry out scientific experiments.

1. First of all, you decide to determine the acceleration due to gravity on the surface of Mars. You find that it takes one second for a ball to fall a distance of two meters. What is the acceleration of gravity on mars?
 2. You now find a spring gun. You fire it horizontally from a two-meter tall table and find that it travels a distance of two meters before striking the floor. What is the muzzle velocity of the gun?
 3. If you were to fire this spring gun straight upwards, what is the maximum height it would reach?

Section 4. Authority and Reason essay (2 pts.)

Answer the following essay question. Be sure to use correct spelling, grammar, and punctuation; and **be sure to support any claims that you make with clearly presented evidence and reason.**

1. Which do you think is more reliable: *authority* or *reason*? Explain your position, and how it differs (if at all) from that of Pascal, as clearly as you can.