**Summer Practice Test 1 (Ungraded) (2208524)**

**Due:** Thu May 28 2015 11:00 PM EDT

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

**Description**

This practice exam will NOT be graded. However, it is in your best interest to practice. Many of these questions appeared on previous tests. The solutions will be placed on the class website, but I strongly encourage you to try the whole exam before looking at the solutions. The best way to practice is to mimic the environment of the exam as much as possible; I recommend giving yourself about an hour or so just to take this test and then look over the solutions. Think carefully about what you got incorrect. If you still don't understand why after thinking about it, ask me to do that problem during the review day.

**Instructions**

Remember that the actual test will be multiple choice. However, I can be very clever with my multiple choice options, even on calculation questions. Just because you get an answer listed as a multiple choice option does not mean that it's necessarily correct. Think very carefully to make sure you have approached the problem correctly. I think about how one might do the problem incorrectly when coming up with alternate answers. Every once in a while (hopefully won't happen at all this semester), I make an algebra mistake on a problem that I've created for the test and the correct answer may not be listed. In that rare case, I ask you to select the closest answer.

**1.** Question Details SerCP8 2.CQ.001. [802537]

If the velocity of a particle is nonzero, can the particle's acceleration be zero?

- yes
- no

Explain.

Key: If the velocity of the particle is nonzero, the particle is in motion. If the acceleration is zero, the velocity of the particle is unchanging or is constant.

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**2.** Question Details SerCP8 2.CQ.008. [802538]

A ball is thrown vertically upward.

(a) What are its velocity and acceleration when it reaches its maximum altitude?

Key: At the maximum height, the ball is momentarily at rest. (That is, it has zero velocity.) The acceleration remains constant, with magnitude equal to the free-fall acceleration *g* and directed downward. Thus, even though the velocity is momentarily zero, it continues to change, and the ball will begin to gain speed in the downward direction.

(b) What is the acceleration of the ball just before it hits the ground?

Key: The acceleration of the ball remains constant in magnitude and direction throughout the ball's free flight, from the instant it leaves the hand until the instant just before it strikes the ground. The acceleration is directed downward and has a magnitude equal to the free-fall acceleration *g*.

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**3.** Question Details SerCP8 3.CQ.008. [824393]

Determine which of the following moving objects obey the equations of projectile motion developed in this chapter.

- ☐ A ball is thrown in an arbitrary direction.
- ☐ A jet airplane crosses the sky with its engines thrusting the plane forward.
- ☐ A rocket leaves the launch pad.
- ☐ A rocket moves through the sky after its engines have failed.
- ☐ A stone is thrown under water.

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**4.** Question Details SerCP8 2.MC.005. [849947]

A racing car starts from rest and reaches a final speed $v$ in a time $t$. If the acceleration of the car is constant during this time, which of the following statements must be true? Select all that apply.

- ☐ The average speed of the car is $v/2$.
- ☐ The car travels a distance $vt$.
- ☐ The velocity of the car remains constant.
- ☐ The acceleration of the car is $v/t$.
- ☐ None of these

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**5.** Question Details SerCP8 2.MC.010. [849934]

A student at the top of a building throws a red ball upward with speed $v_0$ and then throws a blue ball downward with the same initial speed $V_0$. Immediately before the two balls reach the ground (neglecting air friction), which of the following statements is/are *true?* Select all that apply.

- ☐ The speed of each ball is greater than $V_0$.
- ☐ The speed of the red ball is greater than that of the blue ball.
- ☐ The acceleration of the blue ball is greater than that of the red ball.
- ☐ Their velocities are equal.
- ☐ The speed of the red ball is less than that of the blue ball.

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**6.** Question Details SerCP8 2.P.029.soln. [821010]

A truck covers 40.0 m in 8.50 s while smoothly slowing down to a final velocity of 2.60 m/s.

(a) Find the truck's original speed.

[ ] 6.81 m/s

(b) Find its acceleration.

[ ] -0.496 $m/s^2$

Solution or Explanation

(a) To find the truck's original speed, we use the following formula.

$$\Delta x = v_{\text{av}}\,(\Delta t) = \left(\frac{v + v_0}{2}\right)\Delta t$$

We then plug in what we know and solve for $v_0$.

$$40.0\text{ m} = \left(\frac{2.60\text{ m/s} + v_0}{2}\right)(8.50\text{ s})$$

$$v_0 = \underline{6.81}\ \underline{\text{m/s}}$$

(b) We find the acceleration using the following formula.

$$a = \frac{v - v_0}{\Delta t} = \frac{2.60\text{ m/s} - 6.81\text{ m/s}}{8.50\text{ s}} = \underline{-0.496}\ \underline{\text{m/s}^2}$$

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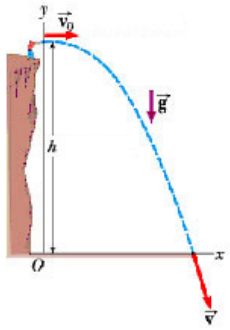
**7.** Question Details SerCP8 3.P.023.ssm. [1582774]

A student stands at the edge of a cliff and throws a stone horizontally over the edge with a speed of 19 m/s. The cliff is 45 m above a flat, horizontal beach as shown in the figure below.




(a) What are the coordinates of the initial position of the stone?

*x* coordinate [ ] 0 m

*y* coordinate [ ] 45 m

(b) What are the components of the initial velocity?

*x* component [ ] 19 m/s

*y* component [ ] 0 m/s

(c) Write the equations for the velocity of the stone with time. (Use the following as necessary: *g* and *t*.)

$v_x =$ $19$

$v_y =$ $-gt$

(d) Write the equations for the position of the stone with time. (Use the following as necessary: *g* and *t*.)

$x =$ $19t$

$y =$ $-\frac{1}{2}gt^2 + 45$

(e) How long after being released does the stone strike the beach below the cliff?

*t* = [ ] 3.03 s

(f) With what speed and angle of impact does the stone land?

speed [ ] 35.3 m/s

angle [ ] 57.4 ° (below the horizontal)

Solution or Explanation

Note the values in this solution reflect those of the text book question, not the values you may have received for this question above.

**3.23** (a) With the origin chosen at point $O$ as shown in Figure P3.23, the coordinates of the original position of the stone are $\boxed{x_0 = 0 \text{ and } y_0 = +50.0 \text{ m}}$.

(b) The components of the initial velocity of the stone are $\boxed{v_{0x} = +18.0 \text{ m/s and } v_{0y} = 0}$.

(c) The components of the stone's velocity during its flight are given as functions of time by

$$v_x = v_{0x} + a_x t = 18.0 \text{ m/s} + (0)t \quad \text{or} \quad \boxed{v_x = 18.0 \text{ m/s}}$$

and

$$v_y = v_{0y} + a_y t = 0 + (-g)t \quad \text{or} \quad \boxed{v_x = -(9.80 \text{ m/s}^2)t}$$

(d) The coordinates of the stone during its flight are

$$x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2 = 0 + (18.0 \text{ m/s})t + \frac{1}{2}(0)t^2 \quad \text{or} \quad \boxed{x = (18.0 \text{ m/s})t}$$

and

$$y = y_0 + v_{0y}t + \frac{1}{2}a_y t^2 = 50.0 \text{ m} + (0)t + \frac{1}{2}(-g)t^2 \quad \text{or} \quad \boxed{y = 50.0 \text{ m} - (4.90 \text{ m/s}^2)t^2}$$

(e) We find the time of fall from $\Delta y = v_{0y}t + \frac{1}{2}a_y t^2$ with $v_{0y} = 0$:

$$t = \sqrt{\frac{2(\Delta y)}{a}} = \sqrt{\frac{2(-50.0 \text{ m})}{-9.80 \text{ m/s}^2}} = \boxed{3.19 \text{ s}}$$

(f) At impact, $v_x = v_{0x} = 18.0$ m/s, and the vertical component is

$$v_y = v_{0y} + a_y t = 0 + (-9.80 \text{ m/s}^2)(3.19 \text{ s}) = -31.3 \text{ m/s}$$

Thus,

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{(18.0 \text{ m/s})^2 + (-31.3 \text{ m/s})^2} = 36.1 \text{ m/s}$$

and

$$\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right) = \tan^{-1}\left(\frac{-31.3}{18.0}\right) = -60.1^\circ$$

or $\vec{\mathbf{v}} = \boxed{36.1 \text{ m/s at } 60.1^\circ \text{ below the horizontal}}$.

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**8.** Question Details SerCP8 1.MC.006. [849935]

A house is advertised as having 1420 square feet under roof. What is the area of this house in square meters?

- 176 $m^2$
- none of these
- 132 $m^2$
- 115 $m^2$
- 222 $m^2$

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**9.** Question Details SerCP8 1.MC.007. [849980]

Which of the following is the best estimate for the mass of all the people living on Earth?

- $1 \times 10^9$ kg
- $2 \times 10^8$ kg
- $4 \times 10^{12}$ kg
- $3 \times 10^{11}$ kg
- $2 \times 10^{10}$ kg

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**10.** Question Details SerCP8 2.MC.004. [849983]

A juggler throws a bowling pin straight up in the air. After the pin leaves his hand and while it is in the air, which statement is true?

- The velocity of the pin is always in the same direction as its acceleration.
- The velocity of the pin is never in the same direction as its acceleration.
- The velocity of the pin is in the same direction as its acceleration on the way up.
- The velocity of the pin is opposite its acceleration on the way up.
- The acceleration of the pin is zero.

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**11.** Question Details SerCP8 2.MC.007. [849925]

An object moves along the *x*-axis, its position measured at each instant of time. The data are organized into an accurate graph of *x* vs. *t*. Which of the following quantities *can* be obtained from this graph? Select all that apply.

- ☐ the acceleration at any instant
- ☐ the average velocity during some time interval
- ☐ the velocity at any instant
- ☐ the speed of the particle at any instant
- ☐ the displacement during some time interval

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**12.** Question Details SerCP8 3.MC.007. [849931]

A NASA astronaut hits a golf ball on the Moon. Which of the following quantities, if any, remain constant as the ball travels through the lunar vacuum?

- ☐ horizontal component of velocity
- ☐ acceleration
- ☐ speed
- ☐ vertical component of velocity
- ☐ velocity

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**13.** Question Details SerCP8 3.MC.010. [849928]

A baseball is thrown from the outfield toward the catcher. When the ball reaches its highest point, which statement is true?

- ○ Its velocity is not zero, but its acceleration is zero.
- ○ Its velocity and its acceleration are both zero.
- ○ Its velocity is perpendicular to its acceleration.
- ○ Its acceleration depends on the angle at which the ball was thrown.
- ○ None of the above statements are true.

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**14.** Question Details SerCP8 3.MC.013. [849985]

Which of the following quantities are vectors?

- ☐ the height of a building
- ☐ the velocity of a sport car
- ☐ the volume of water in a can
- ☐ temperature
- ☐ the displacement of a tennis player from the backline of the court to the net

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**15.** Question Details SerCP8 2.P.031. [859042]

A Cessna aircraft has a lift-off speed of 120 km/h.

(a) What minimum constant acceleration does the aircraft require if the aircraft is to be airborne after a takeoff run of 300 m?

[ ] 1.85 $m/s^2$

(b) How long does it take the aircraft to become airborne?

[ ] 18 s

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**16.** Question Details SerCP10 3.QQ.001. [2872115]

The magnitudes of two vectors $\vec{A}$ and $\vec{B}$ are 16 units and 8 units, respectively. What are the largest and smallest possible values for the magnitude of the resultant vector $\vec{R} = \vec{A} + \vec{B}$?

largest [ ] 24 units

smallest [ ] 8 units

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**17.** Question Details SerCP10 3.WU.001. [2892322]

A vector $\vec{\mathbf{A}}$ has components $A_x = -4.50$ m and $A_y = 8.88$ m. Find the magnitude and the direction of the vector.

magnitude [ ] 9.96 m

direction [ ] 117 ° counterclockwise from the $+x$-axis

Solution or Explanation

(a) The magnitude of a vector with components $A_x$ and $A_y$ is given by

$$A = \sqrt{A_x^2 + A_y^2} = \sqrt{(-4.50\text{ m})^2 + (8.88\text{ m})^2} = 9.96\text{ m}.$$

(b) The direction of the vector is given by

$$\theta = \tan^{-1}\left(\frac{A_y}{A_x}\right) = \tan^{-1}\left(\frac{8.88\text{ m}}{-4.50\text{ m}}\right) = -63.1°.$$

Since $A_x < 0$ and $A_y > 0$, the vector is in the second quadrant, and

$$\theta = 180° - 63.1° = 117°.$$

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**18.** Question Details SerCP10 3.WU.007. [2883701]

A skier leaves the end of a horizontal ski jump at 23.0 m/s and falls through a vertical distance of 3.40 m before landing.

(a) Neglecting air resistance, how long does it take the skier to reach the ground?

[ ] 0.833 s

(b) How far horizontally does the skier travel in the air before landing?

[ ] 19.2 m

Solution or Explanation

(a) The skier has zero initial velocity in the vertical direction ($v_{0y} = 0$) and undergoes a vertical displacement of $\Delta y = -3.40$ m. The constant acceleration in the vertical direction is $a_y = -g$, so we use $\Delta y = v_{0y}t + \frac{1}{2}a_y t^2$ to find the time of flight as

$$t = \sqrt{\frac{2\Delta y}{a_y}} = \sqrt{\frac{2(-3.40\text{ m})}{-9.80\text{ m/s}^2}} = 0.833\text{ s}.$$

(b) During this time, the skier moves with constant horizontal velocity $v_x = v_{0x} = 23.0$ m/s. The horizontal distance traveled during the flight is

$$\Delta x = v_x t = (23.0\text{ m/s})(0.833\text{ s}) = 19.2\text{ m}.$$

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**19.** Question Details SerCP10 1.CQ.001. [2833063]

Estimate the order of magnitude of the length, in meters, of each of the following.

(a) a mouse

- $10^{-3}$ m
- $10^{-1}$ m
- $10^{0}$ m
- $10^{2}$ m

(b) a pool cue

- $10^{-2}$ m
- $10^{-1}$ m
- $10^{0}$ m
- $10^{1}$ m

(c) a basketball court

- between $10^{0}$ m and $10^{1}$ m
- between $10^{1}$ m and $10^{2}$ m
- between $10^{2}$ m and $10^{3}$ m

(d) an elephant

- $10^{0}$ m
- $10^{1}$ m
- $10^{2}$ m

(e) a city block

- $10^{0}$ m
- $10^{2}$ m
- $10^{4}$ m

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**20.** Question Details SerCP10 1.CQ.003. [2832895]

Find the order of magnitude of your age in seconds.

- $10^{3}$ s
- $10^{6}$ s
- $10^{9}$ s
- $10^{12}$ s

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**21.** Question Details SerCP10 1.CQ.013. [2833031]

Answer each question yes or no.

(a) Must two quantities have the same dimensions if you are adding them?

- Yes
- No

(b) Must two quantities have the same dimensions if you are multiplying them?

- Yes
- No

(c) Must two quantities have the same dimensions if you are subtracting them?

- Yes
- No

(d) Must two quantities have the same dimensions if you are dividing them?

- Yes
- No

(e) Must two quantities have the same dimensions if you are equating them?

- Yes
- No

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Assignment Details

Name (AID): **Summer Practice Test 1 (Ungraded) (2208524)**
Submissions Allowed: **10**
Category: **Homework**
Code:
Locked: **Yes**
Author: **Holcomb, Mikel (** mikel.holcomb@mail.wvu.edu **)**
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