

Practice Summer Final Exam (2525989)

Due: Thu Jun 27 2013 11:59 PM EDT

Question

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

Description

This assignment will not be graded, but it is in your best interest to practice for the final exam. The format of the final will be very similar to previous exams. The focus of the final will be on the last third of the [class](#). There will be a few questions from earlier sections of the class.

1. 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?

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

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2. 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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3. Question Details

SerCP8 5.MC.005. [849996]

The work required to accelerate an object on a frictionless surface from a speed v to a speed $2v$ is

- three times the work required to accelerate the object from $v = 0$ to v .
- twice the work required to accelerate the object from $v = 0$ to v .
- equal to the work required to accelerate the object from $v = 0$ to v .
- not known without knowledge of the acceleration.
- four times the work required to accelerate the object from $2v$ to $3v$.

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4. Question Details

SerCP8 13.MC.002. [854687]

The position of an object moving with simple harmonic motion is given by $x = 4 \cos(6\pi t)$, where x is in meters and t is in seconds. What is the period of the oscillating system?

- 6π s
- $1/3$ s
- impossible to determine from the information given
- 4 s
- $1/6$ s

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5. Question Details

SerCP8 13.MC.011. [854670]

Which of the following statements is *not* true regarding a mass-spring system that moves with simple harmonic motion in the absence of friction?

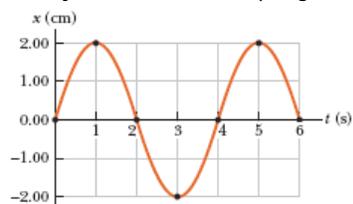
- The total energy of the system remains constant.
- The total energy of the system is proportional to the square of the amplitude.
- The velocity of the oscillating mass has its maximum value when the mass passes through the equilibrium position.
- The potential energy stored in the system is greatest when the mass passes through the equilibrium position.
- The energy of the system is continually transformed between kinetic and potential energy.

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6. Question Details

SerCP8 13.P.042. [974640]

An object attached to a spring vibrates with simple harmonic motion as described by the figure below.



For this motion, find the following.

(a) the amplitude

 2 cm

(b) the period

 4 s

(c) the angular frequency

 1.57 rad/s

(d) the maximum speed

 3.14 cm/s

(e) the maximum acceleration

 4.93 cm/s²

(f) an equation for its position x in terms of a sine function (Do this on paper. Your instructor may ask you to turn in this work.)

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7. Question Details

SerCP8 13.P.012. [828852]

An automobile having a mass of 1000 kg is driven into a brick wall in a safety test. The bumper behaves like a spring with constant 5.85×10^6 N/m and is compressed 3.59 cm as the car is brought to rest. What was the speed of the car before impact, assuming no energy is lost in the collision with the wall?

 2.75 m/s

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8. Question Details

SerCP8 13.P.037.ssm. [828833]

A pendulum clock that works perfectly on Earth is taken to the Moon. Assume that the free-fall acceleration on the Moon is 1.63 m/s^2 .

(a) Does it run fast or slow there?

- neither; it runs the same as on Earth
- slow
- fast

(b) If the clock is started at 12:00 midnight, what will it read after 17.5 h ? (Enter the time to the nearest minute.)

7 : 8 AM

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.

13.37 (a) The period of the pendulum is $T = 2\pi\sqrt{L/g}$. Thus, on the Moon where the free-fall acceleration is smaller, the period will be longer and the clock will run slow.

(b) The ratio of the pendulum's period on the Moon to that on Earth is

$$\frac{T_{\text{Moon}}}{T_{\text{Earth}}} = \frac{2\pi\sqrt{L/g_{\text{Moon}}}}{2\pi\sqrt{L/g_{\text{Earth}}}} = \sqrt{\frac{g_{\text{Earth}}}{g_{\text{Moon}}}} = \sqrt{\frac{9.80}{1.63}} = 2.45$$

Hence, the pendulum of the clock on Earth makes 2.45 "ticks" while the clock on the Moon is making 1.00 "tick." After the Earth clock has ticked off 24.0 h and again reads 12:00 midnight, the Moon clock will have ticked off $24.0 \text{ h}/2.45 = 9.80 \text{ h}$ and will read 9 : 48 AM.

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9. Question Details

SerCP8 4.MC.004. [849943]

A force of 70.0 N is exerted at an angle of 30.0° below the horizontal on a block of mass 8.00 kg that is resting on a table. What is the magnitude of the normal force acting on the block?

- 113 N
- 78.4 N
- 43.4 N
- 126 N
- 92.4 N

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10. Question Details

SerCP8 4.MC.006. [849967]

A crate remains stationary after it has been placed on a ramp inclined at an angle with the horizontal. Which of the following statements must be true about the magnitude of the frictional force that acts on the crate?

- It is greater than the component of the gravitational force acting down the ramp.
- It is larger than the weight of the crate.
- It is at least equal to the weight of the crate
- It is equal to the component of the gravitational force acting down the ramp.
- It is equal to $\mu_s n$.

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11. Question Details

SerCP8 6.MC.003. [849929]

A car of mass m traveling at speed v crashes into the rear of a truck of mass $2m$ that is at rest and in neutral at an intersection. If the collision is perfectly inelastic, what is the speed of the combined car and truck after the collision?

- $v/3$
- $v/2$
- $2v$
- none of these
- v

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12. Question Details

SerCP8 5.P.062. [824432]

A raw egg can be dropped from a third-floor window and land on a foam-rubber pad on the ground without breaking. A 90-g egg is dropped from a window located 34.6 m above the ground and a foam-rubber pad that is 15.0 cm thick stops the egg in 9.2 ms.

(a) By how much is the pad compressed?

 cm

(b) What is the average force exerted on the egg after it strikes the pad? *Note:* Assume constant upward acceleration as the egg compresses the foam-rubber pad.

 N

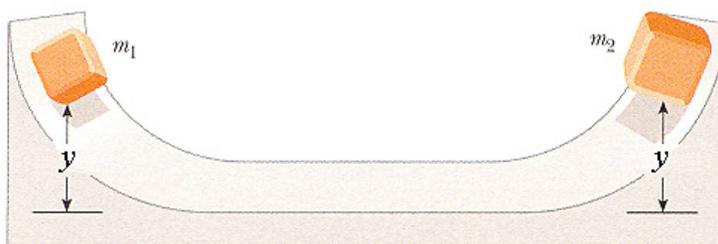
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13. Question Details

SerCP8 6.P.062. [815767]

Two blocks of masses $m_1 = 2.00$ kg and $m_2 = 4.15$ kg are each released from rest at a height of $y = 4.80$ m on a frictionless track, as shown in the figure below, and undergo an elastic head-on collision.



(a) Determine the velocity of each block just before the collision. Let the positive direction point to the right.

$$v_{1i} \text{ [] } \text{ 9.7 m/s}$$

$$v_{2i} \text{ [] } \text{ -9.7 m/s}$$

(b) Determine the velocity of each block immediately after the collision.

$$v_{1f} \text{ [] } \text{ -16.5 m/s}$$

$$v_{2f} \text{ [] } \text{ 2.92 m/s}$$

(c) Determine the maximum heights to which m_1 and m_2 rise after the collision.

$$y_{1f} \text{ [] } \text{ 13.9 m}$$

$$y_{2f} \text{ [] } \text{ 0.434 m}$$

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14. Question Details

SerCP8 8.MC.005. [854758]

Two forces are acting on an object. Which of the following statements is correct?

- The object is in equilibrium if the net force and the net torque on the object are both zero.
- The object is in equilibrium if the net torque on the object is zero.
- The object cannot be in equilibrium because more than one force acts on it.
- The object is in equilibrium if the forces are equal in magnitude and opposite in direction.
- The object is in equilibrium if the forces act at the same point on the object.

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15. Question Details

SerCP8 8.MC.007. [854741]

A constant net nonzero torque is exerted on an object. Which of the following quantities *cannot* be constant for this object?

- angular acceleration
- center of mass
- moment of inertia
- angular momentum
- angular velocity

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16. Question Details

SerCP8 8.MC.009. [854728]

A solid disk and a hoop are simultaneously released from rest at the top of an incline and roll down without slipping. Which object reaches the bottom first?

- The disk arrives first.
- The hoop and the disk arrive at the same time.
- The one that has the largest mass arrives first.
- The one that has the largest radius arrives first.
- The hoop arrives first.

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17. Question Details

SerCP8 8.MC.013. [854684]

A mouse is initially at rest on a horizontal turntable mounted on a frictionless, vertical axle. As the mouse begins to walk clockwise around the perimeter, which of the following statements *must* be true of the turntable?

- It turns counterclockwise with the same angular velocity as the mouse.
- It turns counterclockwise because mechanical energy is conserved.
- It remains stationary.
- It turns counterclockwise because angular momentum is conserved.
- It also turns clockwise.

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18. Question Details

SerCP8 8.P.005.soln. [819733]

A simple pendulum consists of a small object of mass 2.4 kg hanging at the end of a 2.0 m long light string that is connected to a pivot point.

(a) Calculate the magnitude of the torque (due to the force of gravity) about this pivot point when the string makes a 7.5° angle with the vertical.

 $6.14 \text{ N}\cdot\text{m}$

(b) Does the torque increase or decrease as the angle increase?

- increase
 decrease

(c) Explain your answer.

Key: Since $\sin \theta$ increases as θ , the torque also increases with the angle.

Solution or Explanation

$$|\tau| = F \cdot (\text{lever arm}) = mg \cdot [L \sin \theta] = (2.4 \text{ kg}) (9.8 \text{ m/s}^2) \cdot [(2.0 \text{ m}) \sin 7.5^\circ] = \underline{6.14 \text{ N}\cdot\text{m}}$$

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19. Question Details

SerCP8 8.P.055. [839026]

Consider the following.

(a) Calculate the angular momentum of Earth that arises from its spinning motion on its axis, treating Earth as a uniform solid sphere.

 $7.07\text{e}+33 \text{ J}\cdot\text{s}$

(b) Calculate the angular momentum of Earth that arises from its orbital motion about the Sun, treating Earth as a point particle.

 $2.66\text{e}+40 \text{ J}\cdot\text{s}$

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20. Question Details

SerCP8 9.MC.008. [854749]

Bernoulli's equation can be used to explain, in part, which of the following phenomena?

- the curve of a spinning baseball
 vascular flutter
 the lift on an airplane wing in flight
 reduction of pressure of moving fluids
 all these answers

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21. Question Details

SerCP8 9.MC.009. [854705]

A boat develops a leak and, after its passengers are rescued, eventually sinks to the bottom of a lake. When the boat is at the bottom, which of the following statements is true?

- The normal force on the boat is equal to the weight of the displaced water.
- The normal force on the boat is equal to the buoyant force on the boat.
- The normal force on the boat is greater than the weight of the boat.
- The normal force on the boat is equal to the weight of the boat.
- The normal force on the boat is less than the weight of the boat.

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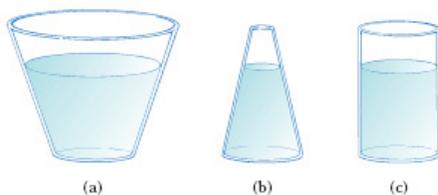
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22. Question Details

SerCP8 9.MC.010. [854729]

Three vessels of different shapes are filled to the same level with water as in the figure below. The area of the base is the same for all three vessels. Which of the following statements is valid?

- The force on the bottom of each vessel is not the same.
- The pressure at the bottom of each vessel is the same.
- The pressure at the bottom of vessel A is greatest because it contains the most water.
- At a given depth below the surface of each vessel, the pressure on the side of vessel A is greatest because of its slope.
- The pressure at the top surface of vessel A is greatest because it has the largest surface area.



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23. Question Details

SerCP8 9.MC.012. [854719]

A hose is pointed straight up, with water flowing from it at a steady volume flow rate and reaching a maximum height of h . Neglecting air resistance, which of the following adjustments to the nozzle will result in the water reaching a height of $4h$?

- Give up because the water cannot reach a height of $4h$.
- Decrease the area by a factor of 4.
- Decrease the area of the opening by a factor of 16.
- Decrease the area by a factor of 2.
- Decrease the area by a factor of 8.

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24. Question Details

SerCP8 9.P.029. [1582762]

A rubber ball filled with air has a diameter of 24.9 cm and a mass of 0.602 kg. What force is required to hold the ball in equilibrium immediately below the surface of water in a swimming pool? (Assume that the volume of the ball does not change. Indicate the direction with the sign of your answer.)

  -73.4 N

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25. Question Details

SerCP8 9.P.032. [1515218]

A 60 kg survivor of a cruise line disaster rests atop a block of Styrofoam insulation, using it as a raft. The Styrofoam has dimensions 2.00 m \times 2.00 m \times 0.09 m. The bottom 0.022 m of the raft is submerged.

(a) Draw a free-body diagram of the system consisting of the survivor and raft. (Do this on paper. Your instructor may ask you to turn in this work..)

(b) Write Newton's second law for the system in one dimension, using B for buoyancy, w for the weight of the survivor, and w_r for the weight of the raft. (Use any variable or symbol stated above as necessary.)

$$F_y = \quad B - w - w_r$$

(c) Calculate the numeric value for the buoyancy, B . (Seawater has density 1025 kg/m³.)

  884 N

(d) Using the value of B and the weight w of the survivor, calculate the weight w_r of the Styrofoam.

  296 N

(e) What is the density of the Styrofoam?

  83.9 kg/m³

(f) What is the maximum buoyant force, corresponding to the raft being submerged up to its top surface?

  3620 N

(g) What total mass of survivors can the raft support?

  339 kg

Need Help?

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26. Question Details

SerCP8 9.P.045. [820866]

(a) Calculate the mass flow rate (in grams per second) of blood ($\rho = 1.0 \text{ g/cm}^3$) in an aorta with a cross-sectional area of 2.0 cm² if the flow speed is 41 cm/s.

  82 g/s

(b) Assume that the aorta branches to form a large number of capillaries with a combined cross-sectional area of $3.0 \times 10^3 \text{ cm}^2$. What is the flow speed in the capillaries?

  0.0273 cm/s

Need Help?

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27. Question Details

SerCP8 7.MC.005. [854707]

A merry-go-round rotates with constant angular speed. As a rider moves from the rim of the merry-go-round toward the center, what happens to the magnitude of total centripetal force that must be exerted on him?

- It increases.
- It is not zero, but remains the same.
- It increases or decreases, depending on the direction of rotation.
- It decreases.
- It's always zero.

Need Help?[Read It](#)

28. Question Details

SerCP8 7.MC.006. [854763]

Consider an object on a rotating disk a distance r from its center, held in place on the disk by static friction. Which of the following statements is *not* true concerning this object?

- If the angular speed is constant, the object is not accelerated.
- If the angular speed is constant, the object must have constant tangential speed.
- If the disk has an angular acceleration, the object has both a centripetal and a tangential acceleration.
- The object always has a centripetal acceleration except when the angular speed is zero.
- The object has a tangential acceleration only if the disk has an angular acceleration.

Need Help?[Read It](#)

29. Question Details

SerCP8 7.MC.009. [854730]

A satellite moves in a circular orbit at a constant speed around Earth. Which of the following statements is true?

- No force acts on the satellite.
- Work is done on the satellite by the force of gravity.
- The satellite has an acceleration directed away from Earth.
- The satellite moves at constant speed and hence doesn't accelerate.
- The satellite has an acceleration directed toward Earth.

Need Help?[Read It](#)

30. Question Details

SerCP8 7.MC.011. [854757]

What is the gravitational acceleration close to the surface of a planet with twice the mass and twice the radius of Earth? Answer as a multiple of g , the gravitational acceleration near Earth's surface.

-  0.5g
- g
- $4g$
- 0.25g
- $2g$

Need Help?

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31. Question Details

SerCP8 7.P.011. [828788]

A car initially traveling at 23.8 m/s undergoes a constant negative acceleration of magnitude 1.80 m/s² after its brakes are applied.

(a) How many revolutions does each tire make before the car comes to a stop, assuming the car does not skid and the tires have radii of 0.330 m?

  75.9 rev

(b) What is the angular speed of the wheels when the car has traveled half the total distance?

  51 rad/s

Need Help?

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32. Question Details

SerCP8 7.P.003.soln. [820966]

The tires on a new compact car have a diameter of 2.0 ft and are warranted for 62,000 miles.

(a) Determine the angle (in radians) through which one of these tires will rotate during the warranty period.

 3.27e+08 rad

(b) How many revolutions of the tire are equivalent to your answer in (a)?

 5.21e+07 rev

Solution or Explanation

(a) We have the following formula.

$$\theta = \frac{s}{r}$$

We use it to find the number of radians through which the wheel turns, converting s to ft so that s and r have the same units.

$$\theta = \frac{s}{r} = \left(\frac{62000 \text{ mi}}{1.0 \text{ ft}} \right) \cdot \left(\frac{5,280 \text{ ft}}{1 \text{ mi}} \right) = 3.27e+08$$

(b) The conversion factor for radians to revolutions is given below.

$$\frac{1 \text{ rev}}{2\pi \text{ rad}}$$

Multiplying our answer to part (a) by the conversion factor gives us the number of revolutions the tire will go through.

$$(3.27e+08 \text{ rad}) \cdot \left(\frac{1 \text{ rev}}{2\pi \text{ rad}} \right) = 5.21e+07 \text{ rev}$$

Need Help?

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33. Question Details

Favorite professor job duty [2184982]

Below is only a partial list of the activities that I (and most professors) have to do frequently. I would like you to answer which of these activities you think you would enjoy the most. Any answer is acceptable. I give this question for two reasons. One, I think understanding what one type of physicist does on a daily basis is useful to know. Two, your answer here reflects upon the kind of job you would likely enjoy the most. [I have a past life in career mentoring.]

- Teaching one or two classes per semester
- Plan cutting edge research
- Manage the students that do that research
- Present your research at conferences and universities
- Department Service (meetings, qualifiers, committees, etc)
- Career development for both myself and a range of students (for example, giving workshops on resume writing or work-life balance)
- Write papers in scientific journals
- Find funding for your research
- Outreach (attracting and retaining attention in students for my topic of interest)

Solution or Explanation

Any answer is acceptable. Here are my job suggestions, but of course several other jobs might also fall into these categories. Clearly, this is just my opinion. I would be happy to chat more about your response if you like. Teaching= Community college or younger students(topic of your interest) Planning research = industry research or science funding Manage research students = University professor Present research = something involving public speaking and has lots of travel (examples: sales, politics) Department Service=Administration (including CEO, manager and secretary) Career Development=some form of counseling or consulting Write papers=writer Find funding= something involving networking (examples: sales, CEO/CFO, politics) Outreach= anything involving educating the public. For example, high/grade school teaching, but also adult education or working for an organization with a cause that you care about.

Assignment Details

Name (AID): **Practice Summer Final Exam (2525989)**
 Submissions Allowed: **10**
 Category: **Homework**
 Code:
 Locked: **Yes**
 Author: **Holcomb, Mikel** (mikel.holcomb@mail.wvu.edu)
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