

Physics 1301, Exam 3 Review

The following is a list of things you should *definitely* know for the exam, however, the list *is not* exhaustive. You are responsible for all the material covered in the assigned readings, lectures, and homework assignments. Note we did not cover waves on a string or beats, so you are not responsible for those topics.

- Solve basic problems involving torque.
- Solve problems regarding objects in static equilibrium.
- Find the center of mass of collections of point masses.
- Solve basic problems using conservation of angular momentum.
- Solve basic problems using Newton's law of gravitation.
- Solve problems regarding the acceleration of gravity.
- Solve basic orbit problems using Kepler's laws of orbital motion.
- Solve basic problems using gravitational potential energy.
- Answer basic questions regarding simple harmonic motion.
- Solve basic problems regarding mass-spring systems.
- Solve basic problems regarding pendulums.
- Answer basic questions about waves.
- Solve problems regarding sound intensity.
- Solve problems regarding the Doppler effect.
- Solve fluid problems using Pascal's principle.
- Solve fluid problems using Archimedes's principle.
- Solve fluid flow problems using the continuity equation and the Bernoulli's equation..

Exam 3 Multiple Choice Problems

Sample

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On the scantron sheet provided, *write* and *bubble in* your name. In the *identification number* field, write and bubble in the 7 digits from your student id number from your black cougar 1 card, or from your fee bill (do not try to fill the first two characters, which are letters.) Each of the following multiple choice questions is worth seven points. Mark the correct answer on the scantron sheet provided.

1. A 0.50 kg mass is attached to a spring with spring constant of 42 N/m, and displaced a distance of 0.1 m from the position it would have when the spring was at its natural, unstretched length. If the mass is released, what would the oscillation frequency of the mass be?
 - (a) 0.15 Hz
 - (b) 2.1 Hz
 - (c) 21 Hz
 - (d) 0.071 Hz
 - (e) 1.5 Hz
2. For the mass spring system described in question 1, what would the maximum kinetic energy obtained by the mass during its oscillations be?
 - (a) 0.071 J
 - (b) 5.0 J
 - (c) 0.21 J
 - (d) 42 J
 - (e) 0.15 J

3. A pendulum in a science museum is made from a 100. kg mass, suspended from a 20. m long wire. What is the oscillation period of this pendulum?
 - (a) 5.0 s
 - (b) 9.0 s
 - (c) 2.2 s
 - (d) 49 s
 - (e) 45 s

4. Two spherical balls are placed in contact with one another. Ball 1 has a mass of 14 kg, and radius of 0.30 m, while the second has a mass of 22 kg, and a radius of 0.25 m. What is the gravitational force acting between the balls?
 - (a) $2.3 \times 10^{-7} N$.
 - (b) $3.3 \times 10^{-7} N$.
 - (c) Because the separation is zero, the gravitational force will be infinite.
 - (d) 350 N.
 - (e) $6.8 \times 10^{-8} N$.

5. A sound source produces an intensity of 43 dB. If the energy output of the source increased by 10 times, what would its intensity be?
 - (a) 44 dB
 - (b) 33 dB
 - (c) 53 dB
 - (d) 430 dB
 - (e) 75 dB

6. At what depth in a swimming pool would you experience a total pressure of 2.0 atm?
 - (a) 10. m
 - (b) 20. m
 - (c) 1.0 m
 - (d) 2.0 m
 - (e) 5.0 m

7. An Orangutang (mass 90. kg) sits on a piston of diameter 20. cm, that is connected to a closed reservoir full of hydraulic oil. A second piston is of diameter 3.0 cm is also connected to that reservoir. What is the minimum force that it would be necessary to apply to the second piston in order to raise the orangutang?
- (a) 130 N
 - (b) 10. N
 - (c) 20. N
 - (d) 40. N
 - (e) 75 N
8. A fluid flows through a cylindrical pipe of diameter 4.5 cm at a speed of 12.0 m/s. If the diameter of the pipe changes to 2.5 cm, and the density of the fluid did not change, what would the speed of the fluid be in the new segment of pipe?
- (a) 22 m/s
 - (b) 39 m/s
 - (c) 12 m/s
 - (d) 6.7 m/s
 - (e) 16 m/s
9. A rapidly spinning ice skater extends their arms so that their hands are further away from their body. Which of the following is true in this case?
- (a) The rotation rate (i.e. angular velocity) of the skater will increase.
 - (b) The rotation rate of the skater will decrease.
 - (c) The rotation rate of the skater will not change.
 - (d) The moment of inertia of the skater will not change.
 - (e) The rotational kinetic energy of the skater will not change.

10. A force of 12.2 N is to be applied to a wrench of length 20.0 cm. The maximum torque that it will be possible to apply with the wrench is:
- (a) 1.24 *Nm*.
 - (b) 61.0 *Nm*.
 - (c) 23.9 *Nm*.
 - (d) 2.44 *Nm*.
 - (e) 7.80 *Nm*.

Exam 3 Worked Problems

Sample

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Both problems are worth 15 points, and will be graded in a manner similar to the assigned homework problems in the book; up to 6 points possible for the description of your solution method, up to 6 points for your algebra and other work (*available only if you receive the full 6 points for the description*), and three points for the correct answer (*available only if you receive the full 6 points for your work*), including units.

1.) Two trains on separate tracks are moving away from one another at the same speed. If the engineer of one train blows its horn at frequency of 131 Hz, and the engineer on the other train hears a sound of frequency of 125 Hz, what is the speed of the trains?

2.) An object with density $2300. \text{ kg/m}^3$ floats in a fluid with 10% of its volume above the surface. What is the density of the fluid?