Physics 2205   4 November, 1999
Practice for Exam 2

Instructions: Allow yourself 75 minutes to take the exam, and use your study guide as an equation sheet. Questions 1-5 are worth 6 points each, questions 6-10 are worth 8 points each, and questions 11-13 are worth 10 points each, for a total of 100 points. Answers are found at the end of the exam.

Questions 1-5 are worth 6 points each.

1.   A spring has a potential energy of 15 J when compressed 8 cm. What is the spring constant? (6 points)

    A)   0.5 N/m
    B)   500 N/m
    C)   2300 N/m
    D)   4700 N/m
    E)   none of the above   Answer: _____

2.   A puck hits a stationary puck, and after the collision the first puck has stopped and the second now has the initial velocity of the first. Which of the following statements is true? (6 points)

    A)   The initially stationary puck is more massive.
    B)   The initially stationary puck is less massive.
    C)   Both pucks have the same mass.
    D)   The relation of the masses cannot be determined.   Answer: _____

3.   The centripetal acceleration on the rim of a spinning platter with radius 6.5 cm and an angular velocity of 6.8 rad/s is: (6 points)

    A)   0
    B)   0.44 m/s^2
    C)   3.0 m/s^2
    D)   44 m/s^2
    E)   300 m/s^2 Answer: _____

4.   If the diameter of a pipe decreases by a factor of two, the velocity of the water running through the pipe (6 points)

    A)   decreases by a factor of 4
    B)   decreases by a factor of 2
    C)   stays the same
    D)   increases by a factor of 2
    E)   increases by a factor of 4   Answer: _____

5.   If George wishes to build a barometer using ethyl alcohol (ρ=790 kg/m^3) instead of mercury, how long of a glass tube will he need if the air pressure is exactly one atmosphere (1.01×10^5 Pa)? (8 points)

    A)   0.76 m
    B)   13 m
    C)   26 m
    D)   76 m
    E)   none of the above   Answer: _____

Questions 6-10 are a little harder and are worth 8 points each.

6.   A pendulum consists of a 0.4 kg bob on the end of a massless string, and it swings with a period of 0.80 sec. What is the length of the string? (6 points)

    A)   16 cm
    B)   0.50 m
    C)   1.00 m
    D)   1.25 m
    E)   none of the above   Answer: _____

7.   A goalie on a hockey team weighs 60 kg. If he is standing still when he catches a hockey puck (mass 0.17 kg) travelling 30 m/s, what will his recoil velocity be? Assume no friction. (8 points)

    A)   0
    B)   8.5 cm/s
    C)   17 cm/s
    D)   0.50 m/s
    E)   30 m/s   Answer: _____

8.   A tire of radius 0.40 m is decelerated from an initial angular velocity of 35 rad/s to rest at a rate of 1.2 rad/s^2. How far does the tire roll while it is decelerating? (8 points)

    A)   200 m
    B)   400 m
    C)   500 m
    D)   1000 m
    E)   none of the above   Answer: _____

9.   An underwater balloon has a volume of 24.5 m³ of air (ρ=1.29 kg/m³). If it is tethered to the bottom of a lake and fully immersed in water (ρ=1000 kg/m³), what is the tension in the cable holding it in position? You can ignore the mass of the skin of the balloon. (8 points)

   A)   0
   B)   310 N
   C) 1.01×10^5 N
   D) 2.40×10^5 N
   E)   none of the above   Answer: _____

10.   Hannah, standing 15 m from an amplifier, hears music at an intensity level of 100 dB. Wyatt, standing 45 m from the amplifier, hears the same sounds at what intensity level? (8 points)

   A)   10 dB
   B)   33 dB
   C)   90 dB
   D)   97 dB
   E)   none of the above   Answer: _____

Questions 11-13 are to be answered free-form and are worth 10 points each.

11.   A 35 kg ladder of length 4.5 m is placed against a (frictionless) wall so that it the foot of the ladder makes an angle of 75° with the horizontal. Find the horizontal and vertical components of the force exerted by the floor on the foot of the ladder, and the horizontal force exerted by the wall on the top of the ladder. (10 points)

12.   A long-playing phonograph album is rotating at a constant frequency of 33 1/3 revolutions per minute. If the phonograph needle is 6.5 cm from the axis and the ripples in the groove have a wavelength of 0.62 mm, what is the frequency of the sound emitted? (10 points)

13.   A frictionless track consists of a ramp of height h leading down to the bottom of a loop of radius r. For a block to slide (without friction) down the ramp and around the loop without losing contact with the track, what must the height h be in terms of the radius r? (10 points)

Answers: 1. D; 2. C; 3. C; 4. E; 5. B; 6. A; 7. B; 8. A; 9. D; 10. C; 11. *F_V = 343 N; F_H = F_W = 46 N*; 12. 366 Hz; 13. *h = (5/2) r*