Instructor(s): *Detweiler*

PHYSICS DEPARTMENT

PHY 2020 Test #4 November 16, 2015

Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

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1. On your pink answer sheet, did you correctly bubble in your test number in rows 76–80, and also bubble in your name and your UF ID number? Also, did you print and sign your name at the top of your test, and will you hand in the "white sheets?" before leaving the room? This question counts, and the correct answer should be "Yes".

   (1) Yes (2) No (3) X (4) X (5) X

2. Typical walking speed depends upon the length ℓ of your leg (which determines how long each step is) and also upon the average time T that a single step takes. Think of your leg as a pendulum of length ℓ, which has a natural time period of $T = 2\pi\sqrt{\ell/g}$. Would you walk faster or slower if your legs were longer?

   (1) Faster (2) Slower (3) No change in speed (4) X (5) X

3. If your natural walking speed is V_0, what would your natural walking speed be if your legs were twice as long?

   (1) $\sqrt{2}V_0$ (2) $V_0/\sqrt{2}$ (3) V_0 (4) $2V_0$ (5) $V_0/2$

4. If your mass is 60 kg, and you walk up the stairs to the top of the Statue of Liberty (a height of 100 m) in 1 hour (3,600 seconds) then how much work did you do in units of Joules?

   (1) 60,000 J (2) 3,600,000 J (3) 600 J (4) 3,600 J (5) 6,000 J

5. A 5 kg block is at rest on a table top. What is the magnitude of the sum of all of the forces acting on the block? This is also called the "net force."

   (1) 0 N (2) 10 N (3) 20 N (4) 40 N (5) 50 N

6. Two children slide down a straight, frictionless slide at a playground. One child has a mass of 35 kg and slides down the slide in 3.5 s. The other child has a mass of 70 kg. How much time will it take the second child to slide down the slide?

   (1) 3.5 s (2) 7 s (3) 2 s (4) 3 s (5) 4 s

7. Your mass is 60 kg, and you are standing on a platform on the surface of the Earth. What is the magnitude of the force of gravity acting upon you?

   (1) 600 N (2) 60 N (3) 120 N (4) 300 N (5) 0 N

8. What is the magnitude of the normal force from the platform acting upon you?

   (1) 600 N (2) 60 N (3) 120 N (4) 300 N (5) 0 N

9. An object of mass 20 kg is acted upon by *three* forces. One force is 3 N to the right, the second is 5 N to the left. The object moves with a constant speed of 4 m/s to the right. What is the magnitude and the direction of the third force?

   (1) 2 N, right (2) 4 N, right (3) 2 N, left (4) 4 N, left (5) 0 N

10. A newly discovered planet has been found orbiting the star Alpha Centauri. The planet has a mass which is one half the mass of the Earth, and a radius which is one half the radius of the Earth. What is the acceleration of gravity (*i.e.,* g) on the surface of this new planet?

    (1) 20 m/s^2 (2) 40 m/s^2 (3) 5 m/s^2 (4) 15 m/s^2 (5) 10 m/s^2

11. A block of mass m slides with no friction at a speed v_i until it bangs into and sticks to a second block, also of mass m. Together they continue to slide with a common speed v_f. What is the common speed of the combined masses after the collision?

    (1) $v_i/2$ (2) $2v_i$ (3) $4v_i$ (4) $v_i/4$ (5) v_i

12. How much kinetic energy was lost in the collision?

    (1) $mv_i^2/4$ (2) $mv_i^2/2$ (3) mv_i^2 (4) $2mv_i^2$ (5) None.

13. While you are standing still next to the road, a fire engine is speeding toward you with its siren going. Do you measure the speed of the sound from the siren to be (complete the sentence)

    (1) equal to the usual speed of sound.
    (2) greater than the usual speed of sound.
    (3) less than the usual speed of sound.
    (4) X
    (5) X

14. Look at the three figures of the bow-wave of boats that I sketched on the blackboard. Rank them in order of the speeds of the boats — fastest first, slowest last.

    (1) B A C (2) A C B (3) C A B (4) C B A (5) A B C

15. Two boxes of cereal sit on the front desk, Rice Chex (an oven toasted rice cereal) and Magic Stars (a sweetened oat cereal with marshmallows). According to the information on the box, which has more Calories per ounce of cereal?

    (1) They have the same amount of Calories per ounce. (2) Magic Stars (3) Rice Chex (4) X (5) X

16. Two blocks with masses $M_2 = 2$ kg and $M_4 = 4$ kg have a firecracker placed between them. After the firecracker goes off M_4 is measured to have a speed 4 m/s. What speed does M_2 have after the explosion?

    (1) 8 m/s (2) 4 m/s (3) 2 m/s (4) 12 m/s (5) 16 m/s

17. Which mass has more kinetic energy after the explosion?

(1) M_2 (2) M_4 (3) They have the same amount. (4) X (5) X

18. What is the total kinetic energy of the two masses after the explosion?

(1) 96 J (2) 32 J (3) 64 J (4) 4 J (5) 16 J

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 3 8 12 17 18