Instructor(s): *C. Parks*

PHYSICS DEPARTMENT

PHY2053, Summer 2014 EXAM 2 July 9, 2014

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

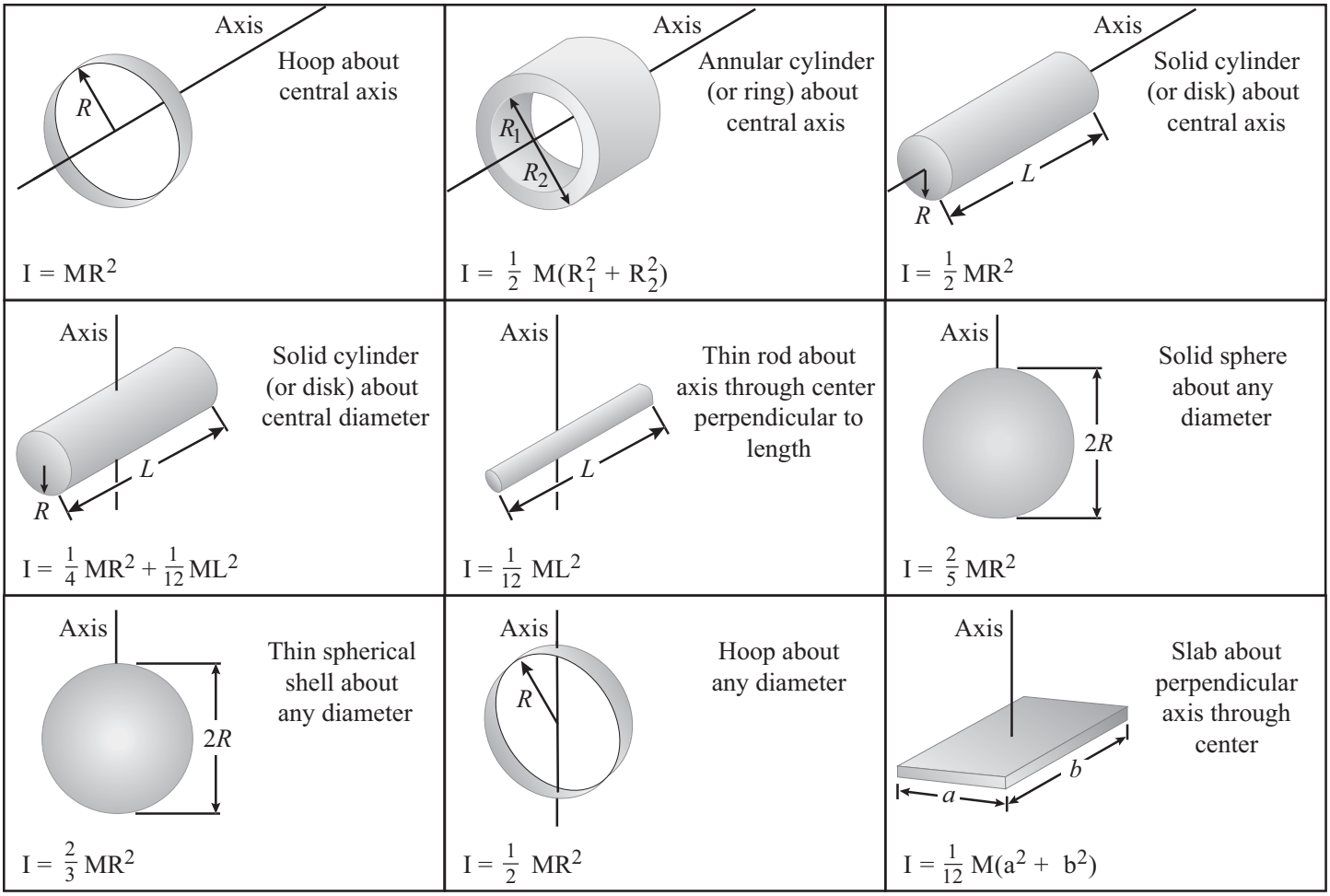
On my honor, I have neither given nor received unauthorized aid on this examination.

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.

Given Information:

$g = 9.80$ m/s^2 1 m = 100 cm 1 kW = 1000 W



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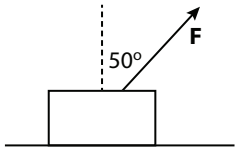
1. A force **F** acts on a 3-kg block as shown. After the the block slides 8 m, **F** has done 16 J of work. What is the magnitude of **F**?



(1) 2.6 N (2) 3.1 N (3) 2.0 N (4) 0.54 N (5) None of these.

2. Mew (4.0 kg) is moving at 45 m/s. How high above the ground should Mewtwo (122 kg) be so that his gravitational potential energy is twice Mew's kinetic energy? We will take the zero of potential energy to be ground level.

(1) 6.8 m
(2) 3.4 m
(3) 0.15 m
(4) 10 m
(5) None of these.

3. After sliding down a 10-m tall hill, a 85.5-kg Blastoise has 9500 J of kinetic energy. What was Blastoise's speed at the top of the hill? Assume that friction can be ignored.

(1) 5.1 m/s
(2) 15 m/s
(3) 10 m/s
(4) 20 m/s
(5) None of these.

4. After sliding down a 10-m tall hill, a 85.5-kg Blastoise has 9500 J of kinetic energy. What was Blastoise's speed at the top of the hill if friction does −1000 J of work?

(1) 7.0 m/s (2) 1.7 m/s (3) 21 m/s (4) 20 m/s (5) None of these.

5. When a 50-kg mass is attached to spring A it stretches 5 cm. When a 75-kg mass is attached to spring B it stretches 7.4 cm. When a 100-kg mass is attached to spring C, it stretches 9.8 cm. Rate the springs from weakest to strongest.

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

6. It takes a force of 80 N to compress a spring 0.196 m. A 0.02-kg ball is placed on the spring and the spring launches the ball vertically up. How far above the starting height will the ball rise after it is launched?

(1) 40 m (2) 10 m (3) 20 m (4) 30 m (5) None of these.

7. When a 1200-kg car is traveling at a constant 15 m/s on level ground, the engine's power is 5000 W. What is the net frictional force acting on the car?

(1) 330 N (2) 4.2 N (3) 780 N (4) 2.4 N (5) None of these.

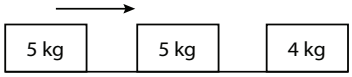
8. A 2-kg mass has a 5 m/s velocity to the right. After an impulse acts, the 2-kg mass is moving at 2 m/s to the left. What is the value of the impulse?

(1) 14 N-s to the left (2) 14 N-s to the right (3) 6.0 N-s to the left (4) 6.0 N-s to the right (5) None of these.

9. An 10-kg bomb is initially at rest hanging from a crane. The bomb explodes into four pieces, two 2-kg pieces and two 3-kg pieces. After the explosion, a 2-kg piece travels at 30 m/s up, a 3-kg piece at 20 m/s to the left, and another 3-kg piece travels at 20 m/s down. What is the velocity of the other piece?

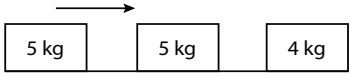
(1) 30 m/s to the right (2) 20 m/s to the right (3) 10 m/s to the right (4) 0 (5) None of these.

10. Three blocks are in a straight line as shown. The 5-kg block is moving at 2.8 m/s when it collides with the other 5-kg block. After the collision, the middle 5-kg block collides with the 4-kg block. What is the velocity of the 4-kg block after the collision? Assume that all collisions are elastic and that the blocks slide on a frictionless surface.



(1) 3.1 m/s (2) 2.8 m/s (3) 0.31 m/s (4) 20 m/s (5) None of these.

11. Three blocks are in a straight line as shown. The 5-kg block is moving at 2.8 m/s when it collides with the other 5-kg block. After the collision, the two 5-kg blocks are stuck together. Then the pair collide and stick to the 4-kg block so that all three blocks are stuck together. What is the velocity of the three block combination? Assume that the blocks slide on a frictionless surface.

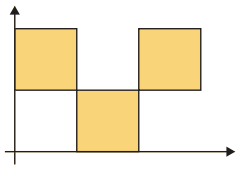


(1) 1.0 m/s (2) 1.6 m/s (3) 2.8 m/s (4) 3.1 m/s (5) None of these.

12. A 1200-kg car traveling north collides with a 1500-kg truck traveling east. After the collision, the vehicles stick together. The car's speed before the collision is 10 m/s and the truck's speed is 14 m/s. What is the direction of the velocity of the wreck after the collision?

(1) 30° N of E (2) 45° N of E (3) 60° N of E (4) 75° N of E (5) None of these.

13. Three uniform squares are arranged as shown. Each square has the same 2.0 kg mass. Each square is 1 m on a side. What is the position of the center of mass according to the given coordinate system?



(1) (1.5 m, 1.2 m) (2) (1.5 m, 1.5 m) (3) (1.2 m, 1.5 m) (4) (1.2 m, 1.2 m) (5) None of these.

14. A 10-kg ring with outer radius 1.5 m and inner radius 1.2 m is placed snuggly around a solid sphere with mass 8.0 kg and radius 1.2 m. The combination rotates about the axis of the cylinder. What is the rotational inertia of the combination?

(1) 23 kg-m^2 (2) 26 kg-m^2 (3) 19 kg-m^2 (4) 15 kg-m^2 (5) None of these.

15. A 2-m beam is horizontal and hinged to a wall at its left end. A 20 N force acts up at the center of the beam and a 15 N force acts down at the right end of the beam. What is the net torque on the beam? Take the axis of rotation for the torques at the hinge. The weight of the beam can be neglected.

(1) 10 N-m clockwise
(2) 10 N-m counterclockwise
(3) 25 N-m clockwise
(4) 25 N-m counterclockwise
(5) None of these.

16. A 2-m beam is horizontal and hinged to a wall at its left end. A 20 N force acts up at the center of the beam and a 15 N force acts down at the right end of the beam. How far from the hinge will a 20 N force be applied to keep the beam in rotational equilibrium? What is the direction of the 20-N force? The weight of the beam can be neglected.

(1) At 0.5 m directed up
(2) at 0.5 m directed down
(3) at 2.5 m directed up
(4) at 2.5 m directed down
(5) None of these.

17. A thin ring has a radius of 0.30 m and a mass of 1.5 kg. A 8.1 N-m torque acts on the ring. What is the angular acceleration of the ring?

(1) 60 rad/s^2 (2) 150 rad/s^2 (3) 120 rad/s^2 (4) 90 rad/s^2 (5) None of these.

18. In lecture I rolled two disks with the same radii down a hill. One cylinder was brass and the other was aluminum. The brass cylinder was significantly heavier than the aluminum. What happened?

(1) They reached the bottom together.
(2) The aluminum cylinder reached the bottom first.
(3) The brass cylinder reached the bottom first.
(4) They did not roll down the hill.
(5) It depends of the slope of the hill.

19. A 20-kg disk with radius 0.3 m rotates about its axis at 25 rad/s. How fast should a 25-kg solid sphere with radius 0.2 m rotate so it has the same angular momentum as the disk?

(1) 56 rad/s (2) 34 rad/s (3) 110 rad/s (4) 45 rad/s (5) None of these.

20. A star rotates once every 40 days. The star explodes and its radius doubled and its mass was halved. How long does it take for the star to complete one rotation now? Model the star as a uniform solid sphere and assume that the angular momentum of the star is conserved.

(1) 80 days (2) 20 days (3) 40 days (4) 60 days (5) None of these.

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 4 11 16