Exam 3--PHYS 101--F12--Ch 5-8

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Which of the following is an example of a nonconservative force?
   a. gravity
   b. magnetism
   c. friction
   d. Both choices a and b are valid.

2. If both mass and velocity of a ball are tripled, the kinetic energy is increased by a factor of:
   a. 3.
   b. 6.
   c. 9.
   d. 27.

3. A rock is thrown straight up with an initial velocity of 15.0 m/s. Ignore energy lost to air friction. How high will the rock rise?
   a. 1.53 m
   b. 22.9 m
   c. 6.50 m
   d. 11.5 m

4. The unit of work, joule, is dimensionally the same as which of these?
   a. newton/second.
   b. newton/kilogram.
   c. newton-second.
   d. newton-meter.
5. A Hooke's law spring is compressed 12.0 cm from equilibrium and the potential energy stored is 72.0 J. What is the spring constant in this case?

   a. 10,000 N/m
   b. 5,000 N/m
   c. 1,200 N/m
   d. No answer is correct.

6. Which of the following is that form of energy associated with an object's motion?

   a. potential
   b. thermal
   c. bio-chemical
   d. kinetic

7. A 75-kg swimmer dives horizontally off a 500-kg raft. If the diver's speed immediately after leaving the raft is 4 m/s, what is the corresponding raft speed?

   a. 0.2 m/s
   b. 0.5 m/s
   c. 0.6 m/s
   d. 4.0 m/s

8. In a system with two moving objects, when a collision occurs between the objects:
   a. the total kinetic energy is always conserved.
   b. the total momentum is always conserved.
   c. the total kinetic energy and total momentum are always conserved.
   d. neither the kinetic energy nor the momentum is conserved.
9. If the momentum of an object is tripled, its kinetic energy will change by what factor? (Assume the mass of the object remains the same.)
   a. zero
   b. one-third
   c. three
   d. nine

10. A system of particles has a momentum of zero. Which of these statements is true about the kinetic energy of the system?
   a. the kinetic energy is zero
   b. the kinetic energy is positive
   c. the kinetic energy is negative
   d. there is not enough information

11. A bouncy rubber ball and bean bag, each with the same mass, fall to the floor from the same height. Which of these statements about the force imparted to the floor is true?
   a. the rubber ball imparts a greater force
   b. the bean bag imparts a greater force
   c. the ball and bean bag impart the same force
   d. there is not enough information

12. A tire placed on a balancing machine in a service station starts from rest and turns through 10 radians in 2.00 s before reaching its final angular speed. What is the final angular speed?
   a. 5.0 rad/s
   b. 10. rad/s
   c. 20.0 rad/s
   d. 1.59 rad/s
13. Kaisa sits on the outer rim of a merry-go-round, and Chad sits midway between the rim and center. The merry-go-round makes 1 revolution every 2 seconds. **Chad’s linear velocity is ...**

   a. same as Kaisa’s
   b. one-half of Kaisa’s
   c. one-quarter of Kaisa’s
   d. twice Kaisa’s
   e. four times Kaisa’s

14. A ball tied to a string is being whirled around in a circle. What can you say about the force of tension on the ball?

   a. the tension is tangent to the circular path
   b. the tension acts towards the center of the circular path
   c. the tension acts away from the center of the circular path
   d. none of these

15. A grindstone spinning at the rate of 8.3 rev/s has what angular speed in rad/s?

   a. 3.2 rad/s
   b. 26 rad/s
   c. 52 rad/s
   d. 81 rad/s
16. A car rounds a curve on a flat road. The coefficient of static friction between the road and tires is 0.70. If the curve has a radius of 50. meters, what is the maximum safe speed at which the car can round the curve?

a. 19 m/s  
b. 35 m/s  
c. 340 m/s  
d. 71 m/s

17. An object at rest begins to rotate with a constant angular acceleration. If this object rotates through an angle \( \theta \) in the time \( t \), through what angle did it rotate in the time \( 1/2 \ t \) ?

a. \( \frac{1}{2} \theta \)  
b. \( \frac{3}{4} \theta \)  
c. \( \frac{1}{4} \theta \)  
d. \( 2 \theta \)  
e. \( 4 \theta \)
18. The following figure shows a configuration of particles that rotate about the vertical axis as shown. What is the moment of inertia for this configuration of particles?

![Diagram of particles](image)

- a. 7.0 kg m$^2$
- b. 16 kg m$^2$
- c. 10.0 kg m$^2$
- d. 44 kg m$^2$

19. This figure shows four identical L-shaped objects. Each rotates around the axis drawn with the thin black line. Rank the four objects from greatest moment of inertia to the least moment of inertia.

![Diagram of L-shaped objects](image)

- a. c>d>b>a
- b. d>c>b=a
- c. c>d>a=b
- d. a=b=c=d
20. A potter’s wheel is spinning at 3 rev/s. The wheel has a moment of inertia of 0.1 kg m² and a radius of 0.5 m. The potter throws a 1.0 kg lump of clay on the edge of the wheel. What is the new speed of the wheel?

a. 0.9 rev/s  
b. 0.4 rev/s  
c. 3 rev/s  
d. 2 rev/s

21. Which of these are the basic SI units for moment of inertia?

a. \( \text{kg m}^2\text{s}^{-2} \)  
b. \( \text{N m} \)  
c. \( \text{kg m}^2 \)  
d. \( \text{kg m}^2\text{s}^{-2} \)

22. A disk, with a mass of 0.50 kg and radius 1.0 m, is spinning at a rate of 10.0 rad/s. What is the energy of the hoop?

a. 13 J  
b. 25 J  
c. 10 J  
d. 5.0 J
23. What is the net torque acting on this thin rod about the point C?

- 25 N m CW
- 10 N m CCW
- 5 N m CCW
- 45 N m CCW

24. The thin rod in the previous question has a mass of 0.75 kg. After 2 seconds while the torque acts on the rod, what is its angular velocity?

- 50 rad/s
- 100 rad/s
- 150 rad/s
- 75 rad/s

25. Two spheres have the same mass. One sphere is made of aluminum, while the other sphere is made of gold. Both are solid. Because gold is more dense, the radius of the gold sphere is smaller than the aluminum sphere. Which has the larger moment of inertia?

- aluminum sphere
- gold sphere
- both the same
- not enough information
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Answer Section

MULTIPLE CHOICE

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