

Exam SECOND EXAM Spring 2008 PHYSICS 111

Name \_\_\_\_\_

NOTE: QUESTIONS 24 AND UP ARE EXTRA CREDIT

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) A rifle recoils from firing a bullet. The speed of the rifle's recoil is small because the
- A) force against the rifle is smaller than against the bullet.
  - B) rifle has much more mass than the bullet
  - C) momentum is mainly concentrated in the bullet.
  - D) momentum of the rifle is smaller.
  - E) none of the above
- 2) In order to catch a ball, a baseball player extends the hand forward before impact with the ball and then lets it ride backward in the direction of the ball's motion upon impact. Doing this reduces the force of impact on the player's hand principally because the
- A) time of impact is decreased.
  - B) relative velocity is less.
  - C) force of impact is reduced.
  - D) time of impact is increased.
  - E) none of these.
- 3) A car traveling along the highway needs a certain amount of force exerted on it to stop it in a certain distance. More stopping force is required when the car has
- A) more momentum.
  - B) less stopping distance.
  - C) more mass.
  - D) all of the above.
  - E) none of these.

- 4) A 4 kg ball has a momentum of 12 kg m / s. What is the ball's speed?  
A) 3 m / s      B) 4 m / s      C) 12 m / s      D) 48 m / s      E) none of these
- 5) A 1000-kg car moving at 10 m / s brakes to a stop in 5 s. The average braking force is  
A) 1000 N.      B) 2000 N.      C) 3000 N.      D) 4000 N.      E) 5000 N.
- 6) A sandbag is motionless in outer space. A second sandbag with 3 times the mass moving at 12 m / s collides with it. They stick together and move at a speed of  
A) 8 m / s.      B) 3 m / s.      C) 4 m / s.      D) 6 m / s.      E) none of these
- 7) An archer shoots an arrow. Consider the action force to be exerted by the bowstring against the arrow. The reaction to this force is the  
A) grip of the archer's hand on the bow.  
B) weight of the arrow.  
C) arrow's push against the bowstring.  
D) air resistance against the bow.  
E) friction of the ground against the archer's feet.
- 8) A horse exerts 500 N of force on a heavy wagon. The wagon pulls back on the horse with an equal force. The wagon still accelerates because  
A) the horse pulls on the wagon a brief time before the wagon reacts.  
B) these forces are not an action-reaction pair.  
C) nevertheless there is still an unbalanced force on the wagon.  
D) the wagon does not accelerate because these forces are equal and opposite.
- 9) Richard Feynman wanted his dollar for  
A) A patent on a nuclear powered airplane  
B) Consulting work with a school board  
C) Royalties on his scientific papers  
D) Assisting General Electric with repair of a large electric generator in a power plant  
E) A can of beer

- 10) A TV set is pushed a distance of 2 m with a force of 20 N that is in the same direction as the set moves. How much work is done on the set?
- A) 2 J      B) 10 J      C) 20 J       D) 40 J      E) 80 J
- 11) Using 1000 J of work, a toy elevator is raised from the ground floor to the second floor 5m above in 20 seconds. How much power does the elevator use?
- A) 20 W       B) 50 W      C) 100 W      D) 1000 W      E) 20,000 W
- 12) Strictly speaking, if any electrical device in your car is turned on (such as an air conditioner, headlights, or even a radio) more gasoline is burned by the engine. This statement is
- A) true only if the car's engine is stopped.  
B) totally false.  
C) true only if the car's engine is running.  
 D) almost always true.  
E) none of these.
- 13) A flower pot of mass  $m$  falls from rest to the ground below, a distance  $h$ . Which statement is correct?
- A) The speed of the pot when it hits the ground depends on  $m$ .  
B) The speed of the pot when it hits the ground is proportional to  $h$ .  
 C) The KE of the pot when it hits the ground is proportional to  $h$ .  
D) The KE of the pot when it hits the ground does not depend on  $m$ .  
E) None of these is correct.
- 14) Two pool balls, each moving at 2 m / s, roll toward each other and collide. Suppose after bouncing apart, each moves at 4 m / s. This collision violates conservation of
- A) kinetic energy.  
B) momentum.  
C) angular momentum  
D) all of the above  
E) none of the above

15) A diver who weighs 500 N steps off a diving board that is 10 m above the water. The diver hits the water with kinetic energy of

- A) 10 J.
- B) 500 J.
- C) 510 J.
- D) 5,000 J.
- E) 10,000 J.

16) Two 5000-kg freight cars roll toward one another (one at 1 m / s and the other at 2 m / s) on a level track. Thus before they collide one car's kinetic energy is 2500 J and the other's is 10,000 J. They collide and couple together. The amount of kinetic energy turned into heat (mostly warming the couplers) in the collision is

- A) 1,250 J.
- B) 12500 J.
- C) 1,000 J.
- D) 750 J.
- E) 250 J.

17) A torque acting on an object tends to produce

- A) velocity.
- B) equilibrium.
- C) rotation.
- D) linear motion.
- E) a center of gravity.

18) The famous Leaning Tower of Pisa doesn't topple over because its center of gravity is

- A) displaced from its center.
- B) relatively low for such a tall building.
- C) above a place of support.
- D) stabilized by its structure.
- E) in the same place as its center of mass.

Figure 8-F



- 19) Suppose you are at the center of a large freely-rotating horizontal turntable in a carnival funhouse. As you crawl toward the edge, the angular momentum of you and the turntable
- A) decreases.
  - B) decreases in direct proportion to your decrease in RPMs.
  - C) increases.
  - D) remains the same, but the RPMs decrease.
  - E) none of these.
- 20) A flywheel's mass is twice that of another of the same size and shape. The more massive flywheel's rotational inertia is
- A) half the other's.
  - B) 4 times the other's.
  - C) the same as the other's.
  - D) 2 times the other's.
  - E) 1 / 4 the other's.
- 21) Since the Earth was formed, the Moon has been
- A) Staying pretty much in the same orbit
  - B) Moving closer to the Earth
  - C) Speeding up in its orbit around the Earth
  - D) Moving further away from the Earth
  - E) Sometimes orbiting the Earth, sometimes other planets such as Venus or Mars

- 22) A car is driving along at 30 miles per hour. If the brakes are applied, it can slide to a stop in 18 meters. How far would it take to stop if one were driving at 40 miles per hour on the same surface?
- A) 36 m
  - B) 32 m
  - C) 24 m
  - D) 18 m
  - E) none of the above
- 23) Which has the most to do with the reason for high speeds in tornado winds?
- A) Conservation of Energy
  - B) Elastic collisions
  - C) Convection of Momentum
  - D) Conservation of Angular Momentum
  - E) Inelastic collisions

#### Extra Credit

- 24) Which of the following seem to be true of black holes?
- A) They are everywhere, including scattered around the Earth.
  - B) They are fairly common, probably at the centers of most galaxies including our own.
  - C) They are holes punched through most stars.
  - D) They are a science fiction fantasy that seem not to exist.
  - E) They are the seed for most major hurricanes.
- 25) Which of the following is true for an inertial frame of reference?
- A) There are fictitious forces.
  - B) Newton's laws appear to hold.
  - C) Newton's laws appear not to hold.
  - D) Objects with no unbalanced forces on them accelerate.
  - E) The law of inertia does not work.

26) Suppose that from the same place you throw a ball up, across, or down at  $10 \frac{m}{s}$  and it hits the ground. The order of speeds of these balls from fastest to slowest, when they hit (ignoring air resistance) is

- A) Down, across, up
- B) Up, down, across
- C) Up, across, down
- D) All the same
- E) It cannot be known without a detailed calculation excluding exact angles.