PUT ANSWERS ON SCANTRON FREE RESPONSE ONLY RECORD FINAL ANSWER> SHOW WORK FOR ALL ON A SEPARATE PAPER. DUE 2/27/17

Name_____

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

1) A boat can move at 30 km/h in still water. How long will it take to move 12 km upstream in a river flowing 6.0 km/h? 1) _____
   A) 22 min B) 20 min C) 30 min D) 24 min

2) If you are driving 72 km/h along a straight road and you look to the side for 4.0 s, how far do you travel during this inattentive period? 2) _____
   A) 20 m B) 18 m C) 80 m D) 40 m

3) A motorist travels 160 km at 80 km/h and 160 km at 100 km/h. What is the average speed of the motorist for this trip? 3) _____
   A) 90 km/h B) 89 km/h C) 91 km/h D) 84 km/h

4) An airplane increases its speed from 100 m/s to 160 m/s, at the average rate of 15 m/s^2. How much time does it take for the complete increase in speed? 4) _____
   A) 0.058 s B) 17 s C) 4.0 s D) 0.25 s

5) A car starting from rest moves with constant acceleration of 2.0 m/s^2 for 10 s, then travels with constant speed for another 10 s, and then finally slows to a stop with constant acceleration of –2.0 m/s^2. How far does it travel? 5) _____
   A) 300 m B) 200 m C) 500 m D) 400 m

6) A bullet shot straight up returns to its starting point in 10 s. What is the initial speed of the bullet? 6) _____
   A) 98 m/s B) 49 m/s C) 9.8 m/s D) 25 m/s

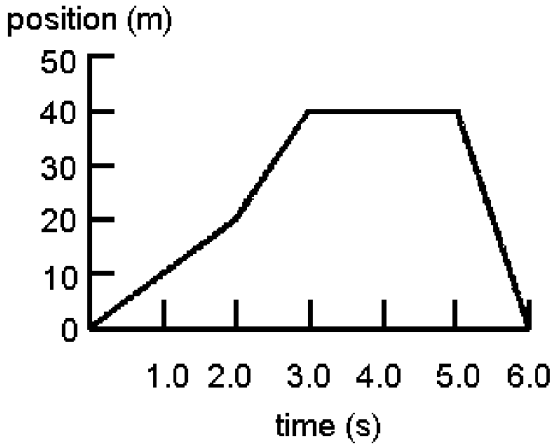

FIGURE 2–1

7) In Fig. 2–1, what is the velocity at t = 2.5 s? 7) _____
   A) 0 B) 20 m/s C) 10 m/s D) –40 m/s

8) Your motorboat can move at 30 km/h in still water. How much time will it take you to move 12 km downstream, in a river flowing at 6.0 km/h? 8) _____

A) 20 min B) 30 min C) 22 min D) 24 min

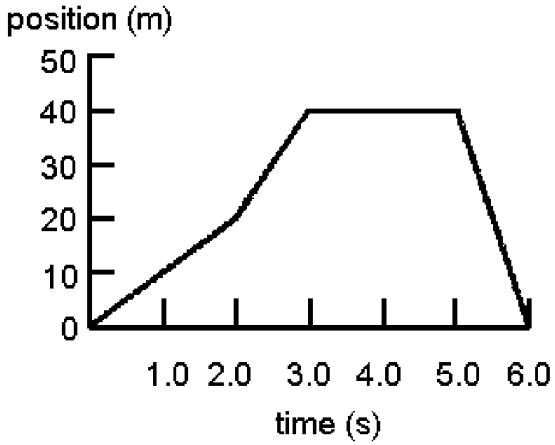

FIGURE 2–1

9) In Fig. 2–1, what is the average velocity from 0 to 6.0 s? 9) _____

A) –40 m/s B) 0 C) 10 m/s D) 20 m/s

10) In Fig. 2–1, what is the average velocity from 0 to 4.0 s? 10) _____

A) 0 B) –40 m/s C) 20 m/s D) 10 m/s

11) In Fig. 2–1, what is the velocity at t = 5.5 s? 11) _____

A) 10 m/s B) –40 m/s C) 20 m/s D) 0

12) In Fig. 2–1, what is the velocity at t = 4.0 s? 12) _____

A) –40 m/s B) 10 m/s C) 0 D) 20 m/s

13) A pilot drops a bomb from a plane flying horizontally at a constant speed. Neglecting air resistance, when the bomb hits the ground the horizontal location of the plane will 13) _____

A) be in front of the bomb.
B) depend on the speed of the plane when the bomb was released.
C) be over the bomb.
D) be behind the bomb.

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

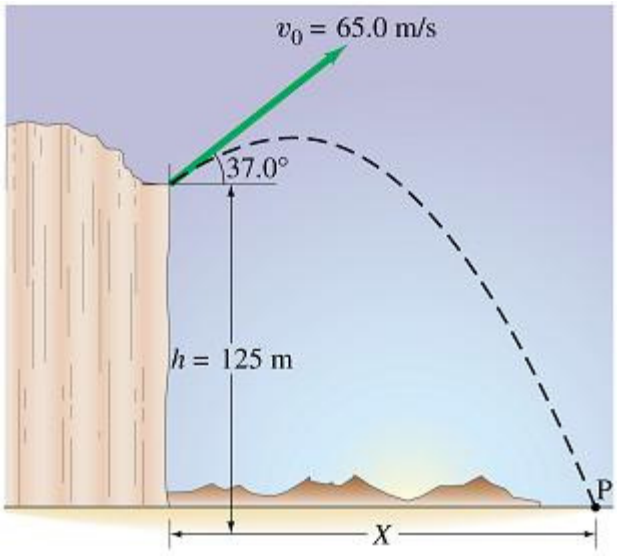

FIGURE 3–35

14) A projectile is shot from the edge of a cliff 125 m above ground level with an initial speed of 65.0 m/s at an angle of 37.0° with the horizontal, as shown in Fig. 3–35. (a) Determine the time taken by the projectile to hit point P at ground level. (b) Determine the range X of the projectile as measured from the base of the cliff. At the instant just before the projectile hits point P, find (c) the horizontal and vertical components of its velocity, (d) the magnitude of the velocity, and (e) the angle made by the velocity vector with the horizontal. (f) Find the maximum height above the cliff top reached by the projectile.

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

15) Which of Newton's laws best explains why motorists should buckle-up? 15) _____

A) the law of gravitation
B) the first law
C) the third law
D) the second law

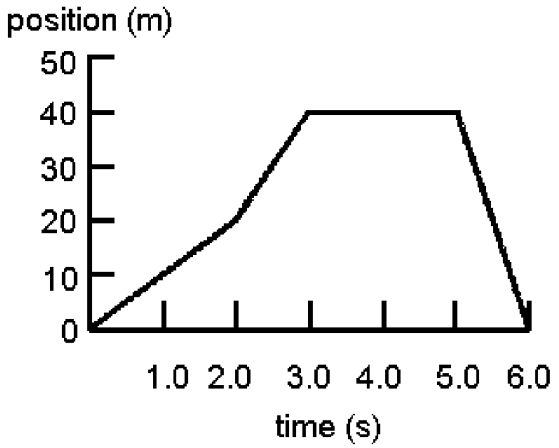

FIGURE 2–1

16) In Fig. 2–1, what is the velocity at t = 1.0 s? 16) _____
A) 10 m/s B) –40 m/s C) 0 D) 20 m/s

17) A constant net force acts on an object. Describe the motion of the object. 17) _____
A) constant acceleration B) constant velocity
C) constant speed D) increasing acceleration

18) A horizontal force accelerates a box from rest across a horizontal surface (friction is present) at a constant rate. The experiment is repeated, and all conditions remain the same with the exception that the horizontal force is doubled. What happens to the box's acceleration? 18) _____
A) It increases to exactly double its original value.
B) It increases somewhat.
C) It increases to less than double its original value.
D) It increases to more than double its original value.

19) Two toy cars (16 kg and 2.0 kg) are released simultaneously on an inclined plane that makes an angle of 30° with the horizontal. Make a statement which best describes their acceleration after being released. 19) _____
A) Both cars accelerate at the same rate.
B) The 16–kg car accelerates 8 times faster than the 2.0–kg car.
C) The 2.0–kg car accelerates 8 times faster than the 16–kg car.
D) none of the above

20) Consider a particle moving with constant speed such that its acceleration of constant magnitude is always perpendicular to its velocity. 20) _____
A) It is moving in a circle.
B) It is moving in a straight line.
C) It is moving in a parabola.
D) None of the above is definitely true all of the time.

21) Consider a small satellite moving in a circular orbit (radius r) about a spherical planet (mass M). Which expression gives this satellite's orbital velocity? 21) _____
A) $(GM/r)^{1/2}$ B) $v = GM/r$ C) GM/r^2 D) $(GM/r^2)^{1/2}$

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

22) Two identical arrows, one with twice the speed of the other, are fired into a bale of hay. Assuming the hay exerts a constant frictional force on the arrows, the faster arrow will penetrate how much farther than the slower arrow? Explain.

FIGURE 6–36

23) A 330–kg piano slides 3.6 m down a 28° incline and is kept from accelerating by a man who is pushing back on it *parallel to the incline* (Fig. 6–36). The effective coefficient of kinetic friction is 0.40. Calculate: (a) the force exerted by the man, (b) the work done by the man on the piano, (c) the work done by the friction force, (d) the work done by the force of gravity, and (e) the net work done on the piano.

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

24) A handball of mass 0.10 kg, traveling horizontally at 30 m/s, strikes a wall and rebounds at 24 m/s. What is the change in the momentum of the ball? 24) _____

A) 72 kg•m/s B) 0.60 kg•m/s C) 5.4 kg•m/s D) 1.2 kg•m/s

25) A 3.0–kg object moves to the right with a speed of 2.0 m/s. It collides in a perfectly elastic collision with a 6.0–kg object moving to the left at 1.0 m/s. What is the total kinetic energy after the collision? 25) _____

A) 3.0 J B) 6.0 J C) 0 J D) 9.0 J

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

26) A 70–cm diameter wheel accelerates uniformly about its center from 130 rpm to 280 rpm in 4.0 s. Determine (a) its angular acceleration, and (b) the radial and tangential components of the linear acceleration of a point on the edge of the wheel 2.0 s after it had started accelerating.

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

27) What condition or conditions are necessary for rotational equilibrium? 27) _____

A) $\Sigma T = 0$ B) $\Sigma F_X = 0, \Sigma F_Y = 0$

C) $\Sigma F_X = 0, \Sigma T = 0$ D) $\Sigma F_X = 0$

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

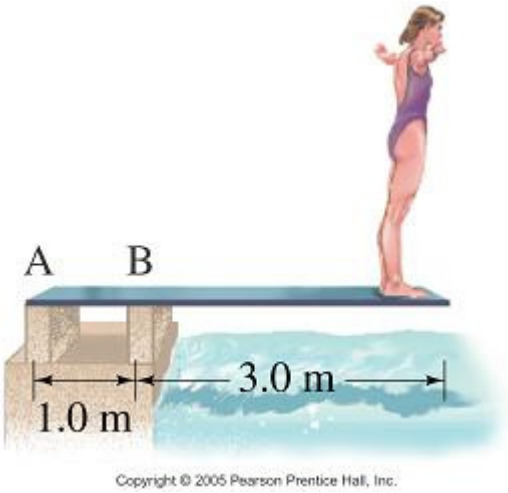

FIGURE 9–42

28) Calculate the forces F_A and F_B that the supports exert on the diving board of Fig. 9–42 when a 58 kg person stands at its tip. (a) Ignore the weight of the board. (b) Take into account the board's mass of 35 kg. Assume the board's CG is at its center.

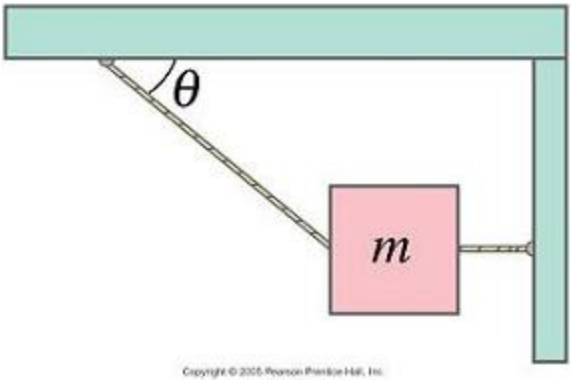

FIGURE 9–45

29) Find the tension in the two cords shown in Fig. 9–45. Neglect the mass of the cords, and assume that the angle θ is 33° and the mass m is 170 kg.

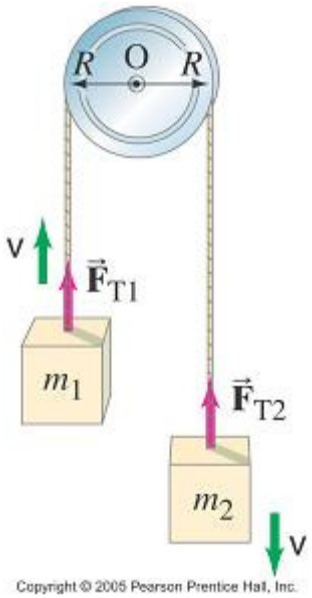

FIGURE 8–47

30) Two masses, m_1 = 18.0 kg and m_2 = 26.5 kg, are connected by a rope that hangs over a pulley (as in Fig. 8–47). The pulley is a uniform cylinder of radius 0.260 m and mass 7.50 kg. Initially, m_1 is on the ground and m_2 rests 3.00 m above the ground. If the system is now released, use conservation of energy to determine the speed of m_2 just before it strikes the ground. Assume the pulley if frictionless.