Practice Test 1

1) Abby throws a ball straight up and times it. She sees that the ball goes by the top of a flagpole after 0.60 s and reaches the level of the top of the pole after a total elapsed time of 4.20 s. What was the speed of the ball at launch?
A) 11.3 m/s  
B) 23.5 m/s  
C) 33.9 m/s  
D) 45.2 m/s  
Answer: B

2) An astronaut stands by the rim of a crater on the moon, where the acceleration of gravity is 1.62 m/s². To determine the depth of the crater, she drops a rock and measures the time it takes for it to hit the bottom. If the time is 6.3 s, what is the depth of the crater?
A) 10 m  
B) 14 m  
C) 26 m  
D) 32 m  
Answer: D

3) A car traveling with velocity \( v \) is decelerated by a constant acceleration of magnitude \( a \). It takes a time \( t \) to come to rest. If its initial velocity were doubled, the time required to stop would
A) double as well.  
B) decrease by a factor of two.  
C) stay the same.  
D) quadruple.  
Answer: A

4) A car moving initially with velocity \( v_0/2 \) with deceleration \( a \) comes to a full stop after traveling a distance \( d \). We can say that the velocity of the car after traveling a distance \( d/2 \) is
A) greater than \( v_0/2 \).  
B) equal than \( v_0/2 \).  
C) smaller than \( v_0/2 \).  
D) has no relationship to \( v_0 \).  
Answer: A

5) A car is moving with a velocity \( (3.0 \text{ m/s}) \hat{x} + (1.0 \text{ m/s}) \hat{y} \) and 3.0 seconds later its velocity is \( (6.0 \text{ m/s}) \hat{x} - (3.0 \text{ m/s}) \hat{y} \). What is the direction of the average acceleration of the car?
A) 67° from the \( x \)-axis  
B) -67° from the \( x \)-axis  
C) 53° from the \( x \)-axis  
D) -53° from the \( x \)-axis  
Answer: D

6) The components of vectors \( \vec{M} \) and \( \vec{N} \) are as follows: \( \vec{M} \) (1, -1) and \( \vec{N} \) (2, 4). The components of the resultant vector \( \vec{M} - \vec{N} \) are given by
A) (-1, -5).  
B) (3, 3).  
C) (1, -5).  
D) (0, 4).  
Answer: A

7) A ball is thrown at an angle 45.0° above the horizontal from ground level with an initial velocity of 20.0 m/s. What is the range of the ball?
A) 20.0 m
B) 40.8 m
C) 19.6 m
D) None of the other choices is correct.
Answer: B

8) A bullet is fired with a certain velocity at an angle $\theta$ above the horizontal at a location where $g = 10.0$ m/s². The initial $x$ and $y$ components of its velocity are 86.6 m/s and 50.0 m/s respectively. How long does it take before the bullet gets to the highest point of its trajectory?
A) 10.0 seconds
B) 5.0 seconds
C) 15.0 seconds
D) None of the other choices is correct.
Answer: B

9) A ball is thrown horizontally with an initial velocity of 20.0 m/s from the edge of a building of a certain height. The ball lands at a horizontal distance of 82.0 m from the base of the building. What is the height of the building?
A) 40.5 m
B) 60.2 m
C) 87.9 m
D) 82.4 m
Answer: D

10) Mary and Debra stand on a snow-covered roof. They both throw snowballs with the same initial speed, but in different directions. Mary throws her snowball downward, at 30° below the horizontal; Debra throws her snowball upward, at 30°. When the snowballs reach the ground below,
A) Debra's snowball will have a higher speed than Mary's.
B) Mary's snowball will have a higher speed than Debra's.
C) Both snowballs will hit the ground with the same speed.
D) Debra's snowball never hits the ground since it is thrown upwards.
Answer: C

11) A 10.0-kg picture is held in place by two wires, one hanging at 35.0° to the left of the vertical and the other at 45.0° to the right of the vertical. What is the tension in the first wire?
A) 70.4 N
B) 50.8 N
C) 98.1 N
D) 69.4 N
Answer: A

12) What does the word "normal" mean in the phrase "normal force"?
A) the force that is usually exerted by a surface
B) the total force exerted by a surface
C) the component of the force exerted by a surface parallel to the surface
D) the component of the force exerted by a surface perpendicular to the surface
Answer: D

13) Imagine that the metal head of a hammer is loose. In order to get the hammerhead tight again you should
A) drop the hammer on its side from some given height.
B) drop the hammer with the handle end down.
C) drop the hammer with the head end down.
D) It makes no difference how you drop the hammer.
Answer: B

14) You ride on an elevator that is moving with constant downward acceleration while standing on a
bathroom scale. The reading on the scale is
A) equal to your true weight, \( mg \).
B) less than your true weight, \( mg \).
C) more than your true weight, \( mg \).
D) could be more or less than your true weight, \( mg \), depending on the magnitude of the acceleration.
Answer: B

15) A 3.00-kg mass rests on the ground. It is attached to a string which goes vertically to and over an ideal pulley. A second mass is attached to the other end of the string and released. The 3.00-kg mass rises 50.0 cm in 1.00 s. How large was the other mass?
A) 3.67 kg
B) 4.29 kg
C) 6.83 kg
D) 7.15 kg
Answer: A

16) A 1000-kg car is picking up speed as it goes around a horizontal curve whose radius is 100 m. The coefficient of static friction between the tires and the road is 0.350. At what speed will the car begin to skid sideways?
A) 23.6 m/s
B) 34.3 m/s
C) 35.0 m/s
D) 18.5 m/s
Answer: D

17) When an object moves at constant speed on a circular path, which of the following is true?
A) A net force pointing along the direction of motion acts on the object.
B) A net force pointing away from the center of the circle acts on the object.
C) The net force acting on the object is zero N.
D) A net force pointing towards the center of the circle acts on the object.
Answer: D

18) An object is under the influence of a force as represented by the force vs. position graph in Figure 7-4. What is the work done as the object moves from 6 m to 12 m?
A) 20 J
B) 30 J
C) 0 J
D) 40 J
Answer: B

19) You need to load a crate of mass \( m \) onto the bed of a truck. One possibility is to lift the crate straight up over a height \( h \), equal to height of the truck's bed. The work done in this case is \( W_1 \). The other possibility is to slide the crate up the frictionless ramp of length \( L \) as shown in the figure. In this case you perform work \( W_2 \).
What statement is true?
A) \( W_1 < W_2 \)
B) \( W_1 = W_2 \)
C) \( W_1 > W_2 \)
D) No simple relationship exists between \( W_1 \) and \( W_2 \).
Answer: B

20) 4.0 J of work are performed in stretching a spring with a spring constant of 2500 N/m. How much is the spring stretched?
A) 3.2 cm
B) 0.3 cm
C) 5.7 m
D) 5.7 cm
Answer: D

21) As compared to Jack, Jill does twice the work in half the time. Jill's power output is
A) the same as Jack's power output.
B) one-half as much as Jack's power output.
C) twice Jack's power output.
D) four times Jack's power output.
Answer: D

A 2-kg mass is moving along the x-axis. The potential energy curve as a function of position is shown in Figure above. The system is conservative. There is no friction.
22) Refer to Figure 8-10. If the kinetic energy of the object at the origin is 12 J, what will be the speed of the object at 6.0 m along the +x-axis?
A) 2.0 m/s
B) 2.2 m/s
C) 2.5 m/s
D) 2.7 m/s
Answer: B
A 2.0 kg mass is moving along the x-axis. The potential energy curve as a function of position is shown in Figure 8-9. The system is conservative. There is no friction.

23) Refer to Figure 8-9. If the speed of the object at the origin is 4.0 m/s, what will be its speed at 7.0 m along the +x-axis?
   A) 4.0 m/s
   B) 4.1 m/s
   C) 4.4 m/s
   D) 10 m/s
   Answer: B

24) Two identical balls are thrown from the top of a building with the same speed. Ball 1 is thrown horizontally, while ball 2 is thrown at an angle \( \theta \) above the horizontal. Neglecting air resistance, which ball will have the greatest speed when hitting the ground below?
   A) Ball 1
   B) Ball 2
   C) Both balls reach the ground with the same speed.
   D) There is not enough data to answer the question.
   Answer: C

25) If the height of the inclined plane is raised to 15.0 m, what is the speed of the object right before it reaches the bottom of the inclined plane?
   A) 16.0 m/s^2
   B) 10.0 m/s
   C) 17.3 m/s
   D) 16.0 m/s
   Answer: C

26) An object of mass \( m \) is moving down an inclined plane that makes an angle \( \theta \) with the horizontal and has height \( h \). Which of the following statements is correct regarding its energy?
   A) It is kinetic and potential.
   B) It is potential only.
   C) It is kinetic only.
   D) None of the other choices is correct.
   Answer: A

27) A 320-g air track cart traveling at 1.25 m/s collides elastically with a stationary 270-g cart. What is the speed of the 270-g cart after the collision?
   A) 0.678 m/s
   B) 0.106 m/s
   C) 1.36 m/s
   D) 1.14 m/s
   Answer: C
28) A uniform piece of wire, 20 cm long, is bent in a right angle in the center to give it an L-shape. How far from the bend is the center of mass of the bent wire?
A) 2.5 cm  
B) 3.5 cm  
C) 5.0 cm  
D) 7.1 cm  
Answer: B

29) An assault rifle fires an eight-shot burst in 0.40 s. Each bullet has a mass of 7.5 g and a speed of 300 m/s as it leaves the gun. What is the average recoil force on the gun during that burst?
A) 45 N  
B) 5.6 N  
C) 16 N  
D) 2.0 N  
Answer: A

30) Two objects of mass \( m \) and \( 3m \) are placed in a frictionless air-track with a compressed spring between them. The spring is released and shares its energy between the two masses. The kinetic energy imparted on mass \( m \) is
A) the same as that on mass \( 3m \).  
B) 3/4 of the total energy stored in the spring.  
C) twice the total energy stored in the spring.  
D) 1/8 of the total energy stored in the spring.  
Answer: B

31) An elastic collision of two objects is characterized by the following.
A) Total momentum of the system is conserved.  
B) Total kinetic energy of the system remains constant.  
C) Both A and B are true.  
D) Neither A nor B are true.  
Answer: C