

Exam:1

1. A ball is thrown at an angle of 45° above the horizontal with an initial velocity of 20 m/s. What is the total time of flight of the ball before it hits the ground?
 - A. 9.8 s
 - B. 1.4 s
 - C. 2.9 s
 - D. 4.9 s
2. A motorist travels at 30 miles/hour for 2 hours and 60 miles/hour for 1 hour. His average speed in miles/hour is:
 - A. 50
 - B. 40
 - C. Zero
 - D. 45
3. A lost boy scout travels along a path which turns out to be a circle of radius R. Halfway around the circle his displacement from his starting position is:
 - A. R
 - B. 2R
 - C. πR
 - D. $2\pi R$
4. A boy kicks a football from ground level with an initial velocity of 20 m/s at angle of 30° above the horizontal. What is the horizontal component of its velocity just before it hits the ground?
 - A. 8.7 m/s
 - B. 9.8 m/s
 - C. 17.3 m/s
 - D. 20 m/s
5. An object is thrown upwards with a speed of 14 m/s. How long does it take it to reach a height of 5.0 m on the way up?
 - A. 0.42 s
 - B. 1.22 s
 - C. 2.44 s
 - D. 3.14 s

6. On a fishing trip you catch a 2.65-lb bass, a 10.1-lb rock cod and a 17.23-lb salmon. The total weight of your catch in significant figures is,
- A. 29.98 -lb
 - B. 29 -lb
 - C. 30.0 -lb
 - D. 29.00 -lb
7. Kangaroos have been clocked at speeds of 65 km/h. How far a kangaroo can hop in 2 minutes at this speed?
- A. 130 km
 - B. 32.5 km
 - C. 0.54 km
 - D. 2.17 km
8. An arrow is shot in the air on a parabolic path to a target. At its highest point:
- A. Velocity and acceleration are both zero.
 - B. Velocity and acceleration are changed in sign.
 - C. The upward velocity is zero but not the acceleration.
 - D. Both velocity and acceleration are negative.
9. A plane has airspeed of 142 m/s. A 16.0 m/s wind is blowing southward at the same time as the plane is flying. If the velocity of the plane relative to the earth is due east, what is the magnitude of that velocity?
- A. 16.2 m/s
 - B. 95.3 m/s
 - C. 158.2 m/s
 - D. 141.1 m/s
10. A motorist with an initial speed of 60 miles/hour steadily decreases his speed to 30 miles/hour while travelling over a measured quarter of a mile "speed trap". The time he takes to travel this distance is (in seconds):
- A. 10
 - B. 30
 - C. 45
 - D. 20

11. A cart is given an initial velocity of 5.0 m/s and experiences a constant acceleration of 2.0 m/s^2 . What is the magnitude of the cart's displacement during the first 6.0 s of its motion?
- A. 10 m
 - B. 55 m
 - C. 66 m
 - D. 80 m
12. Vector A points north and vector B points east. If $C = B - A$, then vector C points:
- A. north of east
 - B. south of east
 - C. north of west
 - D. south of west
13. A boy kicks a football from ground level with an initial velocity of 20 m/s at an angle of 30° above the horizontal. What is the horizontal distance to the point where the football hits the ground?
- A. 20 m
 - B. 35 m
 - C. 18 m
 - D. 60 m
14. If a is acceleration, v is velocity, x is position, and t is time, then which equation is not dimensionally correct?
- A. $t^2 = 2x/a$
 - B. $v = a/t$
 - C. $a = v^2/x$
 - D. $t = x/v$
15. $10 \text{ m}^2 = X \text{ cm}^2$. So X is:
- A. 10,000
 - B. 1,000,000
 - C. 10
 - D. 100,000

16. A car is traveling on a dry road with a velocity of 32.0 m/s . The driver slams on the brakes and skids to a halt with a deceleration of -8.00 m/s^2 . On an icy road the car would have skidded to halt with an deceleration of -3.00 m/s^2 .

(a) How far the car has skidded on the dry road?

(b) How much further the car would have skidded on the icy road compare to the dry road?

17. An astronaut on a planet tosses a rock horizontally with a speed of 6.95 m/s . The rock falls through a vertical distance of 1.40 m and lands a horizontal distance of 8.75 m from the astronaut.

(a) Find the time the landing time of the rock?

(b) What is the acceleration due to gravity on this planet?

Key to Exam.1

1.C

2. B

3. B

4. C

5. A

6. C

7. D

8. C

9. D

10. D

11. C

12. B

13. B

14. B

15. D

16.

a. 64 m

b. 106.7 m

17.

a. 1.26 s

b. 1.77 m/s^2

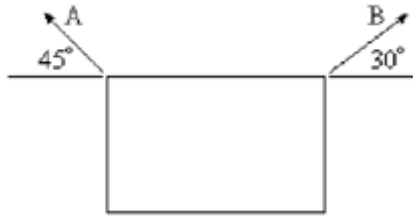
Exam.2

1. Brenda carries an 8.0-kg suitcase as she walks 25 m along a horizontal walkway to her room at a constant speed of 1.5 m/s. How much work does Brenda do in carrying her suitcase?
A) zero J
B) 40 J
C) 200 J
D) 300 J

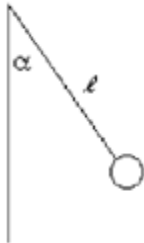
2. A 50.0-kg box is being pushed along a horizontal surface. The coefficient of kinetic friction between the box and the ground is 0.350. What horizontal force must be exerted on the box for it to accelerate at 1.20 m/s^2 ?
A) 60.0 N
B) 172 N
C) 232 N
D) 491 N

3. Which one of the following choices is an example of a conservative force?
A) tension
B) normal force
C) static frictional force
D) elastic spring force

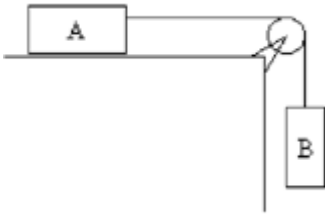
4. A mass of 40.0 grams is attached to a vertical spring with a spring constant $k = 20.0 \text{ N/m}$ and lowered slowly until the spring stops stretching. How much does the spring stretch?
A) 0.00200 m
B) 0.0196 m
C) 0.0816 m
D) 0.800 m



5. A 10-kg sign is held by two ropes as shown in Figure. What is the tension on rope A?
- A) 69 N
 - B) 72 N
 - C) 88 N
 - A) 98 N

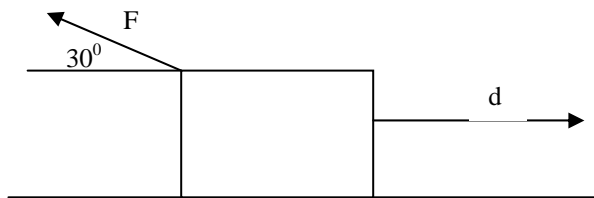


6. A 20.0-gram mass is attached to a 120 cm-long string as shown in Figure. The angle α is measured to be 18.0° . What is the speed of the mass?
- A) 1.95 m/s
 - B) 3.82 m/s
 - C) 1.18 m/s
 - D) 1.09 m/s
7. An object is moving with constant velocity. Which of the following statements is true?
- A) A constant force is being applied in the direction of motion.
 - B) There are no forces acting on the object.
 - C) The net force on the object is zero.
 - D) There is no frictional force acting on the object.



8. Refer to the Figure. Block A has a mass of 2.60 kg and rests on a smooth table and is connected to block B, which has a mass of 2.40 kg, after passing over an ideal pulley, as shown. Block B is released from rest. What is the acceleration of the masses?

- A) 3.92 m/s^2
- B) 5.10 m/s^2
- C) 4.71 m/s^2
- D) 6.54 m/s^2



9. A constant force of 25 N is applied as shown to a block which undergoes a displacement of 7.5 m to the right along a frictionless surface while the force acts. What is the work done by the force?

- A) +94 J
- B) -94 J
- C) +162 J
- D) -162 J

10. A 1500-kg elevator moves upward with constant speed through a vertical distance of 25 m. How much work was done by the tension in the cable?

- A) 900 k J
- B) 815 k J
- C) 146 k J
- D) 368k J

11. A skier leaves the top of a slope with an initial speed of 5.0 m/s. Her speed at the bottom of the slope is 13 m/s. What is the height of the slope?
- A) 1.1 m
 - B) 4.6 m
 - C) 6.4 m
 - D) 7.3 m
12. A rock is thrown straight up from the surface of the Earth. Which one of the following statements describes the energy transformation of the rock as it rises? Neglect air resistance.
- A) The total energy of the rock increases.
 - B) The kinetic energy increases and the potential energy decreases.
 - C) Both the potential energy and the total energy of the rock increase.
 - D) The kinetic energy decreases and the potential energy increases
13. The amount of energy needed to power a 0.10-kW bulb for one minute would be just sufficient to lift a 1.0-kg object through a vertical distance of
- A) 12 m
 - B) 75 m
 - C) 306 m
 - D) 612 m
14. Which one of the following is not a unit of energy?
- foot • pound
 - joule
 - newton • meter**
 - watt

15. A man carrying a 20-kg sack on his shoulder rides in an elevator. What is the force the sack exerts on his shoulder when the elevator is accelerating upward at 2.0 m/s^2 ?

- A) 236 N
- B) 118 N
- C) 156 N
- D) 78.0 N

16. A 3.85-kg block rests on a horizontal surface. A spring of force constant 85.0 N/m pulls it with constant speed. If the elongation produced in the spring is 6.20 cm ,

- a. Find the force applied to pull the spring.
- b. Find the coefficient of kinetic friction between the block and the horizontal surface.

17. A pitcher throws a 0.140-kg baseball and it approaches the bat at a speed of 40.0 m/s . The bat does $W_{nc} = +70.0 \text{ J}$ of work on the ball in hitting it. Ignore the air resistance. When the ball is at 25.0 m above the point of impact, find,

- a. The work done by the conservative force.
- b. The speed of the ball.

Key to Exam.2

1. A

2. C

3. D

4. B

5. C

6. A

7. C

8. C

9. D

10.D

11.D

12.D

13.D

14.D

15.A

16.

a. 5.27 N

b. 0.14

17.

a. -34.3 J

b. 45.93 m/s

Exam 3

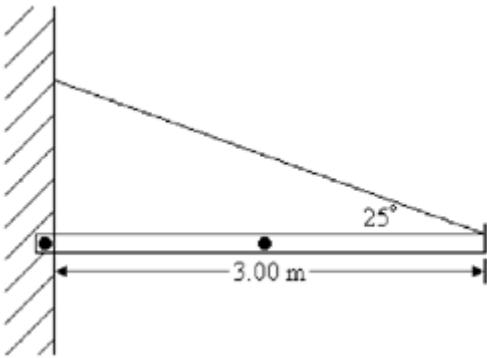
1. After fixing a flat tire on a bicycle you give the wheel a spin. Its initial angular speed was 6.15 rad/s and it rotated 13.2 revolutions before coming to rest with a deceleration. How long did the wheel rotate?
 - A. 3.0 s
 - B. 9.0 s
 - C. 18.0 s
 - D. 27.0 s

2. A man is holding an 8.00-kg vacuum cleaner at arm's length, a distance of 0.550 m from his shoulder. What is the torque on the shoulder joint if the arm is held at 30.0° below the horizontal?
 - A. 21.6 Nm
 - B. 2.20 Nm
 - C. 12.6 Nm
 - D. 37.4 Nm

3. A 2400-kg satellite is in a circular orbit around a planet. The satellite travels with a constant speed of $6.67 \times 10^3 \text{ m/s}$. The radius of the circular orbit is $8.92 \times 10^6 \text{ m}$. What is the acceleration of the satellite?
 - A. zero m/s^2
 - B. 2.5 m/s^2
 - C. 9.8 m/s^2
 - D. 5.0 m/s^2

4. A compact disk rotates at 210 revolutions per minute. What is its angular speed in rad/s ?
 - A. 11.0 rad/s
 - B. 22.0 rad/s
 - C. 69.1 rad/s
 - D. 660 rad/s

5. Calculate the angular momentum of the Earth about its own axis, due to its daily rotation. Assume that the Earth is a uniform sphere. (Moment of inertia of a sphere = $\frac{2MR^2}{5}$, $M_E = 5.97 \times 10^{24}$ kg, $R_E = 6.38 \times 10^6$ m)
- A. 1.32×10^{33} kg m²/s
 B. 3.25×10^{33} kg m²/s
 C. 5.36×10^{33} kg m²/s
 D. 7.07×10^{33} kg m²/s
6. The moment of inertia of a uniform rod (about its center) is given by $I = \frac{ML^2}{12}$. What is the kinetic energy of a 120-cm rod with a mass of 450 g rotating about its center at 3.60 rad/s?
- A. 0.350 J
 B. 4.20 J
 C. 0.700 J
 D. 2.10 J



7. A store's sign, with a mass of 20.0 kg and 3.00 m long, has its center of gravity at the center of the sign. It is supported by a loose bolt attached to the wall at one end and by a wire at the other end, as shown in the figure. The wire makes an angle of 25.0° with the horizontal. What is the tension in the wire?
- A. 464 N
 B. 232 N
 C. 196 N
 D. 297 N

8. You are standing at a bus stop holding an umbrella on a rainy day. While you wait for the bus the rain shower turns into hail. Compared to the rain, the number of hail "drops" hitting the umbrella per second, the mass of the "drops", and their speed all remain the same. The force you must exert to hold the umbrella in the hail is
- A. less than the force required in the rain.
 - B. the same as the force required in the rain.
 - C. more than the force required in the rain.
 - D. impossible to compare with the force required in the rain.
9. What would be the weight of a 59.1-kg astronaut on a planet twice as massive as Earth and having twice Earth's radius?
- A. 580 N
 - B. 290 N
 - C. 160 N
 - D. 118 N
10. Three masses are located as follows: a 3.0-kg mass is at the origin, a 4.5-kg mass at (0.0 m, 4.0 m), and a 2.5-kg mass at (3.0 m, 0.0 m). What is the gravitational energy of the system of masses? $G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$.
- A. $-3.8 \times 10^{-10} \text{ J}$
 - B. $-3.9 \times 10^{-10} \text{ J}$
 - C. $-5.4 \times 10^{-10} \text{ J}$
 - D. $-3.2 \times 10^{-10} \text{ J}$
11. A 0.330-kg volleyball is dropped from rest. It takes it 1.30 s to reach the ground. What is the magnitude of its momentum just before it hits the ground?
- A. 4.21 kg-m/s
 - B. 0.429 kg-m/s
 - C. 4.29 kg-m/s
 - D. 1.18 kg-m/s

12. A light rope wrapped around a disk shaped pulley is pulled with a force of 0.67 N. If the mass of the pulley is 1.5 kg and its radius is 0.13 m. Find the angular acceleration of the pulley? (Moment of inertia of a solid disk = $mr^2/2$)
- A. 1.23 rad/s²
 - B. 3.56 rad/s²
 - C. 6.87 rad/s²
 - D. 7.31 rad/s²
13. Two air track carts move along an air track towards each other. Cart A has a mass of 450 g and moves toward the right with a speed of 0.850 m/s and air track cart B has a mass of 300 g and moves toward the left with a speed of 1.12 m/s. What is the total momentum of the system?
- A. 0.047 kg-m/s toward the right
 - B. 0.719 kg-m/s toward the right
 - C. 0.750 kg-m/s toward the right
 - D. 0.750 kg-m/s toward the left
14. A potter's wheel is rotating at 1.00 rpm. What centripetal force is required to hold a 1.00 g lump of clay in place, 10.0 cm from the axis of rotation?
- A. 1.10×10^{-6} N
 - B. 1.20×10^{-6} N
 - C. 1.30×10^{-6} N
 - D. 1.40×10^{-6} N
15. Two ice skaters push off against one another starting from a stationary position. The 45-kg skater acquires a speed of 0.375 m/s. What speed does the 60-kg skater acquire?
- A. 0.500 m/s
 - B. 0.281 m/s
 - C. 0.375 m/s
 - D. 0.125 m/s

16. A rail road car of mass 2.00×10^4 kg moving at 3.00m/s collides and couples with two coupled railroad cars, each of the same mass as the single car and moving in the same direction at 1.20 m/s.

a. What is the speed of the three-coupled cars after collision?

b. How much kinetic energy is lost in the collision?

17. A solid horizontal cylinder of the mass 10.0-kg and radius 1.00 m rotates with an angular speed of 7.00 rad/s about a fixed vertical axis through its center. A 0.250-kg piece of putty is dropped vertically onto the cylinder at a point 0.900 m from the center of the rotation, and sticks to the cylinder. (Moment of inertia of a solid cylinder is $MR^2/2$)

a. Find the moment of inertia of cylinder and the moment of inertia of the putty-cylinder system

b. Determine the final angular speed of the system (Use the law of conservation of angular momentum)

Key to Exam 3

1. D

2. D

3. D

4. B

5. D

6. A

7. B

8. C

9. B

10.C

11.A

12.C

13.A

14.A

15.B

16.

a. 1.80 m/s

b. 21.6 kJ

17.

a. 5.2 kg-m²

b. 6.73 rad/s

