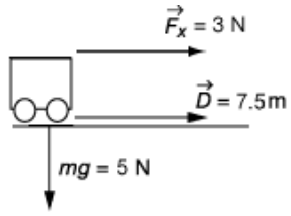
Unit 4 Practice Test

Directions:

This is a 25-question practice test. It does not count toward your overall score, and you may take it as many times as you choose.

1) QID: 6681

A cart weighing 5 N is pushed a distance of 7.5 m by a constant force of 3 N. There is no friction between the cart and the track it is on. Which of the following is the amount of work done by the force?



- 37.5 J
- 22.5 J
- 12.5 J
- 2.5 J

2) QID: 6682

A meteorite with a mass of 25 kilograms falls to Earth in a direction perpendicular to the Earth's surface. At $t = 0$ seconds the meteorite is 1000 meters above the Earth. At $t = 2$ seconds it is 750 meters above the Earth. Assume the meteorite's acceleration due to gravity is constant during this time. Which of the following is the amount of work the Earth's gravitational force has done on the meteorite between $t = 0$ and $t = 2$?

- 245,600 J
- 61,250 J
- 183,750 J
- −6,250 J

3) QID: 6612

A rope that makes a 15° angle with the horizontal pulls a block weighing 3 N a distance of 10 meters to the right at a constant velocity. The tension in the rope is a 2 N force. How much work is done by the rope acting on the block in the horizontal direction? Let F_x be the tension in the rope and Δx be the displacement in the x-direction.

- 28.98 J
- 20 J
- 189.34 J
- 19.32 J

4) QID: 21152

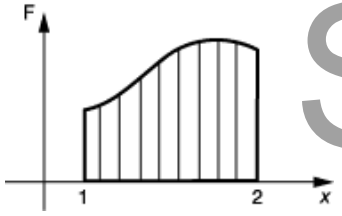
Two ropes are pulling on a box. The first rope is pulling the box from the right and is parallel to the floor. The second rope, pulling from the left, forms a 110° angle with the first rope. If the tension in the second rope is 5 N and the box moves 3 meters to the left, what is the work done by the second rope on the box? Let $\vec{F}_L$ be the tension in rope pulling from the left and $\Delta\vec{x}$ the displacement.

- −14.1 J
- 14.1 J
- 5.13 J
- −5.13 J

5) QID: 7859

For a variable force acting on an object from Position 1 to Position 2, the work done can be approximated by $W = \Sigma F_x \Delta x$. How can the approximation be improved?

- By making Δx smaller
- By making Δx bigger
- By making F_x constant



6) QID: 7870

Suppose a force $F = 3x^2$ N is acting on an object that undergoes a displacement from $x = 1$ m to $x = 2$ m. What is the work done on the object?

- 7 J
- (7/3) J
- 21 J
- 3 J

7) QID: 334

Which of the following expresses the work done by a spring on an object that moves from position x_i to x_f?

- $W = -k(\Delta x)^2$
- $W = \int_{x_i}^{x_f} kx\,dx$
- $W = \int_{x_i}^{x_f} (-kx)\,dx$
- $W = F\Delta x$

8) QID: 331

If we decrease the displacement of an object attached to a spring, the magnitude of the force on the object _____.

- doesn't change
- increases
- decreases
- is zero

9) QID: 7875

How is the kinetic energy of an object affected if its velocity is doubled?

- The kinetic energy is doubled.
- The kinetic energy does not change.
- The kinetic energy is quadrupled.
- The kinetic energy is halved.

10) QID: 7879

In kinematics, the final velocity v_f of an object undergoing constant acceleration is given by which of the following equations?

- $v_f^2 = v_i^2 + 2a_x\Delta v$
- $v_f^2 = v_i^2 - 2a_x\Delta x$
- $v_f^2 = v_i^2 + a_x\Delta x$
- $v_f^2 = v_i^2 + 2a_x\Delta x$

11) QID: 7542

A bobsled team begins at the top of a frozen track that runs down a hill that is 0.2 km tall. The total length of the track as it winds its way down the hill is 1.2 km. Ignoring friction, how fast is the bobsled moving when it gets to the finish line?

- 2.0 m/s
- 140 m/s
- 63 m/s
- 153 m/s

12) QID: 7545

Suppose you push with a constant force on a box with a mass of 20 kg and it moves at a constant speed of 1.5 m/s along a horizontal surface. How much force are you using on the box? The coefficient of sliding friction is 0.5.

- 10 N
- 98 N
- 196 N
- More than 200 N

13) QID: 7513

A 50 kg girl runs up a staircase in 20 s, and a 60 kg boy runs up the same staircase in 15 s. Which of the following is the ratio of the power generated by the girl to the power generated by the boy?

- 5 : 6
- 5 : 8
- 8 : 5
- 2 : 1

14) QID: 7525

A variable force described by the equation $F(t) = at^2 + 5bt$, where a and b are positive constants, moves an object 4 m in 3 s. The force is directed in the direction of motion of the object. Which of the following is the average power used to move the object?

- $24a + 20b$
- $36a + 60b$
- $6a + 5b$
- $\frac{4at^3 + 20bt}{3}$

15) QID: 18535

If an object is shot straight up in the air with a velocity of 5 m/s, how high will it go?

- 12.5 m
- 2.6 m
- 1.3 m
- This can't be determined without knowing the object's mass.

16) QID: 18539

Two objects at rest with the same mass are dropped from two different heights, h_1 and h_2, where $h_1 = 2h_2$. Which of the following correctly relates their final velocities?

- $v_2 = v_1$
- $v_2 = 2v_1$
- $v_1 = \sqrt{2}v_2$
- $v_1 = \sqrt{v_2}$

17) QID: 91

Which of the following is a nonconservative force?

- Gravity
- Spring force
- Viscosity
- Electric force

18) QID: 103

Which of the following formulas can be used to calculate the work done by a nonconservative force?

- $W = \Delta U$
- $W = \Delta K$
- $W = |F\Delta x|$
- $W = F\Delta x$.

19) QID: 6888

A conservative force is given by the formula $F = Qx^2$, where Q is a constant. Which of the following is the potential energy associated with this force, assuming the potential energy is zero at $x = 0$?

- $U = \frac{1}{3}Qx^3$
- $U = Qx^3$
- $U = -\frac{1}{3}Qx^3$
- The potential energy can't be determined.

20) QID: 6890

Which of the following is true based on the equation

$$\Delta U = -\int_{x_i}^{x_f} F_x dx$$

- $F_x = -\frac{dU}{dx}$
- $F_x = -\frac{U}{x}$
- $F_x = -\frac{\Delta U}{\Delta x}$
- $F_x = \text{constant}$

21) QID: 7555

A diver starts on a 20 m tower. His total potential energy is 10,000 J. After jumping off the tower toward a pool of water, which of the following is the diver's potential energy at the heights of 15 m, 10 m, and 2 m, respectively? Ignore any air resistance.

- 2,500 J; 5,000 J; 9,000 J
- 1,000 J; 5,000 J; 7,500 J
- 7,500 J; 5,000 J; 1,000 J
- 10,000 J at all three heights

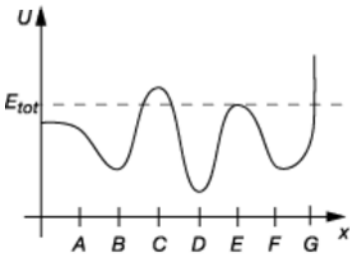
22) QID: 7640

If a car, moving at 15 m/s, drives over a 30 m cliff, how fast is it moving vertically when it hits the ground?

- 28.5 m/s
- 24.2 m/s
- 15 m/s
- 39.2 m/s

23) QID: 7775

At which of the following is the velocity of a particle the fastest?



- *E*
- *D*
- *C*
- *B*

24) QID: 7652

Consider a car weighing 1,500 kg with an engine that can exert a constant maximum force of 3,750 N. The car has moved 50 m when it reaches its maximum velocity. When the car is moving at its maximum velocity, the driver hits the brakes, which apply a decelerating force of 5,000 N. How far will the car travel before it stops?

- 37.5 m
- 50 m
- 75 m
- 18.8 m

25) QID: 7624

In the formula $\Delta K + \Delta U = 0$, potential energy _____.

- must come from a conservative force.
- must be mechanical in nature.
- is any form of energy.
- depends on position.