1. A 0.48-kg object travels from point A to point B. If the speed of the object at point A is 8.0 m/s and the kinetic energy at point B is 8.0 J, determine the following.
   (a) kinetic energy of the object at point A
   15.4 J
   (b) speed of the object at point B
   5.77 m/s

2. If a projectile with a mass of 9.90 g is traveling at a speed of 1.21 km/s, determine the following.
   (a) kinetic energy of the projectile in kilojoules
   7.25 kJ
   (b) kinetic energy of the projectile in kilojoules, if its speed is reduced by a factor of two
   1.81 kJ
   (c) kinetic energy of the projectile in kilojoules, if its original speed is increased by a factor of three
   65.2 kJ

3. The gravitational potential energy of a cliff diver decreases by 28,000 J as she drops to the water from a height of 40.0 m. Determine her weight in newtons.
   700 N

4. The gravitational potential energy of an 85.0-kg man increases by 1.95 \times 10^3 J when he climbs a spiral staircase from the first to the second floor of an apartment building. If his 16.0-kg dog climbs a normal staircase from the same first floor to the second floor, by how much does the potential energy of the dog increase?
   367 J

5. A pendulum bob with a mass of 0.49 kg is attached to a 1.5 m long string as shown. As the pendulum bob swings from point A, where the angle is 30°, to point B at the bottom of its arc, determine the change in its gravitational potential energy.
   -0.965 J

6. Pushing on the pump of a bottle of hand washing solution compresses a small spring which obeys Hooke's Law. If the potential energy of the spring is 0.0030 J when the spring is compressed 0.51 cm, determine the following.
   (a) force constant of the spring
   0.231 kN/m
   (b) compression needed in order for the spring potential energy to equal 0.0081 J
   0.838 cm
7. Question Details

In a shipping yard, a crane operator attaches a cable to a 1410-kg shipping container and then uses the crane to lift
the container vertically at a constant velocity for a distance of 29 m. Determine the amount of work done by each of the
following.

(a) the tension in the cable
4.01e+05 J

(b) the force of gravity
-4.01e+05 J

8. Question Details

As shown in the figure below, a box of mass  \( m = 63.0 \text{ kg} \) (initially at rest) is pushed a distance  \( d = 69.0 \text{ m} \)
across a rough warehouse floor by an applied force of  \( F_x = 228 \text{ N} \) directed at an angle of 30.0° below the horizontal. The coefficient of
kinetic friction between the floor and the box is 0.100. Determine the following. (For parts (a) through (d), give your
answer to the nearest multiple of 10.)

(a) work done by the applied force
13620 J

(b) work done by the force of gravity
0 J

(c) work done by the normal force
0 J

(d) work done by the force of friction
5050 J

9. Question Details

As a 1300-kg truck travels up a 16.8-m-high hill, the nonconservative forces of friction and the force generated by
the engine do work on the truck. If the work done by friction is \( +7.23 \times 10^5 \) J and the work done by the engine is \( +6.33 \times 10^5 \)
J, determine the change in the truck’s kinetic energy as it travels from the bottom of the hill to the top of the hill.

\[ W_{\text{Net}} = 8580 \text{ J} \]

10. Question Details

As shown in the figure below, two masses \( m_1 = 4.70 \text{ kg} \) and \( m_2 \) which has a mass 75.0% that of \( m_1 \), are attached to a cord
of negligible mass which passes over a frictionless pulley also of negligible mass. If \( m_1 \) and \( m_2 \) start from rest, after they
have each traveled a distance \( h = 3.00 \text{ m} \), use energy content to determine the following.

(a) speed \( v \) of the masses
2.9 m/s

(b) magnitude of the tension \( T \) in the cord
39.5 N
12. Question Details

As shown in the figure below, a box of mass $m = 6.40 \text{ kg}$ is sliding across a horizontal frictionless surface with an initial speed $v_i = 3.80 \text{ m/s}$ when it encounters a spring of constant $k = 2900 \text{ N/m}$. The box comes momentarily to rest after compressing the spring some amount $x_c$. Determine the final compression $x_c$ of the spring.

**Physical Constants**

- $m = 6.40 \text{ kg}$
- $v_i = 3.80 \text{ m/s}$
- $k = 2900 \text{ N/m}$

**Supporting Materials**

- Physical Constants

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13. Question Details

As shown in the figure below, a box of mass $m = 10.2 \text{ kg}$ is released from rest (at position A) at the top of a 30.0° frictionless incline. The box slides a distance $d = 3.50 \text{ m}$ down the incline before it encounters (at position B) a spring and compresses it an amount $x_c$ (to point C) before coming momentarily to rest. Using energy content, determine the following.

**Physical Constants**

- $m = 10.2 \text{ kg}$
- $d = 3.50 \text{ m}$
- $x_c = 0.230 \text{ m}$

**Supporting Materials**

- Physical Constants

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14. Question Details

As shown in the figure below, a box of mass $m = 26.0 \text{ kg}$ is sliding along a horizontal frictionless surface at a speed $v_i = 7.90 \text{ m/s}$ when it encounters a ramp inclined at an angle of $\theta = 24.6^\circ$. The coefficient of kinetic friction between the ramp and the box is $\mu_k = 0.0704$ and the box slides a distance $d$ up the ramp before coming momentarily to rest.

(a) Determine the distance the box slides up the ramp before coming momentarily to rest.

(b) Determine which of the following statements is most correct about the box traveling up the ramp and coming momentarily to rest.

- $W_{\text{friction}} = \Delta E$
- $W_g = -\Delta E$
- $W_{\text{friction}} = W_{\text{friction}} + W_{\text{friction}}$
- $\Delta E = W_{\text{friction}}$
- $\Delta E = \Delta E + \Delta E$
- All of these

**Supporting Materials**

- Physical Constants
15. As shown in the figure below, a skateboarder starts at point A on the ramp and rises to point B, a maximum height of $h = 2.43$ m above the top of the ramp. If the amount of work done against friction is insignificant, determine his initial speed at point A.

![Diagram of skateboarder on a ramp](image)

**Physical Constants**

6.9 m/s

6. Question Details

**Supporting Materials**

**Physical Constants**

16. An object moving along a horizontal track collides with and compresses a light spring (which obeys Hooke's Law) located at the end of the track. The spring constant is 50.4 N/m, the mass of the object 0.250 kg and the speed of the object is 1.50 m/s immediately before the collision.

(a) Determine the spring's maximum compression if the track is frictionless.

(b) If the track is not frictionless, will the spring's maximum compression be greater than, less than, or equal to the value obtained in part (a)?

- greater than
- less than
- equal to

**Supporting Materials**

**Physical Constants**

0.106 m

6. Question Details

**Supporting Materials**

**Physical Constants**

17. As shown in the figure, a 1.5-kg box is held at rest against a spring with a force constant $k = 795$ N/m that is compressed a distance $d$. When the box is released, it slides across a surface that is frictionless, except for a rough patch that has a coefficient of kinetic friction $\mu_k = 0.40$ and is 6.0 cm in length. If the speed of the box is 1.7 m/s after sliding across the rough patch, determine the initial compression $d$ of the spring.

![Diagram of spring and box](image)

**Supporting Materials**

**Physical Constants**

7.96 cm

6. Question Details

**Supporting Materials**

**Physical Constants**

18. Block A (mass 40 kg) and block B (mass 80 kg) are connected by a string of negligible mass as shown in the figure. The pulley is frictionless and has a negligible mass. If the coefficient of kinetic friction between block A and the incline is $\mu_k = 0.29$ and the blocks are released from rest, determine the change in the kinetic energy of block A as it moves from C to D, a distance of 24 m up the incline.

![Diagram of blocks](image)

**Supporting Materials**

**Physical Constants**

3660 J

6. Question Details

**Supporting Materials**

**Physical Constants**