Part 1: ***(1 point each)***

1. You ride on an elevator that is moving downward with constant speed while standing on a bathroom scale. The reading on the scale is

A) equal to your true weight, *mg*. B) more than your true weight, *mg*.
C) less than your true weight, *mg*. D) depending on the elevator model.
E) could be more or less than your true weight, *mg*, depending on the value of the speed.

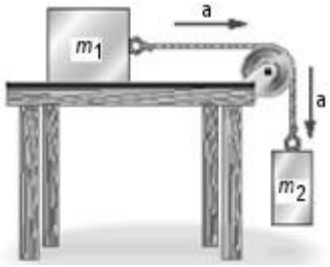
2. An object rests on an inclined surface. If the inclination of the surface is made steeper, what does the normal force on the object do?

A) increase. B) decrease. C) stays the same.
D) The normal force is zero N. E) cannot determine.

3. A 777 aircraft has a mass of **300,000 kg**. At a certain instant during its landing, its speed is **27.0 m/s**. If the braking force is **435,000 N**, how much further does it travel along the runway before it comes to a stop?

A) 40.5 m B) 142 m C) 181 m D) 251 m E) 456 m

4. Two masses, $\boldsymbol{m_1}$ and $\boldsymbol{m_2}$, are connected to each other as shown in the Figure below. Mass $\boldsymbol{m_1}$ slides without friction on the table surface. Both masses have acceleration of magnitude $\boldsymbol{a}$ as shown. How does the tension in the string compare to the weight, $\boldsymbol{m_2 g}$, of mass $\boldsymbol{m_2}$?



A) The tension is equal to $m_2 g$.
B) The tension is larger than $m_2 g$.
C) The tension is smaller than $m_2 g$.
D) It depends on m_1 being smaller than m_2.
E) t depends on m_1 being larger than m_2.

5. A flatbed truck is carrying a **20.0 kg** crate along a level road. The coefficient of static friction between the crate and the bed is **0.400**. What is the maximum acceleration that the truck can have if the crate is to stay in place?

A) 3.92 m/s^2 B) 7.84 m/s^2 C) 8.00 m/s^2 D) 78.5 m/s^2
E) 196 m/s^2

6. A **50.0 kg** box is being pushed along a horizontal surface by a force of **250 N** directed **28.0°** below the horizontal. The coefficient of kinetic friction between the box and the surface is **0.300**. What is the acceleration of the box?

A) 0.769 m/s^2 B) 1.77 m/s^2 C) 3.16 m/s^2 D) 6.31 m/s^2
E) 8.53 m/s^2

7. If you walk **5.0 m** horizontally forward at a constant velocity carrying a **10 N** object, the amount of work you do is

A) more than 50 J. B) equal to 50 J. C) zero.
D) less than 50 J, but more than 0 J. E) Cannot be detrmined.

8. A truck has four times the mass of a car and is moving with twice the speed of the car. If $\boldsymbol{K_t}$ and $\boldsymbol{K_c}$ refer to the kinetic energies of truck and car respectively, it is correct to say that

A) $K_t = 16K_c$. B) $K_t = 4K_c$. C) $K_t = 2K_c$. D) $K_t = K_c$.
E) $K_t = ½\ K_c$.

9. Two identical vertical springs $\mathbf{S_1}$ and $\mathbf{S_2}$ have masses $\boldsymbol{m_1}$ **= 400 g** and $\boldsymbol{m_2}$ **= 800 g** attached to them. If $\boldsymbol{m_1}$ causes spring $\mathbf{S_1}$ to stretch by **4 cm**, what is the ratio of the potential energy of $\mathbf{S_1}$ and $\mathbf{S_2}$? Use $\boldsymbol{g}$ **= 10 m/s^2**.

A) 2:1 B) 1:2 C) 1:3 D) 4:1 E) 1:4

10. A ball is tied to the end of an **80.0 cm** string and swings in a vertical circle about a fixed center under the influence of gravity. The speed of the mass at the bottom of the swing is **6.00 m/s.** Which of the following statements is true?

A) The ball does not have enough energy to reach the top of the circle.
B) The ball has enough energy to continue revolving in a complete vertical circle.
C) This question cannot be answered without knowing the mass of the ball.
D) This question cannot be answered without knowing the tension in the string.
E) The ball has enough energy to reach the top of the circle but the string becomes slack before it can reach that point.

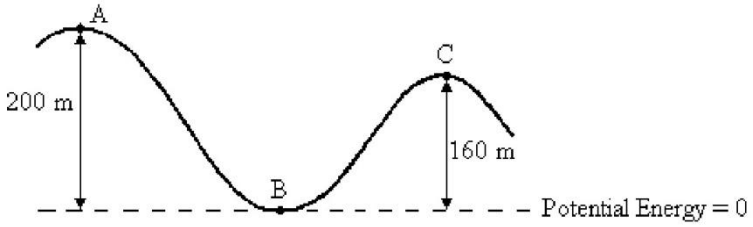
End of Part 1

Part 2: For the following problems, please show your work in the space provided to receive partial credit. ***(2 points each)***

P. 1. A **10.0 kg** picture is held in place by two wires, one hanging at **50.0°** to the left of the vertical and the other at **45.0°** to the right of the vertical. What is the tension in the second wire?

Answer:_____(with units)

P. 2. A roller coaster of mass **80.0 kg** is moving with a speed of **20.0 m/s** at position **A** as shown in the Figure below. The vertical height at position **A** above ground level is **200 m**. Neglect friction and use g **= 10.0 m/s²**.



What is the speed of the roller coaster at point C?

Answer:_____(with units)

P.3. A car accelerates from rest to a speed of **19.0 m/s** in **6.00 seconds**. If the car weighs **16,000 N**, what average power must the motor produce to cause this acceleration? Use **$g = 10\ m/s^2$.**

Answer:_____(with units)

Good Luck