**Unit III Assignment Template**

**Instructions:** Solve the problems below. Each question is worth 10 points. You must show your work with as much detail as possible. Answer the questions directly in this template. Before doing so, it is highly recommended that you thoroughly review the Unit I, II, and III lessons in the study guide.

1. On a sunny spring day, Mr. Hane’s family went to a zoo in his town. His daughter looked at an elephant, and she found that the mass of the elephant is 2019 kg. What is the weight of the elephant in Newtons? Use the acceleration due to gravity (*g*) as 9.8 meters per second squared. (10 points)
2. Bobby and Alice are pushing a stalled car in the same direction. The mass of the car is 2,000 kg. Bobby applies 400 N to the car while Alice applies 300 N. A force created by friction is 500 N in the opposite direction. What is the acceleration of the car? (10 points) Hint: Review Sample Question 2 in the Unit II Lesson and Example I under Section 4.3 in the textbook.
3. Katie pushes her boyfriend, Gabe, on an ice rink with a force of 30 N. The masses of Katie and Gabe are 60 kg and 90 kg, respectively. Calculate the acceleration of Katie and that of Gabe. (10 points) Hint: Review Sample Question 3 in the Unit II Lesson and Example 4 under Section 4.5 in the textbook.
4. The gravity on the surface of Mars is approximately 38% of the gravity on Earth. The gravitational acceleration on the surface of the Earth is 9.8 meters per second squared. That of Mars is 3.7 meters per second squared. What is the weight of a 100-kg object on Mars and on Earth? (10 points) Hint: Review Sample Question 1 in the Unit II Lesson.
5. Two forces of 11 N and 33 N are applied to a 22 kg box. Find (1) the box’s acceleration when both forces point due east and (2) the box’s acceleration when 11 N points due east and 33 N points due west. (10 points)
6. A newly invented ride called Crazy Box in an amusement park has a strong magnet. The magnet accelerates the boxcar and its riders from zero to 35 m/s in 5 seconds. Suppose the mass of the boxcar and riders is 6,000 kg. What is the acceleration of the boxcar and its riders? What is the average net force exerted on the boxcar and riders by the magnets? (10 points) Hint: Review the definition of acceleration and Newton’s second law. Acceleration is defined as the change in velocity divided by the elapsed time. The net force is the product of the mass of an object and its acceleration.
7. Suppose you are in an accelerated elevator. Your weight on earth is 700 N. If the acceleration is the same as the earth’s gravitational acceleration, what is your apparent weight? (10 points) Hint: See Section 4.8 Section 5.6 in the textbook.
8. An object moves at a constant speed around a circular track whose radius is 3 m. The mass of the object is 3 kg, and the speed is 2 m/s. What is the centripetal force? (10 points) Hint: See Section 5.3 in the textbook.
9. If a 2 kg object travels at a constant speed of 3 m/s, what is the kinetic energy of the object? (10 points) Hint: See Section 6.2 in the textbook.
10. Review the content regarding gravitational potential energy on pg. 49 from the following CSU library resource, then answer the question below.

[Physics in FOCUS Class 11](https://libraryresources.columbiasouthern.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=asn&AN=174010650&site=ehost-live&scope=site).

If the height of an object is 5 m and its mass is 3 kg, what is the gravitational potential energy of this object? Here, the gravitational acceleration g is given by 10 m/s2. (10 points) **Hint:** See Section 6.3 in the textbook.