AP Vacation Homework
(Due fourth period, January 7, 2020)

READING:
These two chapters are the three topics we will focus on in January: circular motion, gravitation, and rotational motion

1. Read Giancoli Chapter 5
On page 130 answer questions 3 and 8

2. Read Giancoli Chapter 8
On page 220, answer questions 3 and 13

REVIEW:
Complete the following review problems:

1. If I drop an object from a height of 40 meters, how long does it take to reach the ground?

2. If I drop an object from a height of 20 meters, how fast is it moving when it strikes the ground?

3. A car is moving at a speed of 18 m/s and it stops in a distance of 8 meters. What was its acceleration?

4. On the website: Units-101-H

5. On the website: Units-101-I

6. A block with a mass of 2 kg is pulled with a horizontal force of 4 N to the right. It is moving to the right, and the coefficient of kinetic friction between the block and the surface is 0.17.
a) Draw a free-body diagram of the block.
b) Determine the magnitude and direction of the net force acting on the block.
c) Determine the acceleration of the block.

7. A block with a mass of 4 kg is pulled with a horizontal force of 8 N to the right. It is initially at rest. The coefficient of kinetic friction between the block and the surface is 0.16, and the coefficient of static friction between the block and the surface is 0.28.
a) Determine whether the block moves.
b) Draw a free-body diagram of the block.
c) Determine the magnitude and direction of the net force acting on the block.
d) Determine the acceleration of the block.

8. A battery of 4 volts is connected to a resistor of 20 Ohms. What is the current through the resistor?

9. A resistor of 30 Ohms has a current through it of 0.04 Amps. What is the voltage across the resistor?

10. Draw a diagram of what happens when rabbit fur is rubbed against a PVC pipe. On your diagram, show how electrons move.

11. A pendulum on earth has a length of 0.8 meters. What is its period?

12. A pendulum on Mars has a length of 0.3 meters. What is its period?

13. A pendulum has a length o 40 cm and a period of 1.4 seconds. What is the free-fall acceleration on the planet on which the pendulum is located?

14. A sled (and sledder) with a combined mass of 50 kg is on a hill that is 20 meters tall. When 40 % of their gravitational potential energy is converted to kinetic energy, with no heat loss, what is the speed of the sledder?

14. A sled and sledder with a combined mass of 50 kg is on a hill that 30 meters tall. By the time they reach a height of 18 meters, 28 % of the total energy in the sled-sledder-earth system has been lost to friction. Determine the speed of the sled at this point.

15. A horizontal spring with a spring constant of 20 N/m is attached to a mass of 3 kg. It is stretched a distance 20 cm beyond its equilibrium length and let go. What is the maximum speed of the mass?

16. A horizontal spring with a spring constant of 15 N/m is attached to a mass of 2.5 kg. It is stretched a distance of 30 cm beyond its equilibrium length and let go. When the spring returns to its equilibrium length, the mass is moving at a speed of 0.1 m/s. How much work was done on the spring-mass system? What force probably did this work?

17. A big toy car with a mass of 40 kg is moving to the left with a speed of 2.5 m/s. It runs into a stationary toy with a mass of 5 kg, and the two stick together following the collision. What is their speed following the collision?

18. A car runs off of a cliff with a velocity of 20 m/s. Assuming the cliff is 30 meters tall, the bottom is perfectly horizontal, and air resistance is negligible, how far does the car travel before striking the ground?

19. A car with a speed of 50 m/s and a mass of 4000 kg strikes a wall and stops in a time of 0.002 seconds. What was the average force on the car during the time that it stopped?

20. A block with a mass of 0.4 kg is moving down a ramp with an angle of incline of 15 degrees. The coefficient of kinetic friction between the block and the ramp is 0.19.

a) Draw a free-body diagram of the block.
b) Determine the magnitude and direction of the net force acting on the block.
c) Determine the magnitude and direction of the acceleration of the block.