Name _____ Date _____

Regents Physics Unit 3 WS 4

Period _____ Mr. Moy

Gravity and Circles Review

1. A star with a mass of $2.13 \times 10^{17} kg$ and planet Blue, which has a mass of $4.13 \times 10^{22} kg$, are separated by a distance of $4.8 \times 10^{11} m$.
    a. Calculate the gravitational attractive force between the star and Blue

    b. What would the weight of an astronaut (m = 95 kg) who travels to planet Blue?

2. Two objects, $m_1 and\ m_2$, are separated by a distance r. What happens to the gravitational force between them when the following changes are made?
    a. m_1 is 9 times larger and the distance between them triples.

    b. The distance is cut in fourth.

    c. m_1 is doubled and m_2 is 5 times larger.

3. A student whirls a 19.96 g rubber stopper above their head on a string with a radius of 0.318 meters. The stopper completes 10 revolutions in 4.89 seconds. The force on the stopper is 1.04 Newtons.
    a. Calculate the Period of the stopper.

    b. Calculate the speed of the stopper.

    c. Calculate the centripetal acceleration using the speed.

    d. Calculate the centripetal acceleration using the force.

4. Two rocks are floating in deep space far from the influences of other celestial bodies. One rock has a mass of 4.32 kg and the other has a mass of 8.71 kg. The attractive force between them is 0.03427 newtons. How far apart are they?

5. A car is driving around a circular racetrack of radius 86.0 meters. It experiences a centripetal acceleration of 17.3 m/s^2 inward. What is the speed at which the car is traveling?

6. An object of mass m is traveling around a circle of radius r with speed v.
    a. What happens to the centripetal force if the mass is five times larger?

    b. What happens to the centripetal force if the speed is doubled?

    c. What happens to centripetal force if the radius is cut in quarters?

    d. What happens to the centripetal acceleration if the mass triples?

    e. What happens to the centripetal acceleration if the radius is tripled?

7. A 2.6 kg stopper is twirled in a circle of radius 1.24 meters with a constant speed of 3.39 m/s. What is the tension in the rope?

8. What is the period of a ball swung in a circle of radius 6.71 meters at 6.4 m/s?