Universal Gravitation

Read from **Lesson 3** of the **Circular and Satellite Motion** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/circles/u6l3a.html
http://www.physicsclassroom.com/Class/circles/u6l3b.html
http://www.physicsclassroom.com/Class/circles/u6l3c.html

MOP Connection: Circular Motion and Gravitation: Assignments CG6 and CG7

1. The evidence that stimulated Newton to propose the law of universal gravitation emerged from a study of ____.
   a. the motion of the moon and other celestial or heavenly bodies
   b. the fall of an apple to the Earth
   c. the gravitational interaction of smaller objects upon the Earth
   d. ...nonsense! There was no evidence; it was just proposed as a theory.

2. The *universal* of Newton's law of universal gravitation is a common source of confusion. The *universal* means that _____.
   a. the amount of gravitational forces is the same for all objects.
   b. the acceleration caused by gravity is the same for all objects.
   c. the force of gravity acts between all objects - not just between the Earth and an object, but also between two people. All objects with mass attract.

3. According to Newton's gravitation law, the force of gravitational attraction between a planet and an object located upon the planet's surface depends upon _____. Choose all that apply.
   a. the radius of the planet
   b. the mass of the planet
   c. the mass of the object
   d. the volume of the object
   e. … nonsense! None of these variables affect the force of gravity.

4. The more massive an object is, the _____ (more, less) that it will be attracted to Earth.

5. The more massive a planet is, the _____ (more, less) other objects will be attracted to it.

6. The greater a planet's radius is, the _____ (more, less) other objects will be attracted to it.

7. In the mathematical form of Newton's law of universal gravitation (at right), the symbol **G** stands for _____.

$$F_{grav} = \frac{G m_1 m_2}{d^2}$$

   a. gravity b. the acceleration of gravity c. the gravitational constant

8. **TRUE** or **FALSE**:

   The value of **G** (in the equation above) is an enormously large number; that explains why (at least in part) the force of gravitational attraction between the Sun and the very distant Earth is such a large number.

9. **TRUE** or **FALSE**:

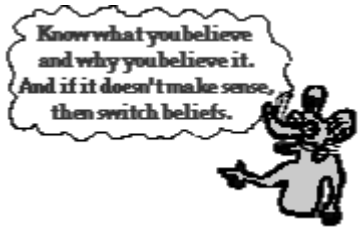
The notion that any two objects attract each other gravitationally is a theory. There is no empirical evidence for such a notion.

10. Orbiting astronauts on the space shuttle do not have weight in space because _____.
    a. there is no gravity in space
    b. there is no air resistance in space
    c. there are no scales in space
    d. the food is terrible and they work all the time
    e. ... nonsense! The astronauts do have weight in space.

Identify the following statements as being **TRUE** or **FALSE**. Put a **T** or an **F** in the blank.

_____ 11. Astronauts on the space station do not weigh anything.

_____ 12. There is no gravity on the space station.



_____ 13. There is no gravity anywhere in space.

_____ 14. There is no gravity in a vacuum.

_____ 15. Orbiting astronauts are not accelerating.

_____ 16. If the Earth were not spinning, then there would be insufficient gravity to hold us on its surface.

_____ 17. The gravitational acceleration of a free-falling object depends upon its mass.