IB PHYSICS

Name: _____

Period: _____ Date: _____

DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

TSOKOS READING ACTIVITY

Section 6-2

1. Essential Idea: The Newtonian idea of gravitational force acting between two spherical bodies and the laws of mechanics create a model that can be used to calculate the motion of planets.
2. Nature Of Science: Laws: Newton's law of gravitation and the laws of mechanics are the foundation for deterministic classical physics. These can be used to make predictions but do not explain why the observed phenomena exist.
3. Theory Of Knowledge:
   a. The laws of mechanics along with the law of gravitation create the deterministic nature of classical physics. Are classical physics and modern physics compatible?
   b. Do other areas of knowledge also have a similar division between classical and modern in their historical development?
4. Understandings:
   a. Newton's law of gravitation
   b. Gravitational field strength
5. Applications And Skills:
   a. Describing the relationship between gravitational force and centripetal force
   b. Applying Newton's law of gravitation to the motion of an object in circular orbit around a point mass
   c. Solving problems involving gravitational force, gravitational field strength, orbital speed and orbital period
   d. Determining the resultant gravitational field strength due to two bodies
6. Guidance:
   a. Newton's law of gravitation should be extended to spherical masses of uniform density by assuming that their mass is concentrated at their centre
   b. Gravitational field strength at a point is the force per unit mass experienced by a small point mass at that point
   c. Calculations of the resultant gravitational field strength due to two bodies will be restricted to points along the straight line joining the bodies
7. Data Booklet Reference:
   a. $F = G\frac{Mm}{r^2}$
   b. $g = \frac{F}{m}$
   c. $g = G\frac{M}{r^2}$

8. Utilization:
    a. The law of gravitation is essential in describing the motion of satellites, planets, moons and entire galaxies
    b. Comparison to Coulomb's law (see Physics sub-topic 5.1)
9. Aim 4: the theory of gravitation when combined and synthesized with the rest of the laws of mechanics allows detailed predictions about the future position and motion of planets
10. Read Pg 259-263 in your textbook and answer the following questions:
    a. What is Newton's formula for the attractive force between two point masses? _____
    b. What is the value of Newton's constant of universal gravitation? _____
    c. What assumption did Newton make concerning spherical bodies of uniform density? _____
    d. What do we mean by a "perfectly deterministic system"? _____
    e. What is "gravitational field strength"? _____
    f. What equation would you use to find the force experienced by a point mass within a gravitational field? _____
    g. What is the gravitational field strength of a spherical mass M at a distance r? _____
    h. If you jump from a 10m building, you will accelerate toward the earth and the earth toward you. What is the value of each acceleration? _____
    i. If you plotted gravitational field strength versus separation distance, what would the graph look like?
    j. Is gravitational field a vector or a scalar? _____
    k. Sketch a picture of yourself and show the gravitational field that you generate.

l. Give the equation that represents the velocity a satellite would have to maintain in order to remain in a circular orbit around a planet _____

m. Give the equation that represents the period of a satellite in a circular orbit around a planet _____

_____

n. Airliners typically cruise at around 30,000ft. What would be the force of the earth's gravity be on a 100-ton airplane be at this altitude? _____

_____

_____

o. Nature of Science: So why is there a force between two masses? _____

_____

11. Answers may be typed or neatly printed. Drawings may be freehand, but try to make use of the 'Shapes' or 'Insert Clipart" functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, "LastnameFirstinitialPerXReadActX-X".