Forces on the Tides: The Attraction of the Sun and the Moon on the Earth's Oceans

Geology Mr. Traeger

Name: _____ Period: _____ Date: _____

1. What is Isaac Newton's Law of Gravitation? Write out the formula and explain it.

2. What is "G" in the Law of Gravitation?

3. What do "m_1" and "m_2" stand for in the Law of Gravitation?

4. What does "r" stand for in the Law of Gravitation?

5. If you double the "r" term in the denominator from 1 to 2 and then square it, by how much will the force of gravity decrease?

6. You will now calculate the force of gravity on the Earth from both the sun and the moon. **Use r^3 instead of r^2 in the denominator ONLY FOR TIDAL FORCE CALCULATIONS. All other force calculations use r^2.** Fill in the following chart.

Body	Value of G?	Mass of Earth (m_1) in kilograms	Mass of Body (m_2) in kilograms	Value of G x m_1 x m_2 in $N*m^2$ (numerator)	Radius from Earth (r) meters	Radius from Earth cubed in $meters^3$ (denominator)	Tidal Force in Newtons? Take the numerator and divide it by the denominator	Divide the Sun's tidal force by the Moon's tidal force.
Sun	$6.67\ e^{-11}$ $N*m^2/kg^2$	$5.97\ e^{24}$ kg	$1.99\ e^{30}$ kg		$1.50\ e^{11}$ m			
Moon	$6.67\ e^{-11}$ $N*m^2/kg^2$	$5.97\ e^{24}$ kg	$7.35\ e^{22}$ kg		$3.91\ e^{8}$ m			

7. After doing the calculation, why is the effect of the ocean tides so much greater from the moon than it is from the sun, even though the sun is much larger in terms of its mass?

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