

Name: _____ Date: _____

MHS Honors Physics - Universal Gravitation Review

1) What is the strength of the gravitational force between Planet 1 (mass = 6.1×10^{23} kg) and Planet 2 (mass = 1.6×10^{27} kg) if the distance between their centers is 2×10^8 m apart?

2) A planet has a mass of M kg and has a moon with a mass of m kg. It exerts a gravitational force of F its moon is R meters (center to center) away from the planet. *In terms of F* what is the strength of the gravitational force between the planet and the moon if both masses are doubled and the distance between them is quadrupled?

3) The sun exerts a gravitational force of approximately 3.53×10^{22} N on the earth. If the sun were replaced with a black hole of the same mass, at the same location what would happen to the orbit of the earth?

4) A 1.0×10^{30} kg planet experiences a 4.41×10^{21} N force when it is 1.8×10^{16} m from an unknown object. What is the mass of the object?

5) What is the acceleration due to gravity of a planet which has a mass of 4.55×10^{26} kg if it has a radius of 2.97×10^6 m?

6) How are weight and mass different?

7) Define directly proportional to: _____

8) Define inversely proportional to: _____

9) In Newton's Law of universal gravitation the distance is measured from what points?

$$\textcircled{1} \frac{(6.67 \times 10^{-11})(6.1 \times 10^{23})(1.6 \times 10^{27})}{(2 \times 10^8)^2} = \boxed{1.63 \times 10^{24} \text{ N}}$$

$$\textcircled{2} F = \frac{GmM}{R^2} \quad \text{???} = \frac{G(2m)(2M)}{(4R)^2} = \frac{4}{16} \frac{GmM}{R^2} = \frac{1}{4} \frac{GmM}{R^2} = \boxed{\frac{1}{4} F}$$

$$\textcircled{3} \boxed{\text{Nothing}} \quad \text{still} \quad \frac{G M_s M_e}{r_{s-e}^2}$$

$$\textcircled{4} 4.41 \times 10^{21} \text{ N} = \frac{(6.67 \times 10^{-11})(1 \times 10^{30})M}{(1.8 \times 10^{16})^2} = \boxed{2.14 \times 10^{34} \text{ N}}$$

$$\textcircled{5} g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(4.55 \times 10^{26} \text{ kg})}{(2.97 \times 10^6)^2} = \boxed{3440.5 \text{ m/s}^2}$$

⑥ Weight depends on location
mass is how much of an object there is

⑦ One goes up so does two
" " down " "

⑧ One goes up, two goes down, vice-versa

⑨ center to center