Mighty Physics Problem Set

CIRCULAR MOTION

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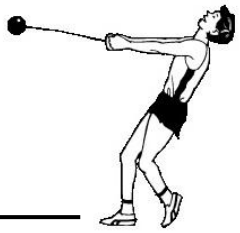

1. David hits Goliath with a rock that he has spun around over head in a sling. If the rock is spun with a frequency of 100 revolutions per minute, what is the rock's period? *Ans: 0.6 seconds*

2. Elizabeth kicks a 0.600 kg soccer ball with a force of 80.0N. How much does she accelerate the soccer ball from rest in the process? *Ans: 133 m/s²*

3. Ashton the ant is skulking on the steal blade of the sealing fan when the fan is turned on, causing Ashton to spin. If Ashton sits on the fan blade at a distance of 0.08 m from the center of the fan and turns with a frequency of 1.2 Hz. a) how fast does Ashton spin? b) If Ashton slips off the spinning fan, describe the path that he will take. *Ans: a) 0.6 m/s. B) tangent to the blade*

4. The millers daughter is spinning straw into gold on a spinning wheel that turns at a speed of 7.5 m/s, making one revolution every 0.50 s. How long is a strand of gold that makes one turn around the wheel? *Ans: 3.8 m*

5. A3.2 kg hawk circles every 10.0 seconds in a circle 12.0 m in radius, what is the linear speed of the hawk? What centripetal force allows him/her to remain in a circle? What is providing the centripetal force? *Ans: a) 7.5 m/s b) 15.2 N c) air on the wings*

6. Sofia's favorite ride at the fair is the ferris wheel that has a radius of 7.0 m (a) If the ride takes 20.0 s to make one full revolution, what is the linear speed of the wheel? (b) What centripetal force will the ride exert on Sofia's 50.0 kg body?(c) Does Sofia feel as if she is being pulled in or out by the ride? (d) Explain the difference between what she feels and what is really happening at the top and bottom of the wheel. *Ans: a) 2.2 m/s b) 35 N c) like she's being pulled out d) Top, lighter - Fc opposes G. Bott. Heavier - Fc adds to G.*

7. Earth orbits the sun once every 365.25 days at an average distance of about $1.5 * 10^{11}$ m. The mass of earth is $5.98 * 10^{24}$ kg. a) What is the centripetal acceleration of earth? b) What is the centripetal force of the sun on earth? c) What is the centripetal force of earth on the sun? d) If this force exists between the sun and earth, does this mean that earth is falling "into" the sun? *Ans: a) 5.9 E -3 m/s² b) 3.5 E 22 N c) Same force, opposite direction d) Falling force and inertia combine to maintain orbit*

8. An early planetary model of the hydrogen atom consisted of a $1.67*10^{-27}$ kg proton in the nucleus and a $9.11*10^{-31}$ kg electron in orbit around it at a distance of $5.0*10^{-11}$ m. In this model, what is the gravitational force between a proton and an electron? *Ans: a) 4.1 E -47 N*

9. At what height above Earth would a 400.0 kg satellite have to orbit in order to experience a gravitational force half as strong as that on the surface of Earth? *Ans: 2.64 E 6 m*

10. It is said that people often behave in unusual ways during a full moon. (a) Calculate the gravitational force that the moon would exert on a 50.0 kg student named Clarise. The moon $3.84*10^{8}$ from Earth and has a mass of $7.35*10^{22}$ kg. (b) Does the moon attract the earth with a greater than, less than, or the same force with which Clarise attracts the moon? Ans: a) 1.66 E -3 N (b) the same

11. The planet Mercury has a radius of 2400 km and a mass of $3.3*10^{23}$ kg. (a) What would be the gravitational acceleration of an astronaut standing on the surface on the surface of Mercury? (b) Compare the motion of a ball dropped on the surface of the Mercury to that of a ball dropped on earth. *Ans: a) 3.8 m/s² (b) more slowly on Mercury*