Extra Practice problems for Unit 8 Circular motion and Gravity with answers

1. A 0.150 kg ball on the end of a 1.10 m long cord (negligible mass) is swung in a vertical circle. A) Determine the minimum speed the ball must have at the top of its arc so that the ball continues moving in a circle. B) Calculate the tension in the cord at the bottom of the arc, assuming the ball is moving at twice the speed of part A). **a) 3.28 m**/**s b) 7.36 N**
2. A) Determine the tension in a string attached to a 0.150 kg ball if a person makes the ball revolve in a horizontal circle of radius 0.600 m making 2.00 revolutions per second. B) Calculate the centripetal acceleration experienced by the ball. **a) 14.2 N b) 94.7 m/s2**
3. Suppose the coefficient of static friction between the road and tires on a car is 0.60. A) What speed will put the car on the verge of sliding out as it round a level curve of 30.5 m radius? B) What angle would the road bed need to be banked at to allow the driver to drive at the speed of part A) as if the road were frictionless? **a) 13.4 m/s b) 31.0**
4. Determine the gravitational field strength on the surface of Mars. **3.70 m/s2**
5. At what height does a satellite need to be placed in orbit around Mars to be in a geosynchronous orbit? **1.72 x107 m**

|  |  |
| --- | --- |
| **Planet** | **Day Length** |
| Mercury | 1,408 hours |
| Venus | 5,832 hours |
| Earth | 24 hours |
| Mars | 25 hours |
| Jupiter | 10 hours |
| Saturn | 11 hours |
| Uranus | 17 hours |
| Neptune | 16 hours |

1. What is the period of orbital motion for Mars if we assume that it is in a circular orbit around the sun? **(will be slightly different than the table) 687.2 days**
2. Two stars are orbiting one another in a circular orbit with a radius of R. The mass of one star is twice the mass of the other. Determine an expression for the period of the orbit in terms of R.