

REVIEW SHEET – GRAVITY AND CIRCLES

1. Read Chapter 7, sections 1-3
2. **Terms to know:** uniform circular motion, cycle, period, linear (tangential) velocity, centripetal force, centripetal acceleration, universal gravitational constant, inverse square law, gravitational field strength, satellite, weightlessness.
3. State: Newton's Law of Universal Gravitation.

4. Define: *gravitational field strength*

5. For an object in uniform circular motion, describe the direction of its:
 - a) instantaneous (linear, tangential) velocity
 - b) centripetal force
 - c) centripetal acceleration
6. State a formula for each quantity in question #4.
7. A race car travels around a circular track at a constant speed. What happens to the centripetal acceleration of the car if:
 - a) the speed doubles?
 - b) the radius decreases to half the initial value?
 - c) the mass of the car doubles?

8. Calculate the force holding the Earth in orbit around the Sun.

9. What happens to the gravitation force of attraction between two masses when:
 - a) the distance between the two masses is doubled?
 - b) the distance between the two masses is halved?
 - c) the mass of both objects is doubled?
 - d) the mass of one object is halved
10. Calculate the gravitational field strength on the surface of the Moon.

11. Use your answer to question #9 to calculate your weight on the surface of the Moon.

12. Are astronauts in the space shuttle really “weightless”? Why do they appear so?
13. A student in lab twirls a rubber stopper on a 0.7 m string around in a circle overhead. If the rubber stopper is revolved 15 times in 3.74 seconds and had a mass of 7.2 g, calculate:
- a) its period
 - b) its speed
 - c) its centripetal acceleration
 - d) the tension in the string.
14. Calculate the average speed of Pluto in its orbit around the Sun.
15. Compare the tension in the rope of a motionless and a swinging pendulum.
16. What are the two names and the two formulas for “ F_g ”?
17. What are the two names and the two formulas for “ g ”?
18. What is the name and value of “ G ”?
19. If a scale is in an elevator, when will it read
- a) normal?
 - b) greater than normal?
 - c) less than normal?

ANSWER KEY:

7. 3.5×10^{22} N
9. 1.62 m/s^2
12. (a) 0.25 s (b) 17.6 m/s (c) 443 m/s^2 (d) 3.2 N
13. $4.7 \times 10^3 \text{ m/s}$