

# Satellites

Name: \_\_\_\_\_

1) Why doesn't an orbiting satellite crash into the Earth? Why doesn't it travel off into space?

2) What is the definition of orbit?

3a) On what quantities is the speed of a satellite dependent?

c) If a space shuttle goes into a higher orbit, what happens to the shuttle's period?

b) Does a satellite with a large or small orbital radius have a greater speed?

d) Mars has about  $1/9$  the mass of Earth. Satellite *M* orbits Mars with the same orbital radius as satellite *E*, which is orbiting Earth. Which satellite has a smaller period?

4) A geosynchronous satellite is one that appears to remain over one spot on Earth. Assume that a geosynchronous satellite has an orbital radius of  $4.23 \times 10^7$  m.

a) Calculate its orbital speed.

b) Calculate its period.

5) As Apollo 11 orbited the Moon, the average orbit was 111 km above the surface. The radius of the Moon is 1785 km, with a mass of  $7.3 \times 10^{22}$  kg.

a) How long did it take Apollo 11 to orbit the Moon?

b) At what speed did Apollo 11 orbit?

6) Chairs in an orbiting spacecraft are weightless. If you were on board and you were barefoot, would you stub your toe if you kicked a chair? Explain.

7a) As an astronaut in an orbiting space shuttle, what would happen if you let go of a ball above your head?

b) How would you get the ball to "drop"?

8) A rocket is orbiting 642 km above the Earth's surface. What is the gravitational acceleration at this distance above the surface? (Radius of the Earth =  $6.38 \times 10^6$  m)

Answers: 4b) 24.06 hr

5b) 1602 m/s

8)  $8.1 \text{ m/s}^2$