

Worksheet 1: Phys233 (Astronomy)

FROM PHYS141

Q1: Earth is approximately a sphere of radius  $6.37 \times 10^6$  m. What are (a) its circumference in kilometers, (b) its surface area in square kilometers, and (c) its volume in cubic kilometers?

Q2: Because Earth's rotation is gradually slowing, the length of each day increases: The day at the end of 1.0 century is 1.0 ms longer than the day at the start of the century. In 20 centuries, what is the total of the daily increases in time?

Q3: Suppose that, while lying on a beach near the equator watching the Sun set over a calm ocean, you start a stopwatch just as the top of the Sun disappears. You then stand, elevating your eyes by a height  $H = 1.70$  m, and stop the watch when the top of the Sun again disappears. If the elapsed time is  $t = 1.1$  s, what is the radius  $r$  of Earth?

Q4: Earth has a mass of  $5.98 \times 10^{24}$  kg. The average mass of the atoms that make up Earth is 40 u. How many atoms are there in Earth? ( $1u = 1.66 \times 10^{-27}$  kg).

Q5: An astronomical unit (AU) is the average distance between Earth and the Sun, approximately  $1.50 \times 10^8$  km. The speed of light is about  $3.0 \times 10^8$  m/s. Express the speed of light in astronomical units per minute.

Q6: An astronomical unit (AU) is equal to the average distance from Earth to the Sun, about  $1.50 \times 10^8$  km. A parsec (pc) is the distance at which a length of 1 AU would subtend an angle of exactly 1 second of arc. A light-year (ly) is the distance that light, traveling through a vacuum with a speed of  $3.0 \times 10^8$  m/s, would cover in 1.0 year. Express the Earth – Sun distance in (a) parsecs and (b) light-years.

