

- To describe natural phenomena, we must make measurements of various aspects of nature.
- The laws of physics are expressed as mathematical relationships among physical quantities.
- In mechanics our physical quantities are mainly **length**, **mass**, and **time**.
- For measuring these physical quantities, there must be a defined standard.
- In 1960, the international committee established a set of standards for the fundamental quantities of science which is called the SI (Système International)

Physical Quantity	SI unit
Length [L]	meter (m)
Mass [M]	kilogram (kg)
Time [T]	second (s)



- We can also use other units as prefixes for powers of ten known as prefix multipliers.

TABLE 1.4 Prefixes for Powers of Ten

Power	Prefix	Abbreviation	Power	Prefix	Abbreviation
10^{-24}	yocto	y	10^3	kilo	K
10^{-21}	zepto	z	10^6	mega	M
10^{-18}	atto	a	10^9	giga	G
10^{-15}	femto	f	10^{12}	tera	T
10^{-12}	pico	p	10^{15}	peta	P
10^{-9}	nano	n	10^{18}	exa	E
10^{-6}	micro	μ	10^{21}	zetta	Z
10^{-2}	centi	c	10^{24}	yotta	Y
10^{-1}	deci	d			

- The "fundamental" quantities are **length**, **mass**, and **time**.
- Other quantities are "derived" which are represented as a mathematical combination of "fundamental" quantities such as
 - **Area**: product of two lengths (e.g. area of rectangle = length * width)
 - **Speed**: a ratio of a length to a time interval

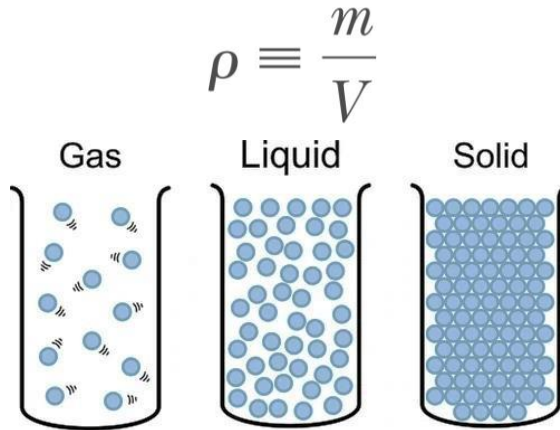


- 1 **SSM** Earth is approximately a sphere of radius 6.37×10^6 m. What are (a) its circumference in kilometers, (b) its surface area in square kilometers, and (c) its volume in cubic kilometers?

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- **Density:** The density ρ (Greek letter rho) of any substance is defined as its *mass per unit volume*:



- Q | C** 2. A proton, which is the nucleus of a hydrogen atom, can be modeled as a sphere with a diameter of 2.4 fm and a mass of 1.67×10^{-27} kg. (a) Determine the density of the proton.



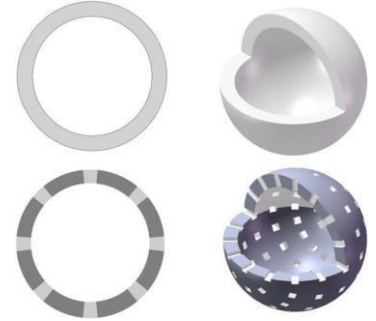
3. Two spheres are cut from a certain uniform rock. One has radius 4.50 cm. The mass of the other is five times greater. Find its radius.

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4. What mass of a material with density ρ is required to make a hollow spherical shell having inner radius r_1 and outer radius r_2 ?



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••9 Antarctica is roughly semicircular, with a radius of 2000 km (Fig. 1-5). The average thickness of its ice cover is 3000 m. How many cubic centimeters of ice does Antarctica contain? (Ignore the curvature of Earth.)

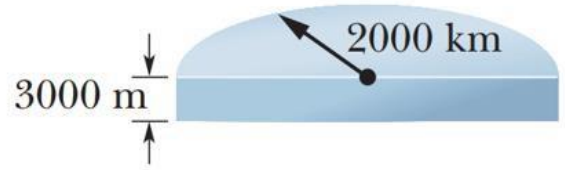


Figure 1-5 Problem 9.

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