

Chapter 1 – Problem Day

12. A lecture period (50 min) is close to 1 microcentury. (a) How long is a microcentury in minutes? (b) Using $\% \text{ diff} = \left(\frac{\text{actual} - \text{approx}}{\text{actual}} \right) \times 100\%$ find the percentage difference from the approximation.
19. 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 time is $t = 11.1$ s, what is the radius r of Earth?
25. Iron has a density of 7.87 g/cm^3 , and the mass of an iron atom is 9.27×10^{-26} kg. If the atoms are spherical and tightly packed, (a) what is the volume of an iron atom and (b) what is the distance between the centers of adjacent atoms?
30. Water is poured into a container that has a leak. The mass m of the water is given as a function of time t by $m = 5t^{0.8} - 3t + 20$, with $t \geq 0$, m in grams, and t in seconds. (a) At what time is the water mass greatest, and (b) what is that greatest mass? In kilograms per minute, what is the rate of mass change at (c) $t = 2$ s and (d) $t = 5$ s?
31. A vertical container with base area measuring 14.0 cm by 17.0 cm is being filled with identical pieces of candy, each with a volume of 50.0 mm^3 and a mass of 0.0200 g. Assume that the volume of the empty spaces between the candies is negligible. If the height of the candies in the container increases at the rate of 0.250 cm/s, at what rate (kilograms per minute) does the mass of the candies in the container increase?
39. A *cord* is a volume of cut wood equal to a stack 8 ft long, 4 ft wide, and 4 ft high. How many cords are in 1.0 m^3 ?
47. A person on a diet might lose 2.3 kg per week. Express the mass loss rate in milligrams per second, as if the dieter could sense the second-by-second loss.

Chapter 1 Answers

12a) 52.6 min

12b) 4.9%

19) 5.2×10^6 m

25a) 1.18×10^{-29} m³

25b) 2.82×10^{-10} m

30a) 4.21 s

30b) 23.2 g

30c) 28.9 g/min

30d) - 6.05 g/min

31) 1.43 kg/min

39) 0.3 cord

47) 3.8 mg/s