

1. Which of the following measurements has five significant figures?
 A. 4867 mi
 B. 56 mL
 C. 60,104 ton
 D. 0.00003 cm
2. What is $5.6792\text{ m} + 0.6\text{ m} + 4.33\text{ m}$ expressed in the correct units with the correct number of significant figures?
 A. 10.6 m^3
 B. 10.6 m
 C. 10.60 m
 D. 10.6092 m
 $5.6792\text{ m} + 0.6\text{ m} + 4.33\text{ m} = 10.6092 = 10.6\text{ m}$
3. What is $7.310\text{ km} \div 5.70\text{ km}$ expressed in the correct units with the correct number of significant figures?
 A. 1.282 km^2
 B. 1.28 km^2
 C. 1.282
 D. 1.28
 $7.310\text{ km} \div 5.70\text{ km} = 1.2825 = 1.28$
4. How many minutes does it take light from the sun to reach Earth, given that the distance from the sun to Earth is 93 million mi, and the speed of light is $3.00 \times 10^8\text{ m/s}$?
 A. 500 min
 B. 0.517 min
 C. 8.3 min
 D. 8.26 min
 $93 \times 10^6\text{ mi} \times \frac{1609\text{ m}}{1\text{ mi}} \times \frac{1\text{ s}}{3.00 \times 10^8\text{ m}} \times \frac{1\text{ min}}{60\text{ s}} = 8.3132 = 8.3\text{ min}$
5. A slow jogger runs a mile (1.0 mi) in 13 min. Calculate the speed in km/h. (1 mi = 1609 m)
 A. 3.5 km/hr
 B. 0.74 km/hr
 C. 2.9 km/hr
 D. 7.4 km/hr
 $\frac{1.0\text{ mi}}{13\text{ min}} \times \frac{60\text{ min}}{1\text{ hr}} \times \frac{1609\text{ m}}{1\text{ mi}} \times \frac{1\text{ km}}{1 \times 10^3\text{ m}} = 7.426 = 7.4\text{ km/hr}$
6. The "normal" lead content in human blood is about 0.40 part per million (that is, 0.40 g of lead per million grams of blood). A value of 0.80 part per million (ppm) is considered to be dangerous. How many grams of lead are contained in $6.0 \times 10^3\text{ g}$ of blood (the amount in an average adult) if the lead content is 0.62 ppm?
 A. $2.8 \times 10^{-3}\text{ g Pb}$
 B. $5.6 \times 10^3\text{ g Pb}$
 C. $9.3 \times 10^{-2}\text{ g Pb}$
 D. $3.7 \times 10^{-3}\text{ g Pb}$
 $6.0 \times 10^3\text{ g blood} \times \frac{0.62\text{ g Pb}}{1 \times 10^6\text{ g blood}} = 0.00372 = 3.7 \times 10^{-3}\text{ g Pb}$
7. What is 25.4 mg when converted to kilograms?
 A. 2540 kg
 B. $2.54 \times 10^{-5}\text{ kg}$
 C. 2.54 kg
 D. $2.54 \times 10^4\text{ kg}$
 $25.4\text{ mg} \times \frac{1 \times 10^{-3}\text{ g}}{1\text{ mg}} \times \frac{1\text{ kg}}{1 \times 10^3\text{ g}} = 2.54 \times 10^{-5}\text{ kg}$
8. The following procedure was used to determine the volume of a flask. The flask was weighed dry and then filled with water. If the masses of the empty flask and filled flask were 56.12 g and 87.39 g, respectively, and the density of water is 0.9976 g/cm^3 , what is the volume of the flask in cm^3 ?
 A. 31.35 cm^3
 B. 87.60 cm^3
 C. 56.26 cm^3
 D. 46.33 cm^3
 $(87.39\text{ g} - 56.12\text{ g}) \times \frac{1\text{ cm}^3}{0.9976\text{ g}} = 31.27\text{ g} \times \frac{1\text{ cm}^3}{0.9976\text{ g}} = 31.3452 = 31.35\text{ cm}^3$
9. A piece of silver (Ag) metal with mass 194.3 g is placed in a graduated cylinder containing 242.0 mL of water. The volume of water now reads 260.5 mL. From these data calculate the density of silver.
 A. 21.0 g/cm^3
 B. 1.25 g/cm^3
 C. 0.746 g/cm^3
 D. 10.5 g/cm^3
 $\frac{194.3\text{ g}}{(260.5\text{ mL} - 242.0\text{ mL})} = \frac{194.3\text{ g}}{18.5\text{ mL}} = 10.503 = 10.5\text{ g/mL}$
10. Lithium is the least dense metal known (density: 0.53 g/cm^3). What is the volume occupied by $1.20 \times 10^3\text{ g}$ of lithium?
 A. $6.4 \times 10^2\text{ cm}^3$
 B. $1.73 \times 10^3\text{ cm}^3$
 C. $2.3 \times 10^3\text{ cm}^3$
 D. $6.7 \times 10^2\text{ cm}^3$
 $1.20 \times 10^3\text{ g} \times \frac{1\text{ cm}^3}{0.53\text{ g}} = 2264 = 2.3 \times 10^3\text{ cm}^3$
11. Chalcopyrite, the principal ore of copper (Cu), contains 34.63 percent Cu by mass. How many grams of Cu can be obtained from $5.11 \times 10^3\text{ kg}$ of the ore?
 A. 147 kg
 B. $1.77 \times 10^6\text{ g}$
 C. 147 g
 D. $1.77 \times 10^3\text{ g}$
 $5.11 \times 10^3\text{ kg ore} \times \frac{34.63\text{ kg Cu}}{100\text{ kg ore}} \times \frac{1 \times 10^3\text{ g}}{1\text{ kg}} = 1.7696 \times 10^6 = 1.77 \times 10^6\text{ g}$
12. A sheet of aluminum (Al) foil has a total area of 1.000 ft^2 and a mass of 3.636 g. What is the thickness of the foil in millimeters? (Density of Al = 2.699 g/cm^3)
 A. $6.750 \times 10^{-2}\text{ mm}$
 B. $2.900 \times 10^{-2}\text{ mm}$
 C. $1.450 \times 10^{-3}\text{ mm}$
 D. $1.450 \times 10^{-2}\text{ mm}$
 $3.636\text{ g} \times \frac{1\text{ cm}^3}{2.699\text{ g}} \times \frac{1}{1.000\text{ ft}^2} \times \left(\frac{1\text{ ft}}{12\text{ in}} \times \frac{1\text{ in}}{2.54\text{ cm}} \right)^2 \times \frac{10\text{ mm}}{1\text{ cm}} = 0.01540077 = 1.540 \times 10^{-2}\text{ mm}$

Chapter 1-2 MC Review

13. The world's total petroleum reserve is estimated at 2.0×10^{22} J. At the present rate of consumption, 1.8×10^{20} J/yr, how long would it take to exhaust the supply?
- A. 4.7×10^1 yr
 B. 9.0×10^{-3} yr
C. 1.1×10^2 yr
 D. 3.0×10^2 yr
- $$2.0 \times 10^{22} \text{ J} \times \frac{1 \text{ yr}}{1.8 \times 10^{20} \text{ J}} = 1.111 \times 10^2 = 1.1 \times 10^2 \text{ yr}$$
14. The diameter of a neutral helium atom is about 1×10^2 pm. Suppose that we could line up helium atoms side by side in contact with one another. Approximately how many atoms would it take to make the distance from end to end 1 cm?
- A. 1×10^8 He atoms
 B. 2×10^5 He atoms
 C. 1×10^9 He atoms
D. 5×10^6 He atoms
- $$1 \text{ cm} \times \frac{1 \times 10^{-2} \text{ m}}{1 \text{ cm}} \times \frac{1 \text{ pm}}{1 \times 10^{-12} \text{ m}} \times \frac{1 \text{ He atom}}{1 \times 10^2 \text{ pm}} = 1 \times 10^8 \text{ He atoms}$$
15. What is the mass number of an iron atom that has 28 neutrons?
- A. 54
 B. 28
 C. 56
 D. 26
- Mass # (A) = #p (Z) + #n = 26 + 28 = 54
16. What is the number of protons, neutrons, and electrons in ${}^{63}_{29}\text{Cu}$?
- A. 29 protons, 34 neutrons, 34 electrons
B. 29 protons, 34 neutrons, 29 electrons
 C. 34 protons, 29 neutrons, 34 electrons
 D. 29 protons, 63 neutrons, 29 electrons
- #n = A - Z = 63 - 29 = 34, #e = Z = 29
17. What is the appropriate symbol for the isotope Z = 74, A = 186?
- A. ${}^{186}_{74}\text{W}$ Z = 74 → W (tungsten)
 B. ${}^{186}_{74}\text{Sg}$
 C. ${}^{186}_{112}\text{W}$
 D. the element does not exist
18. What is the number of protons and electrons in Br^- ?
- A. 35 protons, 35 electrons
B. 35 protons, 36 electrons
 C. 35 protons, 37 electrons
 D. 34 protons, 35 electrons
- Z = 35; #e = Z - charge = 35 - (-1) = 36
19. Which of the following compounds is likely to be ionic?
- A. CH_4
B. NaBr Ionic is a metal & a non-metal
 C. CCl_4
 D. NF_3
20. One isotope of a nonmetallic element has mass number 127 and 74 neutrons in the nucleus. The anion derived from the isotope has 54 electrons. What is the symbol for this anion?
- A. I
 B. W^-
 C. Xe^+
 D. the element does not exist
- Z = A - #neutrons = 127 - 74 = 53 (I, iodine);
 Charge = Z - #electrons = 53 - 54 = -1
21. Which elements are most likely to form ionic compounds?
- A. halogens and noble gases
 B. transition metals and metalloids
C. metals and halogens (M & NM)
 D. metals and noble gases
22. Which of the following elements has a common ion with a 2- charge?
- A. Li
 B. Mg
C. S Must be in O family (group 16)
 D. I
23. Which of the following is an alkali metal whose cation contains 36 electrons?
- A. Se
 B. Br
 C. Kr
D. Rb
- Z = #electrons + charge = 36 + 1 = 37 (Rb, rubidium)