

WKS
Units, Density & Scientific Notation

NAME _____
Period _____ **Date** _____

I. Units

1. List the SI units of measurement for length, mass, time, and temperature.
2. What is the only base unit that has a prefix, and why is that unit used rather than the bare unit?
3. What is the difference between a base unit and a derived unit?
4. What are some examples of derived units? What quantity do they measure?
5. Which of these samples have the same density? Show all calculations and be sure all numbers have units!

Density Data		
Sample	Mass	Volume
A	80 g	20 mL
B	12 g	4 cm ³
C	33 g	11 mL

6. Density is an intensive property, meaning that it can be used to identify a material. From the table at right, determine the identity of an unknown metal if a sample with mass = 47.4 g increases the volume of water in a graduated cylinder from 8.50 mL to 13.85 mL. (Don't forget you can convert mL to cm³ for the metal's density.)

Name	Density, g/cm ³
Aluminum	2.701
Iron	7.86
Nickel	8.90
Zinc	7.13
Lead	11.35

7. What is the mass of an aluminum sample with a volume of 25.9 cm³? (see density above)
8. What is the volume of a sample of lead with a mass of 194.8 g? (see density above)

II. Scientific Notation

A. Express in scientific notation:

9. 186,000 mi/s	10. 0.043 s
11. 3,000,000 km	12. 0.0000307 L
13. 19,850 yr	14. 0.000000482 m
15. 174,000,000 hr	16. 0.00204 mg
17. -350,000 mm	18. -0.00009 kg

B. Express in common decimal form:

19. 7.3×10^2 ms	20. 5.83×10^{-4} L
21. 2.41×10^4 J	22. -9.23×10^{-3} mol
23. 7×10^{-3} kg	24. -9.23×10^3 cm
25. 6.37×10^{-5} kPa	26. 8.003×10^4 MW
27. -3.4×10^6 km	28. -8.003×10^{-4} s

C. Evaluate the following expressions *using your calculator*; write your answer in scientific notation.

Remember to use your calculator's **EE** or **EXP** key or **2nd** **EE** function. Do NOT use “ $\times 10^{\wedge}$ ” and do not use the “ \times ” key *except* to multiply two numbers. Write your answer using proper scientific notation. **Double-check your answers!**

29. $2 \times 10^{-4} \times 3 \times 10^7$	30. $3.5 \times 10^2 \times 2 \times 10^4$
31. $8.1 \times 10^4 \times 3 \times 10^{-2}$	32. $4.3 \times 10^{-4} \times 2 \times 10^{-6}$
33. $3.4 \times 10^{-8} \div 1.7 \times 10^{-3}$	34. $8.5 \times 10^4 \div 2.5 \times 10^{-11}$
35. $\frac{5 \times 10^2 \times 8 \times 10^{-4}}{2 \times 10^7}$	36. $\frac{3 \times 10^4 \times 2 \times 10^8}{2 \times 10^{10}}$
37. $\frac{8 \times 10^{-1} \times 1.5 \times 10^2}{2 \times 10^{-1} \times 7.5 \times 10^1}$	38. $\frac{2.5 \times 10^7 \times 4.9 \times 10^{-8} \times 3.2 \times 10^{-1}}{7 \times 10^1 \times 1.6 \times 10^{-3}}$

Note: you must put the *entire* denominator into parentheses if performing a multiplication, addition or subtraction within it.

Answers: 5) A: $D=4.0 \text{ g/mL}$; B: $D=3.0 \text{ g/cm}^3$; C: $D=3.0 \text{ g/mL}$; 6) $D=8.86 \text{ g/cm}^3$; 7) $M=69.96 \text{ g}$; 8) $V=17.16 \text{ cm}^3$; 29) 6×10^3 ; 30) 7×10^6 ; 31) 2.43×10^3 ; 32) 8.6×10^{-10} ; 33) 2×10^{-5} ; 34) 3.4×10^{15} ; 35) 2×10^{-8} ; 36) 3×10^{-2} ; 37) 8×10^0 ; 38) 3.5×10^0