2. Store

Name _____

Honors Chemistry: Significant Figures Scientific Notation

Date _____

Period _____ Key

2·2

2. Distinguish between the accuracy and precision of a measurement.

accuracy – ~~measure~~ comparison of measured value w/ true or accepted value for an object

precision – comparision of measured values to each other for an object

2·3

3. Identify the number of significant figures in a measurement.

Examples:
a. 0.42 L 2
b. 78.00 m 4
c. 320 g 2

2·4

4. Use the rules for significant figures in calculations to correctly round off numbers.

Examples:
a. Round off 8630 km to two significant figures. 8600 km
b. Round off 0.01025 m to three significant figures. 0.0103 m
c. Round off 0.00543 L to two significant figures. ~~0.0053 m~~ 0.0054 L
d. Round off 7.013 g to three significant figures. 7.01 g
e. Round off 0.003629 mm to three significant figures. 0.00363 mm

3. How many significant figures are in the measurement 40.04 cm^2? 3. 4

4. How many significant figures are in the measurement 400.000 cm^2? 4. 6

5. How many significant figures are in the measurement 3.15 cm^2? 5. 3

6. If the measurement in Question 5 were multiplied by another number, what is the maximum number of significant figures the product could have? 6. 1, 2, or 3 (at max)

7. If the measurement in Question 5 were added to another number, what is the maximum number of significant decimal places the sum could have? 7. 1, 2 at max

Match the numbers on the left with the correct scientific notation on the right.

a. 0.000 71 4
b. 71 000 2
c. 71.000 3
d. 710.00 1
e. 0.710 00 5

(1) 7.1000×10^2
(2) 7.1×10^4
(3) 7.10000×10^1
(4) 7.1×10^{-4}
(5) 7.1000×10^{-1}

Match the numbers on the left with the correct number of significant figures on the right.

a. 0.000 370 3
b. 1.000 37 6
c. 100 1
d. 0.10 2
e. 1001 4
f. 0.001 000 3 5

(1) 1
(2) 2
(3) 3
(4) 4
(5) 5
(6) 6

USING CONCEPTS

How many significant digits are in each of the following numbers?

a. 1.005 g 4 b. 10 000 g 1 c. 74 200 g 3 d. 0.000 010 g 2

Fill in the blanks.

a. 1 m^3 = 1×10^6 cm^3 b. 1 m^3 = 1×10^3 liters c. 4.13 mL = 4.13 cm^3

Fill in the blanks

a. 2 m = 202 cm b. 4.62 L = 4620 mL c. 0.4 kg = 400 g

Write the following numbers in scientific notation.

1. 512 — 1. 5.12×10^2
2. 35 615 — 2. 3.5615×10^4
3. 885 326 251 — 3. 8.85326251×10^8
4. 0.000 40 — 4. 4×10^{-4}
5. 0.010 01 — 5. 1.001×10^{-2}

Write the following numbers in standard notation.

6. 3.0×10^6 — 6. 3,000,000
7. 1.49×10^{-5} — 7. .0000149
8. $5.000\ 102 \times 10^3$ — 8. 5000.102
9. 4.4×10^{-7} — 9. .00000044
10. 9.993×10^{-2} — 10. .09993

Express the following numbers either in scientific notation or in conventional form. (expanded notation)

	Standard Scientific Notation:		Expanded:
a. 93 000 000	9.3×10^7	d. 6.200×10^{-3}	.006200
b. 0.000 000 070 42	7.042×10^{-8}	e. 3.14×10^6	3140000
c. 1.00	1.00×10^0	f. 1×10^1	10

Multiply the following. Be sure the correct number of significant digits appears in the answer.

a. 2.1 x 0.4700 = 0.99 m^2 b. 6000 x 0.144 = 900 m^2

Add the following numbers. Be sure the answer contains the correct number of decimal places.

40.0	g	0.0067	cm
0.7631	g	0.1004	cm
5000.112	g	3	cm
610.70	g	7.00002	cm
5651.5	g	10	cm

Perform the following operations.

a. $(2.1 \times 10^6)(4.0 \times 10^{-4}) =$ 840

b. $\dfrac{1.6 \times 10^{-8}}{8.0 \times 10^{-3}} =$ 2×10^{-6}

c. $4.0 \times 10^4 + 6 \times 10^3$ = 4.6×10^4

d. $8.0 \times 10^{-4} - 9 \times 10^{-5}$ = 7.1×10^{-4}

MR. STONE

NAME Key
DATE
PERIOD

CHEMISTRY ____: SIGNIFICANT FIGURES/SCIENTIFIC NOTATION
CALCULATING WITH SF & SN

1. List the two main causes of error or uncertainty in measurements.

human error / instrument error

2. What general relationship does the number of significant figures found in a measurement have to the accuracy of that measurement?

the greater the # of SF's the greater the accuracy

3. In science, precise measurements are always accurate measurements. TRUE or FALSE. False

(Q:4-8) Indicate the number of SF's in the following measurements:

4. 1200.0023 cm 8
5. 57.00 g 4
6. 1.0020 L 5
7. 0.0000456 s 3
8. 0.000340 Gg 3

(Q:9-13) Perform the following calculations and report your answer to the correct number of SF's:

9. 3.24 cm + 9.11 cm + 2 cm = 14 cm
10. 10.89 kg - 4.123 kg = 6.77 kg
11. 11.44 L + 6.043 L - 2.1257 L = 15.36 L
12. 2.20 s x 4.1 s = 9.0 s^2
13. 6.464 mm ÷ 2.1 mm = 3.1

(Q:14-15) Convert the following numbers into SSN:

14. 243500000 2.435×10^8
15. 0.00004315 4.315×10^{-5}

(Q:16-17) Convert the following numbers from SSN into expanded form:

16. 4.065×10^3 4065
17. 3.002×10^{-4} .00023002

(Q:18-20) Perform the following calculations using SSN:

18. $(2.2 \times 10^7 m) \times (1.0 \times 10^{-4} m) =$ $2.2 \times 10^3 m^2$
19. $4.44 \times 10^5 \div 2.0 \times 10^2 =$ 2.22×10^3
20. $7.33 \times 10^5 + 3.11 \times 10^4 - 2.3 \times 10^3 =$ 7.618×10^5

Key: Chap. 3 Practice Problems

105 m = ? km = .105 km
$10^0 - 10^3 = 10^{-3}$

2.0043×10^{-5} km = ? m = 2.0043×10^{-2} m
$10^3 - 10^0 = 10^3$

499 dm = ? cm = 4990 cm
10^{-1} $10^{-2} = 10^1$

1.549 um = ? km = 1.549×10^{-9} km
10^{-6} $10^3 = 10^{-9}$

7.8835×10^5 mm = ? cm = 7.8835×10^4 cm
$10^{-3} - 10^{-2} = 10^{-1}$

5.97×10^{-6} m = ? mm = 5.97×10^{-3} mm
$10^0 - 10^{-3} = 10^3$

8.06295 mm = ? dm = 8.06295×10^{-2} dm
$10^{-3} - 10^{-1} = 10^{-2}$

6,245,101 km = ? cm = 6.245101×10^{11} cm
$10^3 - 10^{-2} = 10^5$

0.0031 km = ? m = 3.1 m
$10^3 - 10^0 = 10^3$

3.44×10^{-4} m = ? um = 3.44×10^2 um
$10^0 - 10^{-6} = 10^6$

10.00 kg = ? mg = 1.000×10^7 mg
$10^3 - 10^{-3} = 10^6$

0.6321 kg = ? g = 632.1 g
$10^3 - 10^0 = 10^3$

0.822 ug = ? dg = 8.22×10^{-6} dg
$10^{-6} - 10^{-1} = 10^{-5}$

458 cg = ? mg = 4580 mg
$10^{-2} - 10^0 = 10^2$

7.66×10^5 g = ? kg = 7.66×10^2 kg
$10^0 - 10^3 = 10^{-3}$

16. 2.023×10^{-3} mg = ? kg = 2.023×10^{-9} kg
$10^{-3} - 10^3 = 10^{-6}$

17. 89.00 g = ? cg = 8.900×10^3 cg
$10^0 - 10^{-2} = 10^2$

18. 0.000311 g = ? ug = 311 ug
$10^0 - 10^{-6} = 10^6$

19. 1.94×10^{-1} g = ? dg = 1.94 dg
$10^0 - 10^{-1} = 10^1$

20. 6.2×10^4 ug = ? mg = 6.2×10^1 mg
$10^{-6} - 10^{-3} = 10^{-3}$ or = 62 mg

21. 5.00 dm^3 = ? cm^3 = 5.0×10^2 cm^3
$10^{-1} - 10^{-2} = 10^{1 \times 3} = 10^3$

22. 4312 cm^3 = ? m^3 = 0.004312 m^3
$10^{-2} - 10^0 = 10^{-2 \times 3} = 10^{-6}$

23. 1.733×10^5 m^3 = ? dm^3 = 1.733×10^8 dm^3
$10^0 - 10^{-1} = 10^{1 \times 3} = 10^3$

24. 86.3 cm^3 = ? mm^3 = 86300 mm^3
$10^{-2} - 10^{-3} = 10^{1 \times 3} = 10^3$

25. 5.94×10^{10} cm^3 = ? dm^3 = 5.94×10^7 dm^3
$10^{-2} - 10^{-1} = 10^{-1 \times 3} = 10^{-3}$

26. 16 m^3 = ? cm^3 = 16000000 cm^3
$10^0 - 10^{-2} = 10^{2 \times 3} = 10^6$

27. 8.3014×10^{-2} m^3 = ? mm^3 = 8.3014×10^7 mm^3
$10^0 - 10^{-3} = 10^{3 \times 3} = 10^9$

28. 4.261×10^4 m^3 = ? km^3 = 4.261×10^{-5} km^3
$10^0 - 10^3 = 10^{-3 \times 3} = 10^{-9}$

29. 1.07 m × 0.2233 m × 0.895 m = .213815245 =
= .214 m^3

.214 m^3 = ? dm^3 = 214 dm^3
$10^0 - 10^{-1} = 10^{1 \times 3} = 10^3$

30. 587 m × 93.5 m × 107.2 mm = 5883618.4 mm^3
= 5.88×10^6 mm^3

5.88×10^6 mm^3 = ? cm^3 = 5.88×10^3 cm^3
10^{-3} $10^{-2} - 10^{-1 \times 3} = 10^{-3}$

Name _____ Date _____ Class _____

2 MEASURING AND CALCULATING

A. DISCOVERING CONCEPTS

Circle the letter in front of the best answer to complete each statement.

1. The International System (SI) of measurement is a modern version of the B system of measurement.
   a. English (b.) Metric

2. _____ depends on the distance between an object and the center of the earth.
   a. Mass b. Mass density c. Volume (d.) Weight

3. An object's mass C as the object is moved from sea level to the top of a mountain.
   a. increases b. decreases (c.) remains the same

4. The unit used to express our basic standard of time is the A.
   (a.) second b. day c. month d. year

5. The unit of B is the kelvin (K).
   a. time (b.) temperature c. mass d. length

6. The temperature of a bucket of boiling water is C the temperature of a glass of boiling water.
   a. higher than b. lower than (c.) the same as

7. A bucket of boiling water has B heat energy than/as a glass of boiling water.
   a. less (b.) more c. the same

8. The Celsius temperature scale has B degrees between the boiling and freezing points of water.
   a. 32 (b.) 100 c. 180 d. 212

9. The units used to express measurements of speed, area, and volume are called B units.
   a. precise (b.) derived c. significant d. basic

10. The newton (N) is a unit of C.
    a. mass b. length c. ~~weight~~ Force d. volume

11. The standard C is defined in terms of the wavelength of a particular color of light.
    a. kilogram b. second (c.) meter d. degree

12. D is expressed as a length per unit time.
    a. Density b. Area c. Volume (d.) Speed

13. The density of 1 kg of lead is A the density of 1 kg of feathers.
    (a.) more than b. less than c. the same as

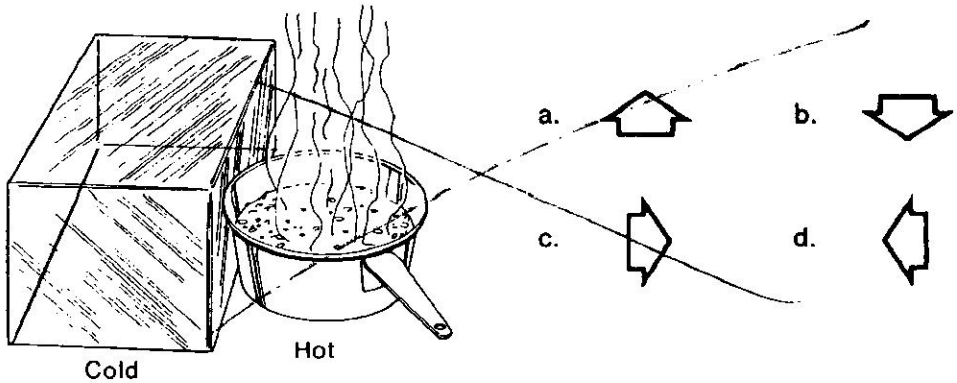
14. The density of 1 kg of lead is C the density of 1 g of lead.
    a. more than b. less than (c.) the same as

15. The mass of 1 kg of lead is C the mass of 1 kg of water.
    a. more than b. less than (c.) the same as

Name _____ Date _____ Class _____

B. INTERPRETING CONCEPTS

1. Circle the arrow indicating the direction heat will flow between the objects.



2. Match the prefixes with their equivalents.

a. micro (μ)	2	(1) 1/1 000 000 000 (billionth)
b. kilo (k)	8	(2) 1/1 000 000 (millionth)
c. deka (da)	6	(3) 1/1 000 (thousandth)
d. deci (d)	5	(4) 1/100 (hundredth)
e. centi (c)	4	(5) 1/10 (tenth)
f. hecto (h)	7	(6) 10 (ten)
g. giga (G)	10	(7) 100 (hundred)
h. milli (m)	3	(8) 1000 (thousand)
i. nano (n)	1	(9) 1 000 000 (million)
		(10) 1 000 000 000 (billion)

3. Fill in the blanks correctly.

a. g/cm^3 is a unit of density. c. cm^2 is a unit of area.

b. cm/s is a unit of speed, velocity d. m^3 is a unit of volume.

4. Match the numbers on the left with the correct scientific notation on the right.

a. 0.000 71	4	(1) 7.1000×10^2
b. 71 000	2	(2) 7.1×10^4
c. 71.000	3	(3) 7.10000×10^1
d. 710.00	1	(4) 7.1×10^{-4}
e. 0.710 00	5	(5) 7.1000×10^{-1}

5. Match the numbers on the left with the correct number of significant figures on the right.

a. 0.000 370 m	3	(1) 1
b. 1.000 37 m	6	(2) 2
c. 100 m	1	(3) 3
d. 0.10 m	2	(4) 4
e. 1001 m	4	(5) 5
f. 0.001 000 3 m	5	(6) 6

6. The answer to the following problem should be expressed in units of s/yr.

$$\frac{60\ s}{min} \cdot \frac{60\ min}{h} \cdot \frac{24\ h}{day} \cdot \frac{365\ days}{yr} =$$