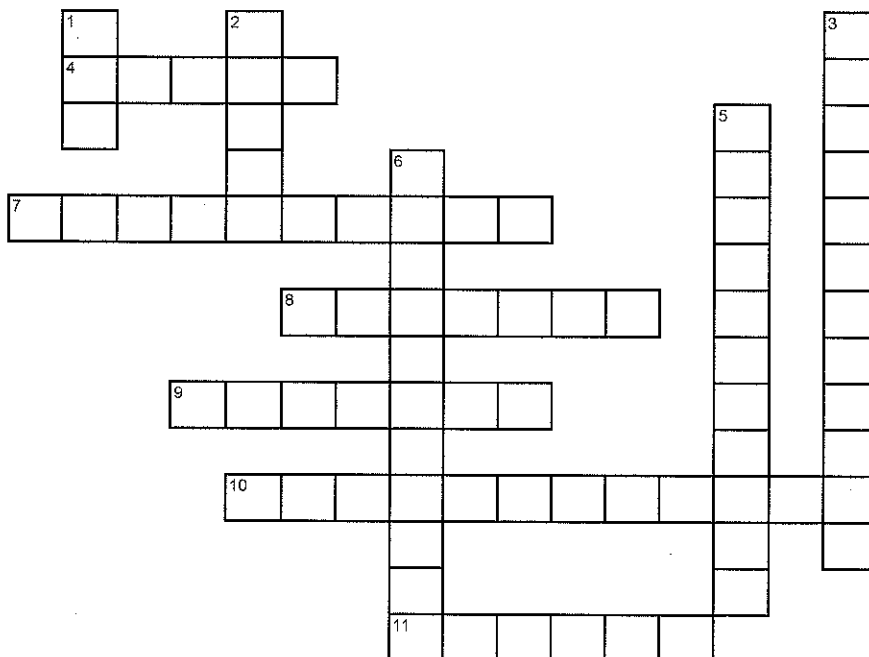


# SAFETY AND THE SCIENTIFIC METHOD



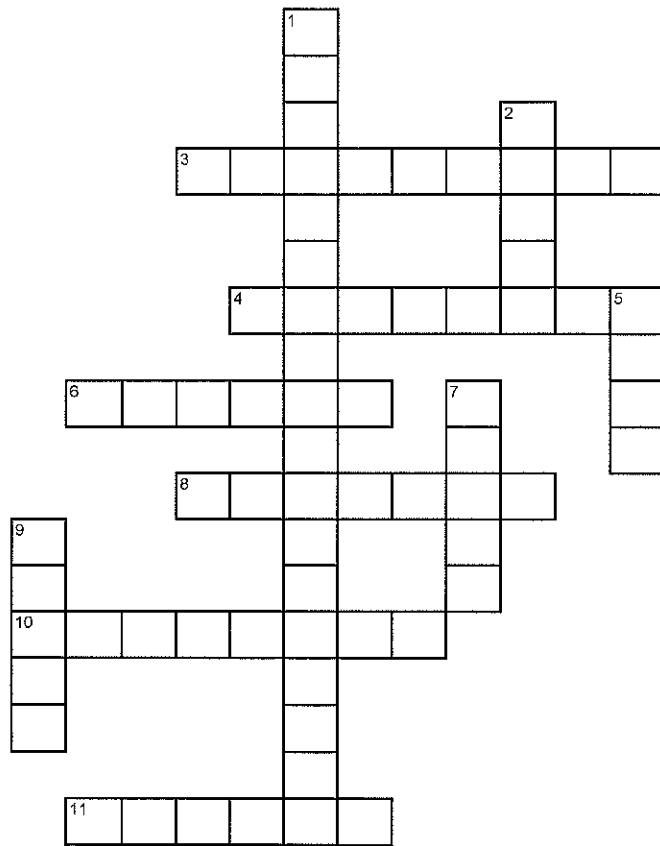
## ACROSS

- 4 Protects clothing from chemical spills
- 7 An inference made from data
- 8 To be used when a chemical gets in the eyes
- 9 Prevent chemicals from getting in the eyes
- 10 Data that is numerical in nature
- 11 An explanation of why or how an experimental result occurs

## DOWN

- 1 An observation about the behavior of the universe that applies in all circumstances
- 2 A visual, verbal, or mathematical representation
- 3 A device to be used in the event of a major chemical spill on a person
- 5 Data that is descriptive in nature
- 6 Use this in addition to "stop, drop, and roll"

# MEASUREMENT



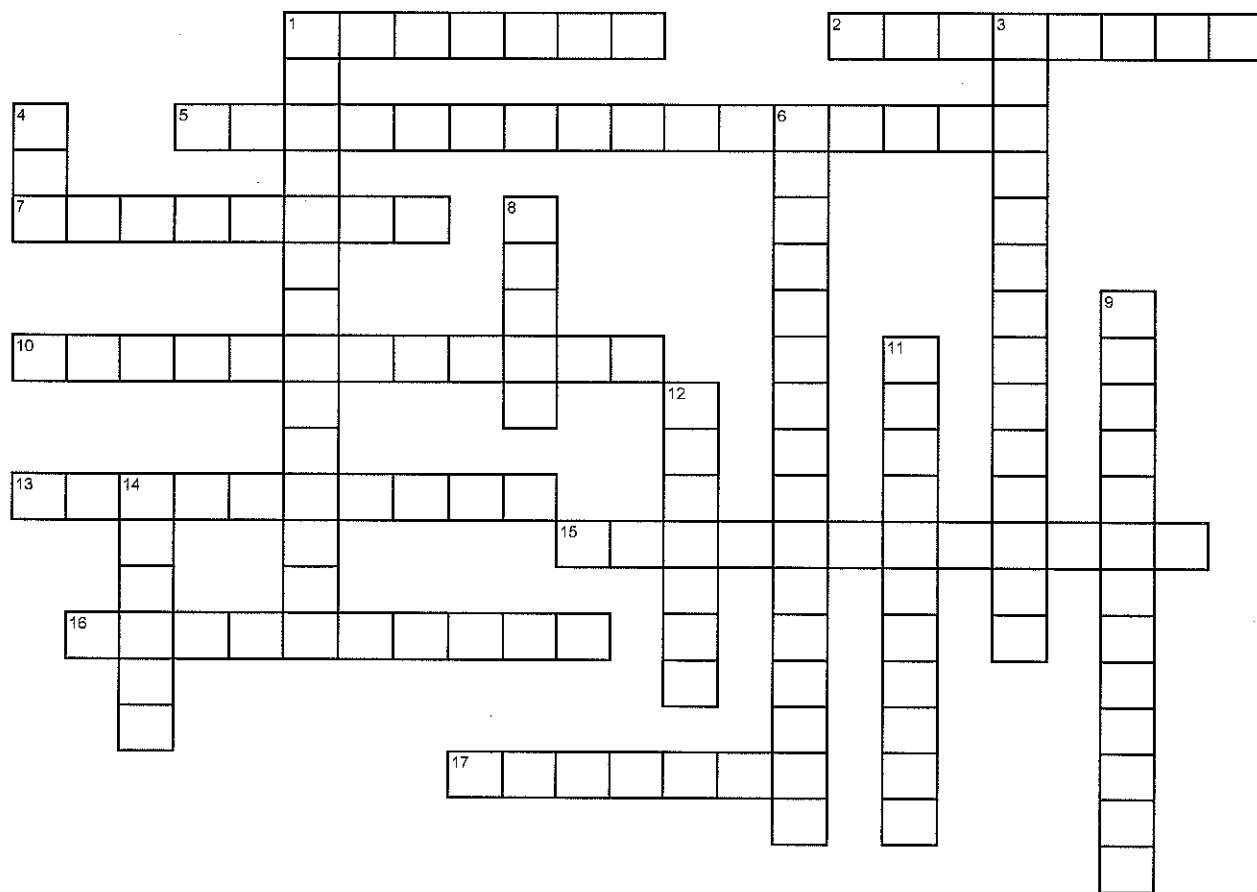
## ACROSS

- 3 A measure of the "repeatability" of a measurement
- 4 The SI unit for mass
- 6 The SI unit for temperature
- 8 Mass per unit volume
- 10 A measure of the "correctness" of a measurement
- 11 The SI unit for time

## DOWN

- 1 A way of expressing very large or very small numbers
- 2 Equivalent to 1000 cubic centimeters
- 5 The SI unit for amount
- 7 The SI unit for length
- 9 A visual display of data

# MATTER



## ACROSS

- 1 A mixture that displays the Tyndall effect
- 2 Two or more elements bonded together
- 5 The ability to combine with or change into another substance
- 7 A homogenous mixture composed of a solvent and a solute
- 10 A method of separating a mixture by boiling and condensing
- 13 A method of separating insoluble substances from a mixture
- 15 Type of mixture in which individual substances remain distinct
- 16 A heterogeneous mixture in which the particles settle out
- 17 A substance that cannot be broken down further by chemical or physical means

## DOWN

- 1 A process that causes a substance to change identity
- 3 A process that alters a substance, but retains it's identity
- 4 State of matter with no definite shape or volume
- 6 A characteristic that can be observed without altering the identity
- 8 State of matter with definite shape and volume
- 9 Matter with a uniform and unchanging composition
- 11 Type of mixture with a constant composition throughout
- 12 Two or more substances that can be separated by physical means
- 14 State of matter with a definite volume, but no definite shape

## DEVELOPMENT OF THE ATOMIC MODEL

S C H R O E D I N G E R E Q M  
M I A A Z S E F Q X U I X V C  
X P P N O S M O H T N D T E K  
L V Z V Z K O K H S R J Q E V  
X E I B X L C E T L Q N C L R  
E M L K M G R E B N E S I E H  
L U K T C F I O F V S P J D O  
L N Z C O N T B E K A D H N B  
Y D P R N T U C G U D I E E K  
Q X D C U A S N L P P D G M H  
A N A K I L L I M M Q H Y D K  
U C L D L W J P R R V W J C L  
N Z T V W X G T C A K O W B S  
Y Z O E M W W U X Z Q N T H F  
L O N R E M Y I Y G O U Z F V

1. Created Principle that states there is a fundamental limit to how precisely both the position and momentum of a particle can be known simultaneously 1 \_\_\_\_\_
2. Discovered the electron during experiments with cathode ray tubes 2 \_\_\_\_\_
3. His equation represents the electron in terms of a mathematical equation with four important variables that can have only certain values 3 \_\_\_\_\_
4. Discovered the nucleus in the famous Gold Foil Experiment 4 \_\_\_\_\_
5. Determined that the energy and frequency of light are proportional 5 \_\_\_\_\_
6. Postulated that electrons travel around the nucleus in fixed orbits 6 \_\_\_\_\_
7. Greek philosopher famous for coining the term "atoms" 7 \_\_\_\_\_
8. Found the charge of a single electron using drops of oil 8 \_\_\_\_\_
9. Arranged the known elements into rows and columns by mass and properties 9 \_\_\_\_\_
10. Found first experimental evidence for the existence of atoms 10 \_\_\_\_\_
11. Popular thinker who advanced the idea of infinitely divisible matter 11 \_\_\_\_\_
12. His exclusion principle demands that electrons in the same orbital have different spins 12 \_\_\_\_\_
13. Physicist who proposed that light is quantized into tiny particles called photons 13 \_\_\_\_\_

## PERIODIC TABLE AND TRENDS

1. An early periodic table developed by \_\_\_\_\_ arranged the elements in order of increasing mass.
2. The number of protons an element contains is identified by the \_\_\_\_\_ found on the periodic table.
3. The sum of the number of \_\_\_\_\_ and protons in an element is called the mass number.
4. Hydrogen-1, hydrogen-2, and hydrogen-3 are all \_\_\_\_\_ of the element hydrogen.
5. The elements in Family 17 of the periodic table are known as the \_\_\_\_\_.
6. The noble gases are in the same \_\_\_\_\_ of the periodic table.
7. The elements lithium, sodium, potassium, rubidium, cesium, and francium are called \_\_\_\_\_.
8. Family 2 of the periodic table is called the \_\_\_\_\_.
9. The rows across the periodic table are called \_\_\_\_\_.
10. Elements in Families 3 through 12 are called \_\_\_\_\_.
11. As you go from left to right in the periodic table, the atomic numbers \_\_\_\_\_, the atomic radius \_\_\_\_\_, electronegativity \_\_\_\_\_, and the ionization energy \_\_\_\_\_.
12. As you go from top to bottom in the periodic table, the atomic numbers \_\_\_\_\_, the atomic radius \_\_\_\_\_, the electronegativity \_\_\_\_\_, and the ionization energy \_\_\_\_\_.

## POLYATOMIC IONS

Assign a charge to each polyatomic ion, and then **match it** with the correct name.

A. OH	1. Sulfate	_____
B. NO <sub>3</sub>	2. Cyanide	_____
C. SO <sub>3</sub>	3. Chlorite	_____
D. MnO <sub>4</sub>	4. Phosphate	_____
E. PO <sub>4</sub>	5. Hydroxide	_____
F. C <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	6. Ammonium	_____
G. ClO <sub>4</sub>	7. Hypochlorite	_____
H. Cr <sub>2</sub> O <sub>7</sub>	8. Permanganate	_____
I. SO <sub>4</sub>	9. Acetate	_____
J. HCO <sub>3</sub>	10. Oxalate	_____
K. CrO <sub>4</sub>	11. Peroxide	_____
L. NH <sub>4</sub>	12. Nitrate	_____
M. CO <sub>3</sub>	13. Sulfite	_____
N. CN	14. Bicarbonate	_____
O. C <sub>2</sub> O <sub>4</sub>	15. Perchlorate	_____
P. ClO <sub>3</sub>	16. Nitrite	_____
Q. ClO	17. Chlorate	_____
R. O <sub>2</sub>	18. Carbonate	_____
S. NO <sub>2</sub>	19. Dichromate	_____
T. HSO <sub>4</sub>	20. Bisulfate	_____
U. ClO <sub>2</sub>	21. Chromate	_____

## DIMENSIONAL ANALYSIS

*Use proper problem solving techniques to answer the questions below. Show your work!*

1. How many centimeters are in 1.50 miles? (*Hint: 1 inch = 2.54 cm*)
2. What is the mass of a 915 kg elephant in micrograms?
3. The speed limit on Highway 75 is 65 miles per hour. What is this in meters per second?
4. A pound of apples is \$0.59, and there are typically 3.5 apples per pound. How much will seven apples cost?

## MEASUREMENT

*Use proper problem solving techniques to answer the questions below. Show your work!*

1. During an experiment to determine the density of ethanol, the value was determined to be 0.805 g/mL. If the actual density of ethanol is 0.789 g/mL, calculate the percent error.
2. An object with a mass of 7.5 grams raises the level of water in a graduated cylinder from 25.1 mL to 30.1 mL. What is the density of the object?
3. Perform the following calculations, reporting the answer with the correct number of significant figures.
  - a)  $4.35\text{cm} \times 3.69\text{cm} \times 2.5\text{cm} =$
  - b)  $3.40\text{mg} + 7.825\text{mg} =$

# ATOMIC STRUCTURE

Complete the table below.

Name	Symbol	Atomic Number	Mass Number	# of Protons	# of Neutrons	# of Electrons
Carbon-14						
	${}_{92}^{238}\text{U}$					
			40	19		
			81		46	
	${}_{26}^{56}\text{Fe}^{2+}$					

## NATURE OF LIGHT

1. List the regions of the electromagnetic spectrum in order from longest to shortest wavelength.
2. What is the frequency of a 1.75m radio wave?
3. How much energy does that radio wave have?
4. A photon of light carries an energy of  $4.79 \times 10^{-19}$  J. What is the wavelength of this light?

## ELECTRONIC STRUCTURE

1. Write the complete electron configurations for:

A. Iron

B. Magnesium

C. Sulfur

D. Barium

2. State whether the above elements are diamagnetic or paramagnetic

A.

B.

C.

D.

3. Draw the lewis structures to represent the following elements:

A. Fluorine

C. Sulfur

B. Xenon

D. Calcium

## NOMENCLATURE

1. Write formulas for the following ionic compounds:

a. iron(II) chloride

b. magnesium hydroxide

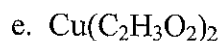
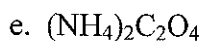
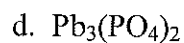
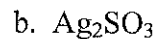
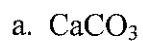
c. copper(I) sulfate

d. aluminum carbonate

e. sodium phosphate

f. tin(IV) nitrite

2. Name the following ionic compounds:



3. Write formulas for the following acids:

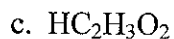
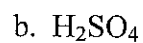
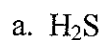
a. hydrobromic acid

b. sulfurous acid

c. perchloric acid

d. carbonic acid

4. Name the following acids:



5. Write formulas for the following covalent compounds:

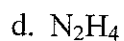
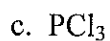
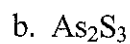
a. dinitrogen pentoxide

b. sulfur hexafluoride

c. carbon tetrahydride

d. tetraphosphorus decoxide

6. Name the following covalent compounds:



7. What are the seven diatomic elements?

# MOLECULAR STRUCTURE

Complete the table below.

Name	Dot Structure	Structural Formula	Shape	Polar or Nonpolar?	Type of IM Force
Carbon dioxide					
Water					
Nitrogen trihydride					
Carbon tetrafluoride					
Chlorine monofluoride					

1. How many sigma bonds do each of the above molecules contain?
2. How many pi bonds do each of the above molecules contain?
3. Draw the structural formula for nitrogen gas, and state how many sigma and pi bonds it has.

## CHEMICAL REACTIONS

*Balance and classify each equation below.*

- 1)  $\text{Al} + \text{N}_2 \rightarrow \text{AlN}$  \_\_\_\_\_
- 2)  $\text{NaCl} + \text{H}_3\text{PO}_4 \rightarrow \text{Na}_3\text{PO}_4 + \text{HCl}$  \_\_\_\_\_
- 3)  $\text{Mg} + \text{H}_3\text{PO}_3 \rightarrow \text{H}_2 + \text{Mg}_3(\text{PO}_3)_2$  \_\_\_\_\_
- 4)  $\text{C}_3\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$  \_\_\_\_\_
- 5)  $\text{BaO} + \text{O}_2 \rightarrow \text{BaO}_2$  \_\_\_\_\_
- 6)  $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{C}_2\text{H}_6\text{O} + \text{CO}_2$  \_\_\_\_\_
- 7)  $\text{Li} + \text{H}_2\text{O} \rightarrow \text{LiOH} + \text{H}_2$  \_\_\_\_\_
- 8)  $\text{TiCl}_4 + \text{H}_2\text{O} \rightarrow \text{TiO}_2 + \text{HCl}$  \_\_\_\_\_

## THE MOLE

1. What is the mass of 0.500 moles of sodium chloride?
2. How many molecules are in 13.0 moles of water?
3. How many moles are in 1.00 gram of silver nitrate?
4. What is the molar mass of silicon dioxide?
5. How many molecules are in 15.0 grams of sodium carbonate?
6. What is the mass in grams of  $4.50 \times 10^{25}$  molecules of calcium sulfate?