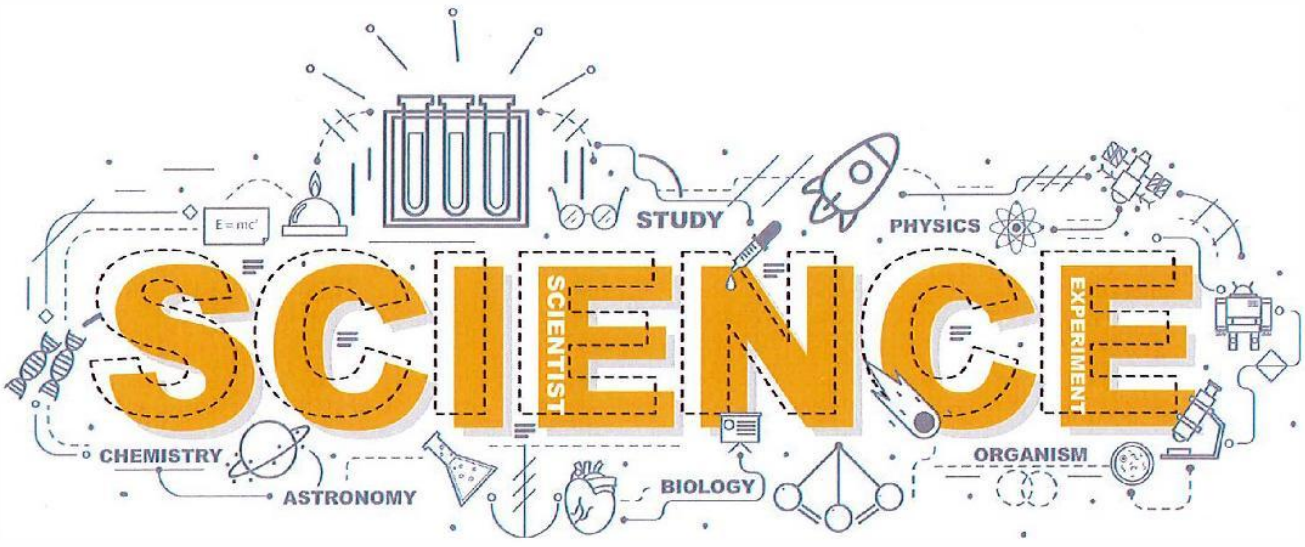



# Summary & Practice Sheets
# Grade 7

## Scientific Explanations
## Motion, Forces, and Newton's Laws
## Foundations of Chemistry
## Understanding the Atom
## The Periodic Table

# The Scientific Method

1. **Make Observations**
(use your senses to gather information)

2. **Ask a Question**

3. **Formulate a Hypothesis**
(explanation that can be tested)

4. **Test a Hypothesis**
(design an experiment, research, or more observations)

5. **Collect Data**

6. **Draw a Conclusion**
(a written summary that states whether the hypothesis is correct or not)

# Measurement and Scientific Tools

Scientists across the world use a measurement system called the International System of Units (SI).

Many different tools can be used to collect both quantitative and qualitative data.

graduated cylinders

scale

ruler

thermometer

microscope

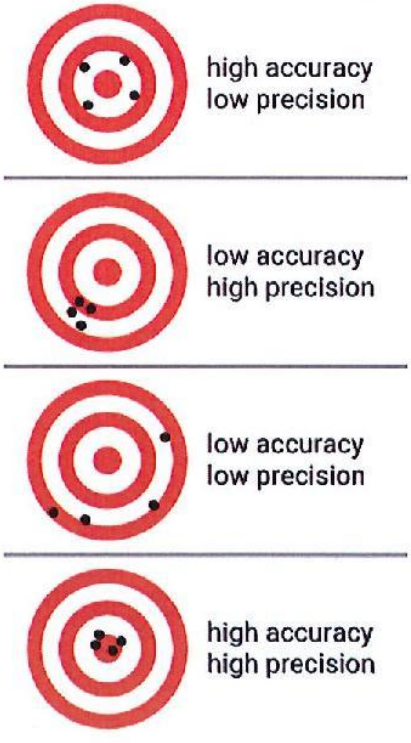
## UNITS:

Length: meter (m)
Mass: kilogram (kg)
Time: second (s)
Temperature: Kelvin (K)

Accuracy is how close a measurement is to the true value.

Precision is the degree to how close measurements are to other measurements taken the same way.

Data should be both accurate and precise!



# MOTION!

An object is in motion when it is changing its position based on a reference point.

### Scalar

physical quantity that has only magnitude

example: length, distance, temperature

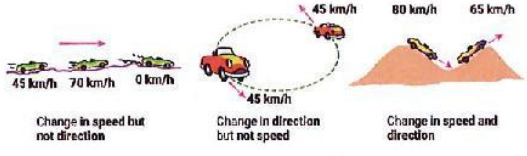
### Vector

physical quantity that has magnitude and direction

example: weight, displacement, force

Speed is how fast an object is traveling.

Velocity is speed in a given direction.



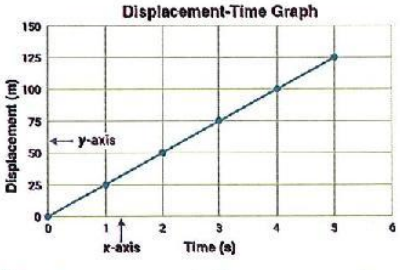

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$s = \frac{d}{t}$$

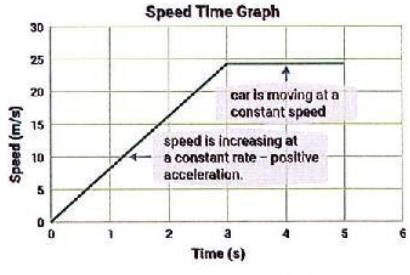
$$\text{acceleration} = \frac{\text{change in velocity}}{\text{change in time}}$$

$$a = \frac{V_f - V_i}{t_f - t_i}$$

## Representing motion using graphs




A displacement-time graph shows the relationship between the displacement traveled by an object and time.




The speed-time graph below shows the relationship between speed and time.

# Forces push or pull

**Contact forces**
forces between objects that are touching


applied force

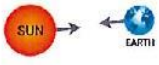

frictional force


tension force

**Non-contact forces**
forces between objects that are touching

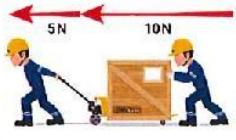

magnetic force


electrical force



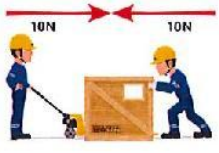
gravitational force

If two forces act on an object in the same direction, the net force is the sum of the two forces.



Net force = 5 N + 10 N = 15 N

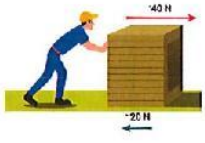
When the net force on an object is 0 N, the forces are called balanced forces.



Net force = 10 N + -10 N = 0 N

If two forces act on an object in opposite directions, the net force is the difference between the two forces.

When the net force on an object is not 0 N, the forces are called unbalanced forces.




Newton's First Law of Motion:
the motion of an object remains constant unless acted on by an outside force.

Newton's Second Law of Motion:
the force experienced by an object is proportional to its mass times the acceleration it experiences. (F = ma)

Newton's Third Law of Motion:
for every action force there is an equal but opposite reaction force

# Revision Sheet

## Chapter 2- Motion, Forces, and Newton's Laws

**Part A- True/False**

*Indicate whether the statement is true or false.*

____ 1. To calculate speed, multiply the distance by the time.

____ 2. The average speed of a moving object is equal to the total distance traveled plus the total amount of time taken to travel it.

____ 3. To calculate average speed, use only the total time and the total distance.

____ 4. To find an object's velocity, you must know the speed and direction of the moving object.

____ 5. Weight is the upward force of Earth's gravity on all objects.

____ 6. There is only one type of force.

____ 7. The metric unit which measures force is the Newton.

____ 8. Net force is one force acting on an object.

**Part B- Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

____ 9. Runners competing in a race speed up and change direction as they run around a track. The runners are _____.

a. increasing electrical energy
b. increasing potential energy
c. accelerating
d. decelerating

____ 10. Newton's third law of motion states that for every action there is an equal and opposite _____.

a. acceleration
b. mass
c. force
d. reaction

11. A change in an object's position is called _____.

a. motion
b. velocity
c. distance
d. acceleration

____ 12. An object at rest tends to stay at rest, and an object in motion tends to stay in motion. Which one of Newton's laws of motion does this statement represent?

a. fourth
b. third
c. second
d. first

____ 13. If you walk 1.5 kilometers in 30 minutes what is your average speed?

a. 10 km/h
b. .75 km/h
c. .05 km/h
d. 1.0 km/h

____ 14. If you know the speed and direction of an object, which could you find?

a. acceleration
b. velocity
c. size
d. apparent motion

____ 15. Any push or pull on an object is called a _____

a. lift
b. force
c. thrust
d. friction

____ 16. As the distance between two objects increases, the gravitational force between the objects_____?

a. increases
b. decreases
c. creates friction
d. stays the same

____ 17. Acceleration is a change in the _____ of an object over time.

a. speed
b. direction
c. motion
d. velocity

____ 18. An airplane travels 290 km between Austin and Dallas in 1 h and 15 min. What is its average speed?

a. 160 km/h
b. 200 km/h
c. 232 km/h
d. 250 km/h

____ 19. When net forces are equal in strength and opposite in direction, they are said to be _____.

a. balanced
b. unbalanced
c. negative
d. opposite

____ 20. Which represents a force pair?

a. A book pushes down on the table, and gravity pulls the book down toward the floor.
b. A boy's foot pushes down on a bicycle pedal, the pedal pushes up on his foot.
c. A golf club hits a golf ball. Gravity pulls the ball back down to Earth.
d. A person's foot pushes on the floor, and the person's weight pushes on the floor.

____ 21. If you take the distance that an object moves and divide it by the time it takes to move the distance, what are you calculating?

a. the object's acceleration
b. the object's speed
c. the object's net force
d. the object's friction

____ 22. In order to accelerate, an object must be acted on by a(n) _____

a. force pair
b. large mass
c. unbalanced force
d. balanced force

____ 23. Which unit measures force?

a. watt
b. kilometer
c. gram
d. Newton

____ 24. When one object exerts a force on another object, the pair of forces that act are called _____ .

a. action-reaction forces
b. balanced-unbalanced forces
c. friction-drag forces
d. positive-negative forces

**Part C- Matching**

*Match each term with its correct description*

a. acceleration
b. distance
c. force
d. friction
e. motion
f. Newton's first law of motion
g. Newton's second law of motion
h. speed
i. velocity

____ 25. A change in the velocity of an object over time.

____ 26. A push or pull exerted by one object on another, possibly causing a change in motion.

____ 27. The length between two places.

28. How fast an object's position changes over time

____ 29. A description of a moving object's speed and direction.

____ 30. A force that opposes the motion of an object in contact with a surface.

____ 31. A change in an object's position compared to fixed objects around it.

____ 32. An object at rest tends to stay at rest, and an object in motion tends to stay in motion.

33. An object's acceleration depends on the object's mass and the amount of net force applied to it.

**Part D- Short Answer**

*Write the correct answer for each of the following questions.*

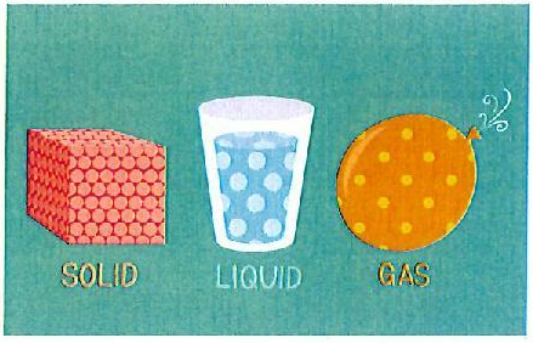
34. Car A traveled 30 miles in one half hour. Car B traveled 15 miles in one quarter of an hour. Which car traveled faster?

35. What is the difference between balanced forces and unbalanced forces?

36. The law of inertia is another name for _____.

# Mass MATTERS!

You have learned matter is anything that takes up space and has a mass.
Matter can be SOLID, LIQUID, or GAS.
Energy does not have mass and is NOT matter.




## Matter

*substances that are always made up of the same thing*

*2 or more pure substances*

- **Pure Substances**
  - **Elements** — *substances made up of 1 type of atom*
  - **Compounds** — *substances made up of 2 or more elements*
- **Mixtures**
  - **Homogeneous** — *evenly mixed*
  - **Heterogeneou** — *NOT evenly mixed*

## Examples

1. **ELEMENTS**
   gold, helium, hydrogen, oxygen
2. **COMPOUNDS**
   water ($H_2O$) , carbon dioxide ($CO_2$)
3. **HOMOGENEOUS**
   salt water, air, lemonade
4. **HETEROGENEOUS**
   salad, sand & water, burger

# Homogeneous vs. Heterogeneous

## Homogeneous

- Two or more substances are equally mixed.
- Not all the substances are seen
- They are also called solutions.
- Solution is made of a solute (sugar) and a solvent(water).
- Examples: tea, salt water, orange juice.

VS

**substances physically mix**

## Heterogeneous

- Two or more substances are not equally mixed.
- All the substances are seen.
- They can be in solids, liquids, gases. Or two or more different states together.
- Examples: Nuts, salad, air, sparkling water.

## Parts of a Solution (Homogeneous)

Water
250 mL

+

Lemon Juice
45 mL

+

Sugar
52 mL

=

Lemonade

**Which ingredient is the most in the lemonade?** WATER

**Water is the** SOLVENT.

**Lemon juice and sugar are the** SOLUTES.

**SOLVENT + SOLUTE = SOLUTION**

# PRACTICE-MATTER

Classify the following pictures as a pure substance, homogeneous mixture or heterogeneous mixture.

_____

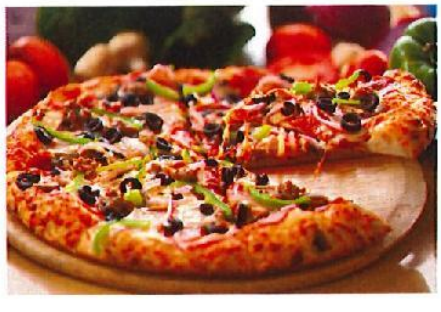
_____

_____

_____


_____

_____



_____

_____

# Separating MIXTURES!

You can use different ways to separate mixtures

## Magnetism

Separate metals from non-metals using a magnet.
example: paper clips and rubber bands

## Picking Apart

Big substances can be picked by hand.
example: crayons and pens

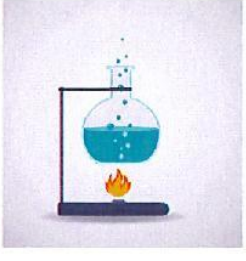
## Filtration

Separate particles that don't dissolve in liquids.

examples:
rocks and water
coffee and water

## Evaporation

Separate solids that dissolve in a liquid.
example: water and sugar



## Distillation

Separate solvent from a solution by heating and then cooling.
example: water from another liquid

# Physical vs Chemical

## PHYSICAL PROPERTIES

Matter you can see without changing the identity of the substances that make it up.

- Changes shape
- Silver in color
- Density: 7.87
- Boiling point: 3,000• C
- Melting point: 1,536• C

## CHEMICAL PROPERTIES

A substance can or cannot combine with or change into one or more new substances.

- Iron can rust
- Reacts with acid

## PHYSICAL CHANGE

A change in the size, shape, form or matter that does not change the matters identity.

CAN reverse!

### EXAMPLES

melting
boiling
mixing
dissolving

changing shape
changing state

## CHEMICAL CHANGE

A change in which something new is made with different properties.

CANNOT reverse!

### EXAMPLES

burning
rusting
rotten food
digestion

### SIGNS

release a gas
color change
solid forms
heat is released

# PRACTICE-MATTER

1. Aisha left her bicycle in the garden for a few weeks. The bicycles' color changed to an orange color. What is the type of change that happened? How did you know?

_____

_____

2. Determine whether each picture is a physical or chemical change.

_____ _____

_____ _____

_____ _____

# Revision Sheets

## Chapter 3 – Foundations of Chemistry

**Part A- Modified True/False**

*Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.*

____ 1. A fruit salad is a homogeneous mixture. _____

____ 2. Matter is anything that has mass and takes up space. _____

____ 3. Matter that can vary in composition is a substance. _____

____ 4. A(n) element is two or more atoms that are held together by chemical bonds and act as a unit.
_____

____ 5. The properties of a compound are usually the same as the properties of the elements from which it is made.
_____

____ 6. A homogeneous mixture is a mixture in which the substances are not evenly mixed. _____

____ 7. Table salt is a compound of sodium and chlorine.

8. Density is an example of a size-dependent property. _____

____ 9. Volume is an example of a size-dependent property. _____

____ 10. The ability of a match to burn is an example of a chemical change. _____

____ 11. A physical property is a characteristic of something that allows it to change to something new.
_____

____ 12. Matter is made up of motionless particles. _____

____ 13. The ability to react with oxygen is a physical property. _____

____ 14. In a physical change, the substance does not change its identity. _____

**Part B-Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

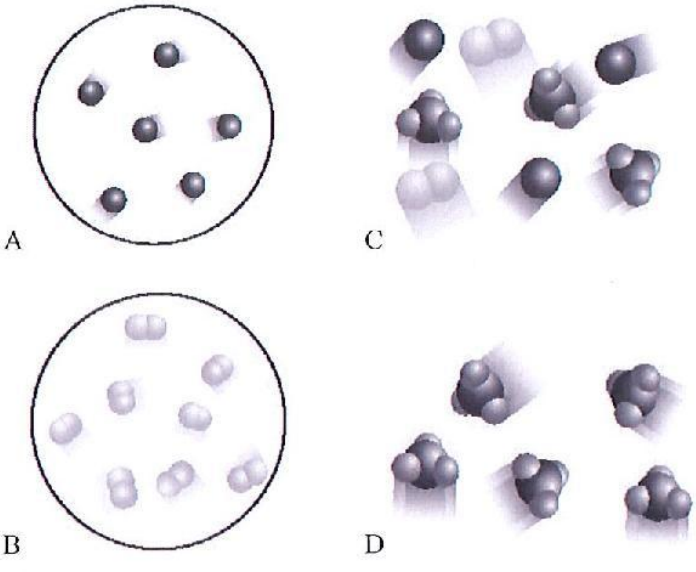
____ 15. ____ is another name for a homogeneous mixture.
a. Liquid
b. Solution
c. Substance
d. Suspension

____ 16. When two or more substances are combined so each substance can be separated by physical means, the result is a(n) .
a. chemical change
b. compound
c. element
d. mixture

____ 17. Which of the following is a pure substance?

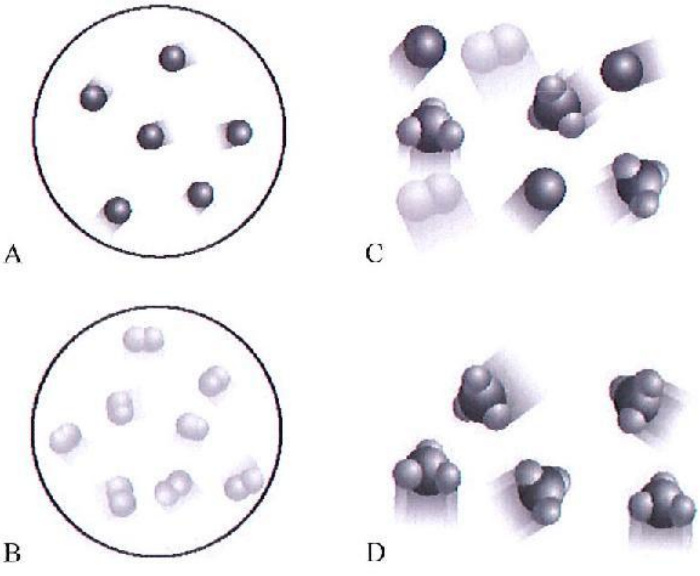
a. soda
b. trail mix
c. granite
d. gold

____ 18. *Which diagram shows a compound?*




a. A
b. B
c. C
d. D

____ 19. *Which diagram shows individual atoms?*




a. A
b. B
c. C
d. D

____ 20. The following are examples of physical properties EXCEPT ____.
a. density
b. shape
c. color
d. ability to react with oxygen

____ 21. A characteristic of matter that allows it to change to something new is a ____.
a. physical property
b. physical change
c. chemical property
d. chemical change

____ 22. The following are examples of chemical properties EXCEPT ____.
a. the ability to burn
b. the ability to be crushed
c. the ability to react with oxygen
d. toxicity

____ 23. All of the following are examples of physical changes EXCEPT ____.
a. melting
b. evaporating
c. burning
d. solidifying

____ 24. Which of the following is an example of a chemical change?
a. painting a house
b. freezing water
c. bending steel
d. baking soda in water

____ 25. Density depends on ____.
a. weight
b. mass
c. mass and volume
d. volume

____ 26. Titanium reacts less with oxygen than most metals do. This is a ____.
a. chemical property
b. physical change
c. chemical change
d. physical property

____ 27. The mass of the products of a chemical reaction ____ the mass of the reactants.
a. is greater than
b. is less than
c. is the same as
d. may be more or less than

____ 28. Which formula listed below correctly finds density?
a. $D = m/V$
b. $D = V/m$
c. $D = g/V^3$
d. $D = g^3/V$

____ 29. The rusting of iron is not a physical property because _____.
a. it cannot be observed
b. the identity of iron remains unchanged
c. a new substance with new properties formed
d. iron is magnetic

____ 30. Which explains the law of conservation of mass?
a. Mass cannot be created or destroyed in a reaction.
b. The total mass before a chemical reaction is the same as the total mass after the reaction.
c. Every reaction creates an equal amount of mass related to the amount of energy required for the reaction.
d. The total amount of mass is equal to the volume of both chemicals in the reaction.

____ 31. Photosynthesis is a chemical reaction which uses _____ as a form of energy.
a. heat
b. light
c. iron
d. gravity

**Part C- Matching**
*Match each term with its correct description*

a. element
b. mixture
c. substance
d. compound
e. matter

____ 32. matter that can vary in composition

33. anything that has mass and takes up space

____ 34. two or more elements chemically combined

____ 35. consists of just one type of matter

____ 36. it has a definite composition

**Part D- Short Answer**
*Write the correct answer for each of the following questions.*

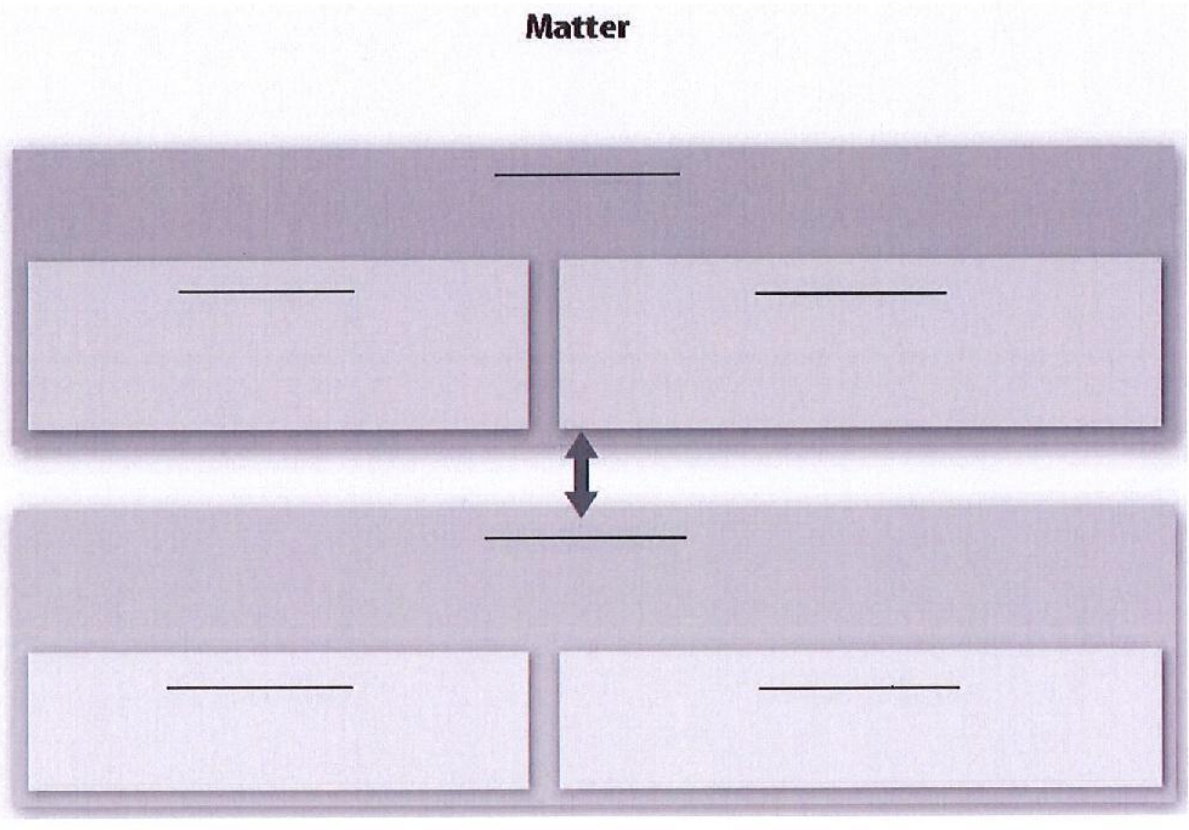
37. Give three examples of mixtures.

38. What are three physical properties of a banana?

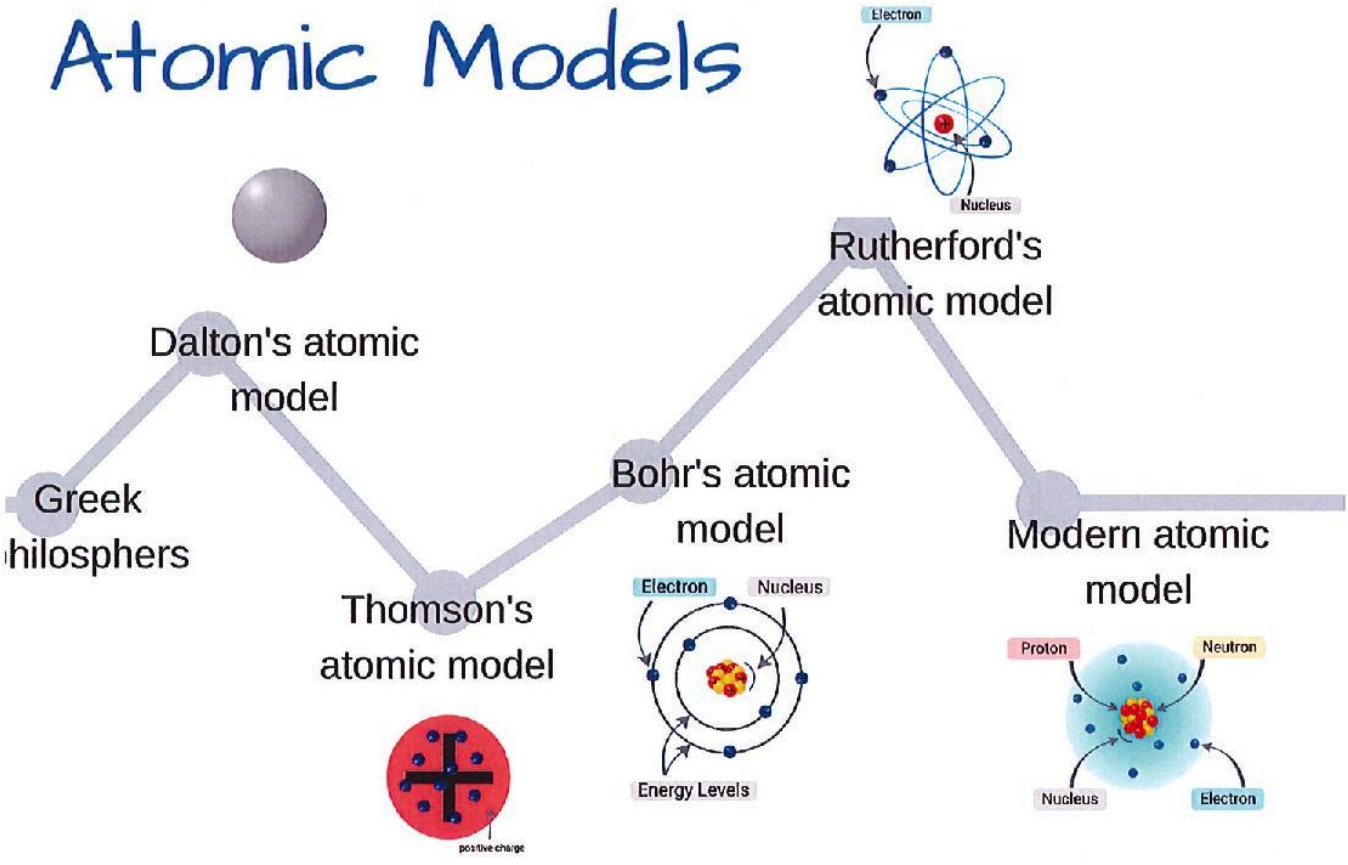
39. What is a chemical property of a banana?

**Part E- Essay**
*Answer the following questions*

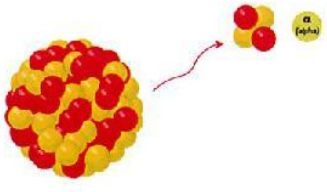
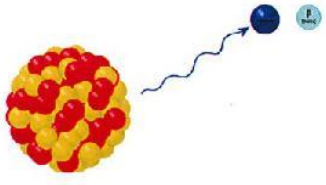
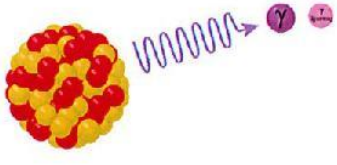
40. Fill in the chart to show the classification of matter. Describe how matter is classified.



# Atomic Models




## Types of Decay

| Alpha Decay | Beta Decay | Gamma Decay |
|---|---|---|
|  |  |  |
| the nucleus loses 2 protons and 2 neutrons, so the atom becomes a new element | the nucleus gains a proton, so the atom becomes a new element | no change in proton number occurs, so the atom does not become a new element |

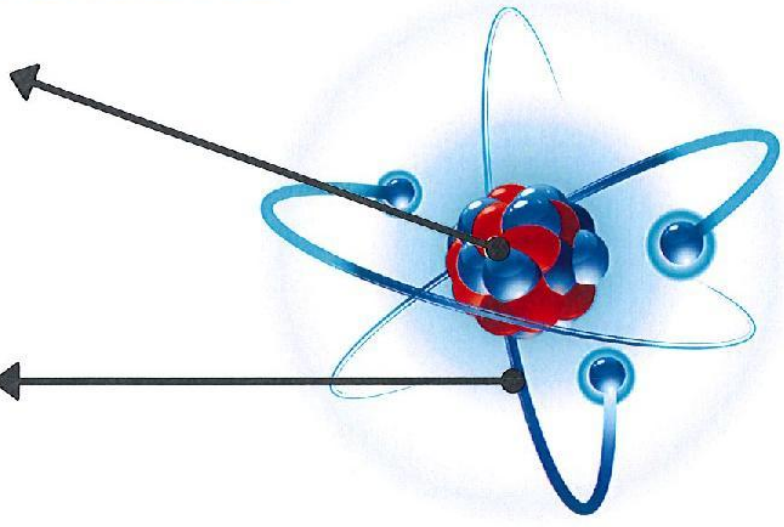
# ALL about ATOMS!

## NUCLEUS

- the center of every atom
- has protons (+ charge)
- has neutrons (no charge)

## ELECTRON CLOUD

- around the nucleus
- has electrons (- charge)
- mostly empty space



## ELEMENTS


ELEMENT NAME

ATOMIC NUMBER
*(number of protons)*

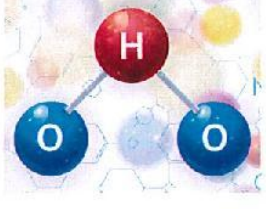
SYMBOL

ATOMIC MASS

## COMPOUNDS

When 2 or more elements CHEMICALLY BOND together.

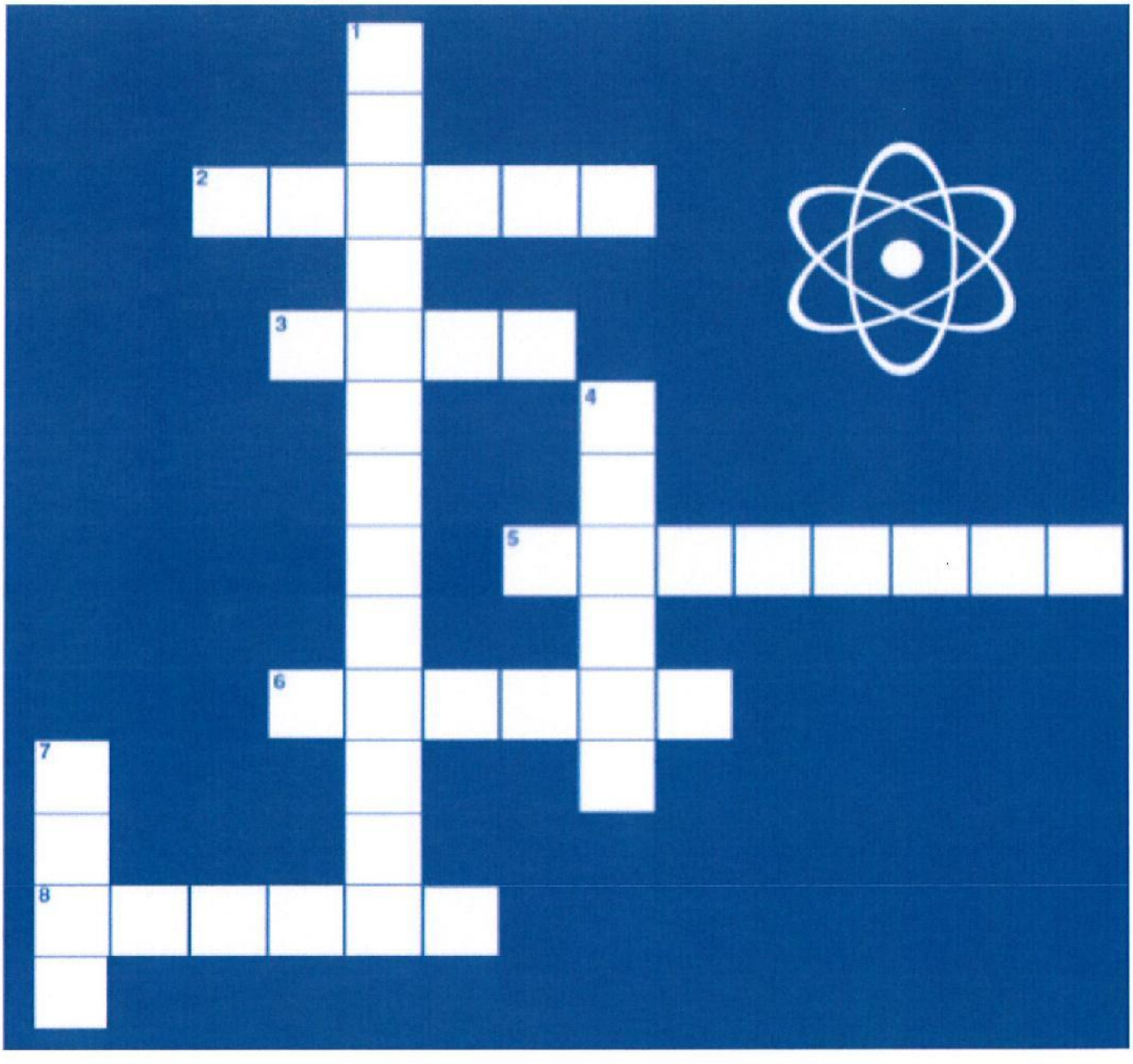
| Name | Chemical Formula | Molecular Structure |
|---|---|---|
| Water | $H_2O$ | |




Water contains
1 hydrogen and 2 oxygens.

How many carbon atoms are in one molecule of $C_6H_{12}O_6$?

# PRACTICE-ATOMS



**Across** →

2. Has a chemical symbol (C) and an atomic number = 6.

3. A shiny metal used for jewellery.

5. There are 115 of them arranged in a chart.

6. has mass and takes up space.

8. A gas in the air

**Down** ↓

1. A chart where all elements are arranged.

2. The second place medals are made of this shiny metal.

7. Tiny particles that make up all elements.

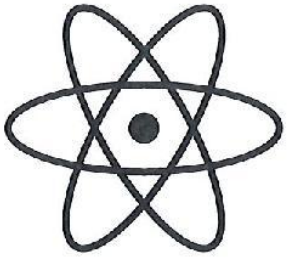
# PRACTICE-ATOMS

## True or False?

1. Scientists can see atoms with microscopes. _____
2. Neutrons are positively (+) charged. _____
3. The center of the atom is called the brain. _____
4. Protons are found in the electron cloud. _____

## Fill in the Blanks!

This is a picture of an _____. The center is called the _____ and the outside is called the _____ .



## Lets Match!

- Name
- Symbol
- Atomic Number
- Atomic Mass


## Pick the correct answer.

**1. Oxygen has an atomic number of 6. How many protons does oxygen have?**

A. 4

B. 8

C. 16

**2. What are atoms are made up of?**

A. electrons

B. protons

C. neutrons

D. all of the above

# Revision Sheets

## Chapter 4 – Discovering Parts of an Atom

**Part A- True/False**
*Indicate whether the statement is true or false.*

____ 1. The mass of an electron is about equal to the mass of a proton.

____ 2. For an atom to be neutral, the number of protons must equal the number of neutrons.

____ 3. The neutrons make up most of the volume of an atom.

____ 4. Dividing an element into smaller pieces results in a molecule.

____ 5. Two isotopes of the same element contain different numbers of protons.

____ 6. Nuclear decay occurs when an unstable atomic nucleus changes into another more stable nucleus by emitting radiation.

**Part B- Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

____ 7. The atomic number of calcium is 20. What can you tell about an atom of this element?

a. the sum of its protons and neutrons is 20
b. it has 20 protons
c. it has 40 protons
d. it has 20 neutrons

____ 8. Where is the densest part of an atom?

a. electron cloud
b. space around the nucleus
c. nucleus
d. All parts of the atom are equally dense.

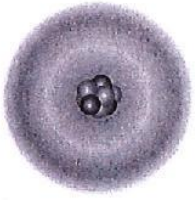
____ 9. How small are atoms?

a. about the size of dust specks
b. about the size of pin holes
c. about the size of grains of salt or sand
d. too small to be seen by the unaided eye

____ 10. The sum of an atom's protons and neutrons is its ____.

a. atomic mass
b. periodic number
c. atomic number
d. atomic weight

____ 11. What are the smallest particles of an element that have the same chemical properties as the element?



a. atoms
b. molecules
c. protons
d. electrons

____ 12. What did Democritus believe an atom was?

a. a solid, indivisible object
b. a tiny particle with a nucleus
c. a nucleus surrounded by an electron cloud
d. a tiny nucleus with electrons surrounding it

____ 13. What determines the identity of elements?

a. its mass number
b. the charge of the atom
c. the number of its neutrons
d. the number of its protons

____ 14. If an ion contains 10 electrons, 12 protons, and 13 neutrons, what is the ion's charge?

a. 2-
b. 1-
c. 2+
d. 3+

**Part C- Matching**

*Match each term with its correct description*

a. atom
b. electron
c. neutron
d. isotope
e mass number
f. average atomic mass
g. nucleus
h. proton
i. nuclear decay
j. ion

____ 15. The smallest particle of an element that still has the same chemical properties of that element.

____ 16. A positively charged particle inside an atom's nucleus.

____ 17. A particle with a negative electric charge.

____ 18. The center of the atom which contains most of the atom's mass.

____ 19. A particle that is found in the nucleus of an atom and has no electrical charge.

____ 20. The average mass of the element's isotopes.

____ 21. Atoms of the same element that have different numbers of neutrons.

___ 22. An atom that is no longer neutral because it has gained or lost electrons.

____ 23. A process that occurs when an unstable atomic nucleus changes into another more stable nucleus by emitting radiation.

**Part D- Short Answer**

*Write the correct answer for each of the following questions.*

24. When the same element has different atomic masses, it is called a(n) .

25. Electrons in an atom move throughout the _____ surrounding the nucleus.

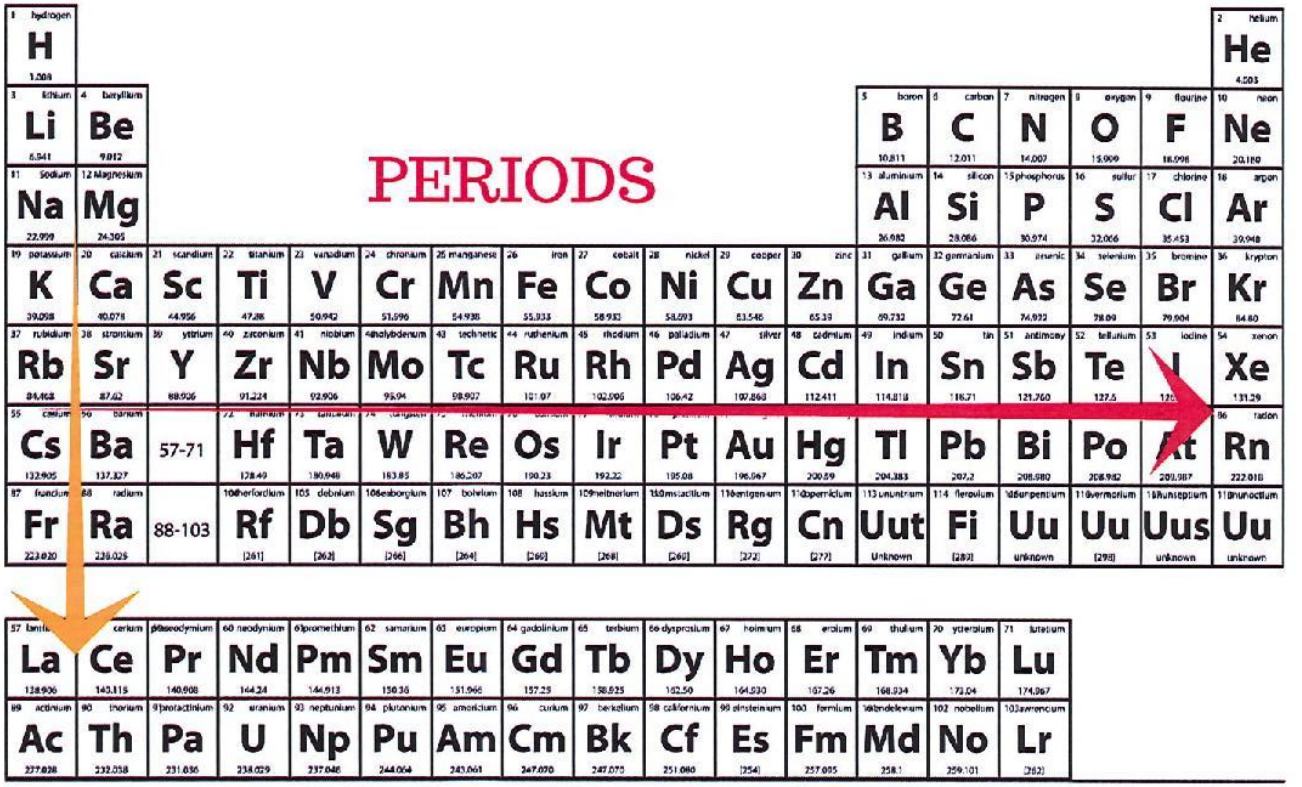
26. How can radioactive decay produce new elements?

27. How can radioactive decay produce new elements?

# The Periodic Table of ELEMENTS

GROUPS

PERIODS




ACTIVITY

1. **Let's number the periods and groups of the periodic table!**

2. **Circle the examples in the periodic table by predicting the symbol.**

*Gold: used in jewelry*

*Iron: found in blood*

*Calcium: found in bones*

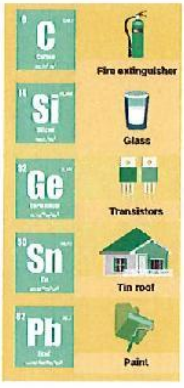
*Oxygen: in the air we breath*

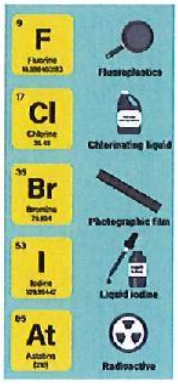
*Aluminum: used for spoons, cans ...*

# Metals, Nonmetals & Metalloids

## Metalloids

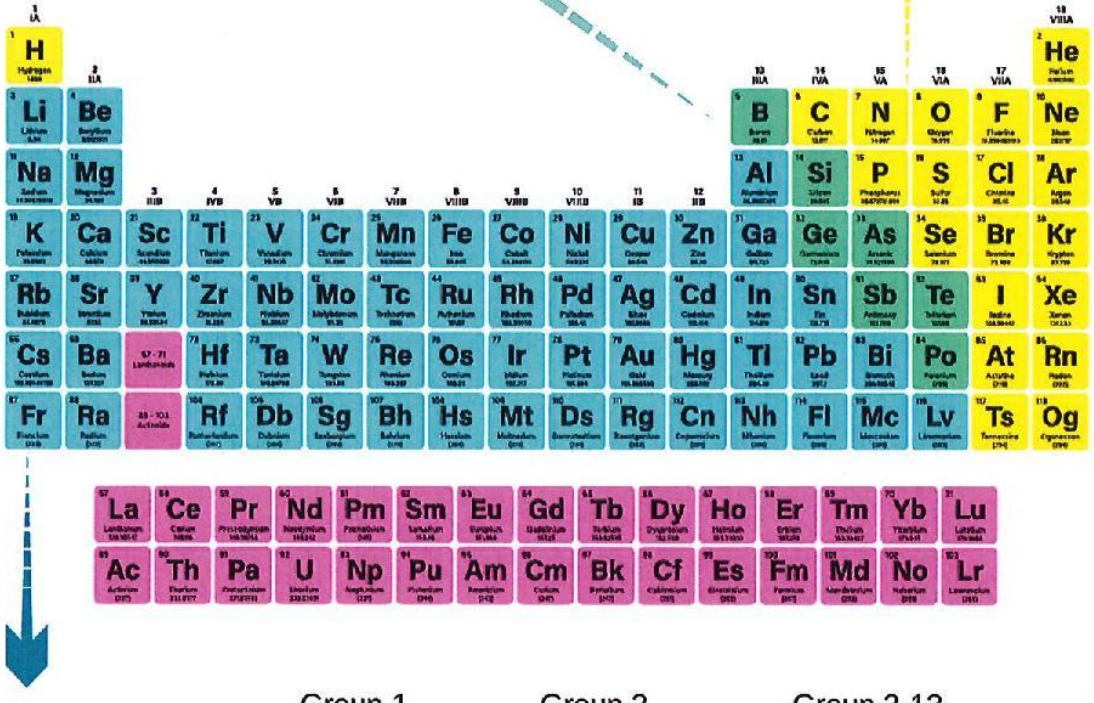
- have metallic and nonmetallic properties




## Nonmetals

- poor conductors of heat and electricity
- brittle
- non-ductile



## Metals

- good conductors of heat and electricity
- malleable
- ductile

### Group 1
Alkali metals


### Group 2
Alkaline metals


### Group 3-13
Transition metals

# Revision Sheets

## Chapter 5 – The Periodic Table

**Part A- True/False**
*Indicate whether the statement is true or false.*

1. A metalloid is an element with all of the same properties as metals.

____ 2. Elements were arranged in order of increasing atomic mass on Mendeleev's first periodic table.

____ 3. Elements on the far right of the periodic table are classified as nonmetals.

____ 4. Copper is a metal and is a conductor of electricity.

____ 5. Ductility is not a property of metals

____ 6. Most metals are on the right side of the periodic table.

**Part B- Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

____ 7. The atomic number of calcium is 20. What can you tell about an atom of this element?

a. the sum of its protons and neutrons is 20
b. it has 20 protons
c. it has 40 protons
d. it has 20 neutrons

____ 8. The scientist best known for contributions to the development of the periodic table is _____.

a. Dmitri Mendeleev
b. Democritus
c. John Dalton
d. Albert Einstein

____ 9. A solid solution, such as sterling silver, is a(n) _____.

a. alloy
b. metalloid
c. colloid
d. emulsion

____ 10. Moving from left to right across the periodic table, how do the elements change?

a. They change from nonmetals to metalloids to metals.
b. They change from metals to metalloids to nonmetals.
c. They decrease in atomic number.
d. They are in alphabetic order.

____ 11. The sum of an atom's protons and neutrons is its _____.

a. atomic mass
b. periodic number
c. atomic number
d. atomic weight

12. When Mendeleev published his periodic table, there were some spaces for undiscovered elements. The image below is a section of a similar table. A reasonable value for the atomic mass of the missing element is ____.

| | | |
|---|---|---|
| **Al** 27.0 | **Si** 28.1 | **P** 31.0 |
| **Ga** 69.7 | **?** | **As** 74.9 |
| **In** 115 | **Sn** 119 | **Sb** 122 |

a. 101
b. 72.3
c. 68.2
d. 34.8

13. Iodine is a solid nonmetal. What is one property of iodine?

a. conductivity
b. dull appearance
c. malleability
d. ductility

____ 14. The elements F, Cl, Br, I and At all appear in the same column of the periodic table and share many _____.

a. atomic numbers
b. chemical formulas
c. physical properties
d. chemical properties

**Part C- Matching**
*Match each tern with its correct description.*

a. atomic number
b. nonmetals
c. alkaline earth metals
d. group
e. periodic table
f. alkali metals
g. metal
h. period

____ 15. The number of protons in an atom of an element.

____ 16. A chart that shows the elements in order of increasing atomic number.

____ 17. Elements that have no metallic properties.

____ 18. The elements that are in group I on the periodic table.

____ 19. An element that is generally shiny and hard.

____ 20. The rows on the periodic table.

____ 21. The columns on the periodic table.

____ 22. The elements that are in group 2 on the periodic table.

**Part D- Short Answer**
*Write the correct answer for each of the following questions.*

23. Describe five physical properties that can help to identify copper.

24. The _____ increases by one for each element as you move left to right across a period.

25. Classify each of the following elements as a metal, nonmetal, or a metalloid:
boron _____
carbon _____
aluminum _____
silicon _____

26. An element that is sometimes a good conductor of electricity and sometimes a good insulator is a(n) _____.

27. An element that is a poor conductor of heat and electricity, but is a good insulator is a(n) _____.

28. What are two properties that make a metal a good choice for use as wires in electronics?

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