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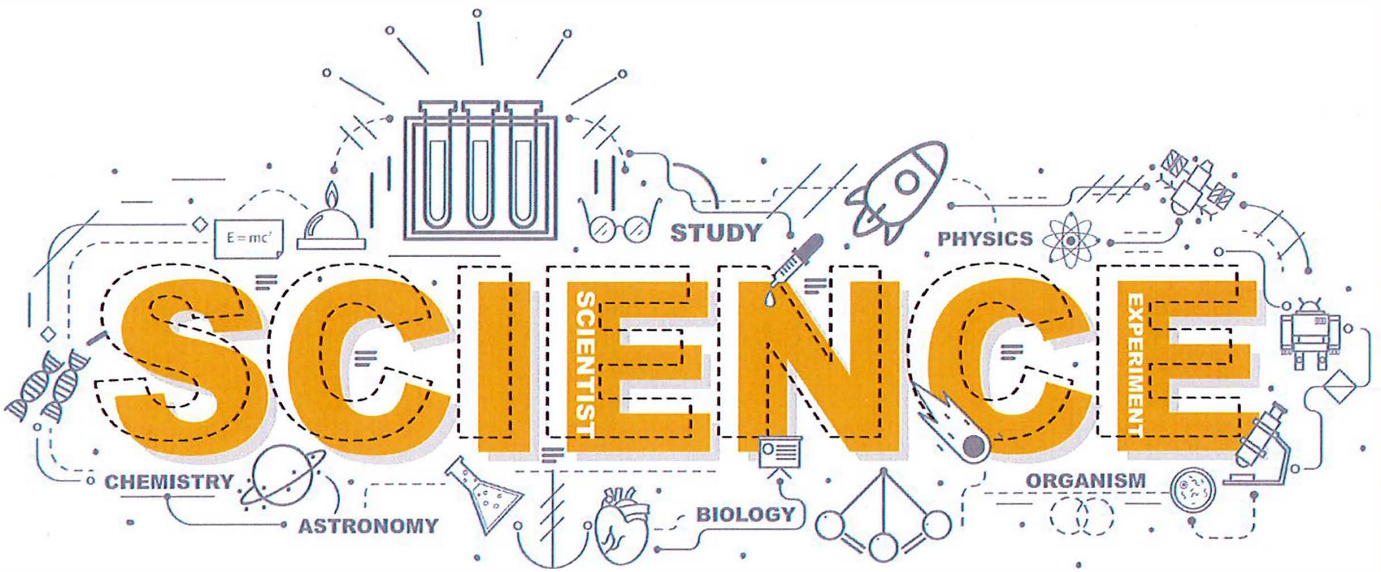
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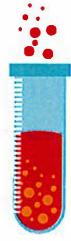
Summary & Practice Sheets

Grade 7



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

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

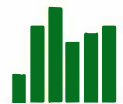
Test a Hypothesis

(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!



high accuracy
low precision



low accuracy
high precision



low accuracy
low precision



high accuracy
high precision

Mass MATTERS!

You have learned matter is anything that takes up space and has a mass.

Matter can be SOLID, LIQUID, or GAS.

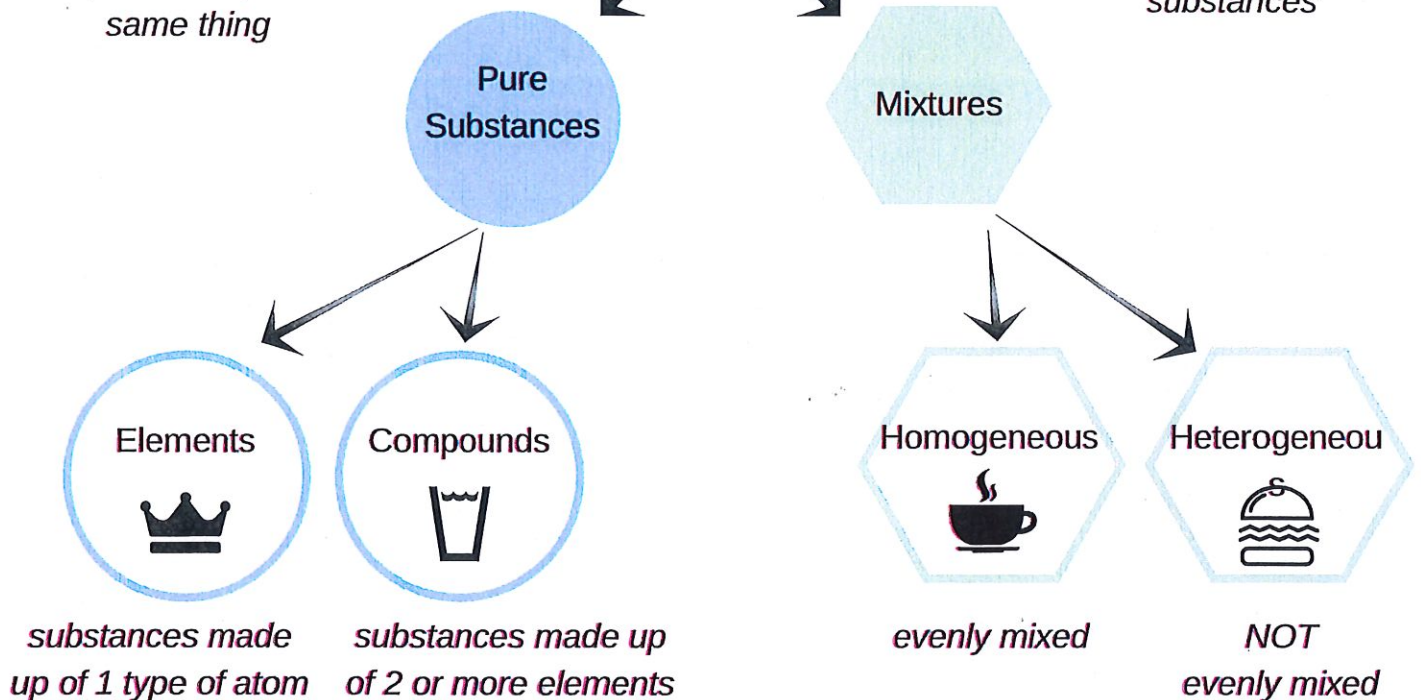
Energy does not have mass and is NOT matter.



Matter

substances that are always made up of the same thing

2 or more pure substances



Examples

1 ELEMENTS

gold, helium, hydrogen, oxygen

3 HOMOGENEOUS

salt water, air, lemonade

2 COMPOUNDS

water (H₂O), carbon dioxide (CO₂)

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

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.

substances
physically mix

Parts of a Solution (Homogeneous)



+



+

Sugar
52 mL

=



Water
250 mL

Lemon Juice
45 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.



Pure



Heterogeneous



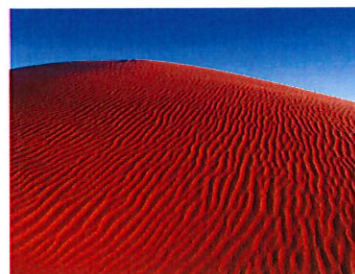
Homogeneous



Heterogeneous



Pure



Homogeneous



Heterogeneous



Pure

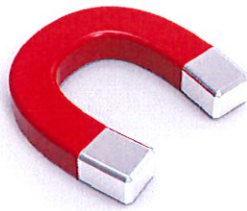
Separating MIXTURES!



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

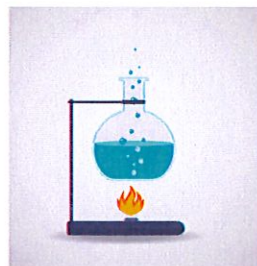
Separate particles that don't dissolve in liquids.



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.

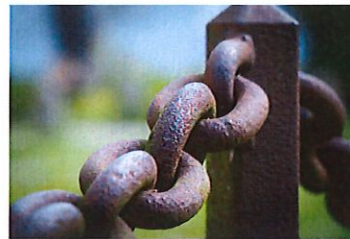


- Changes shape
- Silver in color
- Density: 7.87

- 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 matter's 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

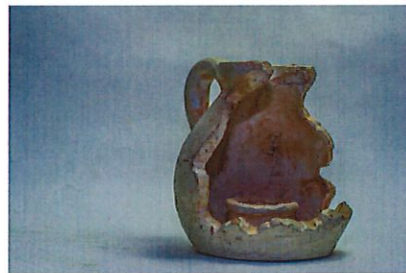
PRACTICE - MATTER

- 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.



Physical



Physical



Physical



Physical



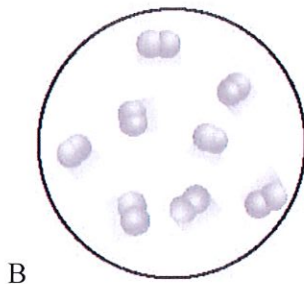
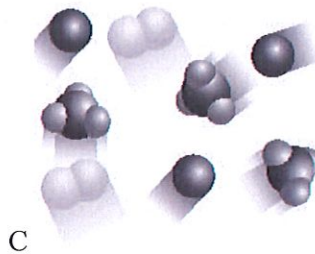
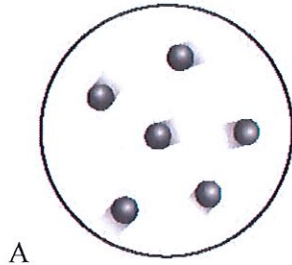
Chemical



Chemical

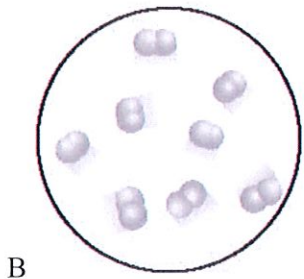
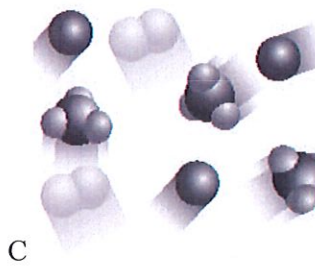
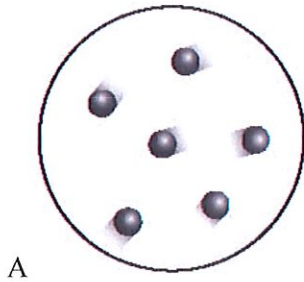
- ___ 17. Which of the following is a pure substance?
 a. soda
 b. trail mix
 c. granite
 d. gold

- ___ 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

- b 32. matter that can vary in composition
- e 33. anything that has mass and takes up space
- d 34. two or more elements chemically combined
- a 35. consists of just one type of matter
- c 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.

Salad
Soda
Air

38. What are three physical properties of a banana?

Yellow color
Soft
curved shape

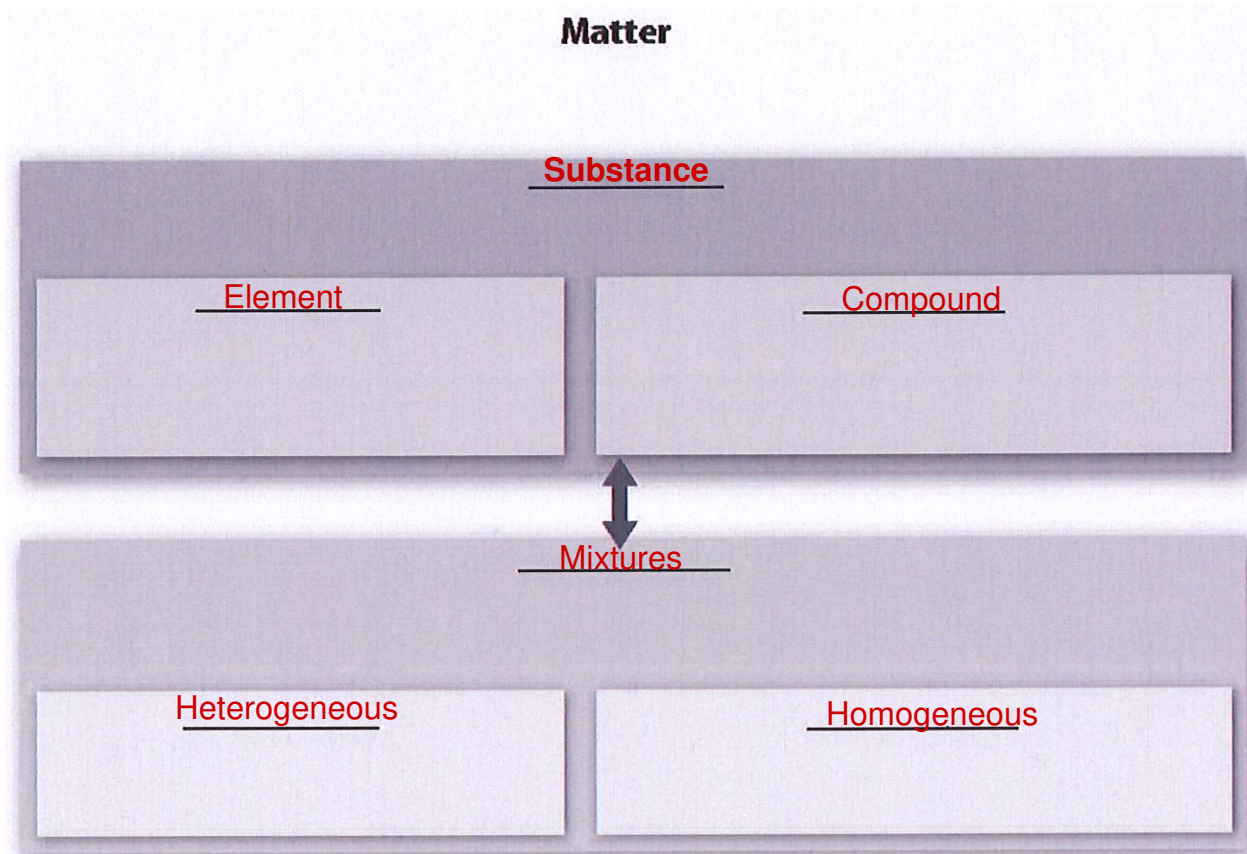
39. What is a chemical property of a banana?

It reacts with the Oxygen when exposed to air and turns to brown

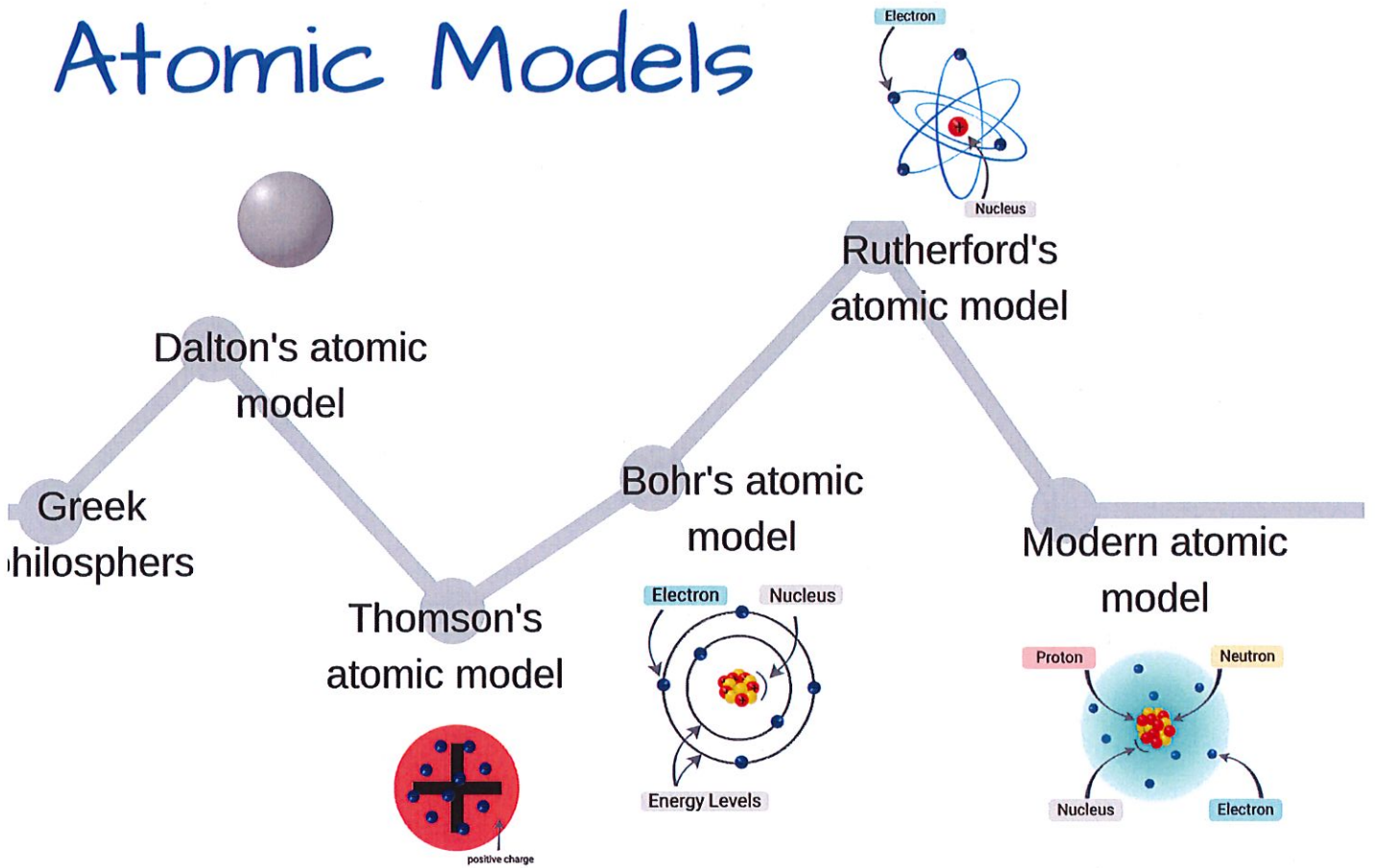
Part E- Essay

Answer the following questions

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

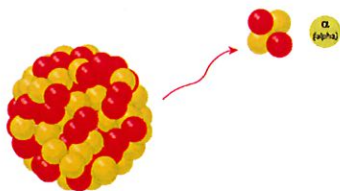


Atomic Models



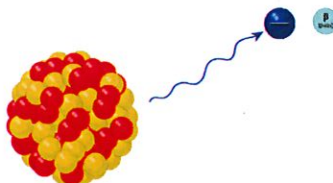
Types of Decay

Alpha Decay



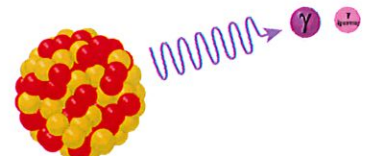
the nucleus loses 2 protons and 2 neutrons, so the atom becomes a new element

Beta Decay



the nucleus gains a proton, so the atom becomes a new element

Gamma Decay



no change in proton number occurs, so the atom does not become a new element

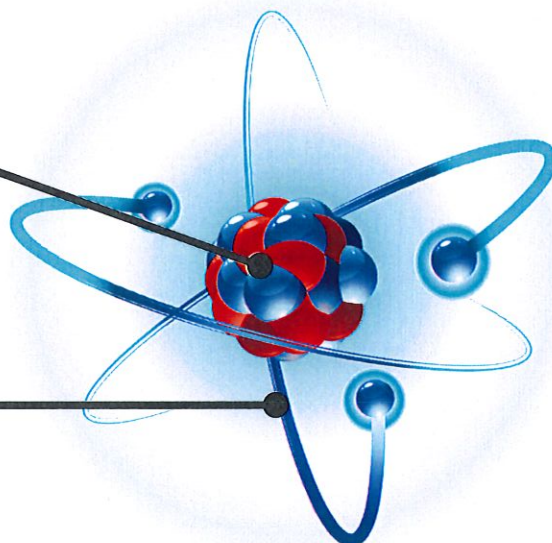
ALL about **ATOMS!**

NUCLEUS

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

ELECTRON CLOUD

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



silver

47

Ag

107.87

ELEMENT NAME

ATOMIC NUMBER
(number of protons)

SYMBOL

ATOMIC MASS

ELEMENTS

When 2 or more elements **CHEMICALLY BOND** together.

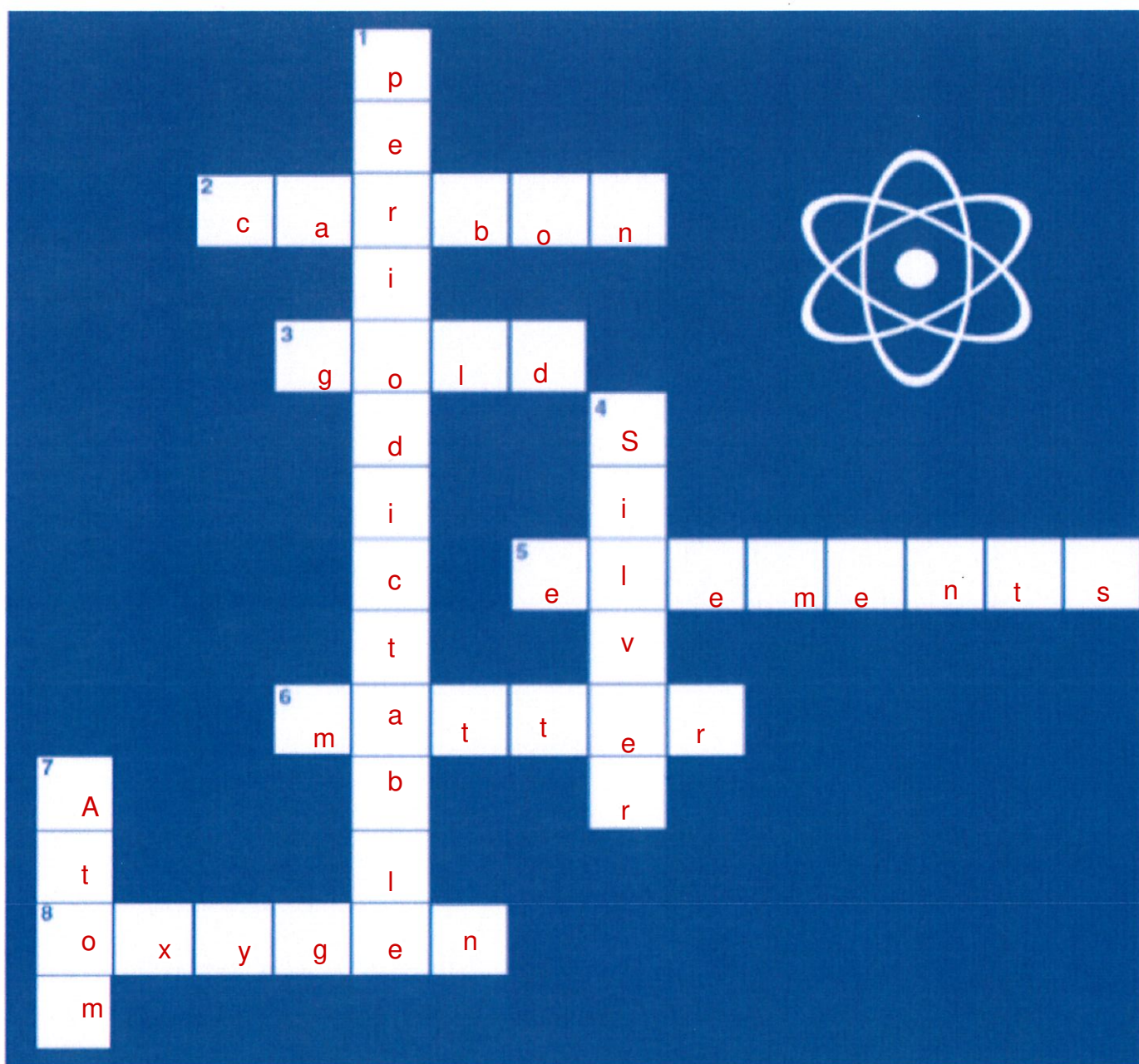
COMPOUNDS

Name	Chemical Formula	Molecular Structure
Water	H ₂ O	

Water contains
1 hydrogen and 2 oxygens.

How many carbon atoms are in one molecule of
C₆H₁₂O₆?

PRACTICE-ATOMS



Across →

Down ↓

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

1. A chart where all elements are arranged.

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

7. Tiny particles that make up all elements.

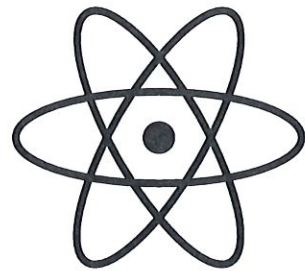
PRACTICE-ATOMS

True or False?

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

Fill in the Blanks!

This is a picture of an Atom. The center is called the Nucleus and the outside is called the Electron cloud.



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 3 - Discovering Parts of an Atom

Part A- True/False

Indicate whether the statement is true or false.

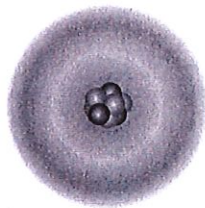
- False 1. The mass of an electron is about equal to the mass of a proton.
- False 2. For an atom to be neutral, the number of protons must equal the number of neutrons.
- False 3. The neutrons make up most of the volume of an atom.
- False 4. Dividing an element into smaller pieces results in a molecule.
- False 5. Two isotopes of the same element contain different numbers of protons.
- True 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

- a 15. The smallest particle of an element that still has the same chemical properties of that element.
- h 16. A positively charged particle inside an atom's nucleus.
- b 17. A particle with a negative electric charge.
- g 18. The center of the atom which contains most of the atom's mass.
- c 19. A particle that is found in the nucleus of an atom and has no electrical charge.
- f 20. The average mass of the element's isotopes.
- d 21. Atoms of the same element that have different numbers of neutrons.

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

i 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) Isotope

25. Electrons in an atom move throughout the Electron cloud surrounding the nucleus.

26. How can radioactive decay produce new elements?

Usually happens when unstable atomic nucleus breaks down and changes to a more stable nucleus by emitting radiation.

27. How can radioactive decay produce new elements?

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 4 - The Periodic Table

Part A- True/False

Indicate whether the statement is true or false.

- False 1. A metalloid is an element with all of the same properties as metals.
- True 2. Elements were arranged in order of increasing atomic mass on Mendeleev's first periodic table.
- True 3. Elements on the far right of the periodic table are classified as nonmetals.
- True 4. Copper is a metal and is a conductor of electricity.
- False 5. Ductility is not a property of metals
- False 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 term 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

- a 15. The number of protons in an atom of an element.
- e 16. A chart that shows the elements in order of increasing atomic number.
- b 17. Elements that have no metallic properties.
- f 18. The elements that are in group 1 on the periodic table.
- g 19. An element that is generally shiny and hard.
- h 20. The rows on the periodic table.

d 21. The columns on the periodic table.

c 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.
- | | | |
|------------------|-----------------------------|-----------------|
| 1. melting point | 3. ductile | 5. malleability |
| 2. color | 4. electricity conductivity | |
24. The atomic number 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 | <u>matalloid</u> |
| carbon | <u>nonmetal</u> |
| aluminum | <u>metal</u> |
| silicon | <u>matalloid</u> |
26. An element that is sometimes a good conductor of electricity and sometimes a good insulator is a(n) matalloid.
27. An element that is a poor conductor of heat and electricity, but is a good insulator is a(n) nonmetal.
28. What are two properties that make a metal a good choice for use as wires in electronics?
- | |
|-----------------|
| 1. conductivity |
| 2. Malleability |

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.



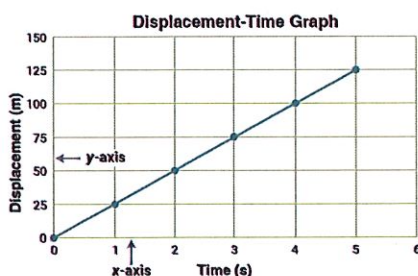
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

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

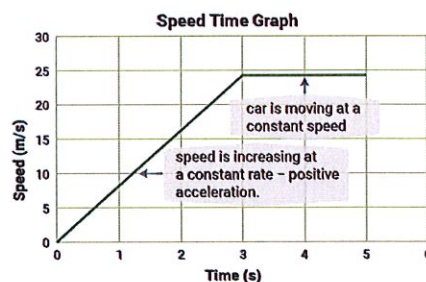
$$\text{acceleration} = \frac{\text{change in velocity}}{\text{change in time}}$$

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

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

Non-contact forces
forces between objects
that are not touching



applied force



frictional force



tension force



magnetic force

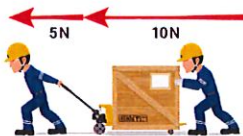


electrical force



gravitational force

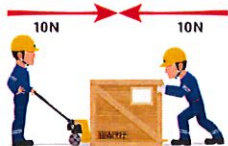
If two forces act on an object in the same direction, the net force is the sum of the two forces.



$$\text{Net force} = 5 \text{ N} + 10 \text{ N} = 15 \text{ N}$$



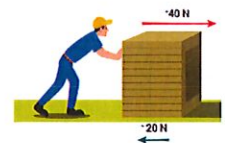
When the net force on an object is 0 N, the forces are called balanced forces.



$$\text{Net force} = 10 \text{ N} + -10 \text{ N} = 0 \text{ N}$$

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 5 - Motion, Forces, and Newton's Laws

Part A- True/False

Indicate whether the statement is true or false.

- False** 1. To calculate speed, multiply the distance by the time.
- False** 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.
- True** 3. To calculate average speed, use only the total time and the total distance.
- True** 4. To find an object's velocity, you must know the speed and direction of the moving object.
- False** 5. Weight is the upward force of Earth's gravity on all objects.
- False** 6. There is only one type of force.
- True** 7. The metric unit which measures force is the Newton.
- False** 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 c. accelerating
b. increasing potential energy d. decelerating
- _____ 10. Newton's third law of motion states that for every action there is an equal and opposite _____.
- a. acceleration c. force
b. mass d. reaction
- _____ 11. A change in an object's position is called _____.
- a. motion c. distance
b. velocity 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 c. second
b. third d. first

- _____ 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 | f. Newton's first law of motion |
| b. distance | g. Newton's second law of motion |
| c. force | h. speed |
| d. friction | i. velocity |
| e. motion | |
- a 25. A change in the velocity of an object over time.
- c 26. A push or pull exerted by one object on another, possibly causing a change in motion.
- b 27. The length between two places.
- h 28. How fast an object's position changes over time
- i 29. A description of a moving object's speed and direction.
- d 30. A force that opposes the motion of an object in contact with a surface.
- e 31. A change in an object's position compared to fixed objects around it.
- f 32. An object at rest tends to stay at rest, and an object in motion tends to stay in motion.
- g 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?

They traveled at the same speed

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

36. The law of inertia is another name for Newton's First Law.