

مراجعة هيكمل العلوم صف تاسع
انسبير

EOT REVISION Grade 9 T-1

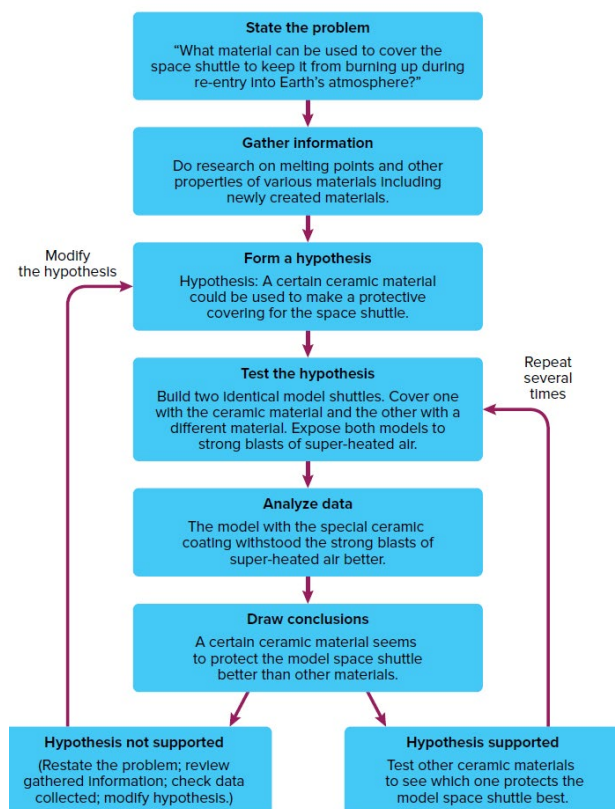
Answer

الحلول



مراجعة علوم الصف التاسع Gen – Science G9 – EOT-T1

Mr. Adham Zewin



Which of the following is the correct order of steps in the scientific method?

- A) Form a hypothesis, conduct an experiment, make observations, ask a question, draw a conclusion
- B) Ask a question, make observations, form a hypothesis, conduct an experiment, analyze results, draw a conclusion
- C) Conduct an experiment, form a hypothesis, make observations, ask a question, draw a conclusion
- D) Analyze results, ask a question, conduct an experiment, make observations, form a hypothesis

1. What is the first step in a scientific investigation, and what form does it usually take?

- A. Drawing conclusions, usually in the form of a report
- B. Making a hypothesis, usually in the form of an educated guess
- C. State the problem, usually in the form of an observation
- D. Conduct an experiment

Dependent variable	What we measure
Independent variable	What we change
Constant	Does not change
control	Standard by which results can be compared

Which variable is the one that we measure in an experiment?

- A) Independent variable
- B) Dependent variable
- C) Constant
- D) Control

What do we call the variable that we deliberately change in an experiment?

- A) Dependent variable
- B) Constant
- C) Independent variable
- D) Control

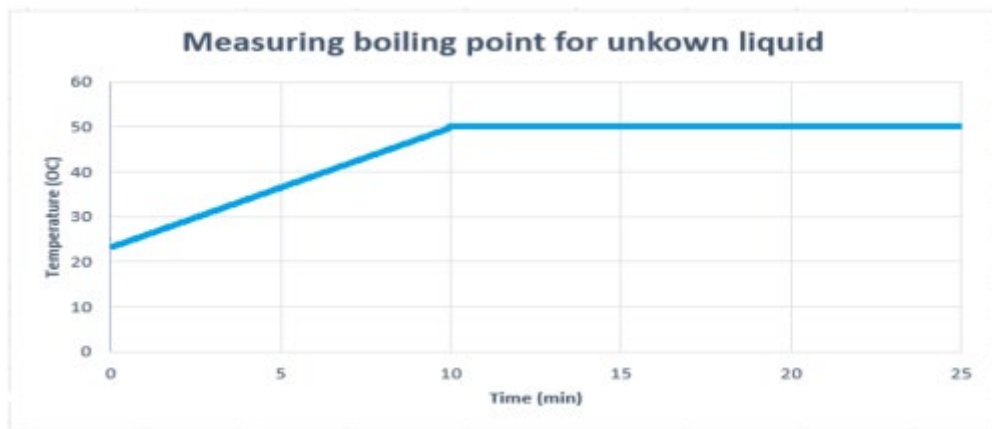
Which term describes a factor that does not change throughout the experiment?

- A) Dependent variable
- B) Constant
- C) Independent variable
- D) Control

What term is used for the standard by which experimental results are compared?

- A) Dependent variable
- B) Constant
- C) Independent variable
- D) Control

To determine the boiling point of an unknown liquid, a student heats 10 mL of the liquid in a test tube and records the temperature every minute for 25 minutes. He plots the relation in the following graph. What does the time on **the x-axis represents**?



- A. The dependent variable
- B. The independent variable
- C. The control
- D. The constant

9. What is **bias** in a scientific investigation?

- A. A type of independent variable
- B. A factor that increases accuracy
- C. When a scientist's expectations influence the results
- D. A type of control used in experiments

Researchers conduct the scientific investigations in a blind experiment procedure, why?



- a. To increase the safety procedures for the investigator or the subject ☐
- b. To increase the bias toward a specific item being tested ☐
- c. To reduce the consumption of study samples ☐
- d. To reduce the bias toward a specific item being tested ☒

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Which of the following statements best describes a **scientific theory**?

- A) It is a random guess based on limited data.
- B) It is an explanation based on extensive observations and investigations.
- C) It is a statement that is always true and cannot be changed.
- D) It describes specific relationships without explaining why.

What happens to a **hypothesis** if **repeated investigations** consistently **support it**?

- A) It becomes a law.
- B) It becomes a theory.
- C) It is discarded.
- D) It is proven and cannot change.

Which statement about a scientific law is **correct**?

- A) It explains why certain natural phenomena occur.
- B) It can change into a theory if new evidence emerges.
- C) It describes what happens under specific conditions but does not explain why.
- D) It is only valid when scientists agree with it.

How does a **theory** relate to a **scientific law**?

- A) A theory can explain a law, but it does not become a law.
- B) A theory can turn into a law with enough evidence.
- C) A law can explain a theory, and they can be used interchangeably.
- D) A theory is less supported by evidence than a law.

SI Base Units

Quantity Measured	Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Intensity of light	candela	cd

1. What is the SI base unit for measuring **length**?

- A. Kilogram
- B. Meter
- C. Candela
- D. Ampere

2. Which SI base unit is used to measure **mass**?

- A. Mole
- B. Kelvin
- C. Kilogram
- D. Second

3. What is the symbol for the SI unit of **time**?

- A. s
- B. A
- C. m
- D. K

4. The SI unit for **electric current** is the:

- A. Mole
- B. Ampere
- C. Meter
- D. Candela

5. Which of the following is the SI base unit for **temperature**?

- A. Celsius
- B. Kelvin
- C. Ampere
- D. Second

6. What does the SI unit "**mol**" measure?

- A. Intensity of light
- B. Mass
- C. Amount of substance
- D. Electric current

Correct Answer: C

7. The SI base unit for measuring **light intensity** is:

- A. Candela
- B. Ampere
- C. Kelvin
- D. Meter

8. Which of the following is **NOT** an SI base unit?

- A. Meter (m)
- B. Kelvin (K)
- C. Liter (L)
- D. Ampere (A)

What property is described by the measurement **298 K**?

- A. Current
- B. Amount of substance
- C. Temperature
- D. mass

Table 3 Common SI Prefixes

Prefix	Symbol	Multiplying Factor
Kilo-	k	1,000
Deci-	d	0.1
Centi-	c	0.01
Milli-	m	0.001
Micro-	μ	0.000 001
Nano-	n	0.000 000 001

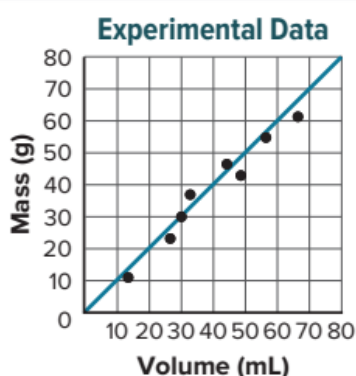


Figure 15 Generally, the line or curve that you draw will not intersect all of your data points.

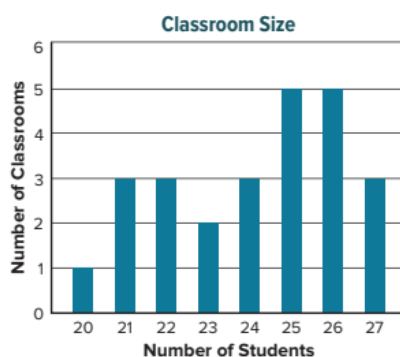


Figure 16 The height of each bar corresponds to the number of classrooms having a particular number of students.

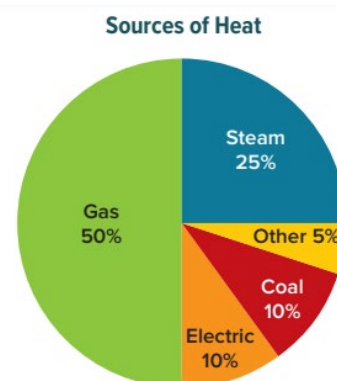
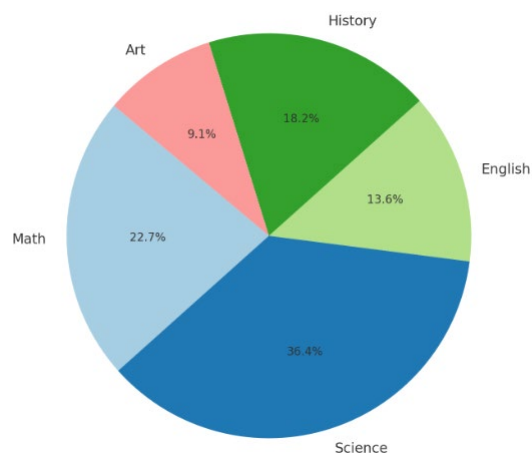


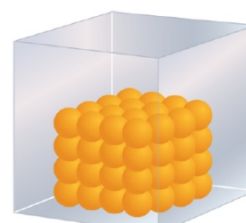
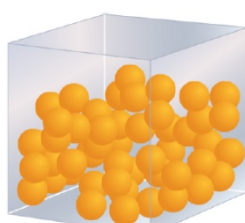
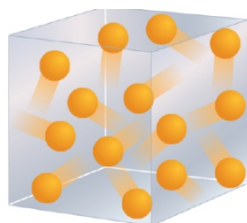
Figure 17 A circle graph shows the different parts of a whole quantity.

Which subject had the highest percentage of study time?

- A) Math
- B) Science
- C) English
- D) Art



Property	Solid	Liquid	Gas
Particle Arrangement	Closely packed in a fixed, often crystalline structure	Particles are close but can slide past each other	Particles are far apart and move freely
Kinetic Energy	Low kinetic energy	Higher kinetic energy than solids but lower than gases	High kinetic energy
Motion of Particles	Particles vibrate in place	Particles move but not as freely as in a gas	Particles move rapidly in all directions
Interparticle Attraction	Strong attraction, particles are tightly bound	Moderate attraction, allowing particles to slide past	Weak or negligible attraction, particles are independent
Shape	Definite shape	No definite shape, takes the shape of the container	No definite shape, fills the entire space available
Volume	Definite volume	Definite volume	Indefinite volume, fills the container completely



Which of the following best describes the particle arrangement in a **solid**?

- A. Particles are far apart and move freely
- B. Particles are closely packed in a fixed structure
- C. Particles are close but slide past each other
- D. Particles are in constant random motion

Which of the following figures represents the **liquid state**?

a.  ☐

b.  ☒

c.  ☐

d.  ☐

In which state of matter are particles able to move past each other but are still close together?

- A. Solid
- B. Liquid
- C. Gas
- D. Plasma

What is the main characteristic of gases in terms of volume?

- A. They have a definite volume
- B. Their volume depends on their temperature
- C. They have an indefinite volume, filling the container completely
- D. They have the same volume as a solid

Which state of matter has particles that are tightly bound due to strong interparticle attraction?

- A. Solid
- B. Liquid
- C. Gas
- D. Plasma

Which of the following correctly describes the change in thermal energy when a **solid melts** into a **liquid**?

- A) Thermal energy decreases, causing particles to move closer together.
- B) Thermal energy increases, allowing particles to move past each other.
- C) Thermal energy remains constant, and particle motion is unaffected.
- D) Thermal energy decreases, leading to a decrease in particle motion.

What is a key difference between the shape of solids and liquids?

- A. Solids have no definite shape, while liquids have a definite shape
- B. Solids have a definite shape, while liquids take the shape of their container
- C. Both solids and liquids have no definite shape
- D. Solids take the shape of their container, while liquids have a definite shape

Which of the following states of matter has particles with weak or negligible interparticle attraction?

- A. Solid
- B. Liquid
- C. Gas
- D. Plasma

The kinetic theory

1. All matter is composed of tiny particles (atoms, molecules, and ions).
2. These particles are in constant, random motion.
3. The particles collide with each other and with the walls of any container in which they are held.
4. The amount of energy that the particles lose from these collisions is negligible.

Which of the following is **not** an assumption of the kinetic molecular theory?

- A) All matter is composed of tiny particles (atoms, molecules, and ions).
- B) Particles are in constant, random motion.
- C) Particles experience significant energy loss during collisions.
- D) Particles collide with each other and the walls of their container.

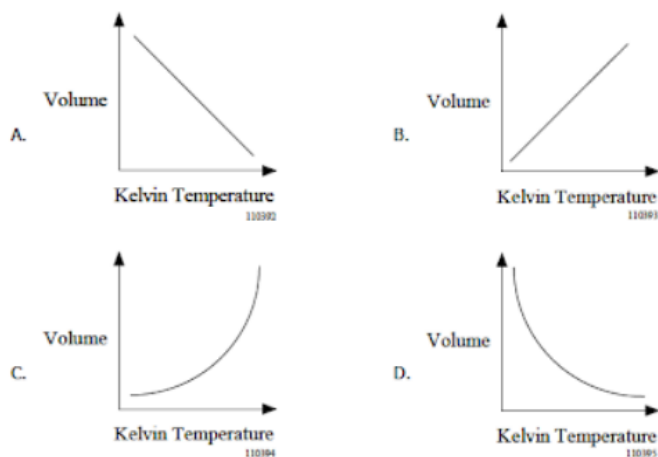
Pascal's Principle states that pressure applied to a confined fluid is transmitted undiminished throughout the fluid. Which formula represents this principle?

- A) $P = \frac{F}{A}$
B) $P_1V_1 = P_2V_2$
C) $V \propto T$
D) $PV = nRT$

Boyle's Law describes the relationship between the pressure and volume of a gas at constant temperature. Which formula expresses Boyle's Law?

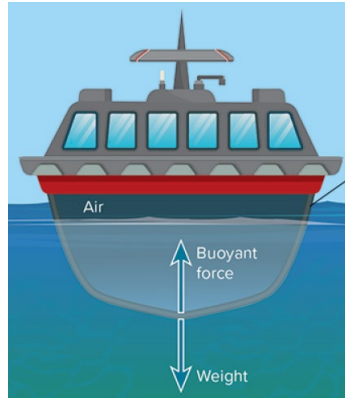
- A) $P_1T_1 = P_2T_2$
B) $P_1V_1 = P_2V_2$
C) $V \propto T$
D) $PV = nRT$

33. Choose the graph which shows the relationship between volume and Kelvin temperature for a gas whose mass and pressure are constant.



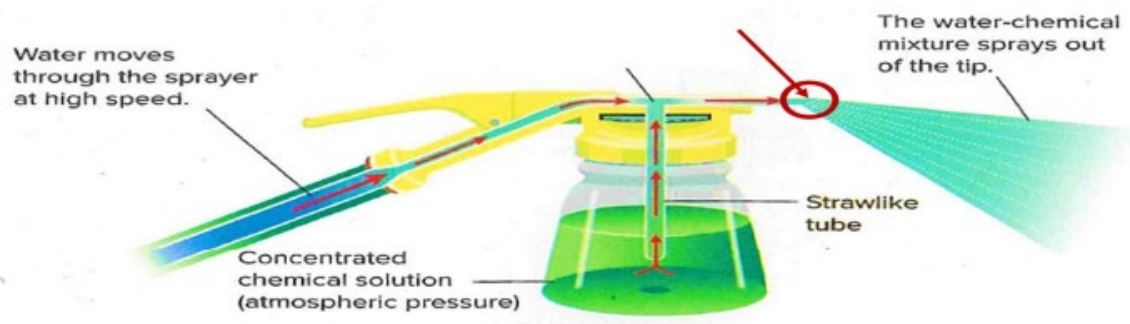
- ☐ B
☐ D
☐ C
☐ A

Which of the following will happen if the buoyant force on an object is less than its weight?



- A. The object will float.
- B. The object will sink.
- C. The object will neither float nor sink.
- D. The object will hover just below the surface.

What will the pressure and the velocity of water be at the extreme narrow portion of a pipe?



- A) Maximum pressure and least velocity
- B) Both pressure and velocity least
- C) Maximum velocity and least pressure
- D) Both pressure and velocity maximum

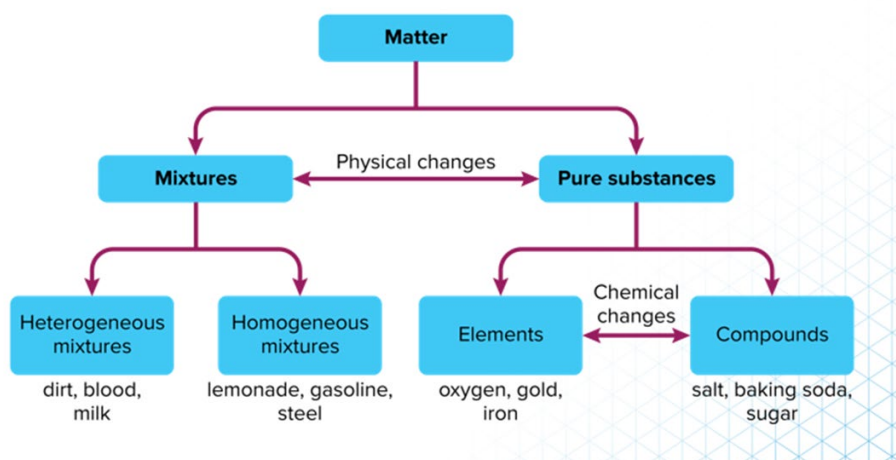
Which of the following is **not** an example of a real-world application of **Bernoulli's Principle**?

- A) Airplane lift
- B) Hose-end spray
- C) Tornado lifting roofs off buildings
- D) Electric fan blowing air

Which of the following statements is true about Bernoulli's principle?

- A. As the velocity of a fluid decreases, its pressure decreases.
- B. Fluid velocity and pressure are directly proportional.
- C. As the velocity of a fluid increases, its pressure decreases.
- D. Fluid pressure remains constant regardless of velocity.

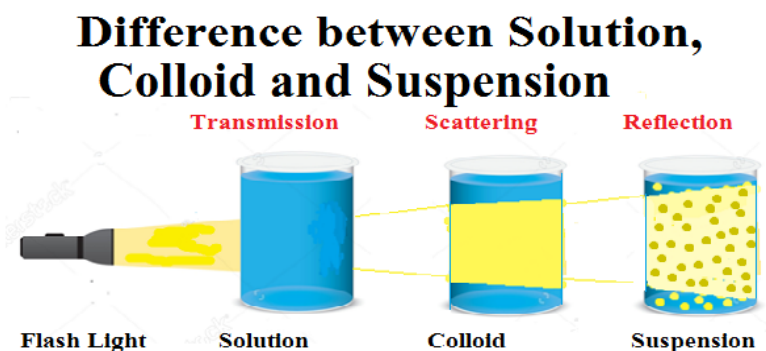
The concept map shows that mixtures can be either heterogeneous or homogeneous. Pure substances can be elements or compounds.



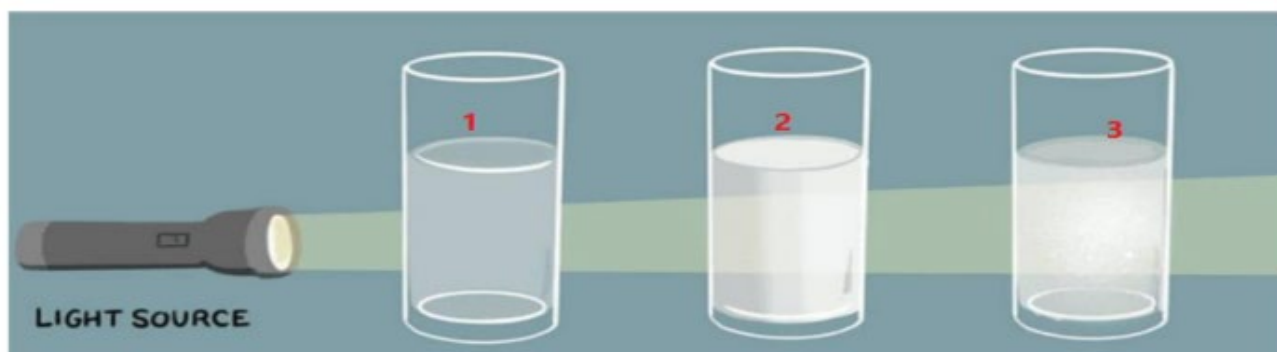
Property	Solution	Suspension	Colloid
Definition	A homogeneous mixture	A heterogeneous mixture	A heterogeneous mixture
Particle Size	Very small	Large particles	Intermediate-sized
Appearance	Transparent, clear	Cloudy	Cloudy
Particle Settling	Particles never settle .	Particles settle over time when left undisturbed.	Particles do not settle .
Visibility of Particles	Cannot be seen, even under a microscope.	Particles are visible or can be seen under a microscope.	Particles cannot be seen directly, but they scatter light.
Example	Soft drinks, vinegar, tea and Gasoline.	Oil and vinegar salad dressing, muddy water.	Milk, fog, smoke, paint And blood
Tyndall Effect	Does not show the Tyndall effect.	Does not show the Tyndall effect.	Shows the Tyndall effect (scatters light).

A(n) _____ is a material made up of two or more substances that can be separated by physical means.

- A- Element B- substance C- compound D- mixture



In the diagram below, what could glass number **1** contain?



- A. Water
B. Milk
C. Muddy water
D. Mayonnaise

What is a suspension?

- A) A homogeneous mixture of two liquids
B) A mixture where solid particles settle in a liquid
C) A gas mixture where particles never settle
D) A mixture where solids are dissolved in liquids

Which of the following is an example of a **suspension**?

- A) Milk
- B) Saltwater
- C) Fog
- D) Oil and vinegar salad dressing

How can you identify a **colloid**?

- A) The particles are visible with the naked eye
- B) It settles when left undisturbed
- C) It shows the Tyndall effect by scattering light
- D) Its particles dissolve completely

Which of the following is **NOT** a characteristic of a colloid?

- A) Particles are large enough to scatter light
- B) Particles will eventually settle if left undisturbed
- C) It can be a mixture of gases, liquids, or solids
- D) Particles remain suspended and do not settle

Which of the following is an example of an **element**?

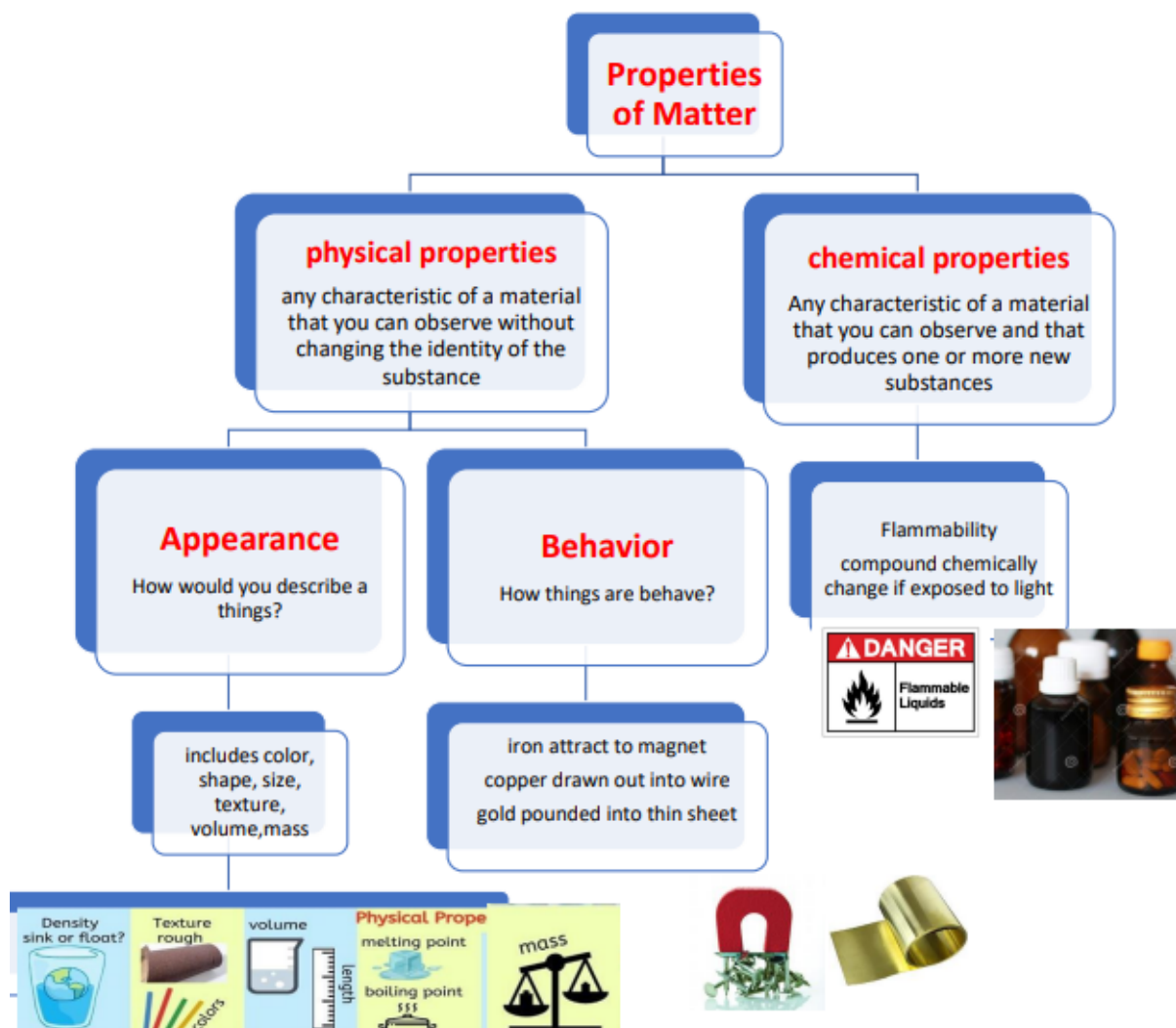
- A) Water (H_2O)
- B) Oxygen (O_2)
- C) Carbon Dioxide (CO_2)
- D) Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)

Which of the following mixtures is **homogeneous**?

- A) Smoke
- B) gasoline
- C) Oil and water
- D) River water with sediment

What is the **Tyndall effect**?

- A) The settling of particles in a suspension
- B) The scattering of light by particles in a colloid
- C) The dissolving of solids in a solution
- D) The mixture of gases in a homogeneous mixture



Which of the following is a chemical change?

- A. Water expands as it freezes.
- B. Glass bends as it is heated.
- C. Sugar dissolves in a cup of water.
- D. Gas burns in an engine

Which of these warnings refers to a **chemical property** of the material?

- A. fragile
- B. sharp object
- C. shake well
- D. flammable

What is **flammability**?

- A) The ability of a substance to dissolve in water
- B) The tendency of a substance to burn
- C) The temperature at which a substance freezes
- D) The ability of a substance to change into a gas

Which of the following is an example of a **chemical property**?

- A) Color
- B) Melting point
- C) Density
- D) Flammability

Which of the following are **physical change**?

- A. A log burns in a fireplace.
- B. Ammonia boils at -33°C .**
- C. Bread bakes in an oven.
- D. Rusting of Iron

Which of the following is **NOT** a clue that a chemical change has occurred?

- A) Formation of bubbles
- B) Change in color
- C) Substance changes state from liquid to gas
- D) Formation of a precipitate

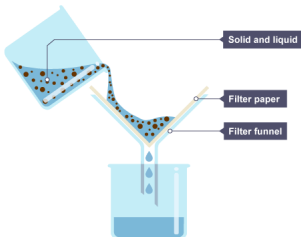
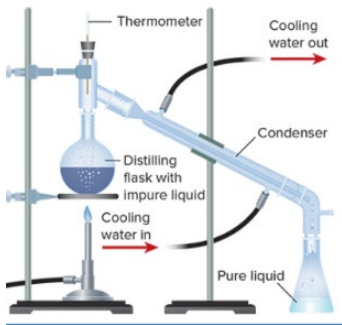


Why are some medicines stored in dark bottles?

- A) To protect them from heat
- B) To prevent light from causing chemical changes
- C) To keep them cool
- D) To stop them from evaporating

What is a **precipitate** in a chemical reaction?

- A) A gas formed during a reaction
- B) A solid that forms from two liquid solutions
- C) A change in temperature
- D) A change in color

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Separation Technique	Principle	Type of Mixture	Example
Filtration	Separation based on particle size	Heterogeneous (solid-liquid)	Sand from water
			
Distillation	Separation based on boiling points	Homogeneous (liquid-liquid)	Alcohol from water
			
Magnetic Separation	Separation using magnetic properties	Heterogeneous (solid-solid)	Iron filings from sand
			
Hand Picking	Physically picking out individual components based on size, shape, or color	Heterogeneous (solid-solid)	sesame seeds from sunflower seeds
			

Which of the following describes a chemical change?

- A) Silver tarnishing when exposed to sulfur compounds in the air
- B) Water freezing into ice
- C) Grinding a solid into a powder
- D) Salt dissolving in water

Which of the following is a physical property used to separate sesame seeds from sunflower seeds?

- A) Color
- B) Shape
- C) Size
- D) All of the above



How can iron filings be separated from a mixture of iron and sand?

- A) By adding water
- B) By using a magnet
- C) By filtering the mixture
- D) By distillation



What is distillation?

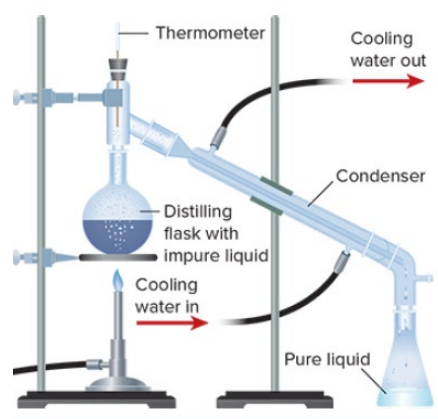
- A) A method to separate substances using magnetism
- B) A process of separating substances by heating and cooling
- C) A technique to separate solids from liquids using filtration
- D) A method to mix two liquids

Which of the following mixtures can be separated using distillation?

- A) Salt and water
- B) Iron filings and sand
- C) Sesame seeds and sunflower seeds
- D) Wood chips and metal shavings

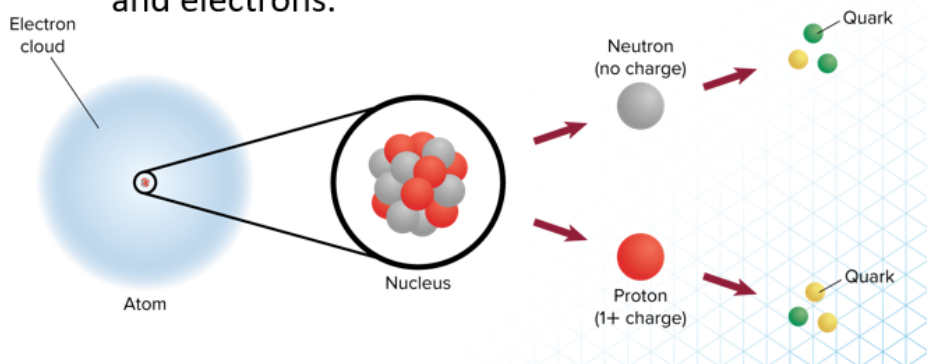
Why does distillation work to separate two liquids?

- A) The liquids have different colors
- B) The liquids have different boiling points
- C) The liquids have different magnetism properties
- D) The liquids have different densities



Subatomic Particles

- An **atom** is the smallest particle of an element that retains the element's properties.
- Atoms are composed of even smaller particles—subatomic particles—called protons, neutrons, and electrons.

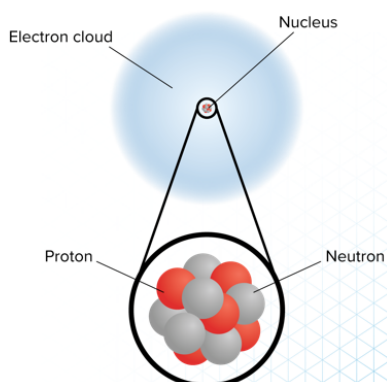


Which subatomic particle is *not* made of smaller particles?

- A) Proton
- B) Neutron
- C) Electron
- D) Quark

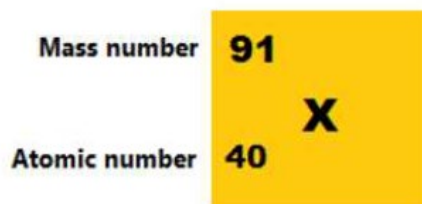
Models—Tools for Scientists

- An **electron cloud** is the area around the nucleus of an atom, where electrons are most likely to be found.
- The electron cloud is 100,000 times larger in diameter than the nucleus of an atom.



Subatomic Particle	Relative Charge	Relative Mass
Proton	1	1
Neutron	0	1
Electron	-1	Negligible (1/2000)

Which of the following is correct for the element X, shown in the figure below?



From the figure find the number of the following

	Electrons	Protons	neutrons
A	91	40	51
B	40	51	40
C	40	40	51
D	40	40	91

What is the smallest particle of an element that retains the element's properties?

- ☐ a) Proton
- ☐ b) Electron
- ☐ c) Atom
- ☐ d) Neutron

Which subatomic particles are found in the nucleus of an atom?

- ☐ a) Protons and electrons
- ☐ b) Neutrons and electrons
- ☐ c) Protons and neutrons
- ☐ d) Electrons only

What is the charge of a proton?

- ☐ a) Positive
- ☐ b) Negative
- ☐ c) Neutral
- ☐ d) No charge

Which of the following is a characteristic of neutrons?

- a) They have a positive charge
 - b) They are found outside the nucleus
 - c) They have no charge
 - d) They have a negative charge
-

Where are electrons located in an atom?

- a) Inside the nucleus
 - b) In the electron cloud surrounding the nucleus
 - c) In the space between protons and neutrons
 - d) Only in the nucleus
-

Which of the following best describes the mass of an electron compared to that of a proton?

- a) Much greater than a proton
 - b) Nearly the same as a proton
 - c) Much smaller than a proton
 - d) Twice the mass of a proton
-

What are protons and neutrons composed of?

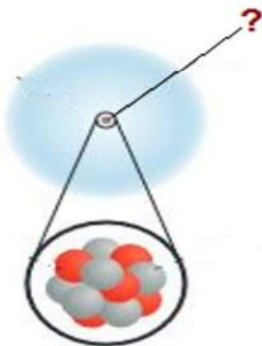
- a) Electrons
 - b) Atoms
 - c) Quarks
 - d) Nuclei
-

Why is it impossible to pinpoint the exact location of an electron in an atom?

- a) Electrons are too small to be detected
 - b) Electrons move too slowly
 - c) Electrons are moving too quickly around the nucleus
 - d) Electrons are found in the nucleus
-

What is the **assigned part** on the atom shown below'?

- A. Nucleus
- B. Neutron
- C. Proton
- D. electron



Which of the following statements **correctly** describes the **isotopes** of an element?

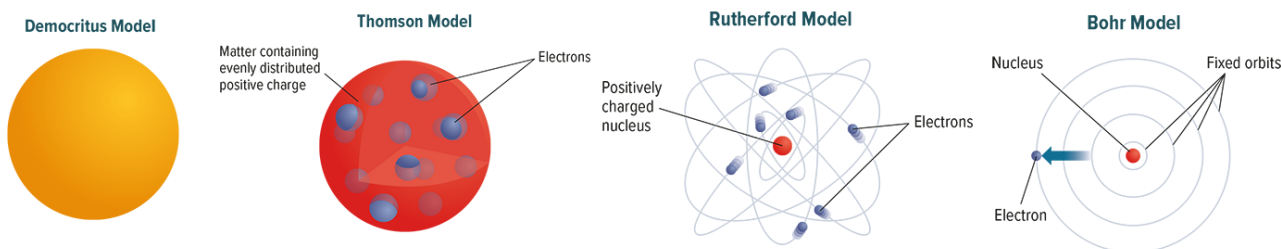
- A) Isotopes have the same number of protons but different numbers of neutrons.
- B) Isotopes have the same atomic mass but different atomic numbers.
- C) Isotopes have different chemical properties due to different numbers of protons.
- D) Isotopes have different numbers of electrons but the same number of neutrons.

An element has two naturally occurring isotopes: Isotope X with a mass of **10** amu and an abundance of **20%**, and Isotope Y with a mass of **11** amu and an abundance of **80%**. What is the average atomic mass of this element?

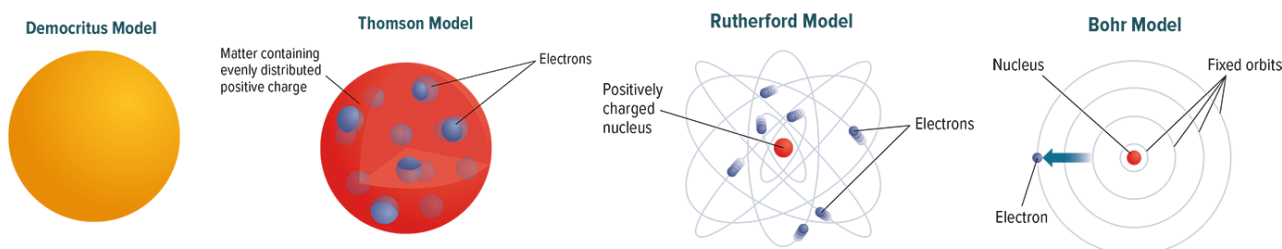
- A) 10.2 amu
- B) 10.5 amu
- C) 10.8 amu
- D) 11.0 amu

Answer: $(10 \text{ amu} \times 0.20) + (11 \text{ amu} \times 0.80) = 2 + 8.8 = 10.8 \text{ amu}$

Model	Key Idea	Structure of the Atom
Democritus Model	Proposed that matter is made of tiny , indivisible particles called " atomos " (uncuttable).	Atoms are solid, indestructible, and cannot be subdivided. No internal structure.
Thomson Model	Suggested atoms are made of electrons embedded in a positively charged "dough" (Plum Pudding Model).	Atoms are a sphere of positive charge with negatively charged electrons scattered within.
Rutherford Model	Proposed that the atom has a dense, positively charged nucleus with electrons orbiting around it.	Atoms have a small, dense nucleus with electrons in orbit, mostly empty space.
Bohr Model	Suggested electrons move in fixed orbits and can jump between orbits by absorbing/releasing energy.	Atoms have electrons in specific orbits, each with quantized energy levels.



Who first proposed the idea that elements consist of tiny, solid particles that cannot be subdivided?

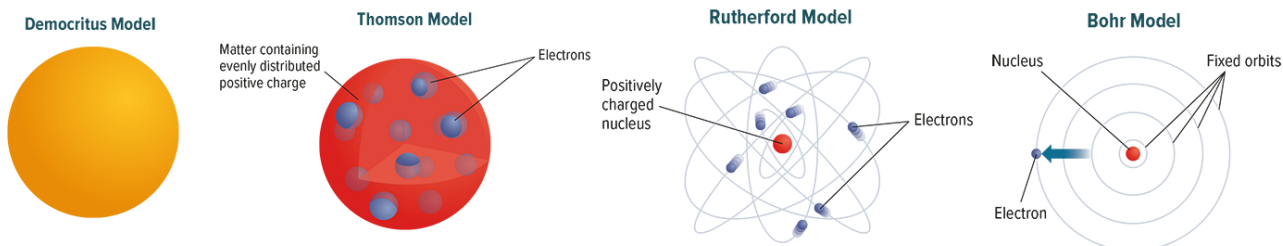


- a) Aristotle
- b) Joseph John Thomson
- c) Democritus
- d) Niels Bohr

What name did Democritus give to the smallest, indivisible particles of matter?

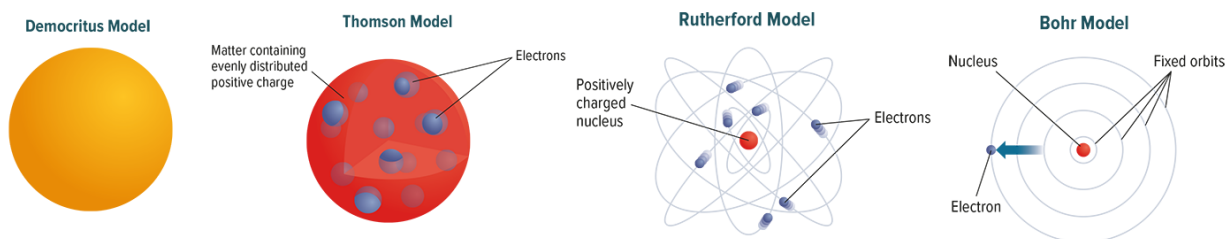
- a) Electrons
- b) Protons
- c) Atomos
- d) Nucleus

Which of the following models suggested that **electrons** are **embedded** within a positively charged sphere, like chocolate chips in cookie dough?



- a) Democritus Model
- b) Thomson Model
- c) Rutherford Model
- d) Bohr Model

Who proposed that all of the positive charge in an atom is concentrated in the nucleus, surrounded by electrons?



- a) Niels Bohr
- b) Joseph John Thomson
- c) Ernest Rutherford
- d) Democritus

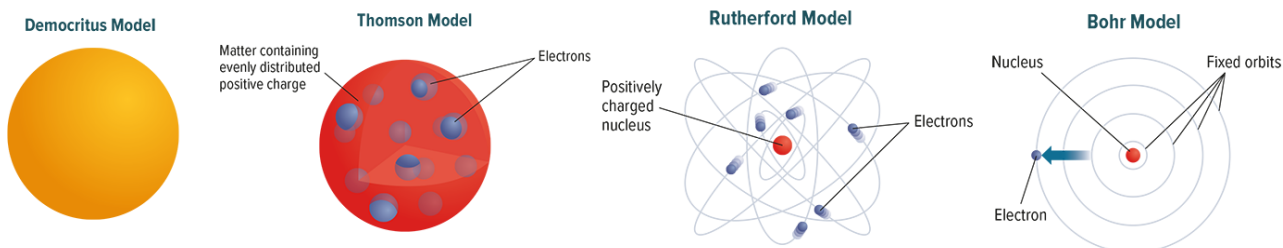
What is the key feature of the Bohr model of the atom?

- a) Electrons move randomly around the nucleus
- b) Electrons are embedded within the nucleus
- c) Electrons travel in fixed orbits around the nucleus
- d) Electrons do not exist

According to the Bohr model, what allows electrons to move between different orbits?

- a) Gaining or losing protons
- b) Absorbing or releasing specific amounts of energy
- c) Changing mass
- d) The presence of neutrons

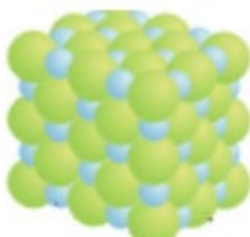
Which atomic model introduced the concept of a central atomic nucleus?



- a) Democritus Model
- b) Thomson Model
- c) Rutherford Model
- d) Bohr Model

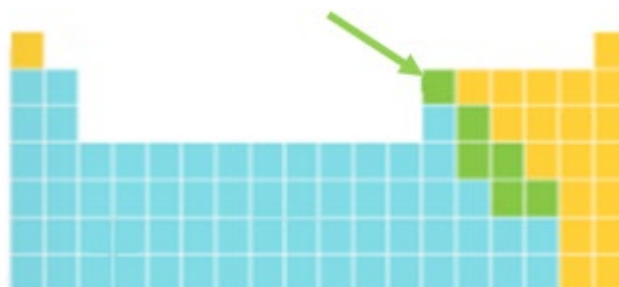
General Questions

In the figure below, what is a crystal of table salt made up from?



- A. Bonding between nonmetal with nonmetal
- B. Bonding between metal with metal
- C. Bonding between nonmetal with metalloid
- D. Bonding between metal with nonmetal

What is the name of the elements shaded in green stair step line in the following periodic table of elements?



- A. Metals
- B. Metalloids
- C. Nonmetals
- D. Undiscovered elements

Ordinarily, substances contract as their temperatures decreases. However, an exception to this rule is water. Which of the following statement is the correct reason for the water's strange behavior when it freezes?

1	The positively and negatively charged ends of the water molecules interact
2	Empty space in the crystal lattice is created
3	Density increase for the water as it changes to ice

- A. 1 only
- B. 3 only
- C. 2 and 3
- D. 1 and 2

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Which of the following is one of the uses for bromine compounds?

- A. Disinfect water in swimming pools
- B. Used to study genetic material, such as DNA
- C. Necessary to produce thyroxine hormone
- D. Medical research due to their radioactive properties

Silver and gold are used in jewelry.

Which of the following is **NOT a reason why silver and gold are used in jewelry?**

- A. High abundance on Earth's crust
- B. Relative softness
- C. Attractive colors
- D. Resistance to corrosion

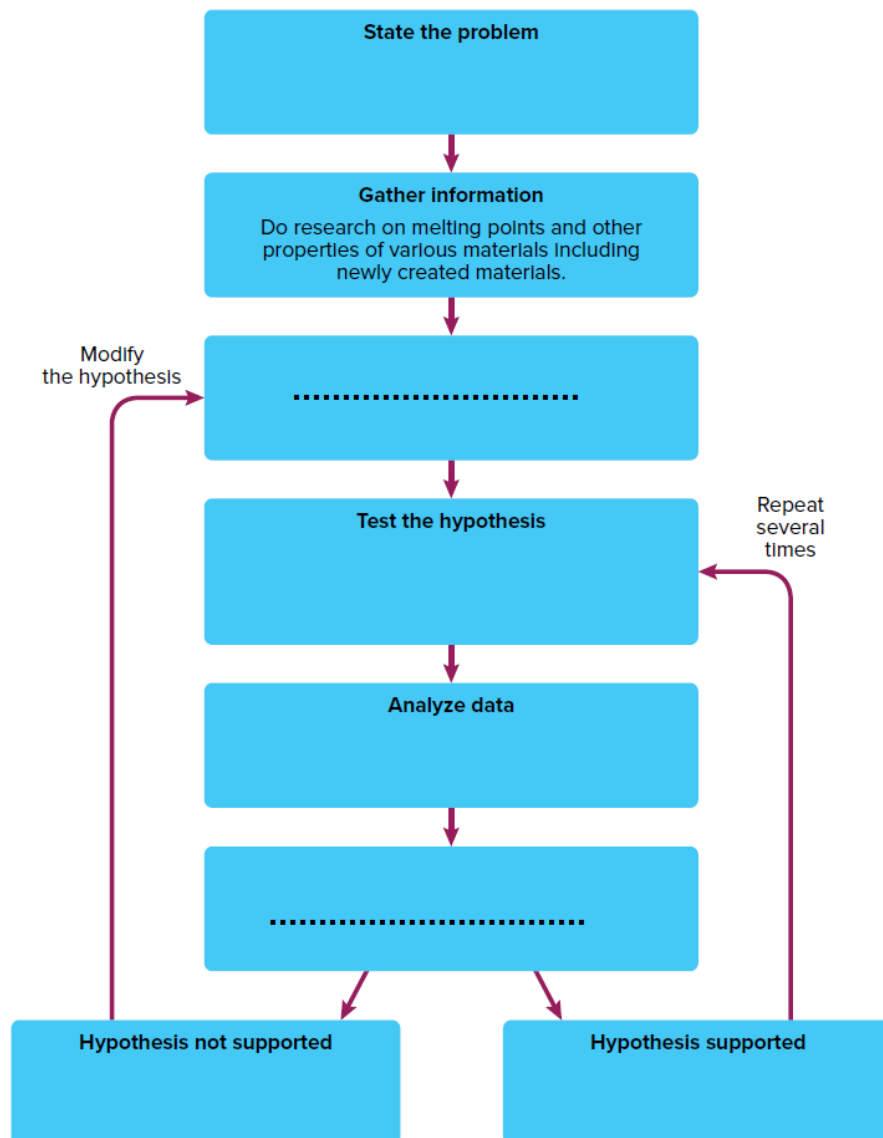
What is the similarity between the elements of group 17 and group 18 in the periodic table?

- A) Both groups contain metals.
- B) Both groups contain highly reactive elements.
- C) Both groups contain elements with seven valence electrons.
- D) Both groups contain nonmetals.

How do Group 17 and Group 18 elements compare in terms of their general state of matter?

- A) Both groups primarily consist of solid elements.
- B) Both groups have elements that are generally found in a liquid state.
- C) Both groups include nonmetals, many of which are gases at room temperature.
- D) Both groups contain elements with high reactivity toward each other.

كتابي



Change of State	Process	Attractive Forces	Energy of Particles	Example
Solid to Liquid	Melting	Attractive forces weaken as particles move apart	Particles gain energy, vibrate faster	Ice melting into water
Liquid to Solid	Freezing	Attractive forces strengthen as particles come closer	Particles lose energy, move slower	Water freezing into ice
Liquid to Gas	Evaporation	Attractive forces break as particles separate completely	Particles gain a lot of energy, move freely	Water boiling to steam
Gas to Liquid	Condensation	Attractive forces re-establish as particles come closer	Particles lose energy, slow down	Steam condensing to water
Solid to Gas	Sublimation	Attractive forces break completely as particles separate	Particles gain a large amount of energy, move freely	Dry ice sublimating to CO ₂ gas

(a) Fig. 5.1 shows the arrangement of the particles in the three states of matter.

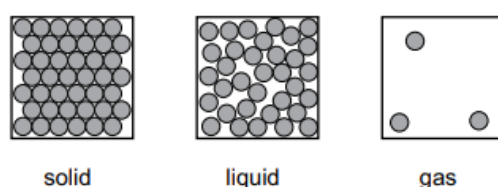


Fig. 5.1

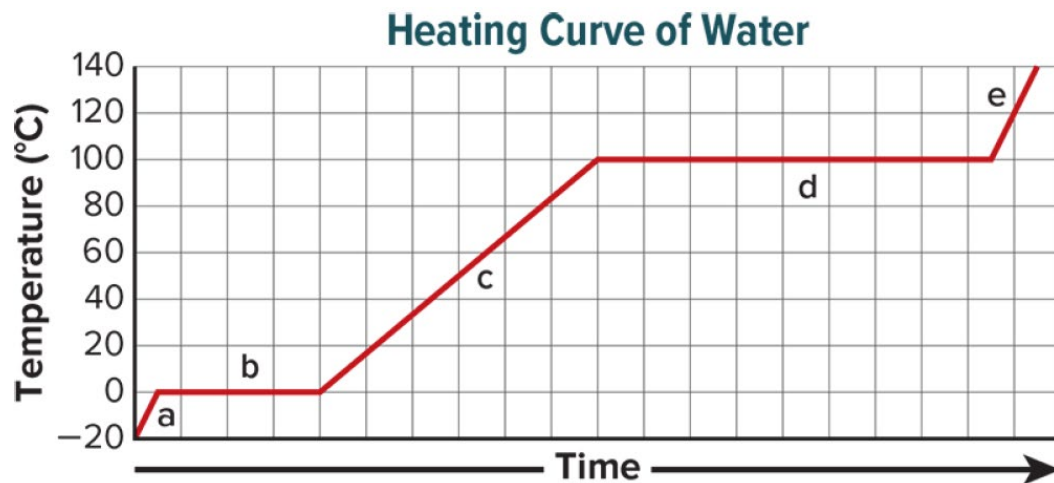
Table 5.1 shows information about the particles in the three states of matter.

Complete Table 5.1.

Table 5.1

state of matter	particle separation	particle arrangement	particle motion
solid	regular	vibrate about fixed positions
liquid	close together	move around each other
gas	far apart	random

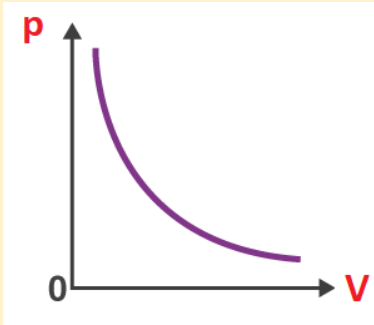
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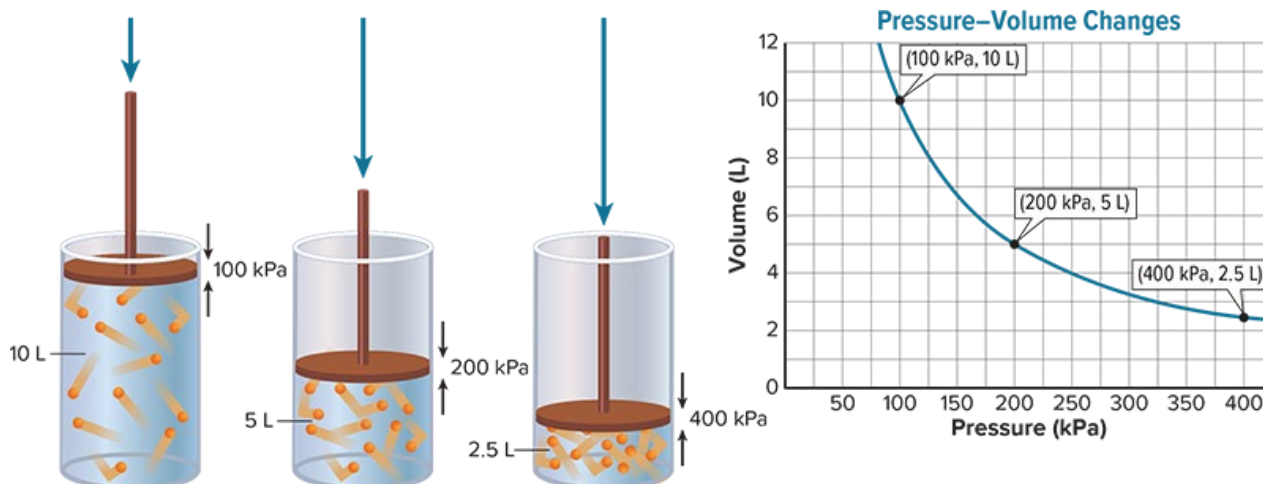


From the figure which letter represent Boiling of water where kinetic energy remains constant and

From the figure which letter represent state where solid and liquid are found

From the figure which letter represent state where only gas is found

Charles's law	Boyle's law
the volume of a gas increases with increasing temperature	pressure of a gas increases if the volume decreases
the pressure is constant	The temperature is constant
.....	$P_1 V_1 = P_2 V_2$
directly proportional
	



Boyle's Law Equation

initial pressure \times initial volume = final pressure \times final volume

$$P_i V_i = P_f V_f$$

EXAMPLE Problem 3

BOYLE'S LAW A weather balloon has a volume of 100.0 L when it is released from sea level, where the pressure is 101 kPa. What will be the balloon's volume when it reaches an altitude where the pressure is 43.0 kPa?

Identify the final volume: V_f

Unknown:

List the initial pressure: $P_i = 101 \text{ kPa}$

Knowns: initial volume: $V_i = 100.0 \text{ L}$

final pressure: $P_f = 43.0 \text{ kPa}$

Set Up the $P_i V_i = P_f V_f$

Problem: $V_f = V_i \left(\frac{P_i}{P_f} \right)$

Solve the $V_f = 100.0 \text{ L} \left(\frac{101 \text{ kPa}}{43.0 \text{ kPa}} \right)$
Problem: $= 235 \text{ L}$

Charles's Law Equation

$$\frac{\text{initial volume}}{\text{initial temperature (K)}} = \frac{\text{final volume}}{\text{final temperature (K)}}$$

$$\frac{V_i}{T_i} = \frac{V_f}{T_f}$$

Use Charles's Law A 2.0-L balloon at room temperature (20.0°C) is placed in a refrigerator at 3.0°C. What is the volume of the balloon after it cools in the refrigerator?

Identify the Unknown: final volume: V_f

List the Knowns: initial volume: $V_i = 2.0 \text{ L}$
 initial temperature: $T_i = 20^\circ\text{C} = 20.0^\circ\text{C} + 273 = 293 \text{ K}$
 final temperature: $T_f = 3.0^\circ\text{C} = 3.0^\circ\text{C} + 273 = 276 \text{ K}$

Set Up the Problem: $\frac{V_i}{T_i} = \frac{V_f}{T_f}$

$$V_f = V_i \left(\frac{T_f}{T_i} \right)$$

Solve the Problem: $V_f = 2.0 \text{ L} \left(\frac{276 \text{ K}}{293 \text{ K}} \right)$
 $= 1.9 \text{ L}$

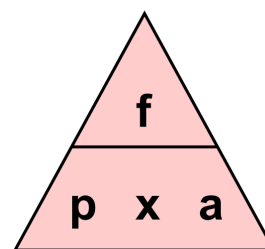
Calculate Force Atmospheric pressure at sea level is about 101 kPa. With how much total force does Earth's atmosphere push on an average human being at sea level? Assume that the surface area of an average human is 1.80 m².

List the Unknown: force: F

List the Knowns: pressure: $P = 101 \text{ kPa} = 101,000 \text{ Pa}$
 area: $A = 1.80 \text{ m}^2$

Set Up the Problem: $P = \frac{F}{A}$

Solve the Problem: $101,000 \text{ Pa} = \frac{F}{1.80 \text{ m}^2}$
 $F = 101,000 \text{ Pa} \times 1.80 \text{ m}^2$
 $= 182,000 \text{ Pa} \cdot \text{m}^2 = 182,000 \frac{\text{N}}{\text{m}^2} \cdot \text{m}^2 = 182,000 \text{ N}$



Calculate Forces A hydraulic lift is used to lift a heavy machine that is pushing down on a 2.8-m^2 platform with a force of $3,700\text{ N}$. What force must be exerted on a 0.072-m^2 piston to lift the heavy machine?

List the Unknowns:

force on piston: F_{in}

List the Knowns:

force on platform: $F_{\text{out}} = 3,700\text{ N}$

area of platform: $A_{\text{out}} = 2.8\text{ m}^2$

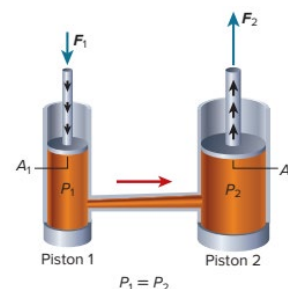
area of piston: $A_{\text{in}} = 0.072\text{ m}^2$

Set Up the Problem:

$$\frac{F_{\text{in}}}{A_{\text{in}}} = \frac{F_{\text{out}}}{A_{\text{out}}}$$

Solve the Problem:

$$F_{\text{in}} = \left(\frac{F_{\text{out}}}{A_{\text{out}}} \right) A_{\text{in}} = \left(\frac{3,700\text{ N}}{2.8\text{ m}^2} \right) 0.072\text{ m}^2 = 95\text{ N}$$



Propane (C_3H_8) is a fuel commonly burned for needs such as home heating and cooking food. When propane burns, it reacts with oxygen (O_2). The products of the reaction are carbon dioxide (CO_2) and water (H_2O). If 44.1 g of propane react completely with 160.0 g of oxygen, 132.0 g of carbon dioxide are formed. **What is the mass of the other product, water, formed in this reaction?**

The reaction is: $\text{C}_3\text{H}_8 + 5\text{ O}_2 \rightarrow 3\text{ CO}_2 + 4\text{ H}_2\text{O}$

Given:

- Mass of propane (C_3H_8): 44.1 g
- Mass of oxygen (O_2): 160.0 g
- Mass of carbon dioxide (CO_2): 132.0 g

Step 1: Calculate the total mass of the reactants

$$\text{Total mass of reactants} = 44.1\text{ g (C}_3\text{H}_8) + 160.0\text{ g (O}_2) = 204.1\text{ g}$$

Step 2: Use the law of conservation of mass

$$\text{Mass of water (H}_2\text{O)} = \text{Total mass of products} - \text{Mass of carbon dioxide (CO}_2\text{)}$$

$$\text{Mass of water (H}_2\text{O)} = 204.1\text{ g} - 132.0\text{ g} = 72.1\text{ g}$$

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Irreversible- Reversible - No new substance - New substances - Rusting of iron

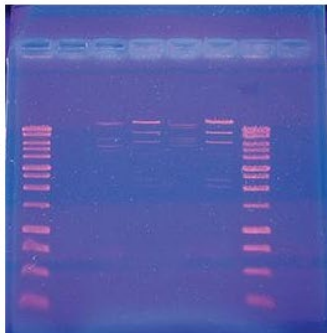
Ice melting

Aspect	Physical Change	Chemical Change
Definition	A change in which the form or appearance of a substance is altered, but its chemical composition remains the same.	A change in which the chemical composition of a substance is altered, resulting in new substances.
Reversibility	Often reversible	Usually
Change in Composition is formed;are formed.
Examples, water boiling, breaking a glass, dissolving sugar in water, burning wood, baking a cake, souring milk

Aspect	Metals	Nonmetals
Position on Periodic Table	Found on the left and center of the periodic table	Found on the right
Appearance	Shiny (metallic luster)	Dull (non-metallic appearance)
Malleability and Ductility	Malleable and ductile	Brittle in solid form
Conductivity	Good conductors of heat and electricity	Poor conductors (insulators)
Melting and Boiling Points	Generally high melting and boiling points	Generally low melting and boiling points
Electron Behavior	Tend to lose electrons and form positive ions (cations)	Tend to gain or share electrons, forming negative ions (anions) or covalent bonds
State at Room Temperature	Mostly solids (except mercury, which is liquid)	Can be solids, liquids, or gases (e.g., oxygen, nitrogen)
Examples	Iron (Fe), Copper (Cu), Sodium (Na)	Oxygen (O), Carbon (C), Sulfur (S)



Chlorine compounds are used to disinfect water in swimming pools.



Scientists use a bromine compound to stain DNA samples.



Iodine will sublime at room temperature.

Which element is known to sublime at room temperature?

- A) Chlorine
- B) Bromine
- C) Iodine
- D) Fluorine

In addition to swimming pools, where else are chlorine compounds commonly used?

- A) In the production of household and industrial bleaches
 - B) In air purification systems
 - C) In food preservation
 - D) In electronics manufacturing
- Answer:** A) In the production of household and industrial bleaches

Iodine change in state from to at room temperature?

- A. Solid – liquid
- B. Liquid – gas
- C. Solid – gas
- D. Gas - solid