

كتب المراجعة وفق الهيكل - انسباير



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف التاسع العام ← علوم ← الفصل الثالث ← ملفات متنوعة ← الملف

تاريخ إضافة الملف على موقع المناهج: 2026-06-27 17:24:20

ملفات اكتب للمعلم اكتب للطالب ا اختبارات الكترونية ا اختبارات ا حلول ا عروض بوربوينت ا أوراق عمل
منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي ا للمدرس

المزيد من مادة
علوم:

إعداد: Aldhaheer Aysha

التواصل الاجتماعي بحسب الصف التاسع العام



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف التاسع العام والمادة علوم في الفصل الثالث

كتب المراجعة وفق الهيكل - انسباير

1

نموذج امتحاني تدريبي غير محلول انسباير

2

نموذج امتحاني تدريبي محلول انسباير

3

مقارنة حالات المادة الثلاث

4

ملزمة الهيكل مراجعة نهائية Science Inspire

5

مدرسة الخير الحلقة الثانية والثالثة - بنات
Al Khair School Cycle 2 & 3 - Girls

مادة العلوم - الصف التاسع (Inspire Science)

غلاف كتيب المراجعة: علوم إنسباير للصف التاسع

رابط المراجعة الرقمي

<https://claude.ai/public/artifacts/29184446-8fd7-4c90-b326-0b9f5a16c0e6>



Ms. Aysha Aldhaheri

المسار العام
(General Track)

العام الأكاديمي:
2025-2026

Q1: Compare the states of matter in terms of volume, shape, intermolecular forces, and distances between particles.



States of Matter

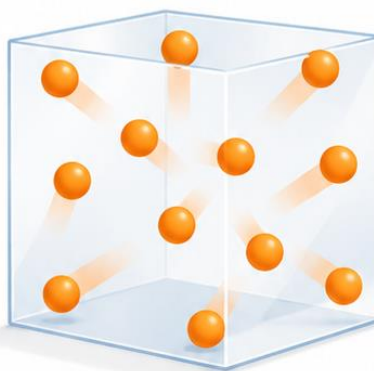
How particles behave in gases, liquids, and solids



A. GAS STATE



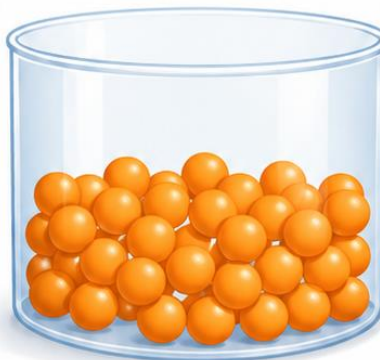
- Particles move **very fast**
- **No fixed shape or volume**
- Particles are **far apart**



B. LIQUID STATE



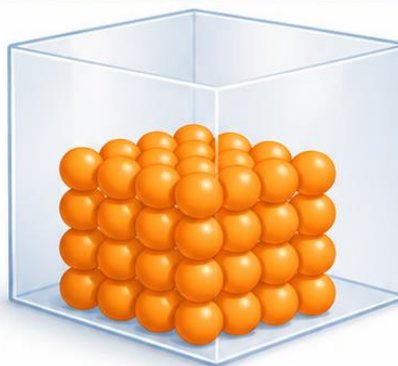
- Particles move **moderately fast**
- Can **flow** and take container shape
- **Definite volume**
- Particles **slide past** each other



C. SOLID STATE

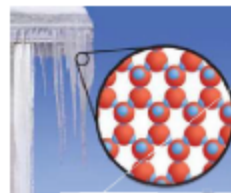


- Particles are **closely packed**
- **Definite shape and volume**
- Very **low** kinetic energy
- Particles **vibrate in place**



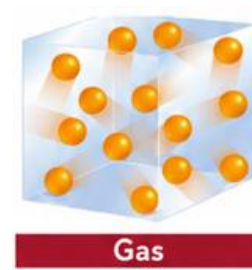
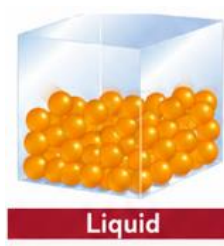
♦ Crystalline Solids

- Have **regular geometric arrangement**
- Example: Ice (alternating hydrogen and oxygen)



Comparing the States of Matter

Feature	Solid	Liquid	Gas
Shape	Definite	Takes container shape	Takes container shape
Volume	Definite	Definite	Fills container
Particle Motion	Vibrate only ↔	Slide past each other ↔	Move freely ↔
Kinetic Energy	Lowest ⌚	Medium ⌚	Highest ⌚
Particle Spacing	Very close 	Close 	Far apart 
Attractive Force	Strong	Moderate	Weak



Which statement **BEST** describes particles in a **liquid**?

- A) Fixed in position, vibrate only
 - B) Move freely with no attraction
 - C) Slide past each other with moderate attraction
 - D) Move randomly with no interaction
-

At the melting point, what happens to particle energy?

- A) Increases kinetic energy only
- B) Remains constant while potential energy increases
- C) Decreases kinetic energy
- D) Stops particle motion

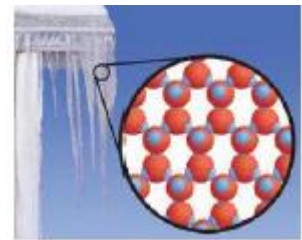
(Correct answer: B At the **melting point**, the temperature stays constant, so **kinetic energy stays the same**. The added heat is used to break/loosen particle forces, so **potential energy increases**.)

Which state has the **STRONGEST intermolecular forces?**

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

Ice is an example of _____.

- A. Amorphous solid
- B. Liquid
- C. Crystalline solid
- D. Liquid crystals



What type of matter has a definite volume and a definite shape?

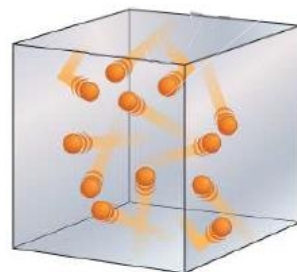
- A. Liquid
- B. Solid
- C. Plasma
- D. Gas

Which state has definite volume but no definite shape?

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

Which is the state of matter shown in this figure?

- a) solid
- b) gas
- c) plasma
- d) liquid



Q1: What is the physical state of matter in which both **shape and volume are fixed**?

- A. The solid state
- B. The gaseous state
- C. The liquid state

Q2: What is the physical state of matter in which both shape and volume are variable?

- A. The gaseous state
- B. The liquid state
- C. The solid state

Q3: What is the physical state of matter in which the shape is variable but the volume is fixed?

- A. The solid state
- B. The liquid state
- C. The gaseous state

Q4: What is the correct order of the physical states of matter according to the attractive forces between their particles, from least to greatest?

- A. The gaseous state, then the liquid state, then the solid state
 - B. The gaseous state, then the solid state, then the liquid state
 - C. The liquid state, then the solid state, then the gaseous state
 - D. The solid state, then the liquid state, then the gaseous state
-

Q5: What is the correct order of the states of water according to the attractive forces between its molecules, from least to greatest?

- A. Vapor, then water, then ice
 - B. Ice, then water, then vapor
 - C. Water, then ice, then vapor
 - D. Water, then vapor, then ice
-

Q6: Which of the following statements is correct?

- A. The kinetic energy of gas particles is greater than the kinetic energy of liquid and solid particles of the same substance.
- B. The kinetic energy of gas particles is less than the kinetic energy of liquid and solid particles of the same substance.
- C. The kinetic energy of gas particles is equal to the kinetic energy of liquid and solid particles of the same substance.
- D. The kinetic energy of gas particles is less than the kinetic energy of liquid particles and greater than that of solid particles of the same substance.

7. In which state of matter do particles stay close together, but can still slide past each other?

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

8. Which of the following describes matter in the solid state?

- A. Its particles can flow past one another.
- B. It can be compressed into a smaller volume.
- C. It takes the shape of its container.
- D. Its particles are packed close together.

2	SCI.4.1.02.04&01 Describe the kinetic theory of particles	Text book - student edition
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Q2: Describe the kinetic theory of particles

Kinetic Molecular Theory

Kinetic Molecular Theory explains the **behavior of particles found in gases**. To explain the behavior of particles, it is necessary to make some basic assumptions. The following are the **assumptions of Kinetic Molecular Theory**:

1. Matter is made up of **tiny particles**: atoms, molecules, and ions.
2. These particles are in **continuous random motion**.
3. The particles **collide** with each other and with the walls of any container they are placed in.
4. The amount of **energy lost by the particles during collisions is very small**.

1. Kinetic Molecular Theory is used to explain the behavior of particles in:

- A. The gaseous state
 - B. The liquid state
 - C. The solid state
 - D. The plasma state
-

Which is a key assumption of kinetic theory?

- A) Particles are stationary
 - B) Particles have no energy
 - C) Particles are in constant random motion
 - D) Particles do not collide
-

According to the kinetic theory, all matter is composed of _____.

- A) waves
- B) particles
- C) solid material
- D) plasma

According to kinetic theory, particles in matter:

- A) Are stationary in solids
 - B) Move only in gases
 - C) Are always in constant motion
 - D) Only move when heated
-

Which of the following is NOT true about the kinetic theory of matter?

- A) Matter is made of tiny particles
 - B) Particles are in constant random motion
 - C) Particles lose a significant amount of energy during collisions
 - D) Particles collide with each other and container walls
-

3. Gas particles are always in a state of motion that is:

- A. Continuous and random
- B. Very slow
- C. Fixed and not moving
- D. Circular and regular

4. The distances between gas particles are:

- A. Very large compared to the size of the particles
- B. Always equal to the size of the particle
- C. Moderate and close to liquids
- D. Very small and almost nonexistent

5. When gas particles collide with each other or with the wall of the container, they:

- A. Lose a very small amount of their energy
- B. Bounce and collide without losing their energy
- C. Gain energy endlessly
- D. Stick together and stop moving

3

SCL4.1.02.048.02 Use the kinetic molecular theory to explain the behavior of particles in the different state of matter

Text book - student edition +figure 4

202

Q3: Use the kinetic molecular theory to explain the behavior of particles in the different states of matter

Changes of State

What happens to a solid when thermal energy is added to it? Think about the iced water in **Figure 4**. The particles that make up the water are moving fast and colliding with the particles that make up the ice cube. Those collisions transfer energy from the water to the ice. The particles at the surface of the ice cube vibrate faster, transferring energy to other particles in the ice cube.

According to the kinetic molecular theory, what happens to the energy lost during collisions between gas particles?

- A) It is converted into thermal energy.
- B) It is transferred to the walls of the container.
- C) The amount of energy lost is considered negligible.
- D) It causes the particles to eventually stop moving.

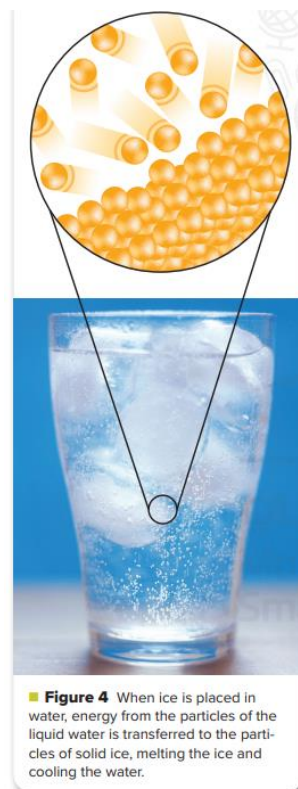


Figure 4 When ice is placed in water, energy from the particles of the liquid water is transferred to the particles of solid ice, melting the ice and cooling the water.

Which statement BEST explains why gases can be compressed easily?

- A) Gas particles have strong intermolecular forces
 - B) Gas particles are fixed in position
 - C) There are large spaces between gas particles
 - D) Gas particles have no kinetic energy
-

A substance changes from a solid to a liquid when heated. According to the kinetic molecular theory, what happens first?

- A) Intermolecular forces weaken as particle energy increases
- B) Particles stop vibrating
- C) Particles become smaller
- D) The mass of particles decreases

Why does water cool down when an ice cube is placed inside it according to Kinetic Molecular Theory?

- A. Because energy transfers from water molecules to ice particles, so the temperature of the water decreases.
 - B. Because energy transfers from ice particles to water molecules, so the temperature of the water decreases.
 - C. Because energy transfers from water to ice only after the temperature of the water is released.
 - D. Because energy transfers from ice to water, so the kinetic energy of ice particles increases.
-

Which of the following statements describes the reason for the melting of an ice cube according to Kinetic Molecular Theory?

- A. Because the particles of the ice cube gain enough kinetic energy to overcome the attractive forces.
 - B. Because the particles of the ice cube lose enough kinetic energy to overcome the attractive forces.
 - C. Because the particles of the ice cube gain enough potential energy to overcome the attractive forces.
 - D. Because the particles of the ice cube lose enough potential energy to overcome the attractive forces.
-

Q3: Which of the following statements describes the reason for the freezing of water according to Kinetic Molecular Theory?

- A. The temperature of the liquid substance decreases, so the average kinetic energy of the liquid particles decreases.
- B. The temperature of the liquid substance decreases, so the average kinetic energy of the liquid particles increases.
- C. The temperature of the liquid substance increases, so the average kinetic energy of the liquid particles decreases.
- D. The temperature of the liquid substance increases, so the average kinetic energy of the liquid particles increases.

4

SCI.4.4.01.083.01 Compare the states of matter in terms of volume, shape, intermolecular forces, and distances between particles.

Text book - student edition + figure 6

203

Q4: Compare the states of matter in terms of volume, shape, intermolecular forces, and distances between particles.

Evaporation Evaporation occurs at the surface of a liquid and can happen at nearly any temperature. To evaporate, particles must be at the liquid's surface and have enough kinetic energy to escape the attractive forces of the liquid.

Boiling Shown in Figure 5, boiling is the second way that a liquid can vaporize. Unlike evaporation, boiling occurs throughout a liquid at a specific temperature, depending on the pressure on the surface of the liquid.

The boiling point of a liquid is the temperature at which the pressure of the vapor in the liquid is equal to the external pressure acting on the surface of the liquid. This external pressure pushes down on the liquid, keeping particles from escaping. Particles require energy to overcome this pressure. The heat of vaporization is the amount of energy required for the liquid at its boiling point to become a gas.

Sublimation At certain pressures, some substances can change directly from solids into gases without going through the liquid phase. Sublimation is the process of a solid changing directly to a gas without forming a liquid. Figure 6 shows frozen carbon dioxide, also known as dry ice, which is a common substance that undergoes sublimation.



Figure 6 Carbon dioxide (CO_2) turns from a solid directly to a gas. Because this gas is very cold, it causes water in the air to condense, forming a white fog.

Explain, at the molecular level, the behavior of CO_2 as it undergoes this phase transition.

Which comparison of states of matter is CORRECT?

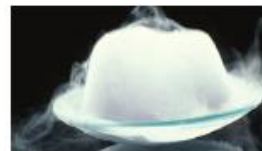
- A) Gases have fixed volume and strong intermolecular forces.
- B) Plasma has the strongest intermolecular forces and fixed shape.
- C) Liquids have particles that are very far apart and no fixed volume.
- D) Solids have closely packed particles and a definite shape.

Q1: What is the name of the process in which matter changes from the solid state to the gaseous state without passing through the liquid state?

- A. Sublimation B. Boiling C. Evaporation D. Freezing
-

Q2: Which of the following statements describes what happens to the substance in the picture?

- A. A sublimation process occurs, where solid carbon dioxide changes into gas.
B. An evaporation process occurs, where solid carbon dioxide changes into gas.
C. A boiling process occurs, where liquid carbon dioxide changes into gas.
D. A freezing process occurs, where gaseous carbon dioxide changes into solid.



Q3: What causes the thick white fog to form around dry carbon dioxide?

- A. Because of the extreme coldness of the gas produced from sublimation, water vapor in the air condenses.
B. Because of the extreme heat of the gas produced from sublimation, water vapor condenses.
C. Because of the high heat produced from sublimation, the water in the plate evaporates.
D. Because of the high heat produced from boiling, the water in the plate evaporates.
-

Q4: What is the difference between evaporation and boiling?

- A. Evaporation occurs at any temperature of the liquid, while boiling occurs at a specific temperature of the liquid.
B. Evaporation occurs in all particles of the liquid, while boiling occurs only in particles on the surface of the liquid.
C. Evaporation occurs at a specific temperature of the liquid, while boiling occurs at any temperature of the liquid.
D. In evaporation, particles do not need energy, while in boiling, particles need energy.
-

Q5: At what temperature does the vapor pressure of a liquid equal the external pressure acting on that liquid?

- A. Boiling point
B. Absolute zero
C. Melting point
D. Heat of fusion

4. What is the temperature when a solid begins to liquefy?

4. A solid begins to liquefy at its melting point.

5. What theory is used to explain the behavior of particles in gases?

The kinetic theory is used to explain the behavior of particles in gases.

7. At what temperature is the pressure of the vapor in a liquid equal to the external pressure on that liquid?

- A) absolute zero
- B) boiling point
- C) melting point
- D) heat of fusion

8. What is the most common state of matter in the universe?

- A) solid
- B) gas
- C) liquid
- D) plasma

9. What is the amount of energy needed to change a solid to a liquid at its melting point?

- A) heat of fusion
- B) temperature
- C) heat of vaporization
- D) absolute zero

1. In which state of matter would you expect to find water on Earth's surface if the temperature is -25°C ?

- A. solid
- B. liquid
- C. gas
- D. plasma

4. Which is unlikely to contain plasma?

- A. a star
- B. a lightning bolt
- C. a neon light
- D. a glass of water

5. Which describes the energy required for a liquid at its boiling point to become a gas?

- A. heat of vaporization
- B. diffusion
- C. heat of fusion
- D. thermal energy

6. In which state of matter do particles stay close together, yet can slide past each other?

- A. solid
- B. liquid
- C. gas
- D. plasma

Q5: Interpret heating and cooling curves and their phases.

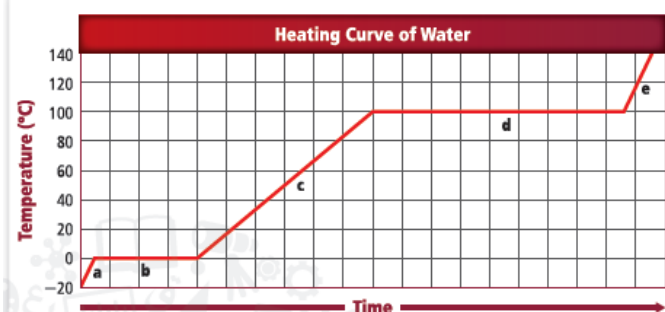


Figure 7 Although thermal energy is added at a constant rate, the temperature of the water only increases at A, C, and E. At B and D, the added energy is used to overcome the attractions between the particles.

Infer how this graph would be different if 2.0 kg of water were being heated instead of 1.0 kg of water. How would this graph be different if 0.5 kg of water were being heated?

Heating curves A graph of temperature v. time for heating of 1.0 kg of water is shown in **Figure 7**. This type of graph is called a heating curve. It shows how temperature changes over time as thermal energy is continuously added. Notice the two areas on the graph where the temperature does not change. At 0°C, ice is melting. All of the energy put into the ice at this temperature is used to overcome the attractive forces between the particles. The flat line on the graph indicates that temperature remains constant during melting.

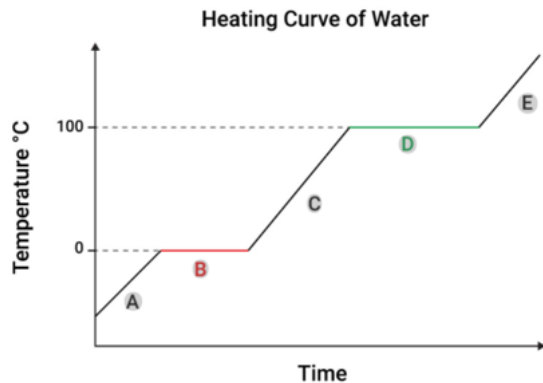
After the attractive forces are overcome, the particles move more freely and their temperature increases. At 100°C, water is boiling, the temperature remains constant again, and the graph is flat. All of the energy that is put into the water goes to overcoming the remaining attractive forces between the particles. When all of the attractive forces between the particles are overcome, the energy goes into increasing the temperature again.

■ Caption Question Figure 7

Regardless of the quantity of water, the shape of the graph would be basically the same, although the times would change. The amount of time required should be roughly twice as long for 2.0 kg of water and roughly half the time for 0.5 kg of water (assuming heat is added at a constant rate).

Heating Curve of Water

A substance, such as water, will not instantly change phases when it reaches its melting or boiling point. It takes energy to heat up water and it takes energy to cause it to change states.



Solid

A

Ice will remain a solid as heat is added until it reaches its melting point, 0°C.

Solid and Liquid

B

- Once ice is heated to its melting point, the energy added will go into changing the solid into a liquid.
- The temperature will not change until it is all liquid.

Liquid

C

Energy added to the liquid will cause the temperature of the liquid to rise until it reaches its boiling point, 100°C.

Liquid and Gas

D

- Once the water reaches its boiling point, the energy will go into changing it from a liquid to a gas.
- The temperature will remain the same.

Gas

E

Once all the liquid has been evaporated, the energy added will cause the temperature of the gas to increase.

Q1: Which letter in the adjacent graph represents water in the liquid state?

- A. c
- B. e
- C. b
- D. d

Q2: At which symbol in the adjacent graph does water boil?

- A. d
- B. e
- C. c
- D. d

Q3: What is the physical state of water at symbol (b)?

- A. Solid and liquid
- B. Solid only
- C. Liquid only
- D. Liquid and gas

Q4: What happens to the temperature when water is boiling?

- A. It remains constant.
 - B. It increases.
 - C. It decreases.
 - D. It increases, then decreases.
-

Q5: The temperature remains constant during the boiling of water, even with continued heating, because:

- A. All the energy added to the liquid is used to overcome the attractive forces between the liquid particles.
 - B. All the energy added to the solid is used to overcome the attractive forces between the solid particles.
 - C. All the energy added to the gas is used to overcome the attractive forces between the gas particles.
 - D. All the energy added to the liquid is used to overcome the attractive forces between the solid particles.
-

Q6: The temperature remains constant during the melting of ice, even with continued heating, because:

- A. All the energy added to the ice is used to overcome the attractive forces between the ice particles.
 - B. All the energy added to the ice is used to overcome the attractive forces between the liquid particles.
 - C. All the energy added to the liquid is used to overcome the attractive forces between the ice particles.
 - D. All the energy added to the liquid is used to overcome the attractive forces between the solid particles.
-

Q7: What changes will happen to the heating curve of water when the amount of water is increased to 2 kg instead of 1 kg?

- A. The time for both melting and boiling increases.
 - B. The time for both melting and boiling decreases.
 - C. The melting time increases and the boiling time decreases.
 - D. The melting time decreases and the boiling time increases.
-

Q8: What changes will happen to the heating curve of water when the amount of water is decreased to 0.5 kg instead of 1 kg?

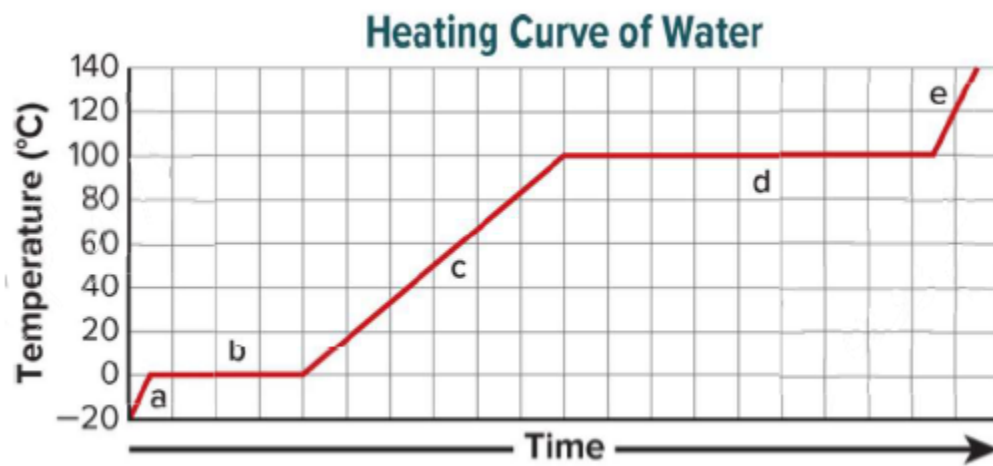
- A. The boiling time decreases.
 - B. The boiling time increases.
 - C. The melting time increases.
 - D. The graph remains the same.
-

Q9: In which state of matter would you expect to find water on Earth's surface if the temperature is -25°C ?

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

What happens to the kinetic energy of particles during the phase where temperature increases on a heating curve?

- A. Kinetic energy decreases.
- B. Kinetic energy remains the same.
- C. Kinetic energy increases.
- D. Kinetic energy changes randomly.



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

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

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

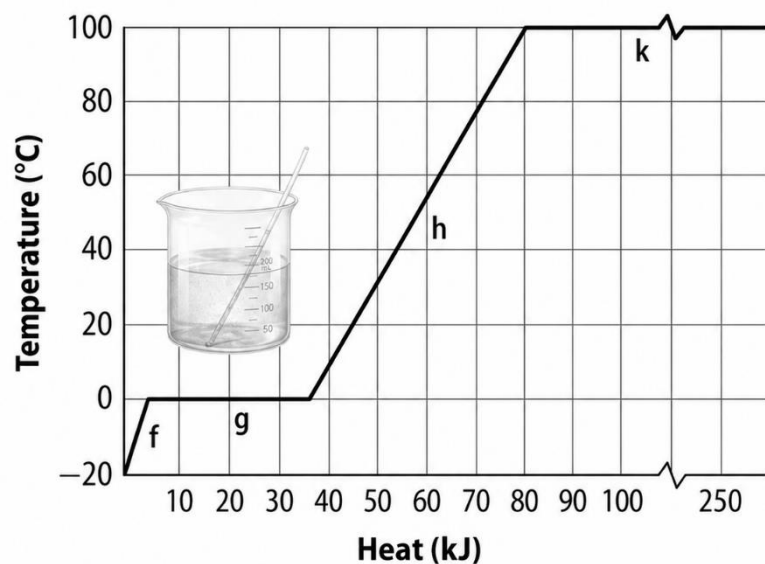
- A. a
 - B. b
 - C. c
 - D. d
-

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

- A. a
- B. b
- C. c
- D. e

On which points on the graph is water increasing in temperature?

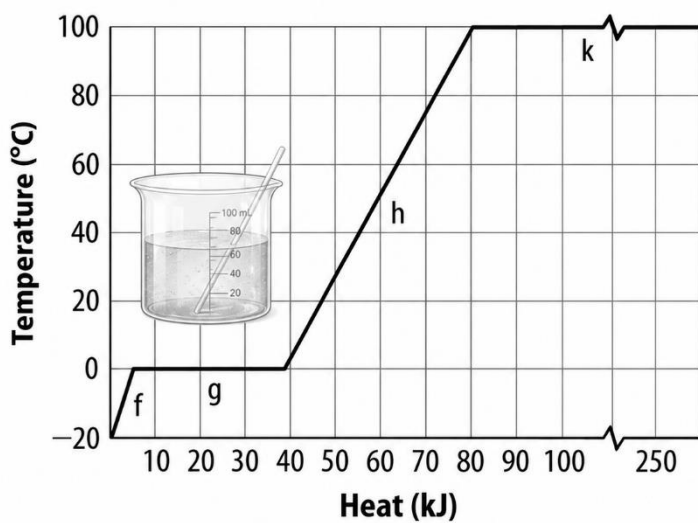
State Changes of Water



- ☐ A) F and G
- ☐ B) G and K
- ☐ C) F, G, H, and K
- ☐ D) F and H

On which points on the graph is the water changing state?

State Changes of Water



- ☐ A) F and G
- ☐ B) G and K
- ☐ C) F and H
- ☐ D) F, G, H, and K

Q6: Predict whether an object will float or sink in a fluid

1. Archimedes' Principle and Buoyancy

Buoyant Force

- A buoyant force is the upward force exerted by a fluid on an object.
- It opposes gravitational force (weight).



Figure 14 The overall density of a large ship is lower than the density of water because its empty hull contains mostly air.

Infer why a boat cannot be made of solid steel.

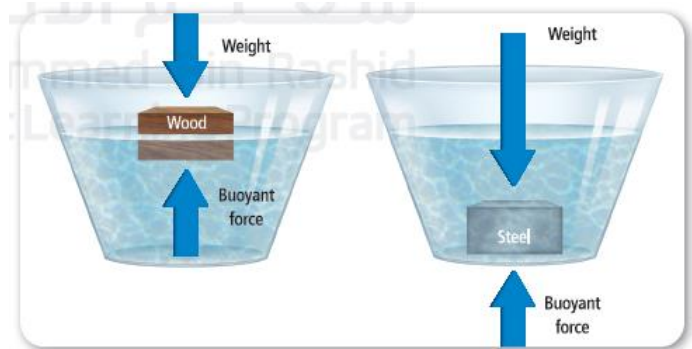
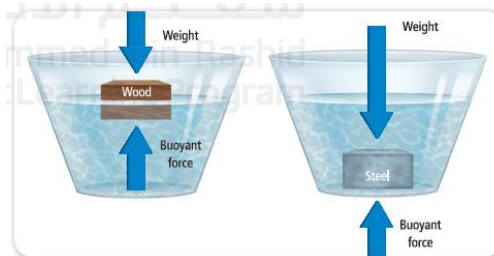


Figure 13 The steel block sinks because the buoyant force from the fluid is less than the gravitational force on the object. When the buoyant force is the same as or greater than the gravitational force—as with the wooden block—the object floats.

Compare the volumes of the wood block and the steel block. How do the masses of the wood block and the steel block compare?

Floating vs sinking



- If buoyant force = weight → object **floats**
- If buoyant force < weight → object **sinks**

Buoyancy

- The ability of a **fluid (liquid or gas)** to exert an upward force on an object immersed in it.

An object floats if: 1) The weight of displaced water (buoyant force) = the weight of the object 2) The density of the object is less than the density of the liquid	An object sinks if: 1) The weight of displaced water (buoyant force) is less than the weight of the object 2) The density of the object is greater than the density of the liquid
--	---

Buoyant Force: It is the upward push exerted by a fluid on an object immersed in it.

What force allows large ships to float despite their weight?

- A. Frictional force
 - B. Magnetic force
 - C. Buoyant force
 - D. Centripetal force
-

An object will float when:

- A. Its weight is greater than buoyant force
 - B. Its weight equals buoyant force
 - C. Its density is always greater than the fluid
 - D. Gravity is absent
-

Buoyancy is best defined as:

- A. Resistance to motion in solids
 - B. Upward force only in liquids
 - C. Ability of a fluid to exert downward force on an immersed object
 - D. Ability of a fluid to exert upward force on an immersed object
-

If the buoyant force is less than the object's weight, the object will:

- A. Float higher
- B. Remain suspended
- C. Sink
- D. Evaporate

Q1: A ship floats on seawater when:

- A. The density of the ship is less than the density of water.
 - B. The buoyant force is less than the weight of the ship.
 - C. The density of the ship is greater than the density of water.
 - D. The weight of the displaced liquid caused by the ship is less than the weight of the ship.
-

Q2: A piece of iron sinks in water because:

- A. The buoyant force is less than the weight of the piece of iron.
 - B. The buoyant force is greater than the weight of the piece of iron.
 - C. The density of the piece of iron is equal to the density of water.
 - D. The weight of the displaced water caused by the piece of iron is greater than the weight of the piece of iron.
-

Q3: A piece of an unknown material was placed on water, and the amount of displaced water was less than the weight of the piece. Which of the following statements is correct?

- A. The material will sink to the bottom of the water.
- B. The buoyant force will be less than the weight of the piece.
- C. The material will float on the surface of the water.
- D. It will sink at first, then return and float on the surface.

Q4: All of the following factors cause a ship to float on seawater, except:

- A. The buoyant force is less than the force of gravity.
 - B. The density of the ship is less than the density of water.
 - C. The buoyant force is greater than the weight of the ship.
 - D. The weight of the displaced liquid caused by the ship is equal to the weight of the ship.
-

Q5: If a piece of cork with a density of 0.24 g/cm^3 and a piece of iron with a density of 7.8 g/cm^3 are placed in water with a density of 1 g/cm^3 , what will happen?

- A. The cork will float and the iron will sink.
 - B. Both will float.
 - C. Both will sink.
 - D. The cork will sink and the iron will float.
-

Q6: What force is represented by the upward arrow in the diagram below?

- A. Pressure
- B. Density
- C. Buoyant force
- D. Gravitational force



Q7: When does a wooden block placed in water stop sinking and begin to float, according to Archimedes' principle?

- A. When it reaches the very bottom of the beaker.
- B. When the weight of the water displaced equals the block's weight.
- C. When all the water in the container evaporates.
- D. When the buoyant force becomes exactly zero.

Q8: If a wood block and a steel block displace the same volume and weight of water when submerged, how do the buoyant forces acting on them compare?

- A. The buoyant force on the steel block is much greater.
- B. The buoyant force on the wood block is much greater.
- C. The buoyant forces on both blocks are equal.
- D. There is no buoyant force acting on either block.

7	SCL4.1.02.047.03 Calculate pressure in pascals (Pa).	Text book - student edition + example 1 + applications	
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Q7: Calculate pressure in pascals (Pa).

Pressure

Right now, pressure from the air is pushing on you from all sides, like the pressure you feel underwater in a swimming pool. **Pressure** is force exerted per unit area.

Pressure Equation

$$\text{Pressure (Pa)} = \frac{\text{force (N)}}{\text{area (m}^2\text{)}}$$

$$P = \frac{F}{A}$$

The SI unit of pressure is the pascal (Pa). Because pressure is the amount of force divided by area, one pascal is one newton per square meter (N/m²). Most pressures are given in kilopascals (kPa) because 1 Pa is a very small amount of pressure.



Calculate

The force of water on a **swimmer** at a depth of **15.0 meters** is **360,000 N**. The surface area of the swimmer is **1.50 m²**.

Calculate the pressure of the water, in kilopascals, at that depth.

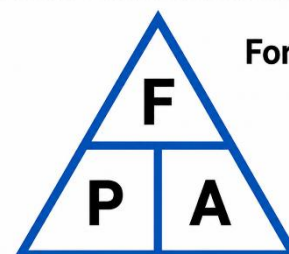
$$P = \frac{F}{A} = \frac{360000}{1.50} = 240,000 \text{ Pa}$$

$$\text{kPa} = \frac{240,000}{1000} = 240 \text{ kPa}$$



Scientific Summary:

Pressure is the force acting perpendicular to a unit area, and it is measured in pascals (Pa). It is expressed mathematically by the relation: $P = F / A$. Pressure increases when the force increases or the area decreases.



Formula Triangle

Force = F

Pressure = P

Area = A

EXAMPLE 1

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 kPa = 101,000 Pa**

area: **A = 1.80 m²**

Set Up the Problem:

$$P = \frac{F}{A}$$

Solve the Problem:

$$101,000 \text{ Pa} = \frac{F}{1.80 \text{ m}^2}$$

$$F = 101,000 \text{ Pa} \times 1.80 \text{ m}^2$$

$$= 182,000 \text{ Pa} \cdot \text{m}^2 = 182,000 \frac{\text{N}}{\text{m}^2} \cdot \text{m}^2 = 182,000 \text{ N}$$

Pressure is defined as:

- A. Force $\times$ area
 - B. Force $\div$ area
 - C. Area $\div$ force
 - D. Mass $\times$ volume
-

The SI unit of **pressure** is:

- A. Newton
 - B. Joule
 - C. Pascal (Pa)
 - D. Watt
-

One **pascal** is equal to:

- A. 1 N
 - B. 1 N/m²
 - C. 1 m²/N
 - D. 1 kg/m³
-

A diver underwater experiences a pressure of **202 kPa** over a surface area of **1.50 m²**.
Approximately how much **force** acts on the diver?

- A. 135 N
- B. 303 N
- C. 303,000 N
- D. 202 N

Q A car weighs **15,000 N** and the tire pressure is **190 kPa**.
What is the total contact area of the tires with the road?



A 0.079 m²

B 7.9 m² ✓

C 79 m²

D 0.79 m²

Remember:

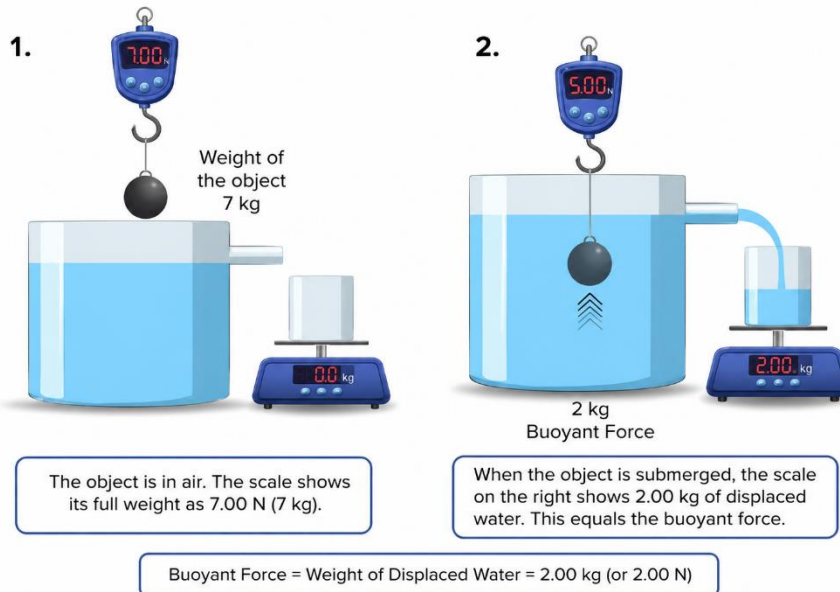
Pressure = $\frac{\text{Force}}{\text{Area}}$

Text book - student edition + example 3 , 5 + applications

Q8: Identify applications of Archimedes', Pascal's, and Bernoulli's principles

Archimedes' Principle

The buoyant force on an object is equal to the weight of the fluid displaced by the object.



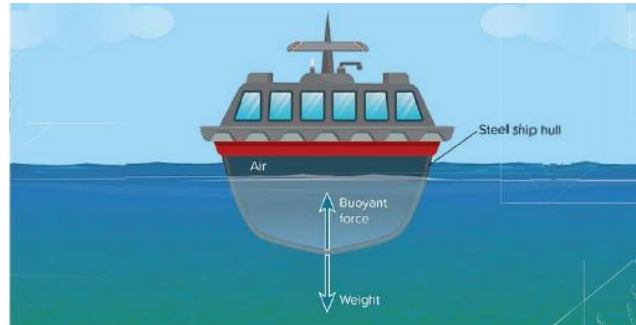
Key Cases

- **Object floats:** Weight of displaced fluid = weight of object
- **Object sinks:** Weight of displaced fluid < weight of object

Example (Wood vs Steel Block)

- Both blocks:
 - Displace **same volume of water**
 - Experience **equal buoyant force**
- Difference:
 - **Steel block:** greater weight → sinks
 - **Wood block:** smaller weight → floats

Density and buoyancy



Density Rule

- Object **floats** if:

density of object < density of fluid

- Object **sinks** if:

density of object > density of fluid

Important Concept

- Density = mass ÷ volume

Ship Example

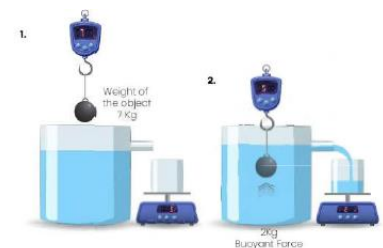
- A steel ship floats because:
 - It is shaped like a hollow hull filled with air.
 - This increases volume.
 - This decreases overall density.

Therefore:

Overall density of ship < density of water → floats

According to Archimedes' principle, buoyant force equals:

- A. Weight of object
- B. Volume of object
- C. Weight of displaced fluid
- D. Density of object



A wooden block sinks initially but then floats because:

- A. Its mass decreases
 - B. Its volume decreases
 - C. Displaced fluid weight equals its weight
 - D. Gravity stops acting
-

A steel block sinks while a wood block floats mainly because:

- A. Steel has greater weight than buoyant force
 - B. Steel has less volume
 - C. Wood has greater mass
 - D. Wood displaces less fluid
-

Density is defined as:

- A. Weight per unit area
 - B. Mass per unit volume
 - C. Force per unit volume
 - D. Volume per unit mass
-

An object floats if its density is:

- A. Equal to fluid density
- B. Greater than fluid density
- C. Less than fluid density
- D. Independent of fluid density

Pascal's Principle

Statement

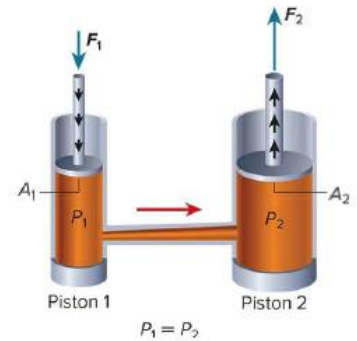
- Pressure applied to a fluid is **transmitted equally throughout the fluid**.

Equation Form

- Pressure in = Pressure out

Mathematical Form

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



A hydraulic brake system applies a force of **50 N** on a master cylinder of area **0.001 m²**. If the brake cylinder at the wheel has an area of **0.005 m²**, **find the force** exerted on the brake shoe.

$$\begin{aligned} \frac{F_1}{A_1} &= \frac{F_2}{A_2} \\ \frac{50}{0.001} &= \frac{F_2}{0.005} \\ F_2 &= \frac{50 \times 0.005}{0.001} \\ &= 250 \text{ N} \end{aligned}$$

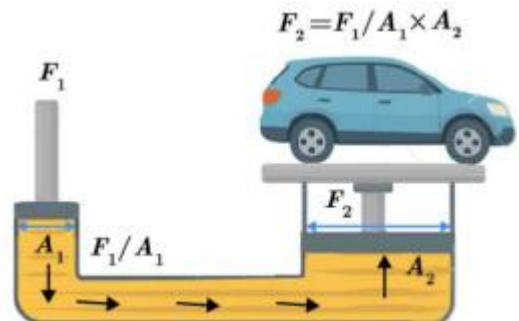
Hydraulic Lifts

- Used in auto repair shops

How It Works

- Small force applied on small area →
- Transmitted through fluid → **Produces large force on large area**

Result: You can lift **heavy loads** with **small effort**.



Q What is the right formula used in Hydraulic Lifts based on **Pascal's Principle**?

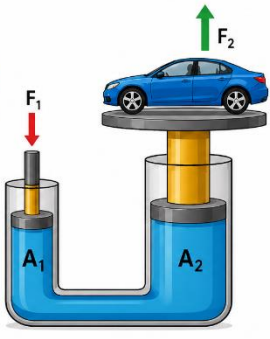
A $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

B $F_1 \times A_1 = F_2 \times A_2$

C $F_1 + F_2 = A_1 + A_2$

D $\frac{A_1}{A_2} = \frac{F_1}{F_2}$

Remember: Pressure = $\frac{\text{Force}}{\text{Area}}$



EXAMPLE 2

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

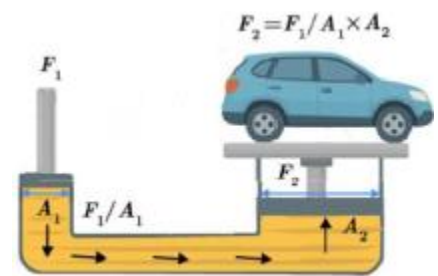
Set Up the Problem: $\frac{F_{\text{in}}}{A_{\text{in}}} = \frac{F_{\text{out}}}{A_{\text{out}}}$

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

Check the Answer: The ratio of the forces should be the same as the ratio of the areas. The area of the platform is about 40 times the area of the piston. Therefore, the force on the platform should be about 40 times the force on the piston. $3,700 \text{ N}$ is about 40 times greater than 95 N , so the answer is reasonable.

Pascal's principle states that pressure applied to a fluid is:

- A. Lost in the fluid
- B. Transmitted equally throughout the fluid
- C. Increased at the source
- D. Only transmitted downward



In **Pascal's principle**, pressure in equals:

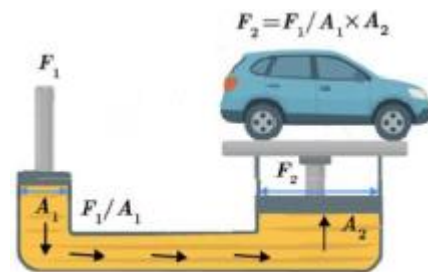
- A. Force out
- B. Area out
- C. Pressure out
- D. Density out

A small force can lift a large load in a hydraulic lift because:

- A. Pressure decreases
- B. Area decreases on output side
- C. Gravity decreases
- D. Area increases on output side

In a hydraulic system, if output area is larger, the output force is:

- A. Smaller
- B. Equal
- C. Larger
- D. Zero



9	
	SCL4.1.02.047.02 Describe Bernoulli's principle.

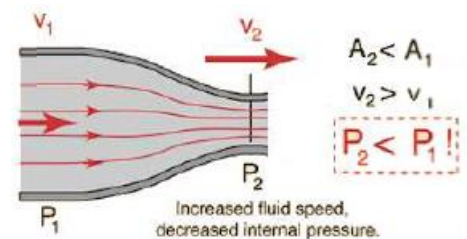


Q9: Describe Bernoulli's principle.

When fluid velocity increases, pressure decreases.

Important Observations

- Fluid flows faster when:
 - The path is restricted
- Example:
 - Covering the end of a hose → water flows faster



Key Relationship

- High velocity $\rightarrow$ Low pressure
- Low velocity $\rightarrow$ High pressure



Application: Hose-End Sprayer

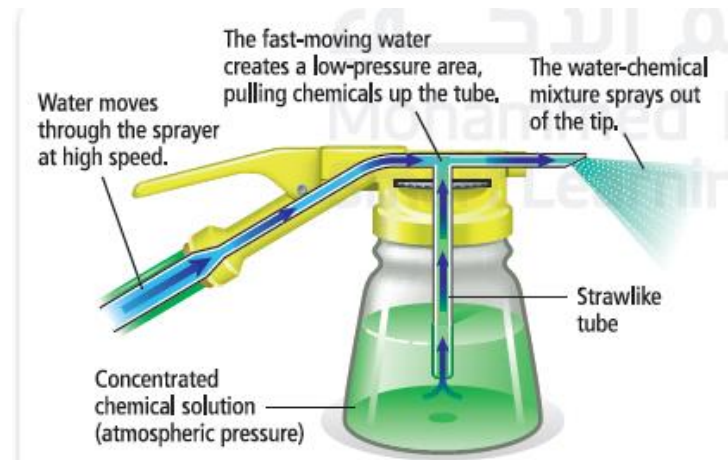
Used for:

o Fertilizers

o Pesticides

How It Works

1. Water flows at high speed.
2. Creates low pressure area.
3. Chemical solution is:
 - o Pulled up through a tube
4. It mixes with water $\rightarrow$ forms spray.



Restricting fluid flow (like covering a hose) causes:

- A. Increase in velocity
- B. Decrease in velocity
- C. Same velocity
- D. Increase in pressure

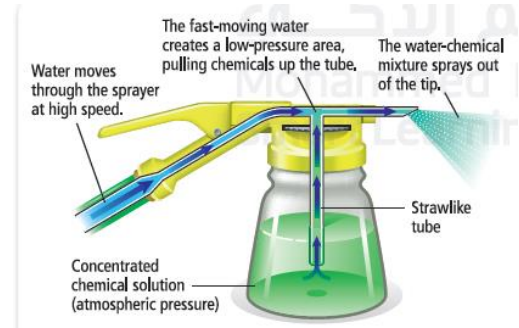


A fast-moving fluid region has:

- A. High pressure
- B. Low pressure
- C. Zero pressure
- D. Constant pressure

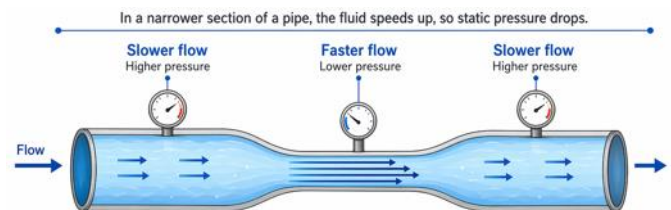
In a hose-end sprayer, chemicals rise into the water stream because:

- A. High pressure pulls them
- B. Low pressure region forms above the tube
- C. Gravity pushes them up
- D. Density increases



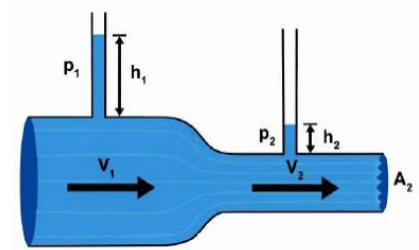
Which statement is TRUE about the fluid in the narrow section of the pipe?

- A) The pressure is higher and the speed is lower
- B) The pressure is lower and the speed is higher
- C) Both pressure and speed decrease
- D) Both pressure and speed increase



Based on the diagram, which comparison is correct?

- A) $A_1 < A_2$ and $v_1 > v_2$
- B) $p_1 < p_2$ because the fluid slows down
- C) $h_1 > h_2$, showing pressure at point 1 is greater than at point 2
- D) The fluid velocity is the same throughout the pipe

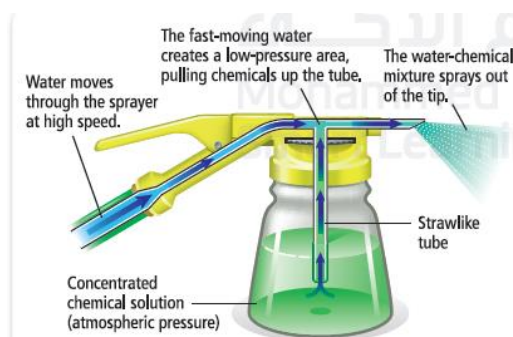


Which of these uses **Pascal's principle**?

- A) aerodynamic
- B) buoyancy
- C) a hydraulic lift
- D) a hose-end sprayer

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) Heating a pot of water on a stove

10. Differentiate, using examples, between extensive and intensive properties

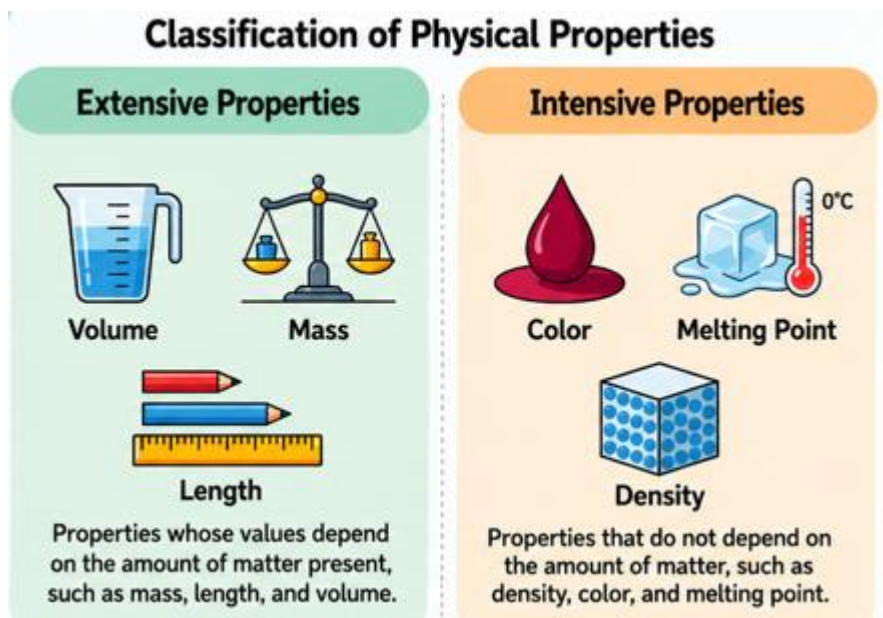
Text book - student edition + example 1 + applications



Types of Physical Properties

Type	Depends on Amount?	Examples	Use
Extensive	Yes	Mass, volume, length	Measuring quantity
Intensive	No	Density, odor, color	Identifying substances

♠ Important Concept



Intensive properties help identify substances

- Example: Spices identified by scent



Which property can identify a substance regardless of sample size?

- A) Mass B) Volume C) Density D) Length
-

Which is an **extensive property**?

- A) Density B) Odor C) Volume D) Boiling point
-

Which property remains the same even if the amount of substance changes?

- A) Mass B) Length C) Volume D) Density
-

Spices can be identified by scent because scent is:

- A) Extensive
B) Chemical
C) Intensive
D) Variable



Text book - student edition + table2

11. Define a chemical property of matter while listing some examples

A chemical property is:

The ability or inability of a substance to change into one or more new substances

Observing Properties of Matter

- Example: Copper

Properties of Copper

Physical Properties

- reddish-brown, shiny
- easily shaped into sheets (malleable) and drawn into wires (ductile)
- a good conductor of heat and electricity
- density = 8.96 g/cm³
- melting point = 1085°C
- boiling point = 2562°C

Chemical Properties

- forms green copper carbonate when in contact with moist air
- reacts with nitric acid and sulfuric acid, forming new substances
- one type of compound forms a deep-blue solution when in contact with ammonia

Copper is an important metal with many uses in everyday life and in different industries.

Which of the following best defines **a chemical property** of matter?

- A. A characteristic that can be observed without changing the substance
- B. The mass and volume of a substance
- C. The size and shape of a substance
- D. A characteristic that describes how a substance changes into a new substance

Which of the following is **NOT** a chemical property?

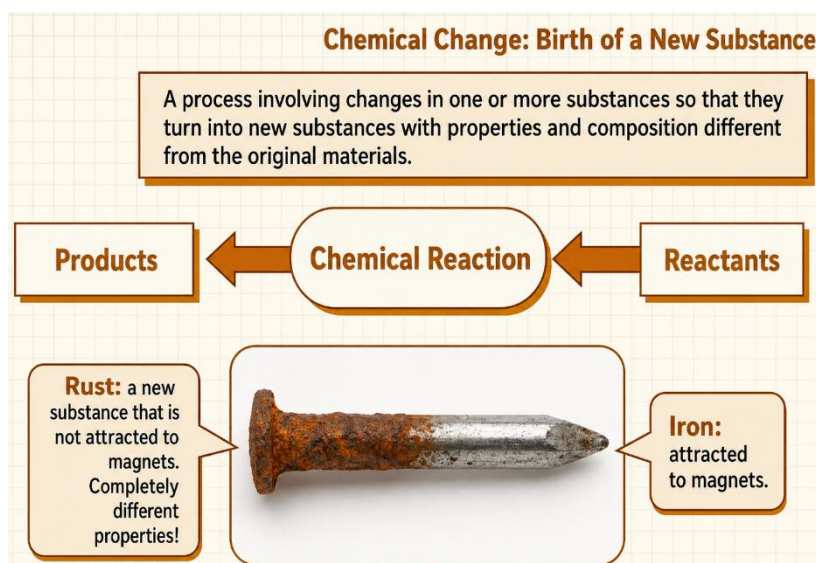
- A. Flammability of gasoline
- B. Ability of iron to rust
- C. Reactivity of sodium with water
- D. Melting point of ice

A student says, “Chemical properties can only be observed when the substance undergoes **a chemical change.**” Which example correctly supports this statement?

- A. Water freezing into ice
- B. Copper conducting electricity
- C. Wood burning and producing ash
- D. Sugar dissolving in water

12. Define a chemical change while listing some examples

Text book - student edition + figure 9



◆ Key Terms

- **Reactants** → Starting substances
- **Products** → New substances formed

◆ **Examples:** Rusting of iron - Burning - Food rotting

◆ Indicators of Chemical Change

✓ Formation of new substance

✓ Change in color

✓ Gas production

✓ Formation of solid (precipitate)

✓ Energy change (heat/light)

◆ Example: Rusting

- **Reactants:** Iron + Oxygen
- **Product:** Rust (iron oxide)

👉 **Rust:**

• Different color (brown-orange)

• Not magnetic (unlike iron)

🍎 Example: Food Spoilage

◆ What Happens?

- Food undergoes **chemical reactions**

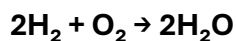
◆ Changes Observed

- Taste changes
- Smell changes
- Digestibility changes



👉 Indicates **new substances formed**

In the chemical reaction shown below, how do you classify hydrogen and oxygen?



- a) products
- b) reactants
- c) physical changes
- d) chemical properties

Which observation best indicates a chemical change has occurred?

- A. A solid melts into a liquid
- B. A gas condenses into liquid droplets
- C. A substance changes color and forms a new solid
- D. A liquid evaporates

In the rusting of iron, which are the **reactants?**

- A. Rust only
 - B. Iron only
 - C. Iron and oxygen
 - D. Oxygen and rust
-

Which statement best explains why rusting is a **chemical change?**

- A. It produces a substance with different properties
 - B. It changes the shape of iron
 - C. It involves a phase change
 - D. It is reversible
-

Which statement best defines a **chemical change?**

- A. A change that only affects the size or shape of a substance
- B. A change in which no new substance is formed
- C. A change that produces one or more new substances with different properties
- D. A change that can always be reversed easily

Which of the following is the best example of a chemical change?

- A. Breaking glass into smaller pieces
- B. Melting candle wax
- C. Dissolving sugar in water
- D. Burning paper into ash and smoke

1 Which observation is the **BEST** evidence that a chemical change has occurred?

- A**
- Ice melting into water



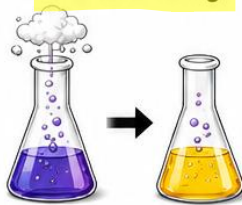
Physical change –
no new substance.

- B**
- Sugar dissolving in tea



Physical change –
no new substance.

- C**
- Formation of a gas and color change



Chemical change –
new substance formed.

- D**
- Cutting paper into pieces



Physical change –
no new substance.

2 Which of the following may indicate that a chemical reaction has taken place?

- A**
- Change in shape only



Physical change.

- B**
- Change in size only



Physical change.

- C**
- Production of heat or light



May indicate a chemical
reaction has occurred.

- D**
- Breaking glass



Physical change.

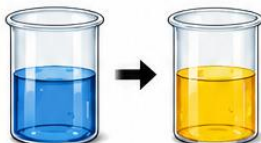
3 All of the following are indicators of a chemical change **EXCEPT**:

- A**
- Production of gas



Indicator

- B**
- Color change



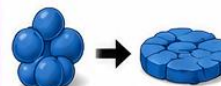
Indicator

- C**
- Formation of a precipitate



Indicator

- D**
- Change in shape



Not an indicator
(physical change)

4 All of the following may provide evidence that a chemical reaction occurred **EXCEPT**:

- A**
- Release of heat or light



Evidence

- B**
- Formation of bubbles



Evidence

- C**
- Change in odor



Evidence

- D**
- Melting of ice



Not evidence
(physical change)

**KEY IDEA:**

Chemical changes produce new substances and often show clues like gas, color change, precipitate, heat, light, or odor.



The law of conservation of mass states:

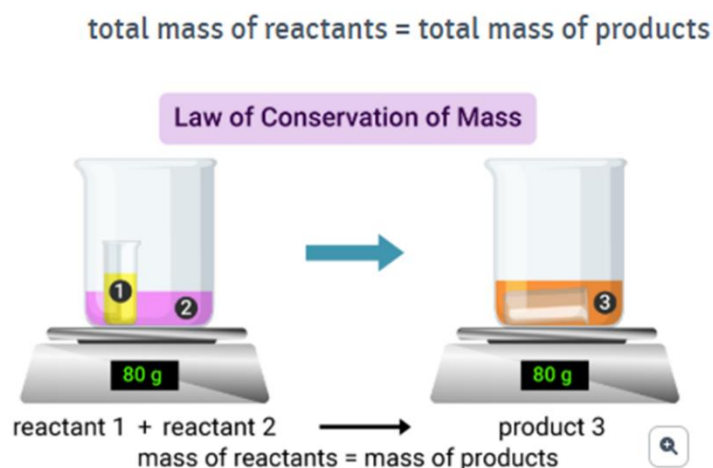
👉 **Mass is neither created nor destroyed during a chemical reaction**

◆ **Key Equation**

Mass of reactants = Mass of products

◆ **Important Points**

- Total mass remains **constant**
- Applies to **all chemical reactions**



The **law of conservation of mass** states that during a chemical reaction:

- A) Mass can be created but not destroyed
- B) Mass can be destroyed but not created
- C) Mass is neither created nor destroyed
- D) Mass always increases

According to the law of conservation of mass, which of the following is **TRUE**?

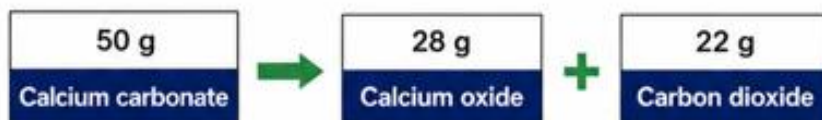
- A) The mass of products is always greater than the mass of reactants
- B) The total mass of reactants equals the total mass of products
- C) Mass is lost as energy in all reactions
- D) Mass changes depending on the type of chemical reaction

15. Apply the Law of conservation of mass

Text book - student edition + example 1 + applications

234

Example 1:



$$50 \text{ g} = 28 \text{ g} + 22 \text{ g} \rightarrow \text{Mass of calcium carbonate} = 50 \text{ g}$$

Example 2:



$$48 \text{ g} + 32 \text{ g} = 80 \text{ g} \rightarrow \text{Mass of oxygen} = 32 \text{ g}$$

Aluminum and Liquid Bromine Reaction

Substance	Before Reaction (g)	After Reaction (g)
Aluminum	10.3	0.0
Liquid bromine	100.0	8.5
Compound	0.0	?

Apply the Law of Conservation of Mass

Total mass before reaction
= 10.3 g + 100.0 g + 0.0 g
= 110.3 g

Total mass after reaction
= 0.0 g + 8.5 g + ?
= 110.3 g

So, ? = 110.3 – 8.5 = **101.8 g**

Option	Mass of bromine reacted (g)	Mass of compound formed (g)
A	91.5	101.8
B	8.5	101.8
C	91.5	108.5
D	100.0	101.8

Correct answer: Option B

Only option B shows 8.5 g of bromine reacted (which matches the amount left: 100.0 – 8.5 = 91.5 g consumed) and 101.8 g of compound formed, which satisfies the Law of Conservation of Mass.

From a laboratory process designed to separate water into hydrogen and oxygen gas, a student collected **10.0 g of hydrogen** and **79.4 g of oxygen**. How much water was originally involved in the process?

- A) 69.4 g
- B) 89.4 g
- C) 79.4 g
- D) 10.0 g

Apply the Law of Conservation of Mass:

$$\begin{aligned}\text{Mass of water} &= \text{mass of hydrogen} + \text{mass of oxygen} \\ &= 10.0 \text{ g} + 79.4 \text{ g} \\ &= 89.4 \text{ g}\end{aligned}$$

Answer: B) 89.4 g

A student carefully placed **15.6 g of sodium** in a reactor supplied with an **excess** quantity of **chlorine gas**. When the reaction was complete, the student obtained **39.7 g of sodium chloride**. Calculate **how many grams of chlorine gas reacted**.
How many grams of sodium reacted?

Use the Law of Conservation of Mass:

Sodium (s) + Chlorine (g) → Sodium chloride (s)

Mass of reactants = Mass of product

Mass of sodium + Mass of chlorine = 39.7 g

15.6 g + Mass of chlorine = 39.7 g

Mass of chlorine = 39.7 g – 15.6 g
= 24.1 g

Mass of sodium reacted = **15.6 g**

Chlorine gas reacted = 24.1 g

Sodium reacted = 15.6 g

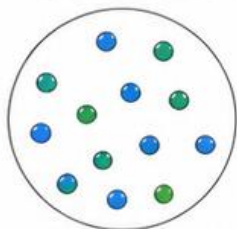
	Mass of chlorine (g)	Mass of sodium (g)
A	24.1	15.6
B	15.6	24.1
C	39.7	15.6
D	24.1	24.1

Answer: B) 15.6 g of chlorine gas reacted and 15.6 g of sodium reacted.

16. Classify, using a particulate diagram and examples, a mixture into homogenous and heterogeneous

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1 Classify the mixture shown in the particulate diagram.



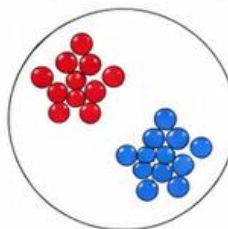
Example: Salt water

- A** Homogeneous
- B** Heterogeneous
- C** Pure Substance
- D** Compound

Answer: A Homogeneous

Particles are evenly distributed throughout.

2 Classify the mixture shown in the particulate diagram.



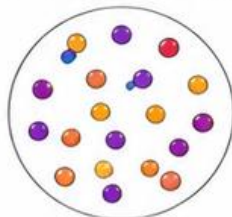
Example: Salad

- A** Homogeneous
- B** Heterogeneous
- C** Pure Substance
- D** Compound

Answer: B Heterogeneous

Particles are in separate groups; not evenly distributed.

3 Classify the mixture shown in the particulate diagram.



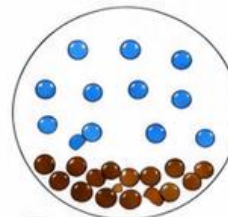
Example: Tea (without leaves)

- A** Homogeneous
- B** Heterogeneous
- C** Pure Substance
- D** Compound

Answer: A Homogeneous

Different particles are evenly distributed.

4 Classify the mixture shown in the particulate diagram.



Example: Sand and water

- A** Homogeneous
- B** Heterogeneous
- C** Pure Substance
- D** Compound

Answer: B Heterogeneous

Particles are in different phases (layers).

1 Which of the following is a **Heterogeneous** mixture?

A



Oil with herbs

Small herb pieces are not evenly distributed.
(Heterogeneous)

B



Tooth cavity

Different parts (tooth, decay, etc.) are clearly separate.
(Heterogeneous)

C



Salt water

Salt is dissolved evenly in water.
(Homogeneous)

D



Chocolate milk

Cocoa, milk, and sugar are mixed evenly.
(Homogeneous)

Answer: B Tooth cavity

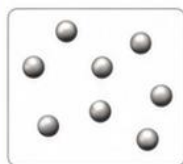
It has visibly different parts and is not uniform throughout.

PURE SUBSTANCE

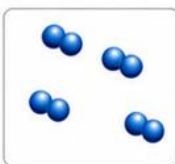
A pure substance has only one type of particle throughout. It can be an **element** or a **compound**.

ELEMENT

Made of only one type of atom.



Example: Iron (Fe)



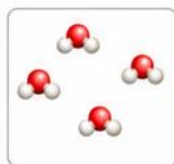
Example: Oxygen (O₂)



Example: Gold (Au)

COMPOUND

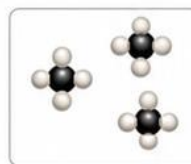
Made of two or more different atoms chemically bonded together.



Example: Water (H₂O)



Example: Carbon
Dioxide (CO₂)



Example: Methane
(CH₄)

17. Classify, using a particulate diagram and examples, a pure substance into element and compound

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Which classification correctly describes matter?

A. Mixtures only

B. Pure substances only

C. Elements, compounds, and mixtures

D. Solutions and compounds only

MCQ

Which of the following is NOT a pure substance?

A.



Copper pot—solid

B.



Mercury switch—liquid

C.



Helium balloon—gas

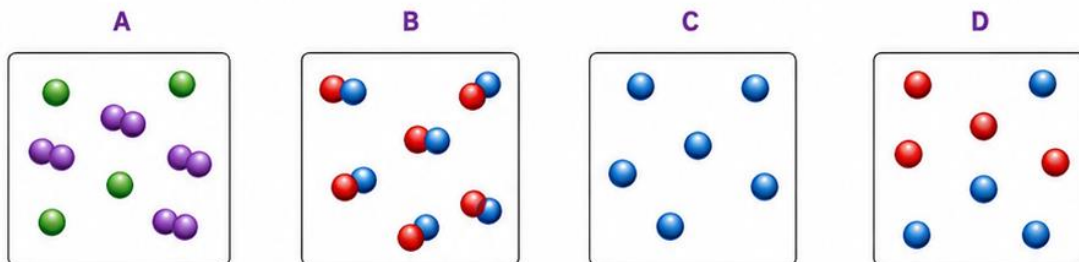
D.



Milk—liquid

MCQ 1

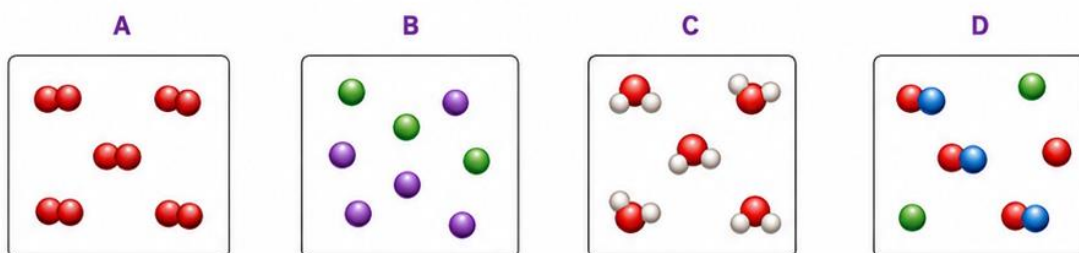
Which diagram represents a pure compound?



- A. A
B. B
C. C
D. D

MCQ 2

Which diagram represents a mixture?

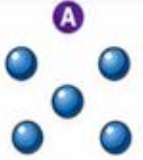


- A. A
B. B
C. C
D. D

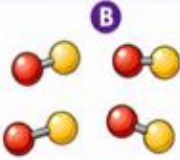
1. Which of the following is an example of a mixture? ☐ A hydrogen peroxide ☐ B rust ☐ C air ☐ D table salt	2. What is true of a mixture? ☐ A It can only be separated by chemical means. ☐ B It may be a solution. ☐ C It may be heterogeneous but not homogeneous. ☐ D It may be homogeneous but not heterogeneous.
3. An alloy is which of the following? ☐ A solid-solid solution ☐ B heterogeneous mixture ☐ C homogeneous mixture but not a solution ☐ D compound	4. Which of the following is <u>not</u> a solution? ☐ A gasoline ☐ B steel ☐ C baking soda ☐ D lemonade

Picture Study

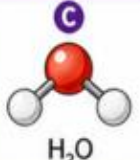
A



B



C

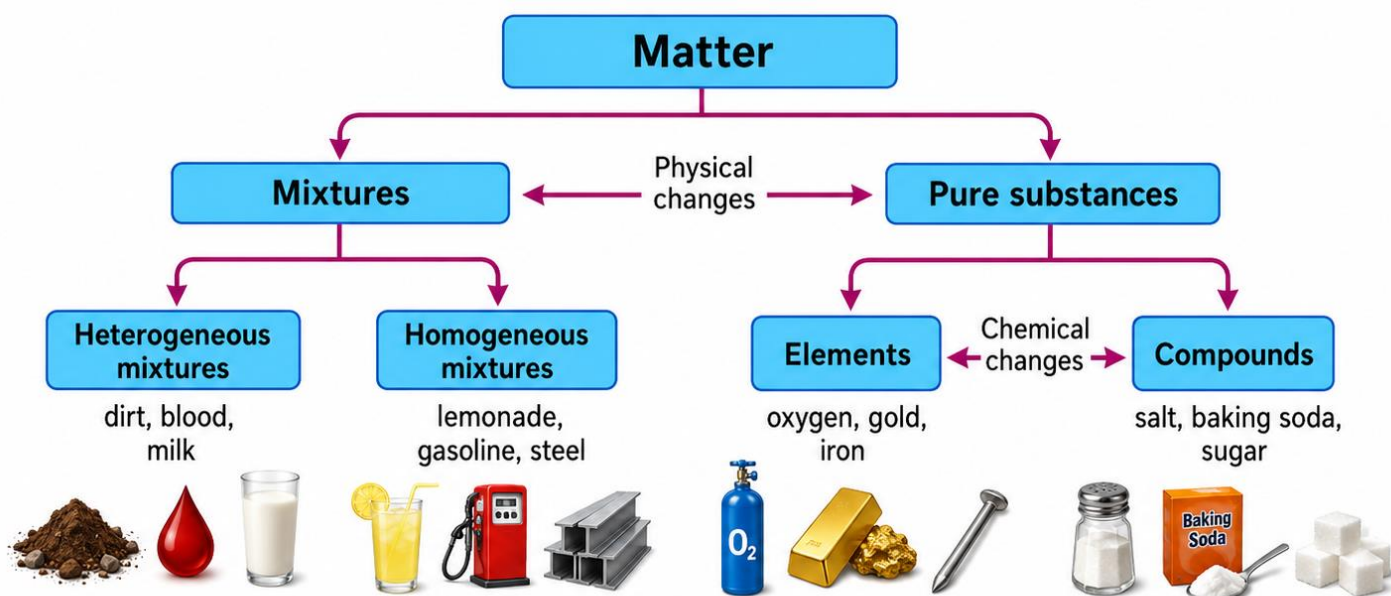


H₂O

1. Which diagram shows an element? _____

2. Which diagram shows a compound? _____

★ Think like a scientist! ★



Matter can be classified into different categories that have defined properties.

Multiple-Choice Questions

1 Which of the following is a homogeneous mixture?

- ☐ A blood
- ☐ B dirt
- ☐ C lemonade
- ☐ D oxygen

2 Which of the following is a pure substance?

- ☐ A gasoline
- ☐ B sugar
- ☐ C milk
- ☐ D steel

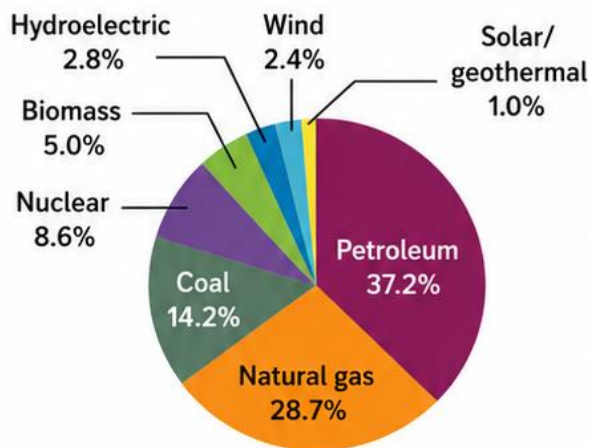
3 Matter can be classified into which two main categories?

- ☐ A Elements and compounds
- ☐ B Solids and liquids
- ☐ C Mixtures and pure substances
- ☐ D Atoms and molecules

18. Identify the energy resources used in daily life

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U.S. Energy Consumption by Source



Which conclusion **BEST** explains why one energy source dominates the chart?

A	Coal is most used because it is the cleanest fuel
B	Petroleum is most used because it provides the largest percentage of energy
C	Natural gas is most used because it is renewable
D	Nuclear energy is most used because it produces no pollution

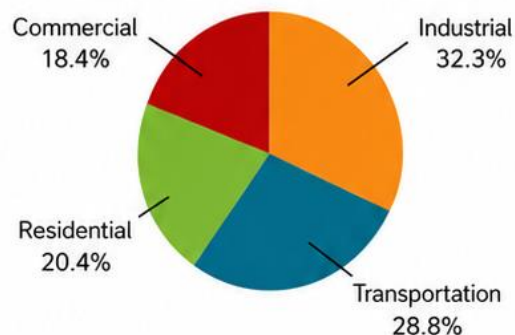
Which statement is **MOST** accurate based on the chart?

A	Coal and nuclear together supply more energy than natural gas
B	Renewable sources together supply more energy than coal
C	Petroleum alone supplies more energy than coal and nuclear combined
D	Natural gas supplies more energy than petroleum

Which of the following comparisons is **CORRECT** based on the chart?

A	Residential and commercial together use less energy than transportation
B	Industrial use is less than the combined total of residential and commercial
C	Transportation uses more energy than industrial
D	Commercial use is greater than residential use

U.S. Energy Consumption by Sector



19. Describe the process of fossil fuel formation.



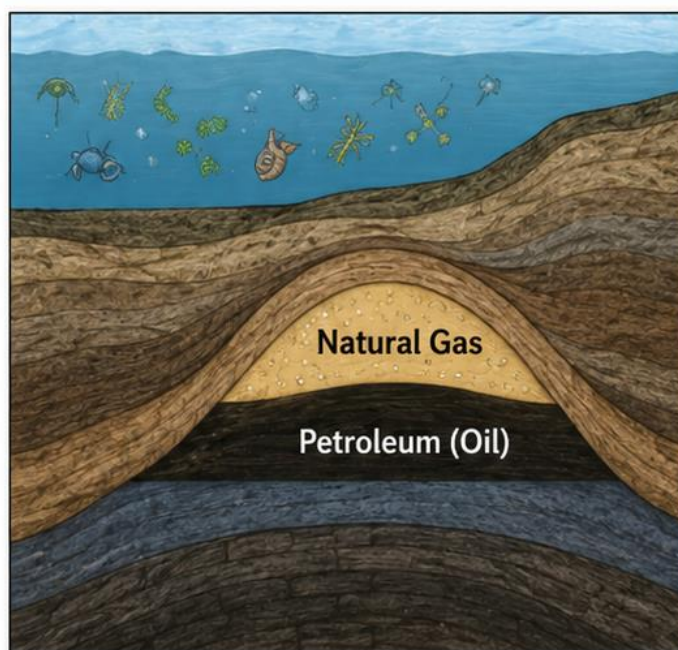
Coal Formation

Step	Process
1	Plants in swamps die
2	Buried under sediments
3	Form peat
4	Heat + pressure
5	Become coal



Petroleum & Natural Gas Formation

Step	Process
1	Marine organisms (plankton, algae) die
2	Buried in seafloor
3	Heat + pressure
4	Form petroleum
5	Natural gas forms above oil (less dense)



Fossil fuels are formed from:

A	Rocks only	B	Water and minerals
C	Ancient plants and animals	D	Air and dust

Why is natural gas usually found ABOVE petroleum deposits underground?

A	It has a higher boiling point than petroleum
B	It is less dense and rises above petroleum
C	It forms later than petroleum
D	It is solid under the seafloor

What is the CORRECT sequence for the formation of coal?

A	Plant material → peat → coal
B	Coal → peat → plant material
C	Peat → coal → plant material
D	Plant material → coal → peat

20. Identify renewable and non-renewable resources, explaining the reason for the need to maintain the sustainability of these resources such as water, coal, natural gas, wind, sun, oil, etc.

Which of the following is a renewable resource?

A	Coal
B	Oil
C	Wind
D	Natural gas

Why is it important to maintain the sustainability of natural resources?

A	To prevent exhaustion of non-renewable resources
B	Because resources can never be replaced
C	Because renewable resources cannot be used
D	To increase pollution

Which of the following is a **non-renewable resource?**

A	Sun
B	Water
C	Oil
D	Wind

Which statement explains why **renewable resources are preferred over non-renewable resources?**

A	Renewable resources can be replaced naturally and are less likely to run out
B	Non-renewable resources are always free
C	Renewable resources are limited and cannot be used
D	Non-renewable resources do not pollute

Which combination correctly classifies the resources?

A	Coal – Renewable, Sun – Non-renewable
B	Natural gas – Non-renewable, Wind – Renewable
C	Oil – Renewable, Water – Non-renewable
D	Sun – Non-renewable, Coal – Renewable

21. List the different renewable energy resources.

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The main renewable energy resources:

1.		Solar Energy – Energy from the Sun, captured using solar panels or solar thermal systems.
2.		Wind Energy – Energy generated by wind turbines.
3.		Hydropower – Energy from flowing or falling water, such as rivers or dams.
4.		Biomass Energy – Energy produced from organic matter, such as plant materials, wood, and agricultural waste.
5.		Geothermal Energy – Energy from the heat stored inside the Earth.
6.		Tidal Energy – Energy generated from the movement of ocean tides.
7.		Wave Energy – Energy harnessed from surface ocean waves.

Which of the following is **not** a renewable energy resource?

A	Solar energy
B	Wind energy
C	Coal
D	Hydropower

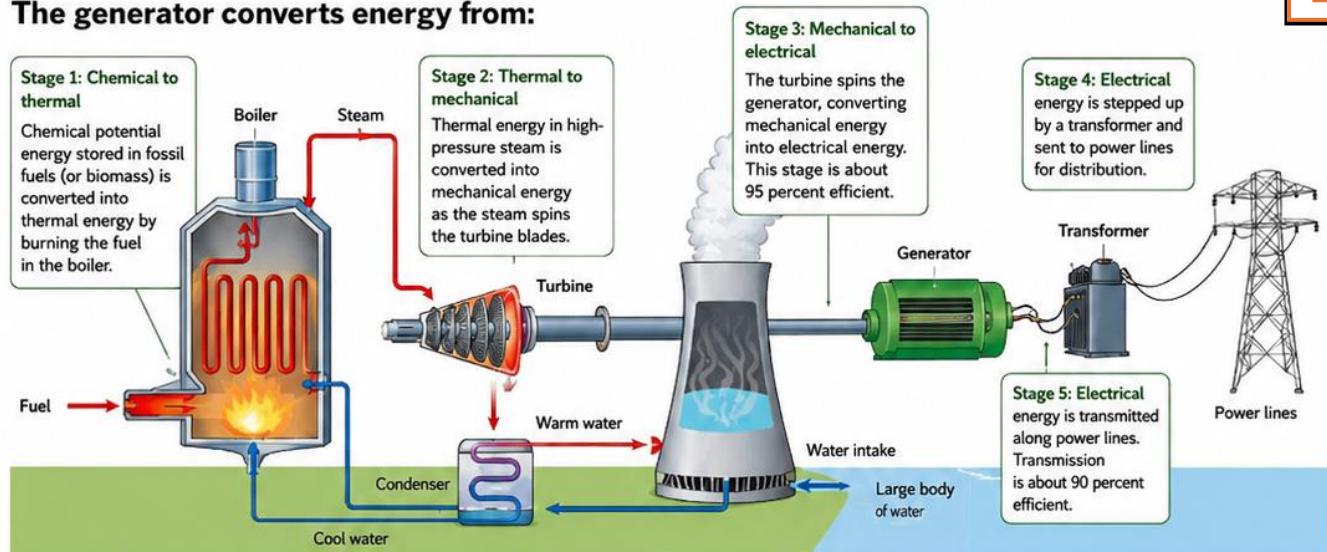
Which of the following cannot be naturally replenished in a short period of time and is therefore non-renewable?

A	Biomass
B	Oil
C	Tidal energy
D	Geothermal energy

22. Describe the methods used to convert different types of renewable energy resources into electrical energy.

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The generator converts energy from:



- A. Chemical to thermal
- B. Thermal to mechanical
- C. Mechanical to electrical
- D. Electrical to chemical

Answer: C. Mechanical to electrical

The generator converts the mechanical energy from the turbine into electrical energy.

Which of the following sources of electrical power is **most efficient**?

- A) Nuclear power plants
- B) Coal power plants
- C) Solar cells
- D) Hydroelectric dams

Answer: A. Nuclear power plants

Nuclear power plants have the highest conversion efficiency (about 33–37%), higher than coal (about 30–35%), hydroelectric (about 80–90% for the turbine only but overall lower considering elevation and losses), and solar cells (about 15–22%).

Which energy source relies on the movement of water to generate electricity?

- A) Wind turbines
- B) Geothermal plants
- C) Hydroelectric dams
- D) Solar cells

Answer: C. Hydroelectric dams

Hydroelectric dams use the movement of flowing or falling water to spin turbines that generate electricity.

Which of the following energy sources **cannot be depleted** quickly and is naturally replenished?

- A) Coal
- B) Oil
- C) Biomass
- D) Natural gas

Answer: C) Biomass

Biomass comes from living or recently living organisms (plants, wood, waste) and can be regrown naturally in a short time.

The others are fossil fuels and take millions of years to form.



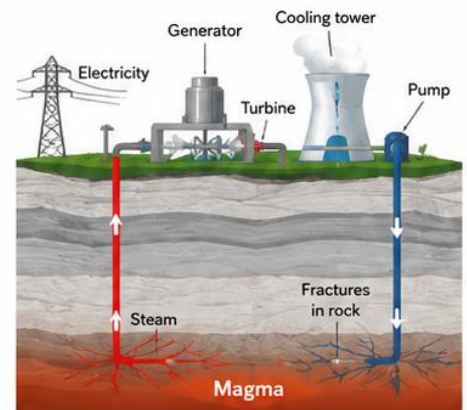
Biomass

Which of the following energy sources uses heat from inside the Earth to generate electricity?

- A) Tidal energy
- B) Geothermal energy
- C) Hydroelectric energy
- D) Wind energy

Answer: B) Geothermal energy

Geothermal energy uses heat from deep within the Earth to produce steam or hot water, which spins a turbine connected to a generator to produce electricity.

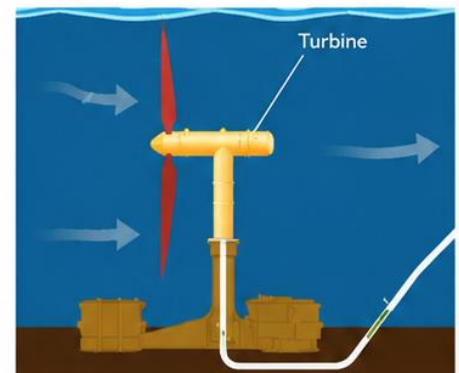


How could underwater turbines in the Gulf Stream contribute to electricity generation?

- A) By converting the Sun's heat into electricity
- B) By spinning with ocean currents to generate mechanical energy that is converted to electricity
- C) By using tidal waves to evaporate water
- D) By burning natural gas found in the ocean

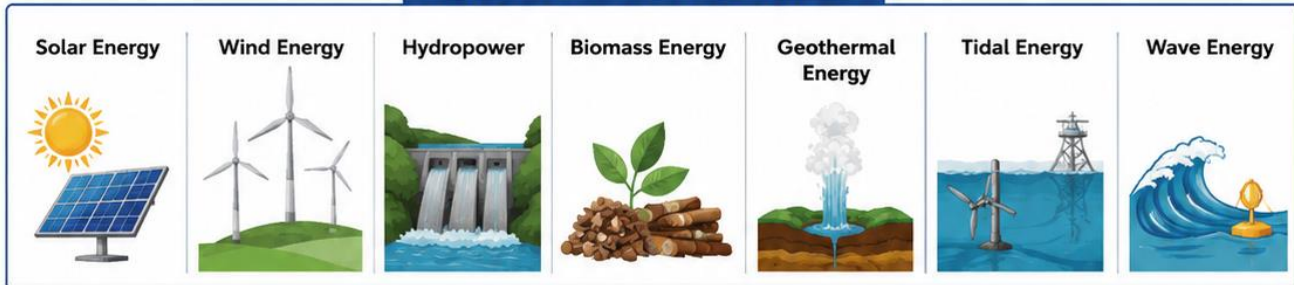
Answer: B

Underwater turbines are placed in strong ocean currents like the Gulf Stream. The moving water spins the turbine blades, creating mechanical energy that a generator converts into electricity.



23. List the different renewable energy resources.

RENEWABLE ENERGY RESOURCES



Why is geothermal energy unlikely to become a major energy source?

A	It produces a lot of air pollution
B	It is limited to regions with suitable underground heat sources
C	It depends on sunlight
D	It cannot produce electricity

How is the steam produced to run turbines in a geothermal power plant?

A	By boiling water using solar panels
B	By burning coal to heat water
C	By using underground heat from Earth to convert water into steam
D	By using wind to heat water

All of these are considered renewable sources of energy except:

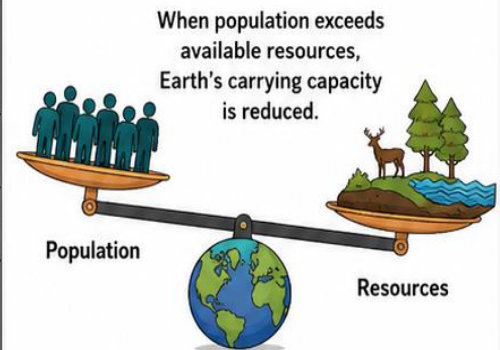
A	Hydroelectric dams
B	Solar cells
C	Wind turbines
D	Nuclear power plants

24. Describe how the human population affects the Earth's carrying capacity

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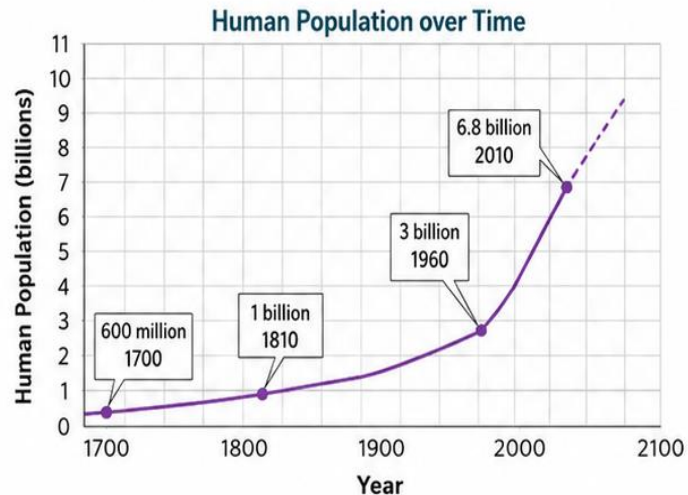
How does the human population affect the Earth's carrying capacity?

A	Increasing population can exceed the Earth's resources, reducing sustainability
B	Human population has no effect on Earth's resources
C	A larger population always increases the Earth's carrying capacity
D	The Earth's carrying capacity is only affected by natural disasters, not humans



Why did the human population increase rapidly after the mid-1800s?

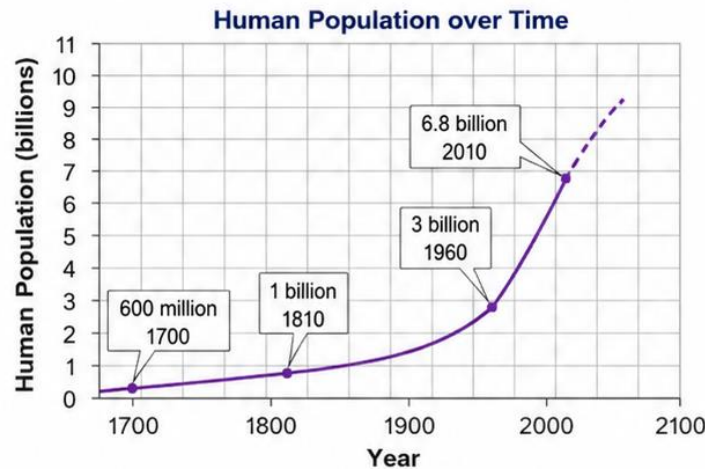
A	More food became available from oceans
B	Advances in medicine and clean water availability improved survival
C	People began having more children only due to culture
D	Earth increased its carrying capacity



Which statement **BEST** explains why increasing population can reduce the Earth's carrying capacity?

A	More people use more resources like food, water, energy, and space, which can lead to shortages and environmental damage.
B	More people always create new resources to meet their needs.
C	More people reduce natural disasters, making resources last longer.
D	More people have no impact on the availability of resources.

What best explains why population growth was slow before the 1800s?



- A. High death rates limited population size
- B. Lack of agriculture only
- C. Earth had no resources
- D. People migrated less

Answer: A

Before the 1800s, high death rates from disease, poor sanitation, limited medical care, and famine kept population growth slow, even though people had children.

What does **Carrying capacity** mean?

- A. The number of people born each year
- B. The maximum population an environment can support
- C. The number of resources humans create
- D. The total land area of Earth

Answer: B

Carrying capacity is the largest population size that an environment can support with the available resources such as food, water, shelter, and space.

What happens when a population **exceeds** carrying capacity?

- A. Resources increase automatically
- B. Population becomes immortal
- C. Environmental stress increases and populations suffer
- D. Pollution disappears

Answer: C

When a population exceeds carrying capacity, resources become scarce. This leads to more competition, hunger, disease, and other stresses, causing suffering and possibly a decline in population.

25. Describes actions that can be taken to help protect and conserve Earth's natural resources.



Which of the following is a way you can conserve natural resources at home?

A	Compost yard and kitchen waste
B	Throw all waste directly into the trash
C	Use more energy than needed
D	Burn fossil fuels for no reason

How can scientists and engineers help conserve resources?

A	By developing technologies that produce more waste
B	By developing technologies that produce less pollution and use resources efficiently
C	By encouraging unlimited resource use
D	By ignoring energy efficiency

Which action can help reduce water and energy use at home?

A	Using low-flush toilets and leak-free faucets
B	Leaving taps running and lights on
C	Using older, inefficient appliances
D	Driving cars with low fuel efficiency