

ملزمة الهيكل مراجعة نهائية Science Inspire



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: 2026-06-20 22:10:33

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 للمدرس

المزيد من مادة
علوم:

إعداد: Waswas Issa

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

اختبار تجريبي وفق الهيكل

1

أسئلة نموذج امتحان

2

إجابة نموذج امتحان

3

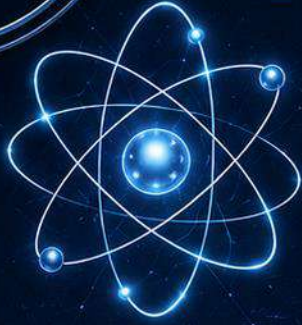
نموذج امتحاني 2026م غير محلول

4

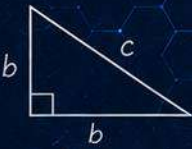
كن مستعدا نموذج مراجعة نهاية الفصل غير محلول

5

طريقك نحو التفوق



$$E = mc^2$$



$$a^2 + b^2 = c^2$$

ملزمة الهيكل

EOT

مراجعة نهائية



THINK
EXPLORE
UNDERSTAND
INSPIRE



SCIENCE
— IS —
EVERYWHERE

Grade 9
GENERAL
INSPIRE
SCIENCE

TERM 3
2025 – 2026



FOCUSED
REVISION



SIMPLIFIED
EXPLANATION



COMPREHENSIVE
QUESTIONS



HIGHER
LEVEL

Mr. Issa Waswas

1	Compare the states of matter in terms of volume, shape, intermolecular forces, and distances between particles.	Textbook + Figures 4 & 6	208 209 210 211
2	Describe the kinetic theory of particles		
3	Use the kinetic molecular theory to explain the behavior of particles in the different states of matter		
4	Compare the states of matter in terms of volume, shape, intermolecular forces, and distances between particles.		

Kinetic Theory

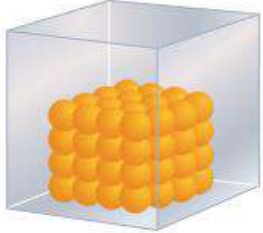
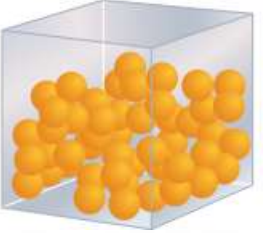
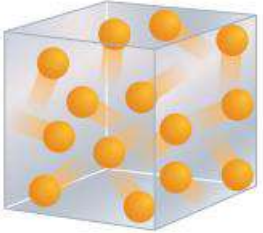
(Kinetic Molecular Theory)

An explanation of how the particles in gases behave.

Assumptions

- All matter is composed of **tiny particles** (atoms, molecules, and ions).
- These particles are in **constant, random motion**.
- The particles **collide** with **each other** and with the **container walls**.
- The **amount of energy** that **particles lose** from these collisions is **negligible**.

States of Matter Comparison

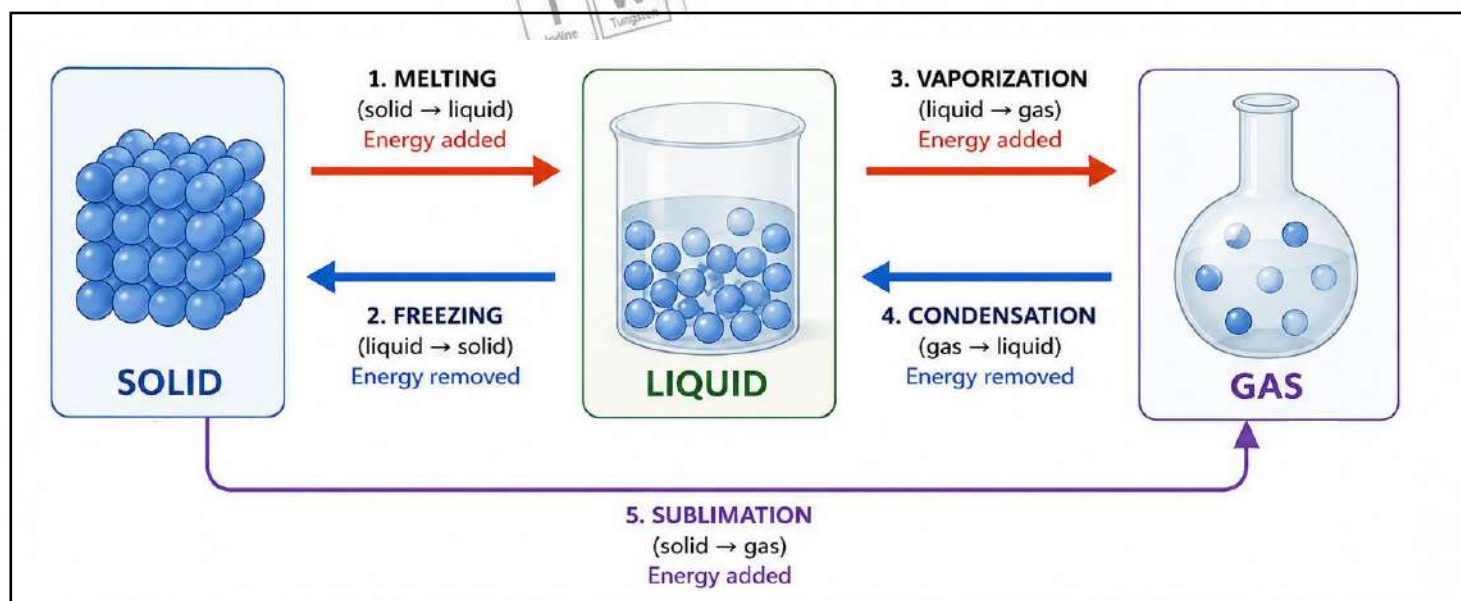
Property	Solid	Liquid	Gas
Model			
Shape	Definite shape	Takes the shape of the container	No fixed shape
Volume	Definite volume	Definite volume	No fixed volume
Particle arrangement	Closely packed together	Particles cling together	Spread out to fill the container
Particle motion	Vibrate in place	Constantly moving and sliding past each other	Constant, random motion
Kinetic energy	Least kinetic energy	Less kinetic energy than a gas	Highest kinetic energy
Attractive forces	Strong attraction between particles	Particles have not completely overcome attractive forces	Particles overcome attractive forces

Thermal Energy	Temperature
Total energy of a material's particles	Explains how hot or cold an object is
Includes kinetic energy + potential energy of particles	Represents the average kinetic energy of particles

Changes of State

Thermal energy added $\uparrow$ → particles gain **kinetic energy** → move faster → overcome **attractive forces**

Thermal energy removed $\downarrow$ → particles lose **kinetic energy** → move slower → **attractive forces** hold particles together



Term	Definition
Melting point	The temperature at which a solid becomes a liquid
Heat of fusion	The energy required to change a substance from solid to liquid at its <u>melting point</u>
Boiling point	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.
Heat of vaporization	The energy required for a liquid at its <u>boiling point</u> to become a gas
Freezing point	The temperature at which a liquid turns into a solid

Vaporization has two types:

- **Evaporation:** occurs at the **surface of a liquid** and can happen at **nearly any temperature**.
- **Boiling:** occurs **throughout a liquid** at a **specific temperature**.



Liquid water particles **transfer energy** to ice particles

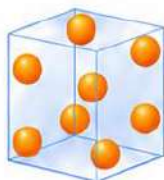
Ice particles **vibrate faster**

ice melts (becomes liquid)

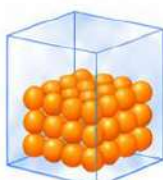


(**Sublimation**) → **Dry ice (CO_2)** changes **directly** from **solid to gas** → cold gas causes **water** in the **air to condense** → forming **white fog**

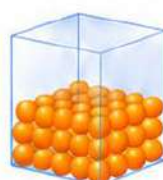
1. Which model represents the state of matter that has a definite shape and definite volume?



1



2



3

A) 1 only

B) 2 only

C) 1 and 3

D) 2 and 3

2. Which statement best describes particles in a solid?

- A) Particles move freely past each other.
- B) Particles can be compressed into a smaller space.
- C) Particles take the shape of their container.
- D) Particles are packed closely together.

3. Which state of matter has a definite volume but changes its shape to match its container?

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

4. What allows a liquid to flow and take the shape of its container?

- A) Its particles are fixed in a crystal pattern.
- B) Its particles can slide past each other.
- C) Its particles have completely overcome all attractive forces.
- D) Its particles stop moving.

5. Why do gases have no definite shape or volume?

- A) Their particles are fixed in one position.
- B) Their particles spread out and move freely.
- C) Their particles have very strong attractive forces.
- D) Their particles are unable to move.

6. Which statement correctly describes particles in a gas?

- A) Particles are close together and vibrate in place.
- B) Particles move freely and spread out to fill their container.
- C) Particles are arranged in a fixed pattern.
- D) Particles have the lowest kinetic energy.



7. The spaces between gas particles are:

- A) Very large compared with the size of the particles. B) Always equal to the size of the particles.
C) Medium and similar to liquids. D) Very small and almost absent.

8. Arrange the states of matter according to the strength of attractive forces between particles from strongest to weakest.

- A) Solid → Liquid → Gas B) Gas → Liquid → Solid
C) Liquid → Solid → Gas D) Solid → Gas → Liquid

9. Which theory explains the behavior and motion of particles in gases?

- A) Atomic theory B) Structural theory
C) Kinetic molecular theory D) Nuclear theory

10. According to the kinetic molecular theory, which statement correctly describes gas particles?

- A) They are fixed in place. B) They are in constant random motion.
C) They are tightly packed together. D) They only move when heated.

11. Which statement is an assumption of the kinetic molecular theory?

- A) Particles lose all their energy during collisions. B) Particles are large and easily seen.
C) Particles move continuously and collide with each other. D) Attraction forces between all particles are very strong.

12. According to the kinetic molecular theory, matter is made of:

- A) Empty spaces only. B) Large visible compounds.
C) Tiny particles such as atoms, molecules, and ions. D) Only water droplets and ice crystals.

13. Which statement is NOT an assumption of the kinetic molecular theory?

- A) Particles are very small compared with the distance between them. B) Particles collide with each other because of their random motion.
C) Particles lose a large amount of energy during collisions. D) Particles are in continuous random motion.

14. Which of the following is NOT an assumption of the kinetic molecular theory?

- A) Matter is made of tiny particles. B) Particles collide with each other and with container walls.
C) Particles are always stationary. D) Particles lose negligible energy during collisions.

15. According to the kinetic molecular theory, what happens when the temperature of a substance increases?

- A) Particles move slower and lose kinetic energy.
- B) Particles move faster and their average kinetic energy increases.
- C) Particles keep the same speed.
- D) Particles stop moving completely.

16. What does thermal energy mean?

- A) The average kinetic energy of particles.
- B) The total energy of a material's particles.
- C) The energy produced only by chemical reactions.
- D) The speed at which a substance melts.

17. What does temperature represent?

- A) The total potential energy of all particles.
- B) The amount of heat stored in a solid only.
- C) The average kinetic energy of the particles of a substance.
- D) The total mass of the particles.

18. When ice is placed in warm water, why does it melt?

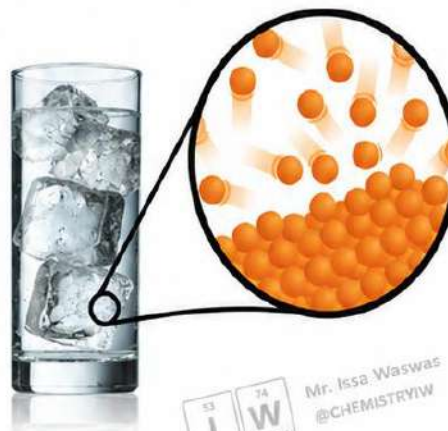
- A) Energy transfers from the water to the ice particles.
- B) Energy transfers from the ice to the water particles.
- C) Ice particles lose all kinetic energy.
- D) Water particles stop moving.

19. Which statement explains why ice melts according to kinetic theory?

- A) Ice particles gain enough energy to overcome some attractive forces.
- B) Ice particles lose kinetic energy and become fixed.
- C) Ice particles combine with air particles.
- D) Ice particles become smaller.

20. What is the melting point of a solid?

- A) The temperature at which a liquid becomes a solid.
- B) The temperature at which a gas becomes a liquid.
- C) The temperature at which a solid becomes a liquid.
- D) The temperature at which water boils.



21. What is heat of fusion?

- A) Energy required to change a substance from solid to liquid at its melting point.
- B) Energy released when a gas becomes a liquid.
- C) Energy needed to raise water temperature by 1°C .
- D) Total thermal energy of a melting solid.



22. During freezing, what happens to the particles of a liquid?

- A) Their average kinetic energy decreases and they become fixed in place.
- B) Their average kinetic energy increases and they spread out.
- C) Energy is added to change the liquid into a solid.
- D) The temperature increases quickly.

23. What is vaporization?

- A) A gas becoming a liquid.
- B) A liquid becoming a gas.
- C) A solid becoming a liquid.
- D) A solid becoming a gas directly.



24. What are the two forms of vaporization?

- A) Melting and freezing
- B) Evaporation and boiling
- C) Sublimation and condensation
- D) Heating and cooling

25. Where does evaporation occur, and when can it happen?

- A) At the surface of a liquid, and it can happen at many temperatures.
- B) Throughout the liquid, but only at one specific temperature.
- C) Inside gas bubbles only.
- D) At the bottom of the container only.



**26. What is the difference between evaporation and boiling?**

- A) Evaporation occurs at the surface; boiling occurs throughout the liquid at a specific temperature.
- B) Evaporation occurs throughout the liquid; boiling occurs only at the surface.
- C) Both occur only at 100°C.
- D) There is no difference between them.

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@CHEMISTRY1W**27. The energy required to change a substance from liquid to gas at its boiling point is called:**

- A) Heat of fusion
- B) Melting point
- C) Heat of vaporization
- D) Freezing point

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@CHEMISTRY1W**28. Which process is the reverse of vaporization?**

- A) Melting
- B) Sublimation
- C) Condensation
- D) Freezing

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- A) Condensation
- B) Sublimation
- C) Freezing
- D) Evaporation

nas
v**30. Why does white fog form around dry ice?**

- A) The CO₂ gas is very hot.
- B) The cold CO₂ gas causes water vapor in the air to condense.
- C) CO₂ reacts with oxygen in the air.
- D) Solid CO₂ melts into liquid water.

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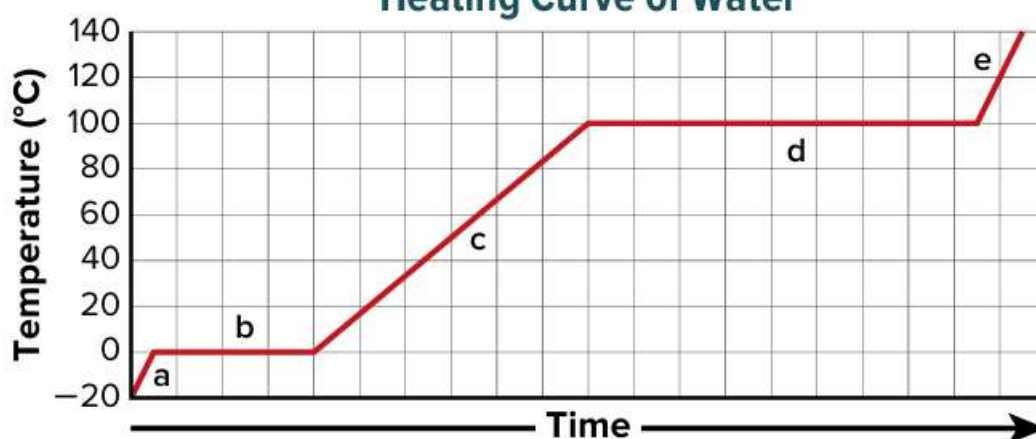
5 Interpret **heating and cooling curves** and their phases.

Textbook + Figure 7

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Heating Curve

A graph showing how **temperature changes over time** as **thermal energy is continuously added**.

Heating Curve of Water

Part	What happens?	Temperature
a	Solid (ice)	Increases
b	Melting (solid → liquid): energy is used to overcome attractive forces	Constant at 0°C
c	Liquid (water)	Increases
d	Boiling (liquid → gas): energy is used to overcome remaining attractive forces	Constant at 100°C
e	Gas (water vapor)	Increases

- During **melting and boiling**, the temperature **remains constant** because added energy is used to **overcome attractive forces between particles**.
- After attractive forces are overcome → **particles move more freely** → temperature increases.

Effect of water quantity (mass) on heating curve:

- More mass → requires more time/ Less mass → requires less time.
- The **shape of the graph remains the same** (melting & boiling points do not change).

Heating Curve of Water



1. What is a heating curve?

- A) A graph showing pressure vs. volume of a substance.
- B) A graph showing temperature changes over time as thermal energy is continuously added.
- C) A graph showing how fast a substance melts.
- D) A graph showing kinetic energy vs. potential energy.

2. Which part of the heating curve represents melting of ice?

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

3. Which part of the heating curve represents boiling of water?

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

4. What is the state of water during part (b) of the heating curve?

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

5. Which parts of the heating curve show an increase in temperature?

- A) b and d only B) a, c, and e
- C) a and b only D) d and e only



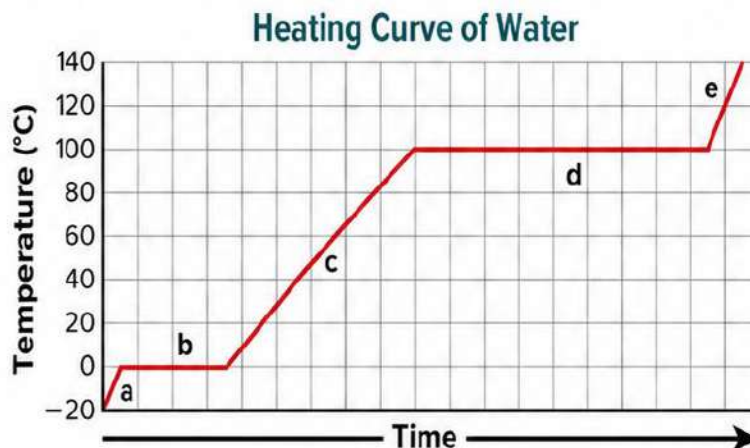
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6. What happens to temperature during boiling?

- A) It remains constant.
- B) It decreases.
- C) It increases.
- D) It becomes zero.



7. Why does temperature remain constant during melting and boiling?

- A) Energy is used to increase particle size.
- B) Energy is used to overcome attractive forces between particles.
- C) Particles stop moving completely.
- D) No energy is absorbed by the substance.



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8. What happens after attractive forces are overcome during heating?

- A) Particles move more freely and temperature increases.
- B) Particles stop moving and temperature decreases.
- C) Particles become closer together.
- D) Particles lose all kinetic energy.

9. How does increasing the amount of water (mass) affect the heating curve?

- A) The graph becomes higher because melting and boiling points increase.
- B) The graph shape remains the same, but more time is needed for each stage.
- C) The graph shape changes completely and less energy is required.
- D) The temperature remains constant during the whole graph.

10. What happens to the temperature of water during part (c) of the heating curve?

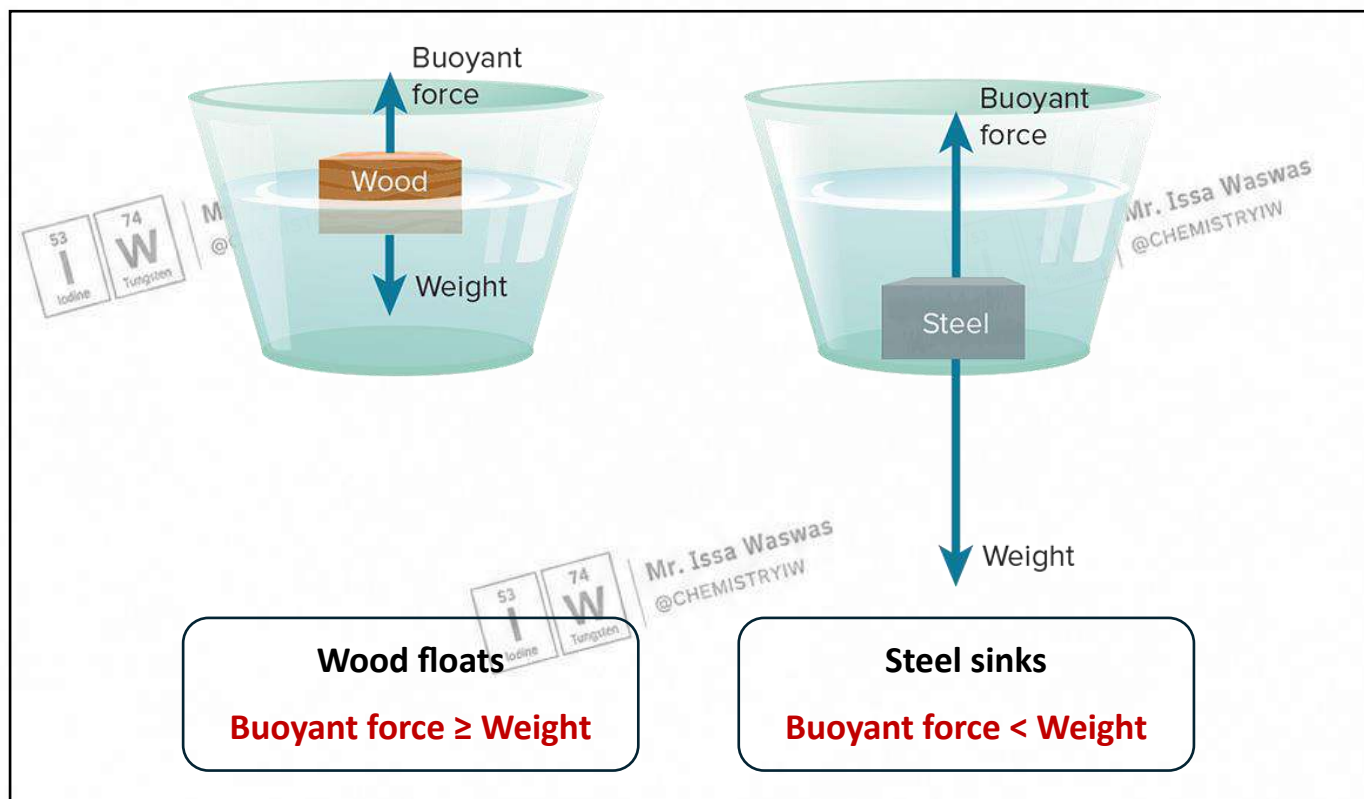
- A) Temperature increases because liquid particles gain kinetic energy.
- B) Temperature stays constant because water is changing state.
- C) Temperature decreases because particles lose energy.
- D) Temperature remains at 0°C.



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6 Predict whether an object will **float or sink** in a fluidTextbook + Figures
13 & 14217
218**Buoyancy**The ability of a **fluid (Liquid or Gas)** to exert an **upward force** on an object immersed in it.**Buoyant force**

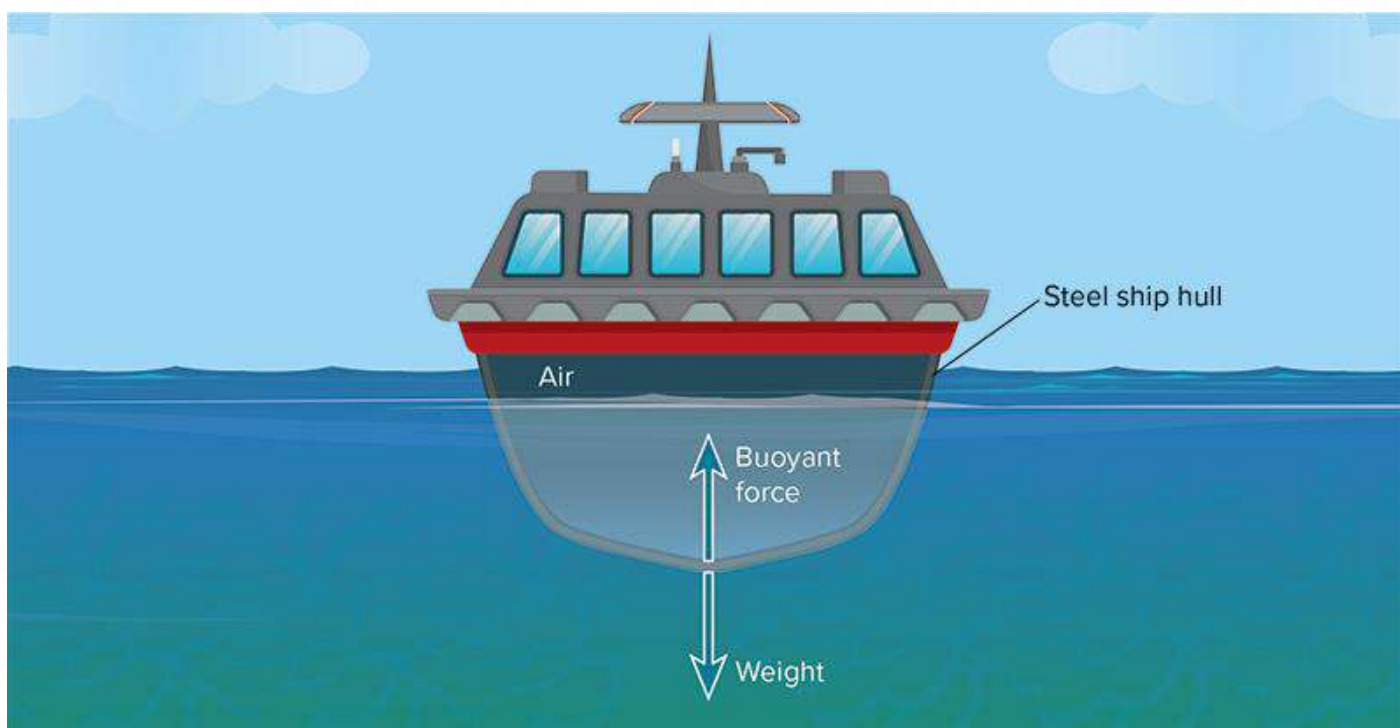
(weight of displaced fluid)

The **upward force** that **opposes the** gravitational force (**weight**) pulling an object down.**Archimedes' Principle**The **buoyant force** on an object is **equal** to the **weight of the fluid displaced** by the object.Objects **float or sink** depending on the comparison between their **density** and **the density of the fluid.**

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Wood and steel have the same volume, but steel has more mass → steel has greater density.

Condition (Forces)	Condition (Density)	Result
Buoyant force $\geq$ Weight	Object density $<$ Fluid density	Object floats
Buoyant force $<$ Weight	Object density $>$ Fluid density	Object sinks



Why does the steel ship float?

A steel block is shaped into a **hollow ship filled with air**



The same mass takes up a **larger volume**



Overall density of the **steel boat + air** becomes **less than the density of water**



The ship floats

1. What is buoyancy?

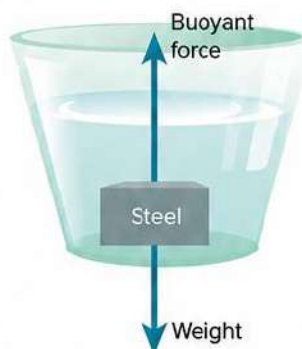
- A) The ability of a solid to resist compression.
- B) The ability of a fluid to exert an upward force on an object immersed in it.
- C) The downward pull of gravity on an object in water.
- D) The pressure exerted by a fluid on the walls of its container.

2. According to Archimedes' principle, the buoyant force on an object is equal to:

- A) The weight of the object itself.
- B) The weight of the fluid displaced by the object.
- C) The volume of the fluid in the container.
- D) The density of the object divided by the density of the fluid.



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3. Why does the steel block sink while the wooden block floats?

- A) The steel block has a larger volume than the wood block.
- B) The buoyant force on steel is less than its weight, while the buoyant force on wood equals or exceeds its weight.
- C) Steel is colder than wood so it sinks.
- D) The water level is higher on the steel side.



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4. An object will float in a fluid if its density is:

- A) Greater than the density of the fluid.
- B) Less than the density of the fluid.
- C) Equal to zero.
- D) Twice the density of the fluid.

5. Why does a steel ship float even though a solid steel block sinks?

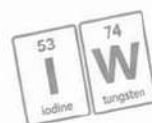
- A) Steel becomes less dense when shaped into a ship.
- B) The ship contains air, making its overall density less than water.
- C) The ship's engine creates an upward force.
- D) Water becomes denser around the ship.

6. What is the main factor that determines whether an object floats or sinks?

- A) The color and texture of the object.
- B) Whether the object's density is less or greater than the fluid density.
- C) The temperature of the fluid only.
- D) The size of the container holding the fluid.

7. If an object is floating and the density of the fluid increases, what happens to the submerged part of the object?

- A) The submerged part increases.
- B) The submerged part stays the same.
- C) The submerged part decreases.
- D) The object sinks completely.

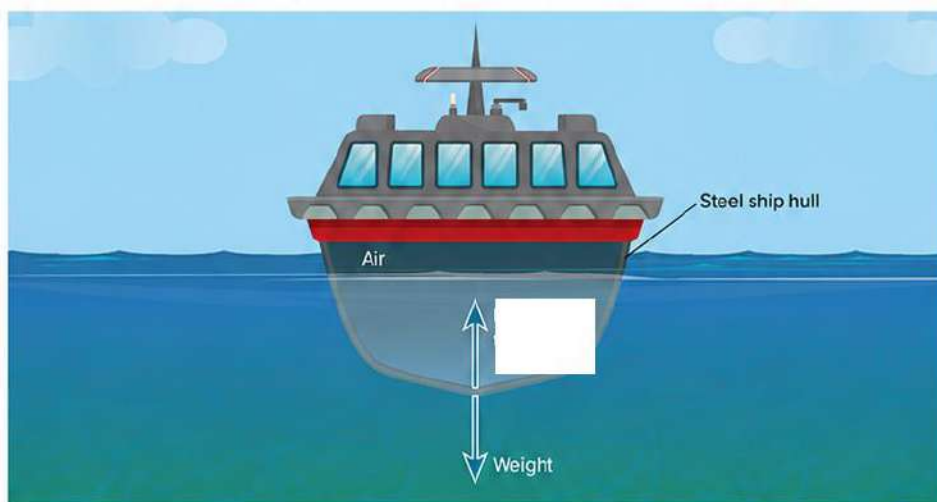


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8. A cork has a density of 0.24 g/cm^3 and iron has a density of 7.8 g/cm^3 . Both are placed in water with a density of 1 g/cm^3 . What will happen?

- A) Cork floats and iron sinks.
- B) Cork sinks and iron floats.
- C) Both float.
- D) Both sink.

9. The upward arrow acting on a floating boat in the picture represents:



- A) Density
- B) Weight
- C) Buoyant force
- D) Gravity force



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7 Calculate pressure in pascals (Pa)

Textbook + example 1 + applications

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PRESSURE

Pressure: the force exerted per unit area.

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

Symbol	Meaning	Unit (SI)
P	Pressure	Pa (pascal)
F	Force	N (newton)
A	Area	m ² (square meter)

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

**NOTE**

- The SI unit of pressure is the pascal (Pa).
- 1 pascal (Pa) = 1 newton per square meter (N/m²).

CONVERSION (kPa to Pa)

kPa

× 1000

Pa

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.

- A) 182,000 N
- B) 56,100 N
- C) 101,000 N
- D) 18,200 N

8. A diver who is 10.0 m underwater experiences a pressure of 202 kPa. If the diver's surface area is 1.50 m^2 , with how much total force does the water push on the diver?

- A) 135,000 N
- B) 303,000 N
- C) 202,000 N
- D) 3,030 N

9. A car weighs 15,000 N, and its tires are inflated to a pressure of 190 kPa. How large is the area of the car's tires that are in contact with the road?

- A) 0.0079 m^2
- B) 0.079 m^2
- C) 7.9 m^2
- D) 12.7 m^2

10. **CHALLENGE** The atmospheric pressure at the surface of Venus is 91 times the pressure at sea level on Earth. With approximately how much total force would Venus's atmosphere push on an average human being at sea level? Assume that the surface area of an average human being is 1.8 m^2 .

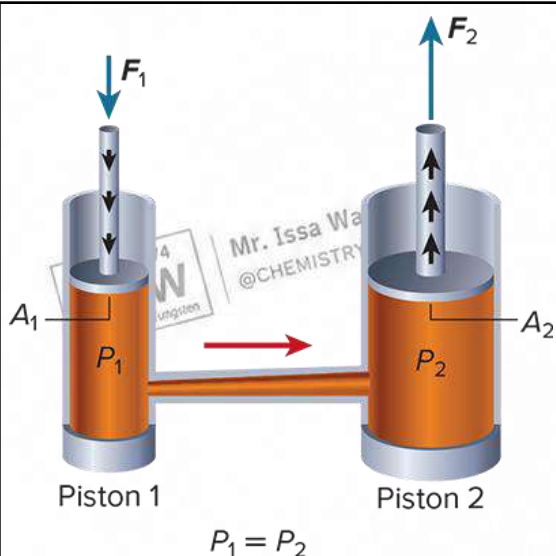
- A) $1.66 \times 10^5 \text{ N}$
- B) $1.66 \times 10^6 \text{ N}$
- C) $1.66 \times 10^7 \text{ N}$
- D) $1.66 \times 10^8 \text{ N}$

8	Identify applications of Archimedes', Pascal's, and Bernoulli's principles.	Textbook + applications	220
9	Describe Bernoulli's principle.		221

Pascal's Principle

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

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



Small input force (F_1) applied to a small area (A_1)



Same pressure is **transmitted through the fluid** ($P_1 = P_2$)



Piston with **larger area** (A_2) produces a **larger output force** (F_2)



Hydraulic lifts increase **force**, not pressure.

EXAMPLE Problem 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 3700 N. What force must be exerted on a 0.072-m^2 piston to lift the heavy machine?

- A) 3700 N
- B) 260 N
- C) 144,000 N
- D) 95 N

Bernoulli's Principle

As the **velocity** of a fluid **increases**, the **pressure** it exerts **decreases**.

Fluid moves slower → pressure increases



Covering the end of a hose



Restricted flow

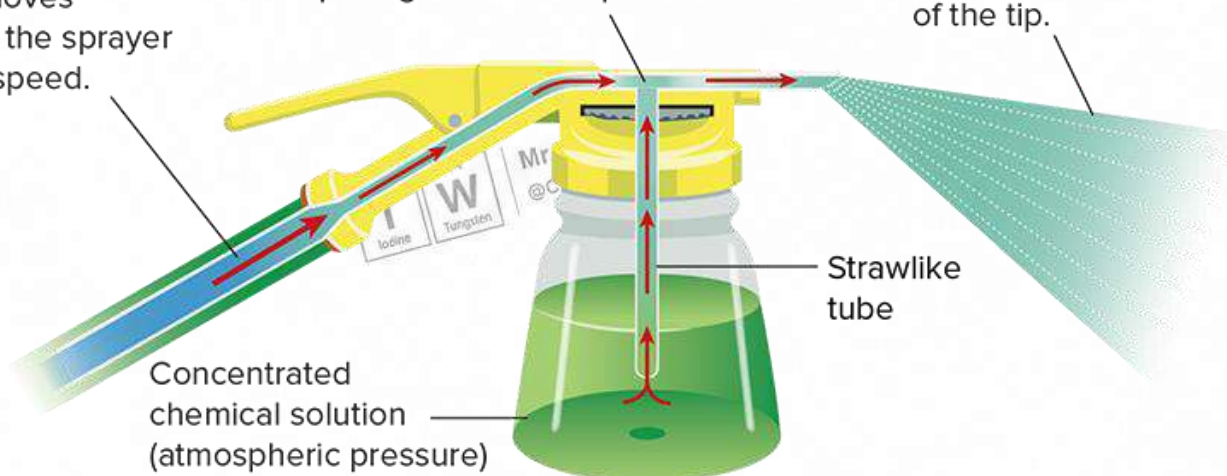


Fluid moves faster → pressure decreases

Water moves through the sprayer at high speed.

The fast-moving water creates a low-pressure area, pulling chemicals up the tube.

The water-chemical mixture sprays out of the tip.



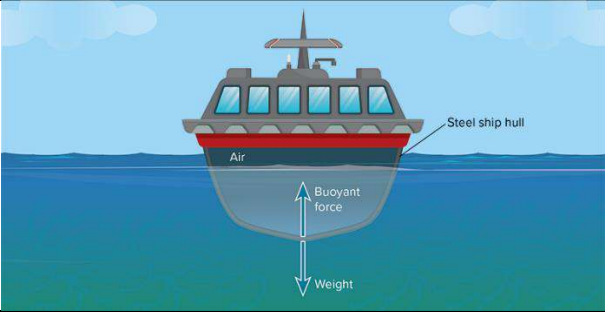
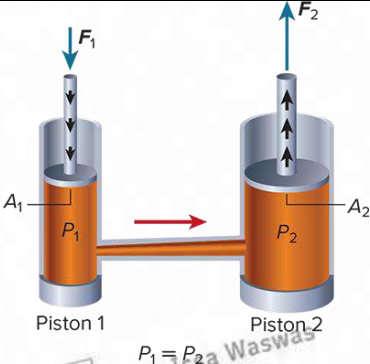
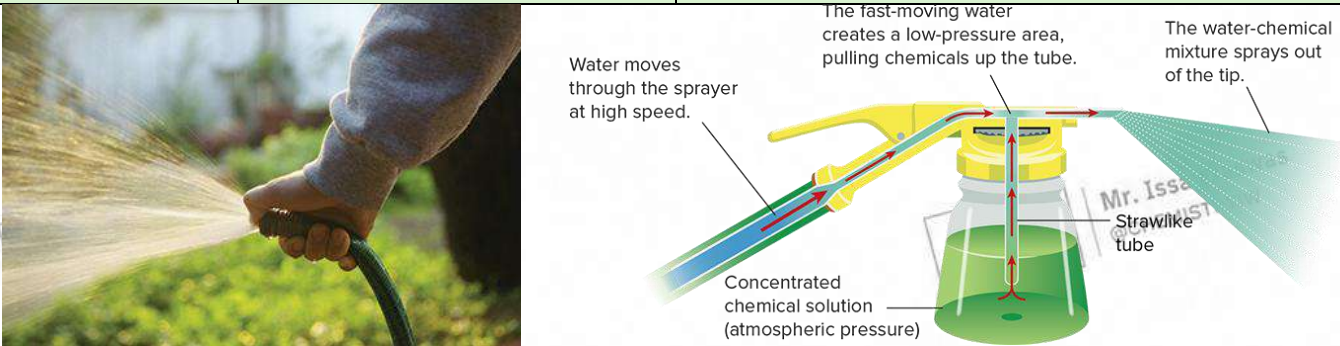
Concentrated chemical solution (atmospheric pressure)

Strawlike tube

Hose-End Sprayer (Application)

Fast-moving water passes over the tube → Creates a low-pressure area → Pressure difference pushes the chemical solution up the tube → Water and chemical mix and spray out

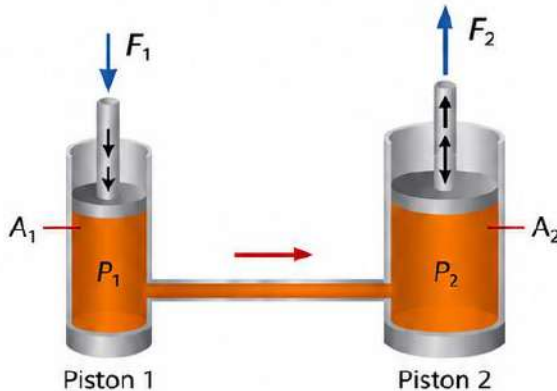
Summary

Principle	Main Idea	Applications / Examples
Archimedes' Principle	Buoyant force = weight of displaced fluid	Floating ships (ship hull filled with air → lower overall density → floats)
		
Pascal's Principle	Pressure applied to a fluid is transmitted throughout the fluid	Hydraulic lift (small force on small piston → larger force on large piston)
		
Bernoulli's Principle	Fluid velocity ↑ → fluid pressure ↓	Garden hose restriction (smaller opening → faster water flow) Hose-end sprayer (fast water → low pressure → pulls chemical up)
		

1. What is Pascal's principle?

- A) A buoyant force always acts downward on submerged objects.
- B) Pressure applied to a fluid is transmitted equally throughout the fluid.
- C) Objects in water always displace their own volume.
- D) The density of a fluid increases with temperature.

2. Which statement describes the pressure relationship in a hydraulic press when a force is applied?



- A) Fluid pressure in the small piston equals fluid pressure in the large piston.
- B) Fluid pressure in the small piston is greater than in the large piston.
- C) Fluid pressure in the small piston is less than in the large piston.
- D) Fluid pressure in the small piston is half the pressure in the large piston.

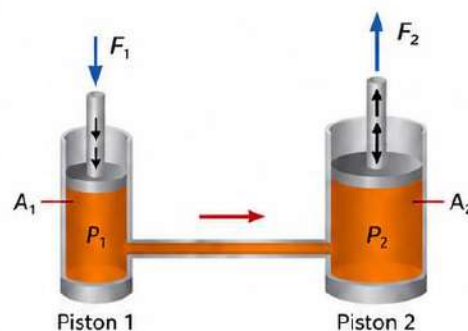
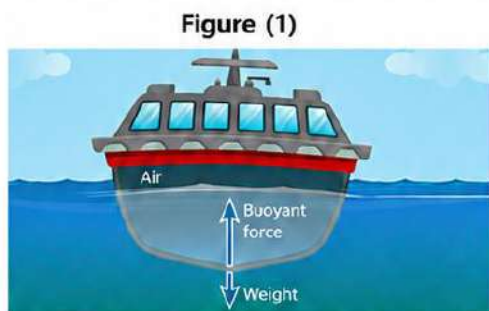
3. A car weighing 15,000 N is on a hydraulic lift platform measuring 10 m². What is the area of the smaller piston if a force of 1100 N is used to lift the car?

- A) 0.73 m²
- B) 1.36 m²
- C) 7.3 m²
- D) 136 m²

4. A heavy crate applies a force of 1500 N on a 25 m² piston. The smaller piston is 1/30 the size of the larger one. What force is needed to lift the crate?

- A) 30 N
- B) 50 N
- C) 500 N
- D) 45,000 N

5. Which relationship is correct for the two figures shown?



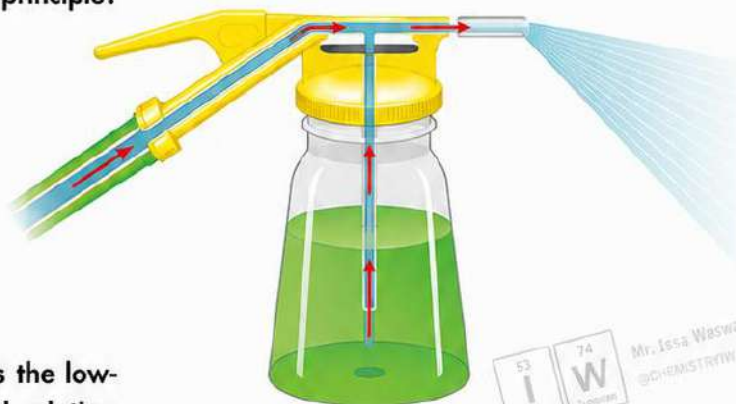
- A) Figure 1 applies Archimedes' principle and Figure 2 applies Pascal's principle.
- B) Figure 1 applies Pascal's principle and Figure 2 applies Archimedes' principle.
- C) Both figures apply Pascal's principle.
- D) Both figures apply Archimedes' principle.

6. Which relationship describes Bernoulli's principle?

- A) As fluid velocity increases, pressure increases.
- B) As fluid velocity decreases, pressure decreases.
- C) As fluid velocity increases, pressure decreases.
- D) There is no relationship between fluid velocity and pressure.

7. The tool shown in the picture (hose-end sprayer) is an application of which principle?

- A) Bernoulli's principle
- B) Pascal's principle
- C) Archimedes' principle
- D) Newton's principle

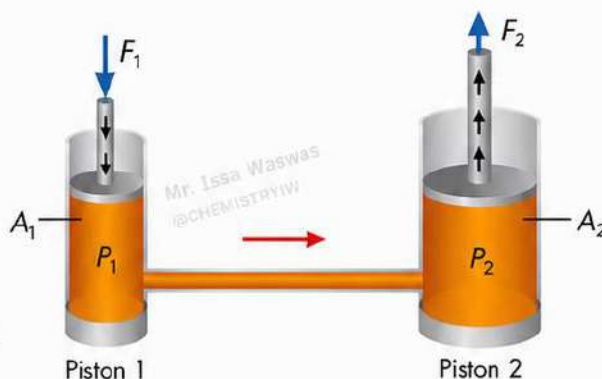


8. In a hose-end sprayer, what creates the low-pressure area that pulls the chemical solution up through the strawlike tube?

- A) High pressure from the pump pushes the chemical upward.
- B) Fast-moving water creates a low-pressure area, and atmospheric pressure pushes the chemical upward.
- C) The chemical evaporates and rises as a gas.
- D) The weight of water pulls the chemical sideways.

9. In a hydraulic lift, why can a small input force lift a heavy object?

- A) The larger piston produces a larger output force because it has a larger area.
- B) The pressure decreases before reaching the larger piston.
- C) The fluid increases the weight of the object.
- D) The smaller piston creates more pressure than the larger piston.



10

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

Textbook + example
1 applications

241

Intensive Properties	Extensive Properties
Do not depend on the amount of substance present	Depend on the amount of substance present
Changing the amount → property stays the same	Changing the amount → property changes
Examples Density, Color, State of matter, Melting point, and Boiling point	Examples Mass, Volume, and Length
Intensive properties stay constant for a substance, so they can be used for identification.	

1. Which of the following properties is an intensive property?

- A) Mass
- B) Volume
- C) Boiling Point
- D) Length

2. If a chocolate bar is divided into two equal halves, which property will become half of its original value?

- A) Density
- B) Color
- C) Taste
- D) Mass

3. Which of the following properties is an extensive property?

- A) Density
- B) Melting Point
- C) Volume
- D) Boiling Point

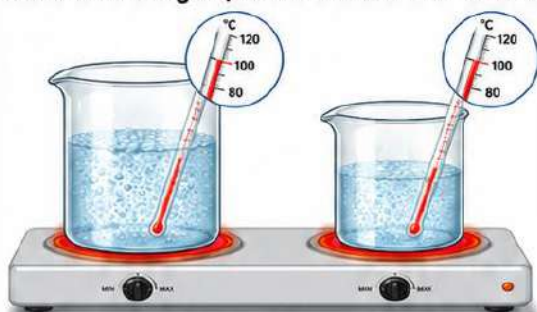
4. A cup of boiling water has a temperature of 100°C . If half of the water is poured into another container, what will the temperature of the water in the new container be?

- A) 50°C
- B) 100°C
- C) 150°C
- D) 200°C

5. Intensive properties of a substance are characterized by the fact that they:

- A) Depend on the amount of substance present
- B) Increase when the sample size increases
- C) Remain constant regardless of the amount of substance present
- D) Depend on the shape of the container

6. Based on the figure, which statement is correct?



- A) Boiling point is an extensive property and depends on the amount of substance present.
- B) Boiling point is an intensive property and depends on the amount of substance present.
- C) Boiling point is an extensive property and does not depend on the amount of substance present.
- D) Boiling point is an intensive property and does not depend on the amount of substance present.

7. Which of the following properties is an extensive property?

- A) Volume
- B) Density
- C) Boiling Point
- D) Melting Point

8. Based on the figure, how can the density of water remain the same in all bottles despite their different sizes?



Density of water
at 25°C

0.997 g/cm^3

- A) Density is an extensive property and depends on the amount of substance present.
- B) Density is an intensive property and depends on the amount of substance present.
- C) Density is an extensive property and does not depend on the amount of substance present.
- D) Density is an intensive property and does not depend on the amount of substance present.

9. Which statement correctly compares intensive and extensive properties?

- A) Both intensive and extensive properties depend on the amount of substance.
- B) Intensive properties depend on the amount of substance, while extensive properties do not.
- C) Intensive properties do not depend on the amount of substance, while extensive properties do.
- D) Neither intensive nor extensive properties depend on the amount of substance.

11	Define a chemical property of matter while listing some examples	Textbook + Table 2 + Figures 9 and 10	242
12	Define a chemical change while listing some examples		245
13	List evidence (indicators) of a chemical change		247

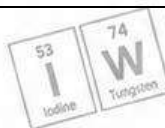
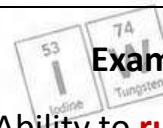
Physical Properties	Chemical Properties
Can be observed or measured without changing the substance composition	Describe the ability of a substance to change into a new substance
The substance stays the same	A new substance can form
 Examples Color, density, state of matter, melting point, boiling point, conductivity, malleability, and ductility	 Examples Ability to rust/corrode Ability to burn (flammability) Reactivity with acids Reactivity with other substances

Table 2 Properties of Copper

Physical Properties	Chemical 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	• forms green copper carbonate compound 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

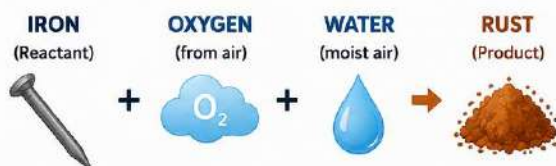
Chemical Change

A process in which one or more substances change into **new substances** with **different compositions and different properties**.

During a chemical reaction (Change):

Reactants (starting substances) → **Products** (new substances formed)

EXAMPLE 1: RUSTING



Iron reacts with oxygen in moist air and forms **rust**.
Rust is a new substance.



EVIDENCE OF CHEMICAL CHANGE

- ✓ New substance is formed (rust).
- ✓ Rust is brownish-orange and powdery.
- ✓ Rust is not attracted to a magnet, unlike iron.
- ✓ Properties are different from the reactants (iron and oxygen).

EXAMPLE 2: ROTTING



FRESH FOOD (Reactant)



ROTTEN FOOD (Product)



Fresh food undergoes chemical changes and **new substances** are formed.
This causes the food to rot.

EVIDENCE OF CHEMICAL CHANGE

- ✓ New substances are formed.
- ✓ The food's color, smell, taste, and texture change.
- ✓ The rotten food has different properties from the fresh food.

OTHER EXAMPLES OF CHEMICAL CHANGES

BURNING



FERMENTING



TARNISHING



EXPLODING



Evidence (Indicators) of a chemical change:

- Change in **color** (example: iron rusting)
- Change in **smell/taste** (example: food rotting)
- Formation of **gas** (bubbles)
- Formation of a **precipitate** (solid)
- **Energy** change (temperature or light change)

"A chemical reaction always produces a change in properties."

1. Which of the following is an example of a chemical change?

- 1) Crushing an aluminum can
- 2) Recycling an aluminum can
- 3) Aluminum reacting with oxygen to form a layer of aluminum oxide
- 4) Melting and reshaping an aluminum can

A) 1 only B) 3 only C) 2 and 3 D) 1 and 4

2. Which of the following is a chemical property of copper?

- A) Easily shaped into sheets
- B) Good conductor of heat and electricity
- C) Reddish-brown and shiny
- D) Forms a deep-blue solution when it reacts with ammonia

3. Which of the following is a physical change?

- A) Burning wood
- B) Baking a cake
- C) Change in the color of leaves during autumn
- D) Water freezing to form ice

4. Which of the following is a chemical Change

- A) Copper is malleable and can be drawn into wires.
- B) Iron and oxygen react to form rust.
- C) Oil and water do not mix.
- D) Mercury melts at 39°C.

5. Which statement best describes a chemical property?

- A) A property that can be observed without changing the substance.
- B) A property that depends on the amount of substance present.
- C) The ability of a substance to change into a new substance.
- D) A property that describes the color or shape of a substance.

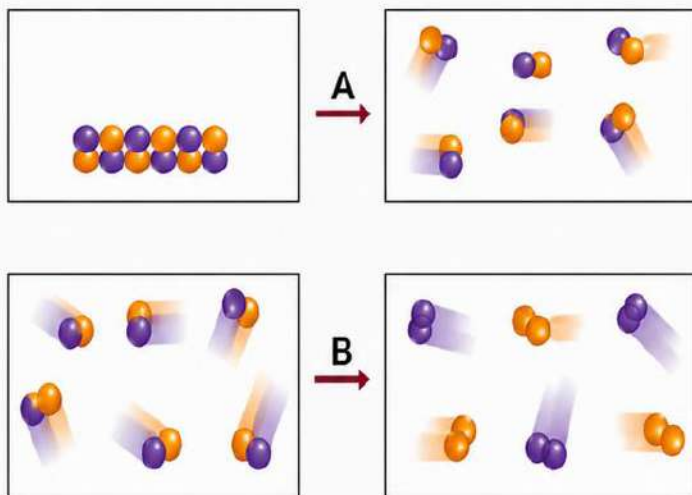
6. When a chemical change occurs in a substance, the main characteristic that causes it is:

- A) The substance changes from a solid to a liquid only.
- B) The original composition of the substance remains unchanged.
- C) New substances are formed with properties different from the original substances.
- D) The volume of the substance changes temporarily and then returns to its original state.

7. Which of the following is clear evidence that a chemical reaction has occurred when two substances are mixed?

- A) Gas is released, bubbles appear, or there is a sudden change in temperature.
- B) A solid dissolves in water and disappears from sight.
- C) A substance is broken into smaller pieces.
- D) A liquid is transferred from a large container to a smaller container.

8. Which statement correctly describes the particle diagrams shown?



- A) Diagram A represents a physical change, while Diagram B represents a chemical change.
- B) Diagram A represents a chemical change, while Diagram B represents a physical change.
- C) Both Diagram A and Diagram B represent physical changes.
- D) Both Diagram A and Diagram B represent chemical changes.

9. Based on the figure, what is the evidence that a chemical reaction has occurred?



- A) Change in odor
- B) Change in the color
- C) Increase in temperature
- D) Change in taste

10. Based on the figure, what is the visible evidence that a chemical reaction has occurred?



- A) Change in the color of the apple
- B) Increase in temperature
- C) Change in odor
- D) Change in taste

11. Based on the figure, what is the evidence that a chemical reaction has occurred when mercury(II) oxide is heated?



- A) Change in odor
- B) Change in shape
- C) Change in color
- D) Formation of bubbles

12. Based on the figure, what is the evidence that a chemical reaction has occurred?



- A) Formation of bubbles
- B) Change in shape
- C) Change in odor
- D) Change in the color of water

13. Which of the following is a chemical property?

- A) Iron is denser than aluminum.
- B) The boiling point of ammonia is -33.34°C .
- C) Sodium ignites when placed in water.
- D) Oil and water form separate layers when mixed.

14. Which of the following are examples of chemical changes?

- 1) Food rotting
- 2) Iron rusting
- 3) Ice melting
- 4) Water boiling

- A) 1 and 2 only B) 1 and 3 only C) 2 and 4 only D) 3 and 4 only

14 State Law of conservation of mass

Textbook + Example

245

15 Apply the Law of conservation of mass

1 + Applications

246

LAW OF CONSERVATION OF MASS



LAW OF CONSERVATION OF MASS

- During a chemical reaction, mass is **neither created nor destroyed**.
- The total mass of **reactants** equals the total mass of **products**.
- Mass is conserved in a chemical reaction.

$$\text{Mass}_{\text{reactants}} = \text{Mass}_{\text{products}}$$

REACTANTS

Substances that
take part in the reaction

CHEMICAL REACTION



PRODUCTS

New substances
formed in the reaction



The total mass before the reaction =
The total mass after the reaction
(MASS IS CONSERVED)

CONSERVATION OF MASS In an experiment, 10.00 g of red mercury(II) oxide powder is placed in an open flask and heated until it is converted to liquid mercury and oxygen gas. The liquid mercury has a mass of 9.26 g. What is the mass of oxygen formed in the reaction?

A) 0.26 g

B) 0.54 g

C) 1.74 g

D) 0.74 g

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1. Which statement correctly describes the Law of Conservation of Mass?

- A) Mass is not created during a chemical reaction, but it can be destroyed.
- B) Mass is not created or destroyed during a chemical reaction, so it is conserved.
- C) Mass is created during a chemical reaction, but it is conserved.
- D) Mass is created and destroyed during a chemical reaction.



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2. Which statement correctly describes the Law of Conservation of Mass in a chemical reaction?

- A) The mass of the reactants is always greater than the mass of the products.
- B) The mass of the reactants is always less than the mass of the products.
- C) The mass of the reactants is always equal to the mass of the products.
- D) The mass of the reactants is much less than the mass of the products.



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3. Which relationship is correct according to the Law of Conservation of Mass?

- A) Mass of Reactants > Mass of Products
- B) Mass of Reactants < Mass of Products
- C) Mass of Reactants $\leq$ Mass of Products
- D) Mass of Reactants = Mass of Products



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4. In a chemical reaction, if the total mass of the products is 58.5 g, what is the total mass of the reactants?

- A) 29.25 g
- B) 58.5 g
- C) 116.0 g
- D) 35.2 g



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5. Use the data in the table to answer the following questions.

Aluminum and Liquid Bromine Reaction

Substance	Before Reaction	After Reaction
Aluminum	10.3 g	0.0 g
Liquid bromine	100.0 g	8.2 g
Compound	0.0 g	

How many grams of bromine reacted?

- A) 8.2 g
- B) 91.8 g
- C) 100.0 g
- D) 108.2 g

5. Use the data in the table to answer the following questions.

Aluminum and Liquid Bromine Reaction

Substance	Before Reaction	After Reaction
Aluminum	10.3 g	0.0 g
Liquid bromine	100.0 g	8.2 g
Compound	0.0 g	

How many grams of compound were formed?

- A) 91.8 g
- B) 102.1 g
- C) 110.3 g
- D) 113.3 g

6. 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) 79.4 g
- C) 89.4 g
- D) 99.4 g

7. 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.

- A) 15.6 g
- B) 24.1 g
- C) 39.7 g
- D) 55.3 g

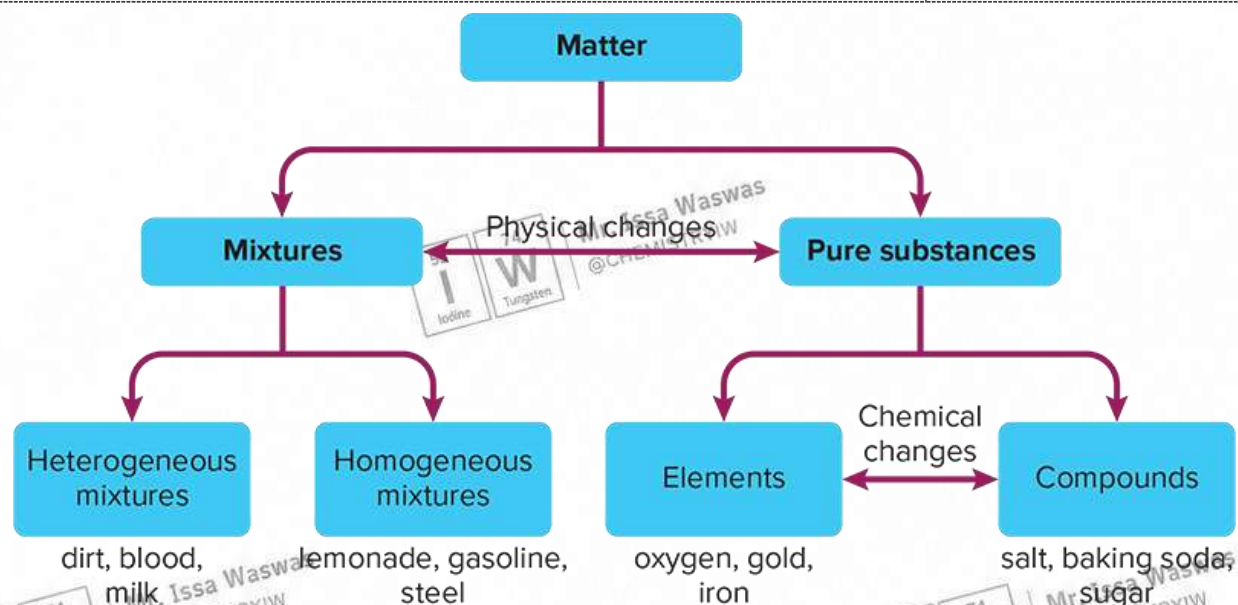
8. A 10.0-g sample of magnesium reacts with oxygen to form 16.6 g of magnesium oxide. How many grams of oxygen reacted?

- A) 6.6 g
- B) 10.0 g
- C) 16.6 g
- D) 26.6 g

9. **CHALLENGE** 106.5 g of HCl(g) react with an unknown amount of $\text{NH}_3\text{(g)}$ to produce 156.3 g of $\text{NH}_4\text{Cl(s)}$. How many grams of $\text{NH}_3\text{(g)}$ reacted? Is the law of conservation of mass observed in the reaction? Justify your answer.

- A) 49.8 g
- B) 106.5 g
- C) 156.3 g
- D) 262.8 g

16	Classify, using a particulate diagram and examples, a mixture into homogeneous and heterogeneous	Textbook + Figures 15 & 16	249
17	using a particulate diagram and examples, a pure substance into an element and a compound		252 253



TYPES OF MIXTURES

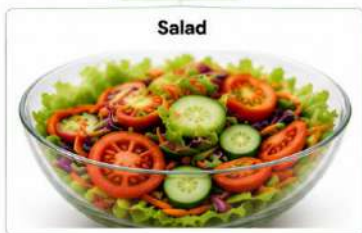
A mixture is a combination of two or more pure substances that are physically combined.

1. HETEROGENEOUS MIXTURE

A mixture that does **NOT** blend smoothly throughout.
The substances remain **distinct**.
It has two or more **distinct areas**.

Example

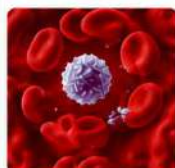
Salad



Dirt (Soil)



Blood



Milk



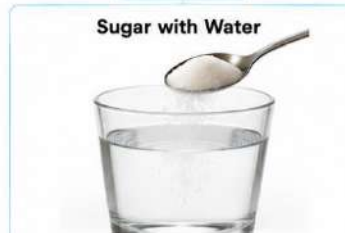
(unevenly distributed)

2. HOMOGENEOUS MIXTURE (SOLUTION)

A mixture that blends smoothly and has **constant composition** throughout.
It has only **one phase**.

Example

Sugar with Water



Lemonade



Gasoline



Steel (Alloy)



(evenly distributed)

PURE SUBSTANCES

ELEMENT

- Made of only **one type of atom**.
- Cannot be separated** into simpler substances by chemical means.
- Examples:** gold (Au), iron (Fe).

Gold (Au)



Iron (Fe)



COMPOUND

- Made of **two or more different elements** chemically combined in a **fixed ratio**.
- Can be separated** into elements by chemical means.
- Examples:**
 - Sodium chloride (NaCl) → sodium + chlorine
 - Water (H₂O) → hydrogen + oxygen

Sodium Chloride (NaCl)

Water (H₂O)

Separating Compounds into Elements

Electrolysis of water

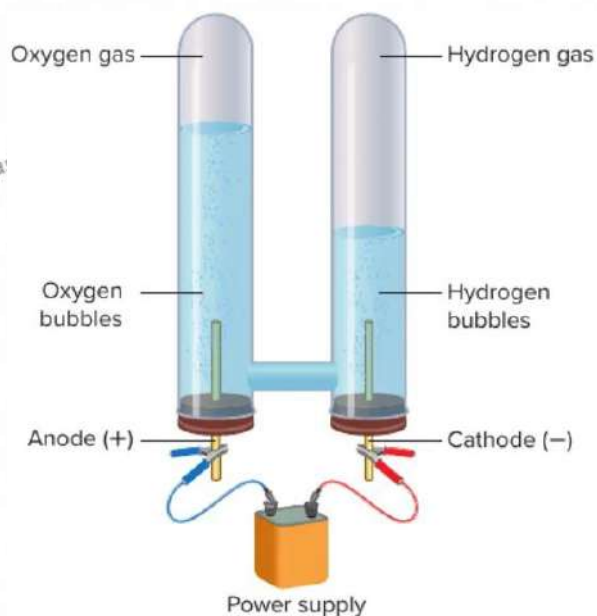
Electricity **breaks down** water into its elements:



Hydrogen and oxygen are produced in a **fixed ratio: 2:1**

Water (H₂O) is a stable **liquid** / Hydrogen and oxygen are **colorless, odorless gases**.

New substance (Chemical Change)





Potassium



Iodine



Potassium Iodide

Figure 16 When potassium and iodine react, they form potassium iodide, a compound with different properties.



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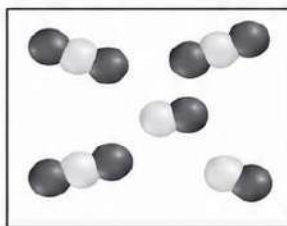


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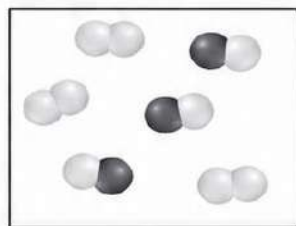
1. Based on the particle diagram, what does Diagram A represent?



A



B



C

- A) Mixture
- B) Element
- C) Solution
- D) Compound

2. What does Diagram B represent?

- A) A mixture of compounds
- B) A mixture of elements
- C) An element
- D) A compound

3. Which of the following diagrams contains a mixture of an element and a compound?

- A) Diagram A
- B) Diagram B
- C) Diagram C
- D) Both Diagrams A and C

4. Which of the following statements is NOT correct?

- A) Diagram B consists of two different compounds.
- B) Diagram C consists of two different particles.
- C) Diagram C contains three different types of elements.
- D) Diagram B represents 13 atoms.

5. Which of the following is a homogeneous mixture?

- A) Salad
- B) Air
- C) Orange juice with pulp
- D) Distilled water

6. A mixture whose components do not mix completely and can be distinguished clearly is called:

- A) Homogeneous mixture
- B) Solution
- C) Heterogeneous mixture
- D) Compound



7. Dental amalgam used in tooth fillings (a mixture of silver and mercury) is an example of:

- A) Heterogeneous mixture
- B) Compound
- C) Element
- D) Homogeneous mixture



8. Which of the following is a heterogeneous mixture?

- A) Tea
- B) Drinking water
- C) Orange juice with pulp
- D) Air



9. Which of the following correctly describes a compound?

- A) A pure substance made of two or more different elements and can be separated by chemical means.
- B) An impure substance made of two or more different elements and can be separated by chemical means.
- C) A pure substance made of two or more different elements and cannot be separated by chemical means.
- D) An impure substance made of two or more different elements and can be separated by physical means.



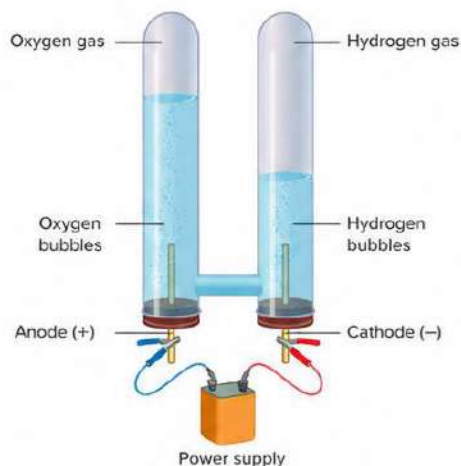
10. Which of the following cannot be separated into simpler substances by chemical means?

- A) Water (H_2O)
- B) Sodium chloride (NaCl)
- C) Iron (Fe)
- D) Carbon dioxide (CO_2)

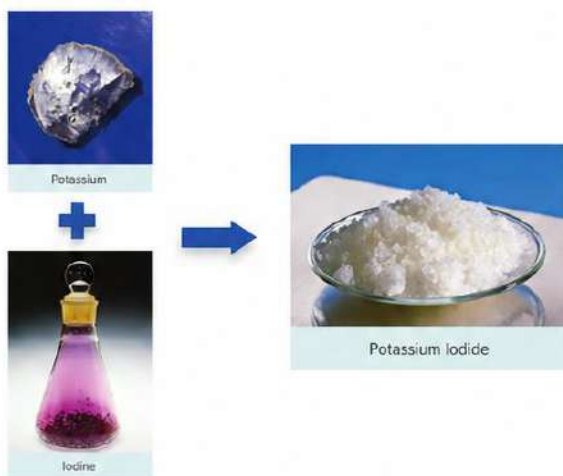


11. Which statement is supported by the electrolysis of water shown in the figure?

- A) Compounds can be separated into their elements by chemical means.
- B) Elements can be separated into simpler substances by chemical means.
- C) Mixtures are always formed from one type of atom.
- D) Water is an element.

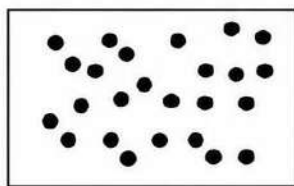


12. Based on the figure, which statement is NOT correct?

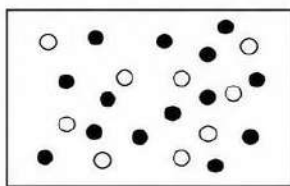


- A) Potassium and iodine are elements.
- B) Potassium iodide is a compound formed by a chemical reaction.
- C) Potassium iodide has the same properties as potassium and iodine.
- D) Potassium iodide is made from potassium and iodine.

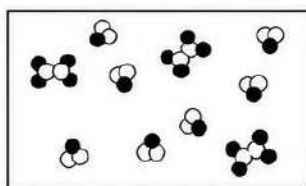
13. Which of the following particle diagrams represents a mixture of elements?



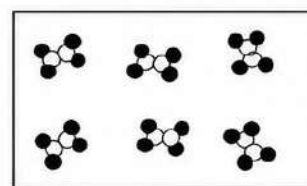
1



2



3



4

A) Diagram 1

B) Diagram 3

C) Diagram 4

D) Diagram 2

18 Identify the energy resources used in daily life.

Textbook + Figure 2

293

Energy resources are used in daily life to provide **different forms of energy**.

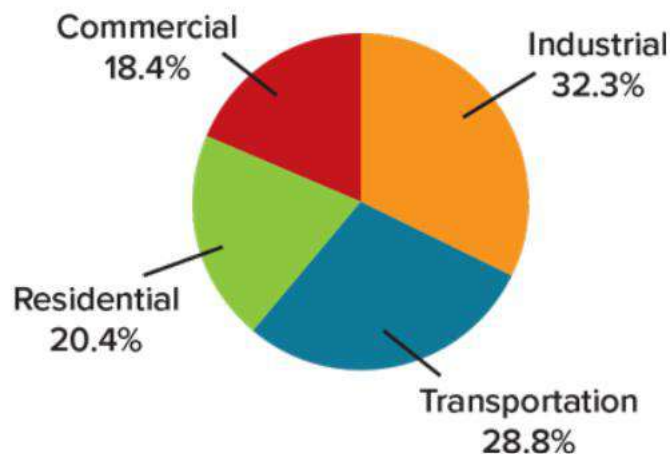
Law of **Conservation of Energy**: Energy **cannot be created or destroyed**. It can only **transform from one form into another**.

Examples:

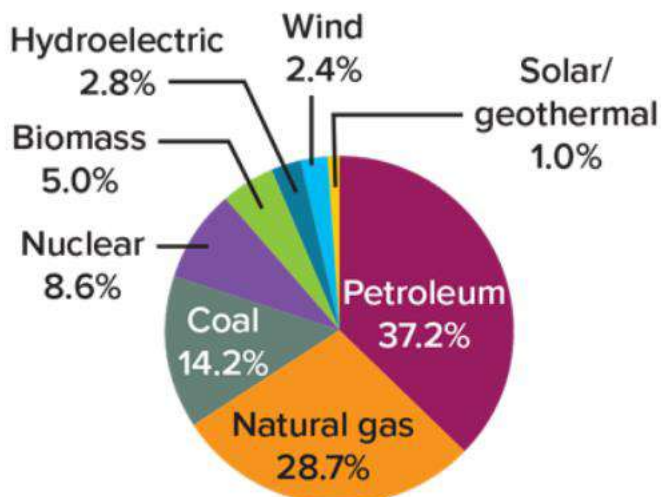
- Furnaces and stoves use **thermal energy** for heating and cooking.
- Air conditioners use **electrical energy** to cool homes.
- Cars and vehicles use **mechanical energy** to transport people and materials.

Sources of Energy

U.S. Energy Consumption by Sector



U.S. Energy Consumption by Source



Non-renewable Energy	Fossil Fuel (Petroleum, natural gas, coal)	About 80%
Nuclear energy	Nuclear power plants	About 9%
Renewable Energy	Solar, wind, hydroelectric, geothermal, biomass	About 11%



1. According to the pie chart, approximately what percentage of electrical energy comes from renewable energy resources?

A) 11%
B) 51%
C) 65%
D) 93%



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2. According to the pie chart, what percentage of electrical energy comes from coal?

A) 3%
B) 20%
C) 14%
D) 8%



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3. What percentage of energy is produced from fossil fuels according to the pie chart?

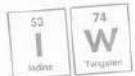
A) 51%
B) 55%
C) 80%
D) 93%



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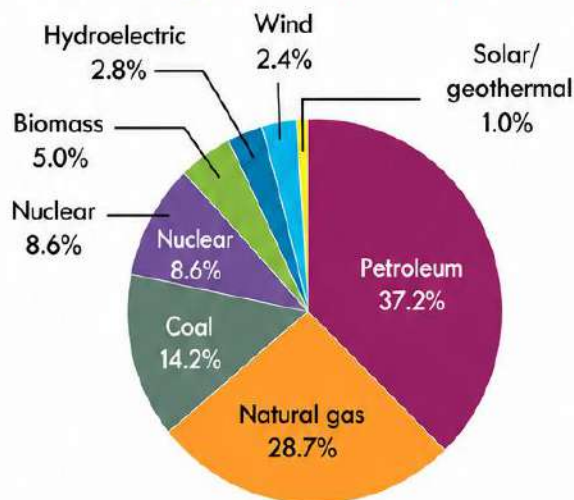
4. Which fossil fuel produces the smallest percentage of energy according to the pie chart?

A) Coal
B) Natural gas
C) Petroleum
D) Biomass



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U.S. Energy Consumption by Source



5. According to the pie chart, which energy resource produces the largest percentage of energy?

A) Natural gas
B) Coal
C) Petroleum
D) Nuclear energy



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6. According to the pie chart, which renewable energy resource produces the largest percentage of energy?

A) Wind
B) Solar/geothermal
C) Hydroelectric
D) Biomass



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7. According to the pie chart, what percentage of energy comes from natural gas?

A) 14%
B) 29%
C) 4%
D) 8%



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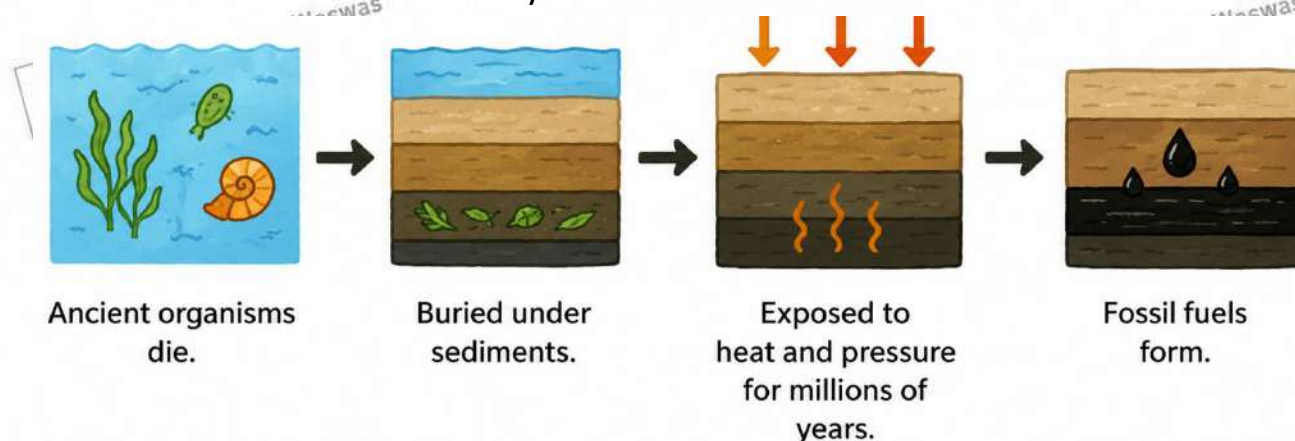
19	Describe the process of fossil fuel formation.	Textbook	294
20	Identify renewable and non-renewable resources, explaining the reason for the need to maintain the sustainability of these resources, such as water, coal, natural gas, wind, sun, oil, etc.		295
			296 297

Fossil Fuel

Fossil fuels are energy resources formed from the **remains of ancient plants and animals** that were buried and changed over **millions of years**.

Formation Process

Ancient organisms **die** → **buried** under sediments → exposed to **heat and pressure** for millions of years → **fossil fuels form**

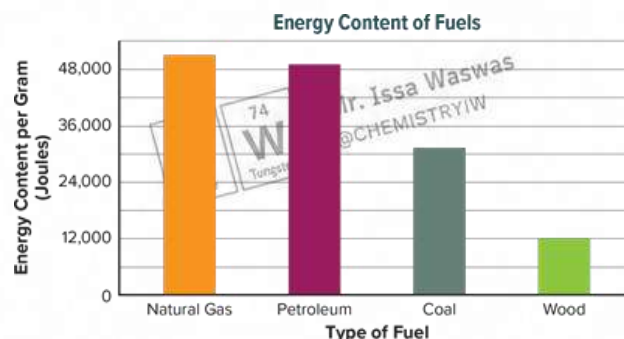


Combustion Reactions

Fossil fuel (hydrocarbon) + Oxygen → Carbon dioxide + Water + Energy (heat & light)

Chemical **potential** energy → **thermal energy** + light.

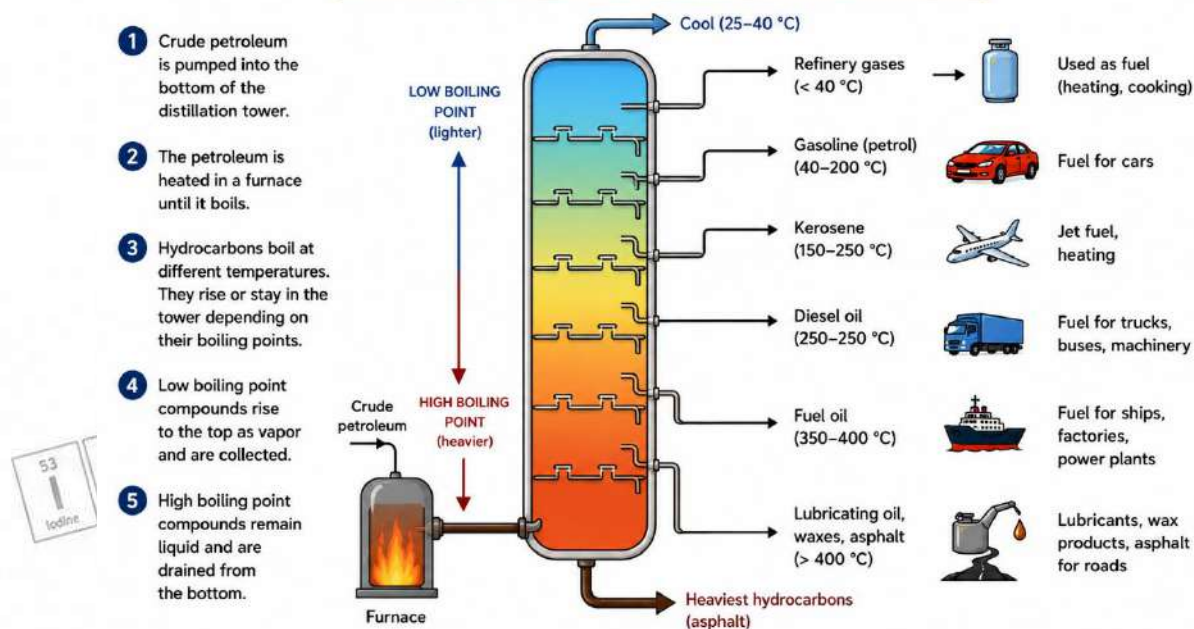
- Fuels with **more chemical potential** energy release **more energy** when burned.



Types of fossil fuels

Fossil Fuel	Formation / Composition	Uses & Important Notes
Petroleum (Oil)	➤ Formed from the decay of ancient organisms such as microscopic plankton and algae. ➤ A flammable liquid mixture of thousands of hydrocarbons.	➤ Used as fuel and to make plastics, synthetic fabrics, cosmetics, medicines, lubricants, wax products, and asphalt.
Natural Gas	➤ Found trapped above petroleum deposits. ➤ Mainly methane, with other hydrocarbons such as propane and butane.	➤ Contains the most chemical potential energy per kg. ➤ Burns cleaner and produces fewer pollutants. ➤ Used for cooking, heating, manufacturing, and some vehicles.
Coal	➤ Formed from ancient swamp plants buried under sediments → changed to peat → heat and pressure over millions of years → coal. ➤ A solid fossil fuel containing hydrocarbons and impurities.	➤ Mostly burned in power plants to produce electricity. ➤ Contains more impurities (sulfur and nitrogen compounds), producing more pollutants when burned.

FRACTIONAL DISTILLATION OF PETROLEUM



Remember

Renewable Resources	Non-renewable Resources
Resources that are naturally replaced at a faster rate than humans can consume .	Resources that are used faster than they can be replaced and require millions of years to form .
Examples: sunlight, wind, water, biomass	Examples: coal, petroleum (oil), natural gas

Why must we use resources sustainably?

- To avoid **running out of important resources**
- To **protect the environment**
- To **reduce pollution** and environmental damage
- To make sure **future generations can use these resources**



1. Which of the following is classified as a non-renewable resource?

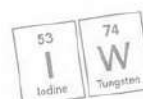
- A) Wind and sunlight
- B) Coal, petroleum, and natural gas
- C) Water and biomass
- D) Geothermal energy



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2. Why should we conserve natural resources such as water, coal, and natural gas?

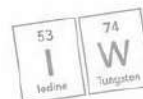
- A) They are not important for human life.
- B) They can be replaced quickly.
- C) They are limited and some are non-renewable, so they should be available for future generations.
- D) They are only used as fuels.



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3. Why are fossil fuels considered non-renewable resources?

- A) They contain hydrocarbons.
- B) Their rate of production equals their rate of consumption.
- C) Their production eventually stops.
- D) They are consumed faster than they can be replaced.



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4. What is the correct sequence of energy transformations when fossil fuels are used to generate electrical energy?

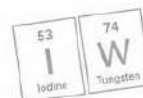
- A) Thermal Energy → Chemical Potential Energy → Mechanical Energy → Electrical Energy
- B) Mechanical Energy → Electrical Energy → Chemical Potential Energy → Thermal Energy
- C) Chemical Potential Energy → Thermal Energy → Mechanical Energy → Electrical Energy
- D) Electrical Energy → Thermal Energy → Mechanical Energy → Chemical Potential Energy



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5. What process is used to separate different hydrocarbon fractions from crude oil?

- A) Electrolysis
- B) Fractional Distillation
- C) Filtration
- D) Crystallization

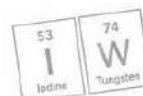


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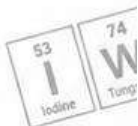


6. Which of the following statements about natural gas is correct?

- A) It is the most abundant fossil fuel in the world.
- B) It produces more pollutants than coal when burned.
- C) It produces fewer pollutants when burned and leaves no ash residue.
- D) It is a renewable energy resource.



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7. Which of the following is considered a non-renewable resource?

- A) Agricultural plants
- B) Animals
- C) Fresh water
- D) Radioactive uranium



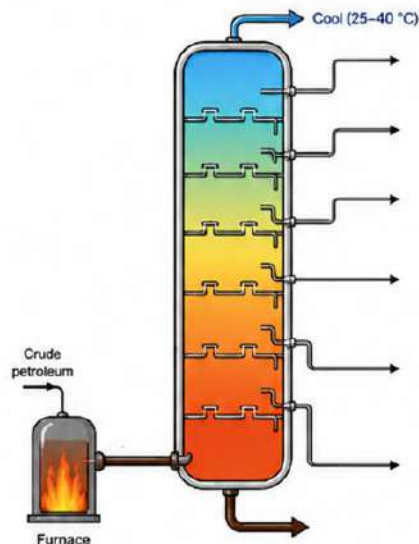
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8. The sun, wind, water, and Earth's internal heat are classified as _____ because they are replaced faster than they are consumed.

- A) Renewable energy resources
- B) Non-renewable energy resources
- C) Nuclear energy
- D) Fossil fuels



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9. All of the following explain why fossil fuels are considered non-renewable energy resources EXCEPT:

- A) They can be replaced at the same rate they are consumed.
- B) Their reserves decrease over time.
- C) They are consumed faster than they are produced.
- D) They cannot be replaced at the same rate they are consumed.



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10. Which of the following statements about separating petroleum fractions in a fractional distillation tower is NOT correct?

- A) Petroleum fractions with higher boiling points rise to the top of the distillation tower.
- B) Petroleum fractions with lower boiling points rise to the top of the distillation tower.
- C) Petroleum fractions with higher boiling points move to the bottom of the distillation tower.
- D) Petroleum fractions with lower boiling points separate first from the petroleum mixture.

11. Which of the following correctly describes the formation of fossil fuels?

- A) Fossil fuels form from rocks that cool and harden.
- B) Fossil fuels form from the remains of ancient plants and animals that were buried and exposed to heat and pressure for millions of years.
- C) Fossil fuels form when water evaporates from oceans.
- D) Fossil fuels form from minerals dissolved in groundwater.



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12. Why is it important to use natural resources sustainably?

- A) To increase the rate at which resources are consumed.
- B) To make fossil fuels form more quickly.
- C) To ensure that future generations can continue to use these resources.
- D) To prevent the use of renewable resources.



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21 List the **different renewable energy resources**.

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

23 List the **different renewable energy resources**.

Textbook + Figures
17,18,19,20,21,22,
and 23.

Renewable energy resources

1) Solar Energy (Energy from the Sun)

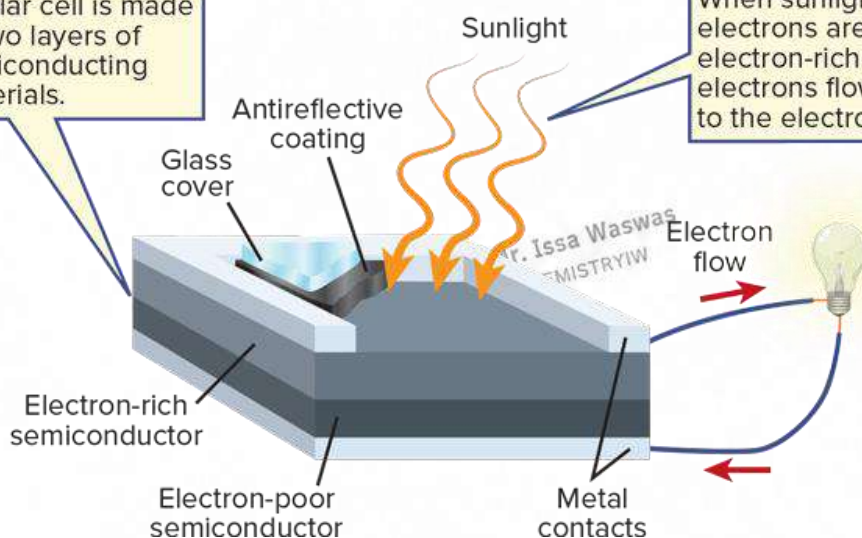
- It is a **renewable** resource because it is **replaced** by natural processes **faster than humans consume** it.
- **Sunlight (radiant energy) → Electrical energy**
- Solar cells are made of **two layers of semiconducting material sandwiched** between **two layers of conducting metal**.



How do Photovoltaic cells (solar cells) work?

A solar cell is made of two layers of semiconducting materials.

When sunlight strikes a solar cell, electrons are ejected from the electron-rich semiconductor. These electrons flow through a circuit back to the electron-poor semiconductor.



Sunlight **strikes** the solar cell.

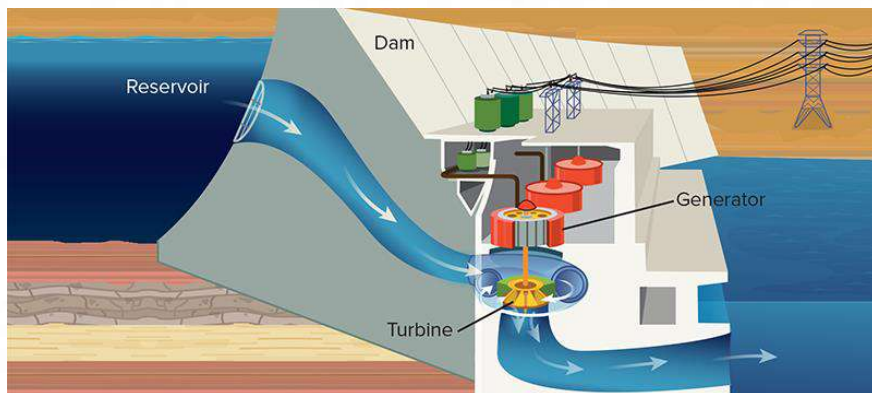
Electrons **move** through an electric circuit.

The movement of electrons produces **electricity**.

Note: Solar cells are **expensive**, but they are useful in remote areas without power lines.

2) Hydroelectricity (Energy from Water), Dams

- Produced from the energy of **moving water**.
- **Moving water** spins a **turbine** connected to an **electric generator**.
- Gravitational **potential** energy (stored water) → **Mechanical** energy (moving turbine) → **Electrical** energy

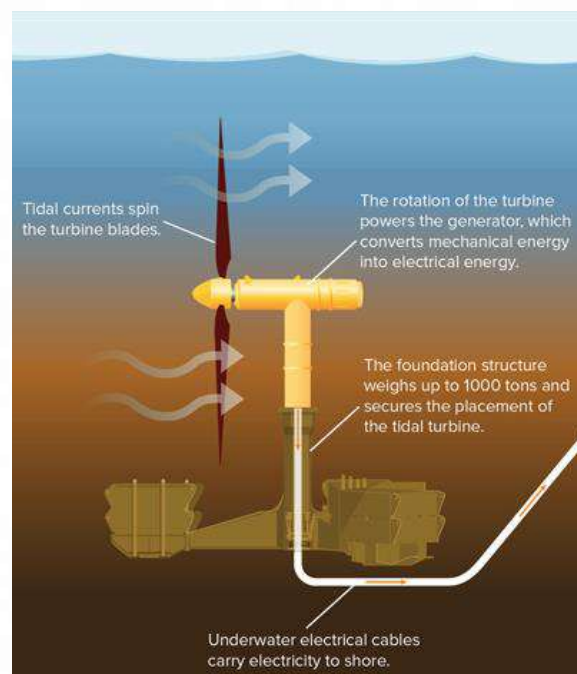


Advantages of Hydroelectricity	Disadvantages of Hydroelectricity
Almost no pollution	Can disturb natural ecosystems
More efficient than fossil fuel-burning power plants	Can block fish migration , reducing fish populations
Dams create lakes that provide water for drinking, irrigation, and recreation	Can change water temperature and cause sediment buildup , affecting habitats

3) Tidal and Wave Energy (Energy from Ocean)

- **Tidal**: caused by the **gravitational** pull of the **Moon and Sun**.
- **Wave**: produced from the **movement of ocean waves**.
- **Mechanical** energy (moving water) → **Electrical** energy

Disadvantage: It is only useful in places with **large differences** between **high and low tides**. (Tidal)



4) Wind Energy

- Wind turbines convert wind energy into **electrical energy**.

➤ Wind energy → Mechanical energy → Electrical energy

Disadvantages: Wind energy requires **areas with sufficient wind**, requires **batteries for storage**, and turbines can be **noisy**, alter landscapes, and disturb bird migration.

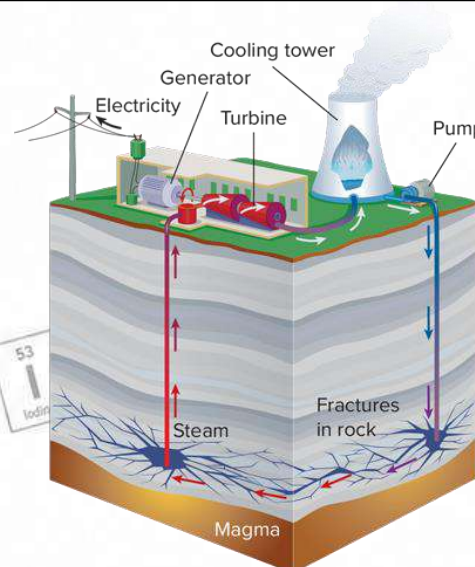


5) Geothermal Energy

- Geothermal energy is thermal energy contained in and around **magma** inside Earth.
- It comes from the **decay** of **unstable radioactive elements** in inside Earth.

➤ Thermal energy (hot rocks/magma) → Mechanical energy (steam spins turbine) → Electrical energy

Disadvantages: Geothermal energy is **limited** to areas **where magma** is close to Earth's surface.



6) Alternative Fuels

Hydrogen Fuel Cells

- A fuel cell behaves like a **battery**.
- It combines **hydrogen with oxygen** (**chemical**) to produce **electrical energy**, water, and heat.

Disadvantages: Hydrogen **requires a lot of energy** to obtain, fuel cells are **expensive**, and **hydrogen storage** is difficult.

Biomass

- **Biomass** is renewable **organic matter** (wood, crops, and animal waste).
- Burning biomass converts stored **chemical potential energy** into **thermal energy**.

➤ Chemical potential energy → Thermal energy

Summary

Resource	How electricity is produced	Energy Conversion	Advantages / Disadvantages
Solar	Solar cells convert sunlight	Radiant → Electrical	Renewable, but solar cells are expensive
Hydroelectric	Moving water spins the turbine connected to the generator	Gravitational → Mechanical → Electrical	Almost no pollution, but it can disturb ecosystems
Ocean (Tidal/Wave)	Moving ocean water spins turbines	Mechanical → Electrical	Nearly pollution-free, but useful only in some areas
Wind	Wind spins turbines connected to a generator	Wind → Mechanical → Electrical	Clean, but needs sufficient wind and batteries
Geothermal	Hot rocks heat water, steam spins the turbine	Thermal → Mechanical → Electrical	Clean, but limited to volcanic areas
Hydrogen fuel cell	Hydrogen combines with oxygen	Chemical → Electrical + heat	Clean, but expensive and hard to store
Biomass	Organic matter is burned	Chemical → Thermal	Renewable, but burning releases gases

Q1. Which of the following is considered a renewable energy resource?

- A) Coal
- B) Solar energy, wind energy, hydropower, and biomass
- C) Natural gas
- D) Uranium

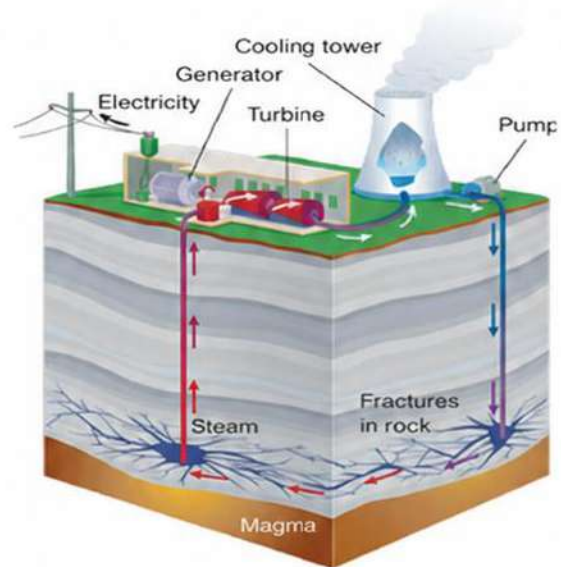
Q2. Which of the following is considered a disadvantage of using dams and hydroelectric power stations?

- A) More efficient than other energy resources
- B) Can disrupt the balance of natural ecosystems
- C) Can provide drinking water and irrigation water
- D) Does not cause any pollution



Q3. The energy represented in the adjacent figure is:

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

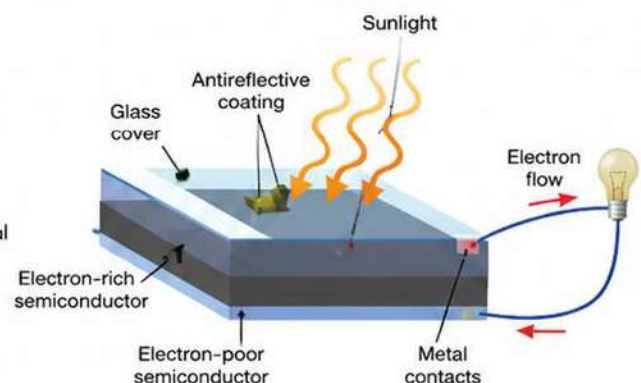


Q4. Which of the following belongs to alternative fuels?

- A) Solar energy
- B) Wind energy
- C) Hydrogen fuel cells
- D) Nuclear energy

Q5. A solar cell is made of:

- A) Two layers, one conducting material and one semiconductor material
- B) Two layers, both conducting materials
- C) Two layers, one conducting material and one insulating material
- D) Two layers of semiconductor materials



Q6. What energy transformation occurs in photovoltaic cells?

- A) Thermal energy → Electrical energy
- B) Wind energy → Electrical energy
- C) Radiant energy → Electrical energy
- D) Gravitational potential energy → Electrical energy



Q7. Which of the following is considered a disadvantage of wind energy?

- A) Uses non-renewable energy resources
- B) Causes noise and changes the natural landscape
- C) Causes air and water pollution
- D) Produces hazardous waste



Q8. Which of the following is considered an advantage of wind energy?

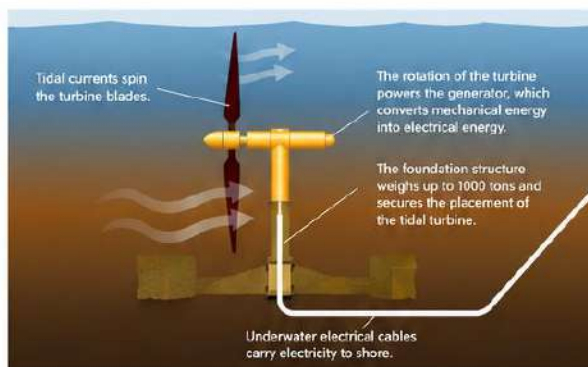
- A) Requires a large area for installation
- B) Cannot be stored
- C) Does not cause air or water pollution
- D) Causes noise

Q9. Which of the following is considered a non-renewable resource?

- A) Mineral deposits
- B) Solar energy
- C) Agricultural plants and animals
- D) Clean air

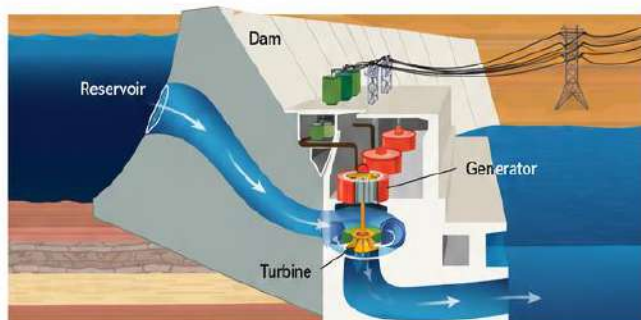
Q10. What energy transformation occurs in a tidal power station?

- A) Radiant Energy → Electrical Energy
- B) Thermal Energy → Electrical Energy
- C) Mechanical Energy → Electrical Energy
- D) Chemical Energy → Electrical Energy



Q11. Which of the following statements about hydroelectric energy is NOT correct?

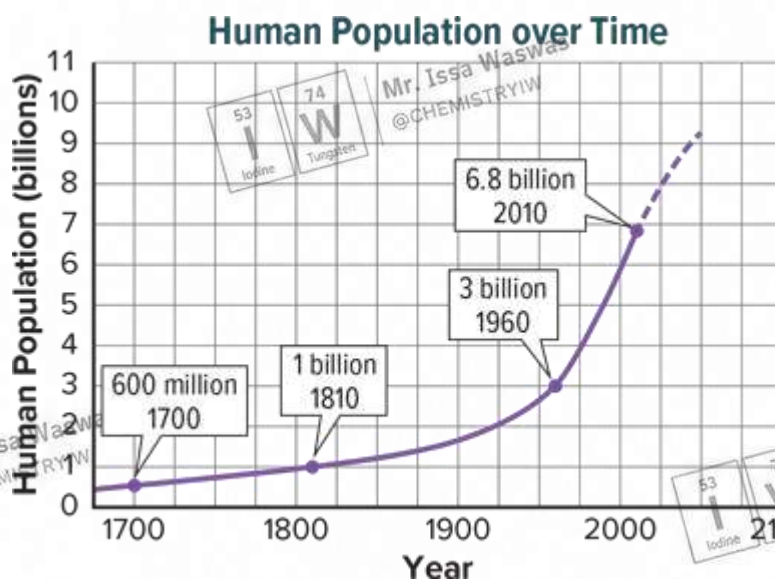
- A) Moving water spins a turbine connected to an electric generator.
- B) It is a renewable energy resource.
- C) It may disrupt the balance of natural ecosystems.
- D) It depends on burning fossil fuels to generate electricity.



24	Describe how the human population affects the Earth's carrying capacity .	Textbook + Figures 12 & 33
25	Describes actions that can be taken to help protect and conserve Earth's natural resources .	

Population

→ All individuals of one species living in a particular area.



Human population growth was **slow at first**, then **increased rapidly** after the mid-1800s.

Why?

- ✓ Advances in **medicine**
- ✓ Availability of **clean water**
- ✓ Better **nutrition**

Carrying capacity

→ The **greatest number of individuals** of a species that the **environment can support** with the available natural resources.

Effect of human population on carrying capacity:

Increasing human population → **increased** use of natural resources → resources **consumed too quickly** → environment becomes **threatened** → populations **suffer**

Protecting and Conserving Natural Resources

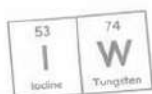
Action	How it helps
Reduce	Use fewer materials and produce less waste
Reuse	Use materials again instead of throwing them away
Recycle	Convert used materials into new products
Compost	Convert organic waste into useful material
Use energy-efficient technologies	Reduce energy use and pollution
Save water	Reduce water consumption
Use fuel-efficient vehicles / public transport	Reduce air pollution



Pollution can spread across borders through air and water, so **reducing pollution helps protect the environment.**

Q1. Which term describes the maximum number of individuals of a species that an environment can support?

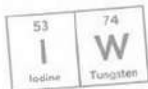
- A) Community
- B) Population explosion
- C) Population
- D) Carrying capacity



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Q2. When does a population reach its carrying capacity?

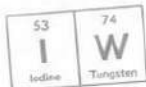
- A) When resources are consumed rapidly and are not managed carefully.
- B) When the population size decreases suddenly.
- C) When the population size reaches the maximum number that available resources can support.
- D) When all individuals migrate to another area.



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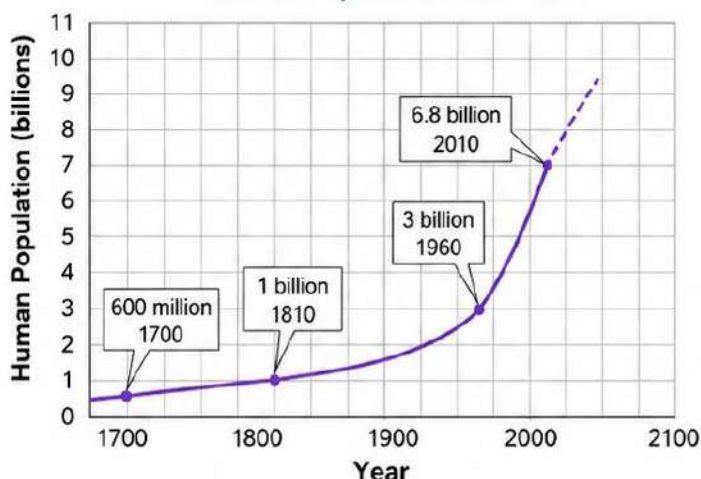
Q4. How does the human population negatively affect the Earth's carrying capacity?

- A) By increasing life expectancy due to improved healthcare.
- B) By increasing the number of people who survive to adulthood, leading to more births.
- C) By overconsuming resources and producing waste and pollution, reducing the Earth's ability to support life.
- D) By providing clean water and good nutrition in different regions.



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Human Population over Time



Q3. According to the graph, by how many billion people did the world's population increase between 1960 and 2010?

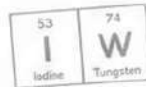
- A) 5.9 billion
- B) 4.2 billion
- C) 3.8 billion
- D) 1.0 billion



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Q5. Which of the following factors contributes to reducing the Earth's carrying capacity?

- A) Using natural resources carefully and avoiding waste.
- B) Slow population growth that takes centuries to reach one billion people.
- C) Increased carbon emissions, deforestation, and water pollution.
- D) Availability of clean water and modern medical technologies.



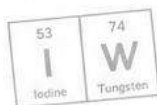
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Q6. Which of the following is NOT a method used to conserve biodiversity?

- A) Complete dependence on fossil fuels
- B) Establishing national parks and nature reserves
- C) Sustainable use of natural resources
- D) Providing wildlife corridors between habitats

Q8. Which of the following does NOT help reduce pollution?

- A) Reducing the amount of materials you consume
- B) Using some kitchen waste for composting
- C) Reusing and recycling paper, plastic, and glass
- D) Using private cars instead of buses



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Q10. Why is conserving natural resources considered a shared responsibility?

- A) Because resources are not important for human life
- B) Because resources can be renewed without limits
- C) Because sustainable use ensures quality of life for present and future generations and helps maintain environmental balance
- D) Because they only affect wildlife

Q7. Land can be affected when extracting raw materials or using it for agriculture. Which of the following helps reduce pollution and other negative effects on land?

- A) Deforestation
- B) Disposal of hazardous waste
- C) Organic farming
- D) Urban development

Q9. How can humans help protect Earth's natural resources?

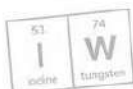
- A) Increasing fossil fuel consumption
- B) Disposing of waste in rivers and seas to protect farmland
- C) Conserving resources, recycling, using renewable energy, and planting trees
- D) Using large amounts of pesticides to protect crops



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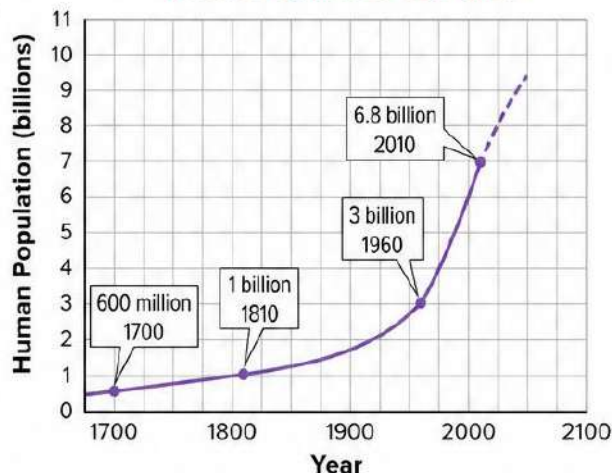
Q11. What caused the world's population to increase rapidly during the mid-19th century?

- A) Development of medicine and the availability of clean water and good nutrition
- B) Availability of renewable energy sources on a large scale
- C) Excessive consumption of natural resources
- D) Careful use of energy resources



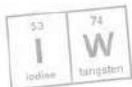
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Human Population over Time



Q12. According to the graph, what is the projected world population in the year 2100?

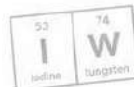
- A) 11 billion
- B) Approximately 10 billion
- C) Approximately 20 billion
- D) 9.2 billion



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Q13. The Earth's population will reach its carrying capacity in all of the following situations EXCEPT:

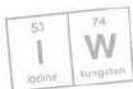
- A) If natural resources are used carefully.
- B) If natural resources are consumed very quickly.
- C) If natural resources are not managed sustainably.
- D) If the environment becomes seriously threatened.



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Q14. All of the following actions can help conserve and protect Earth's natural resources EXCEPT:

- A) Using low-flow showers, faucets, and toilets
- B) Using private cars instead of buses
- C) Recycling plastic, paper, and glass
- D) Using organic waste for compost instead of chemical fertilizers



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Q15. The image shown represents one of the methods used to conserve and protect Earth's natural resources. Which method is it?



- A) Recycling plastic, glass, and paper materials
- B) Burning plastic and paper waste for disposal
- C) Reusing plastic and glass materials after cleaning and sterilizing them
- D) Storing plastic, glass, and paper waste until needed



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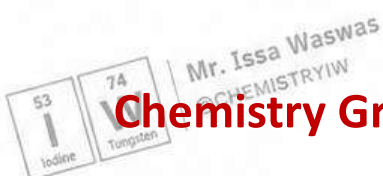
Grade 9 General

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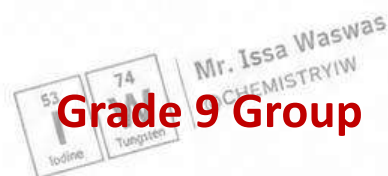
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