

Water and its solutions



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ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
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المزيد من مادة
أحياء:

إعداد: Adel Rania

التواصل الاجتماعي حسب الصف التاسع العام



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

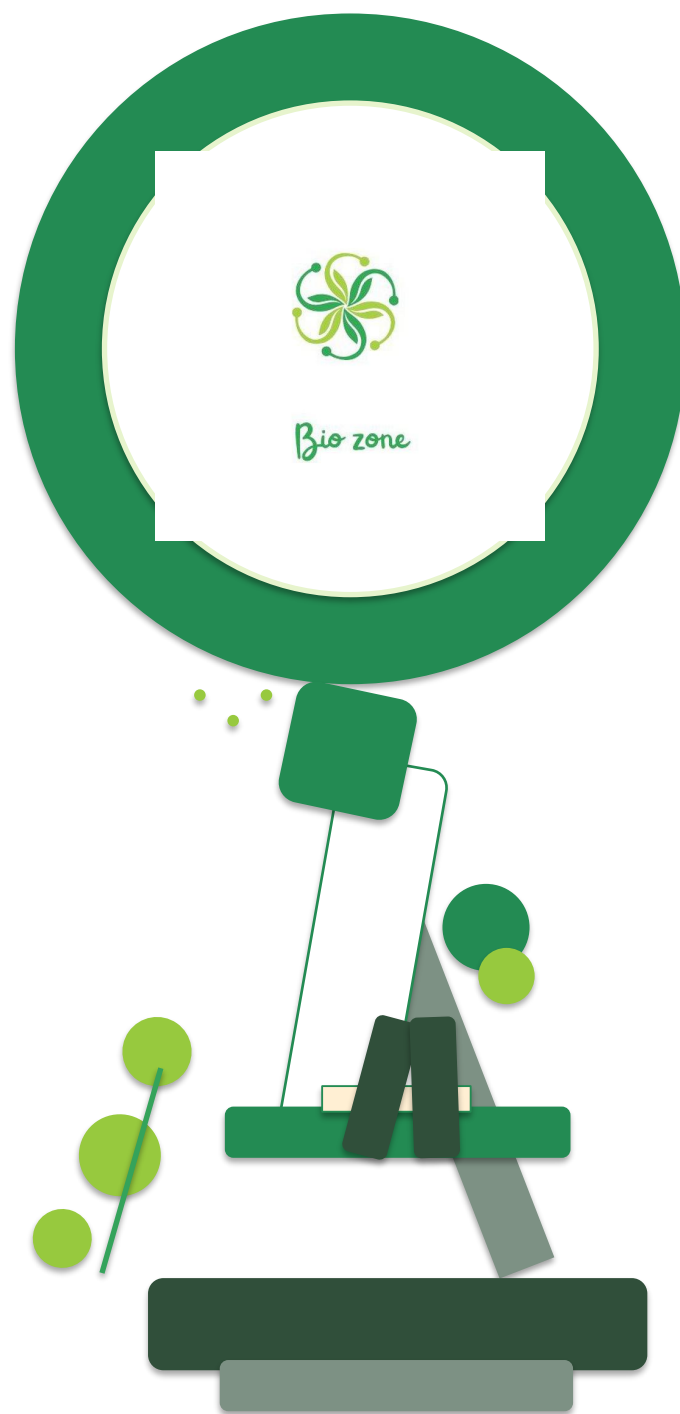
التربية الاسلامية

المواد على تلغرام

المزيد من الملفات حسب الصف التاسع العام والمادة أحياء في الفصل الأول

أسئلة درس الكائنات الحية وعلاقاتها المتبادلة - عام بريدج

1



BIO

Chemistry in biology

Water and its solutions



DATE

16/ 09 / 2026



TEACHER

Rania
Adel



GRADE

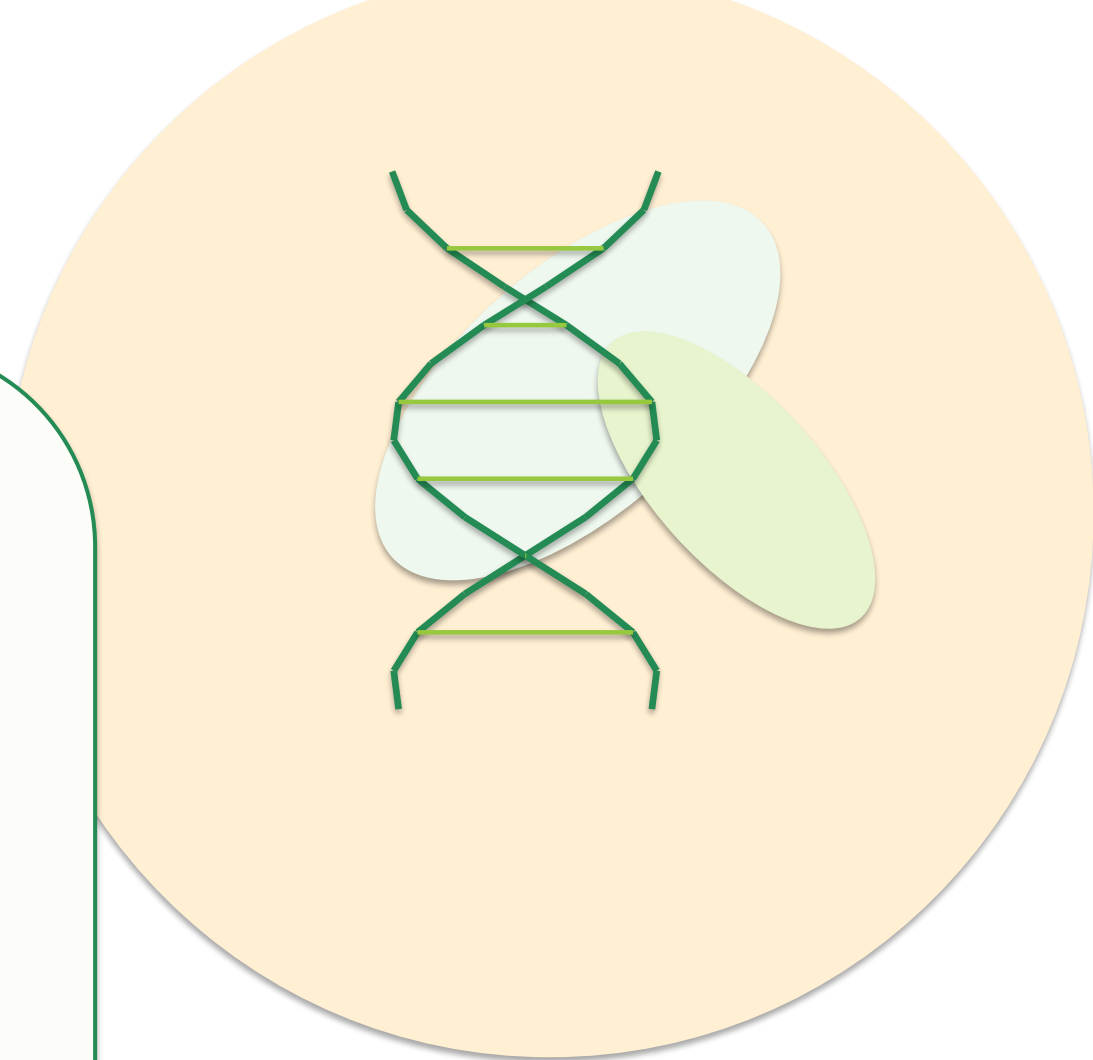
تاسع متقدم
أنسباير



SUBJECT

Biology

Learn • Understand • Apply

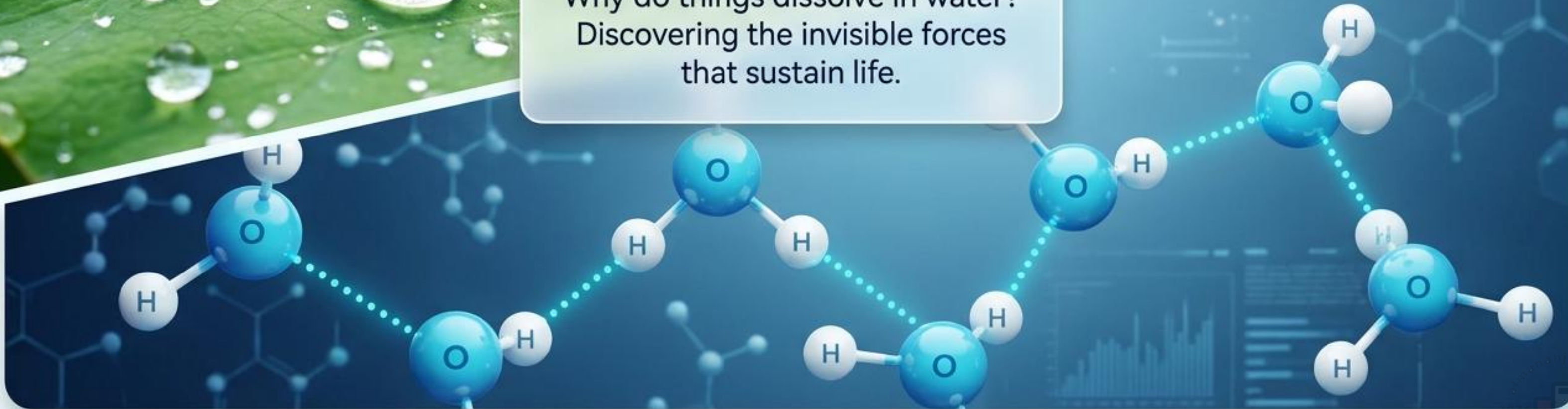


Water and Its Solutions

The Molecular Blueprint of Life

Focus Question

Why do things dissolve in water?
Discovering the invisible forces
that sustain life.



Core Explainer

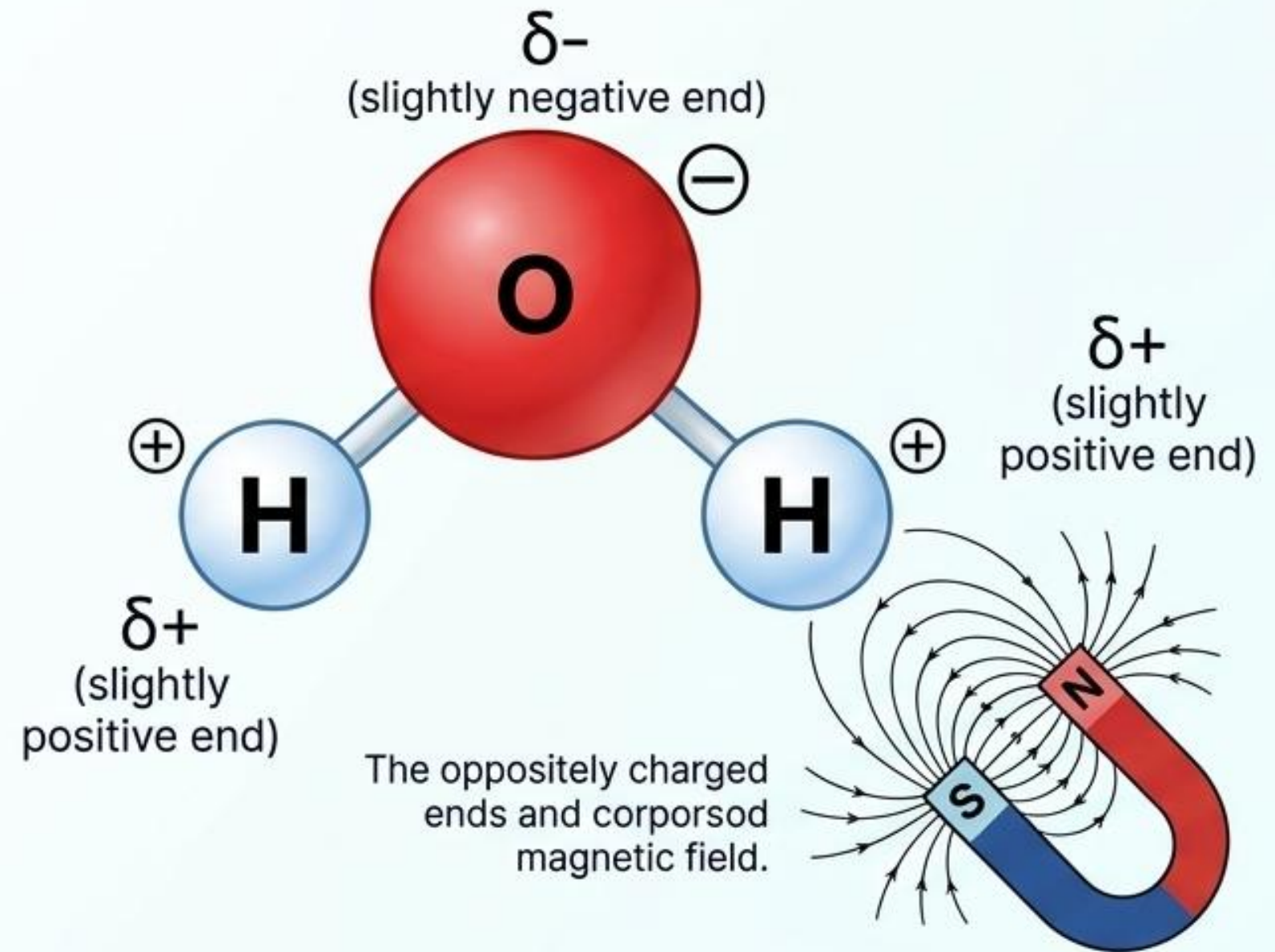
The Polar Molecule

In some covalent bonds, atoms do not attract electrons equally. Oxygen holds electrons more tightly than hydrogen, resulting in an unequal distribution of charges.

Key Takeaway

Polar molecules have oppositely charged regions due to unequal electron sharing.

Visual Evidence



The Physics

Van der Waals Forces

Opposite charges on polar molecules attract each other, creating **weak electrostatic forces**.

Forces. The strength depends on molecule size, shape, and **electron** attraction.

Real-Life Application



SEM Magnification: 11,000 X

Van der Waals forces act like “molecular velcro” allowing geckos to climb smooth surfaces and holding water droplets together to support a water strider.

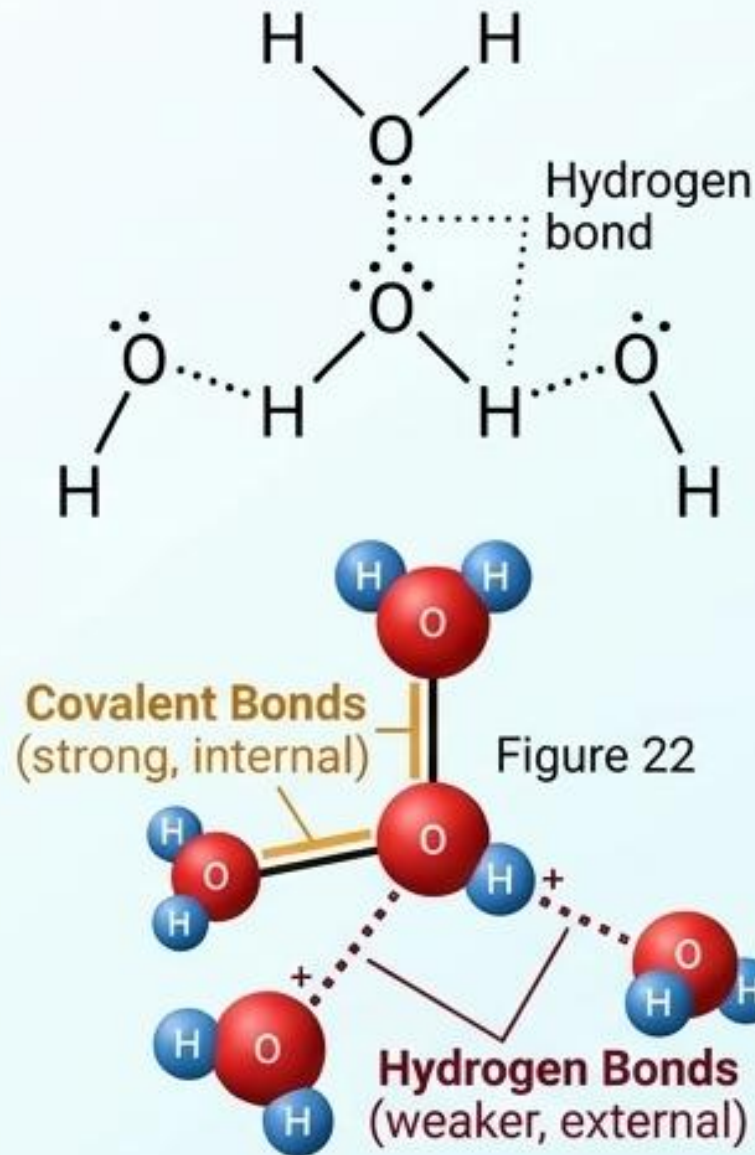
Quick Check

Think About It: Are van der Waals forces stronger or weaker than covalent bonds? (Hint: They are ideal for short-term interactions).

Hydrogen Bonds: The Water Web

A hydrogen bond is a strong type of van der Waals force involving a hydrogen atom and a fluorine, oxygen, or nitrogen atom from a different molecule.

Visual Evidence



Chemical Forces Matrix

	Covalent Bond	Van der Waals Forces	Hydrogen Bond
Nature of Interaction	Electrons shared within a molecule	Electrostatic attraction between oppositely charged regions	Specific interaction between H and F, O, or N in different molecules
Relative Strength	Strong (Molecular knot)	Weak (Molecular velcro)	Weak, but a strong type of van der Waals force
Biological Example	Forming the H ₂ O molecule	Gecko climbing a wall	Water molecules attracting each other

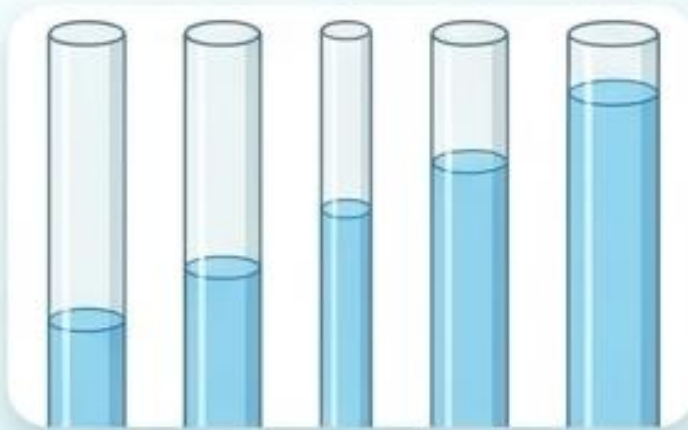
The Properties of Water:

Cohesion vs. Adhesion

Adhesion

Water forming hydrogen bonds with other surfaces.

Real-Life Action: Capillary action (water traveling up plant stems).



Capillary action in glass tubes



Cups demonstrating adhesion

Cohesion

Water molecules attracted to each other.

Real-Life Action: Surface tension.



Water strider

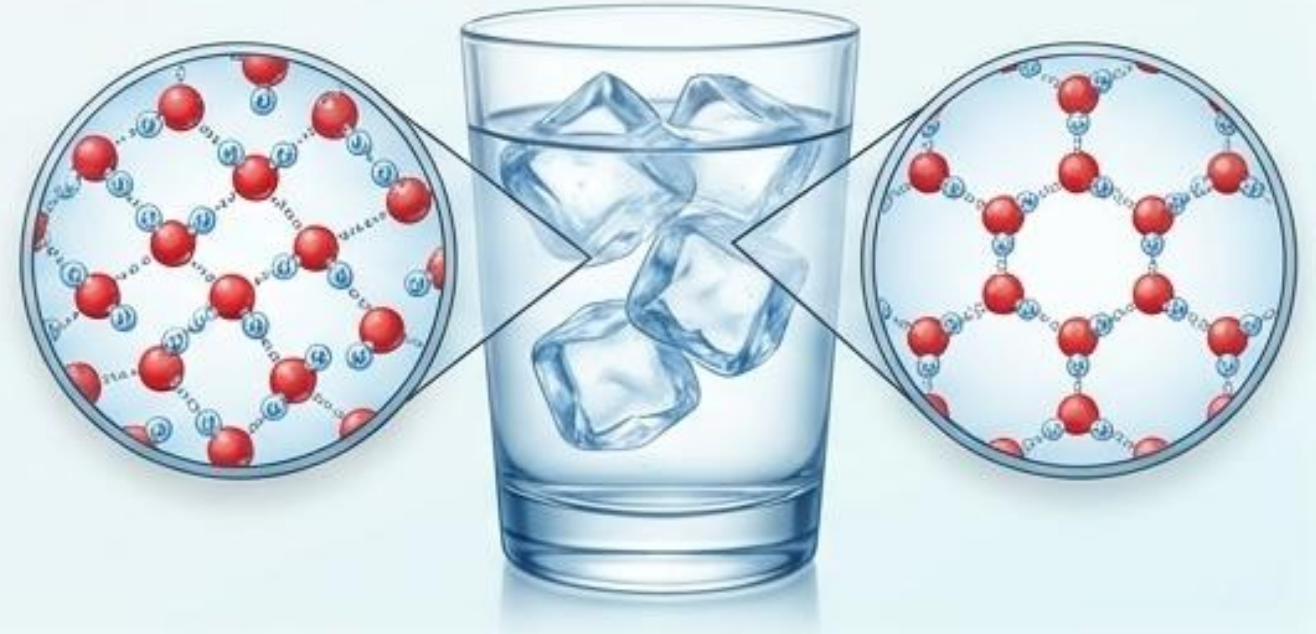


Dew on grass

The Properties of Water: Ice & Solvent

Ice Floats

Liquid water becomes more dense as it cools to 4°C, but ice is less dense than liquid water. Nutrients mix, and fish survive winter beneath the ice.



The Universal Solvent

Water's polarity allows it to dissolve many substances, earning the title "universal solvent".

Takeaway: Without this, cells couldn't transport nutrients!

Mixtures with Water

(Substances retain individual properties)

Homogeneous Mixtures (Solutions)

Uniform composition throughout.



Definitions

Solvent: The substance doing the dissolving (e.g., Water).

Solute: The substance being dissolved (e.g., Drink powder, salt).

Biological Example: Saliva (contains water, proteins, salts).
Air (solution of gases).

Analyzing Mixtures

Solutions (Homogeneous)

Uniform composition.
Does not settle.

Example:
Powdered drink mix.

Suspensions (Heterogeneous)

Components remain
distinct. Particles settle to
the bottom over time.

Example:
Sand and
water.



Colloids (Heterogeneous)

Particles do NOT settle
out.

Example:
Blood
(plasma,
cells), smoke,
milk, ink, butter.

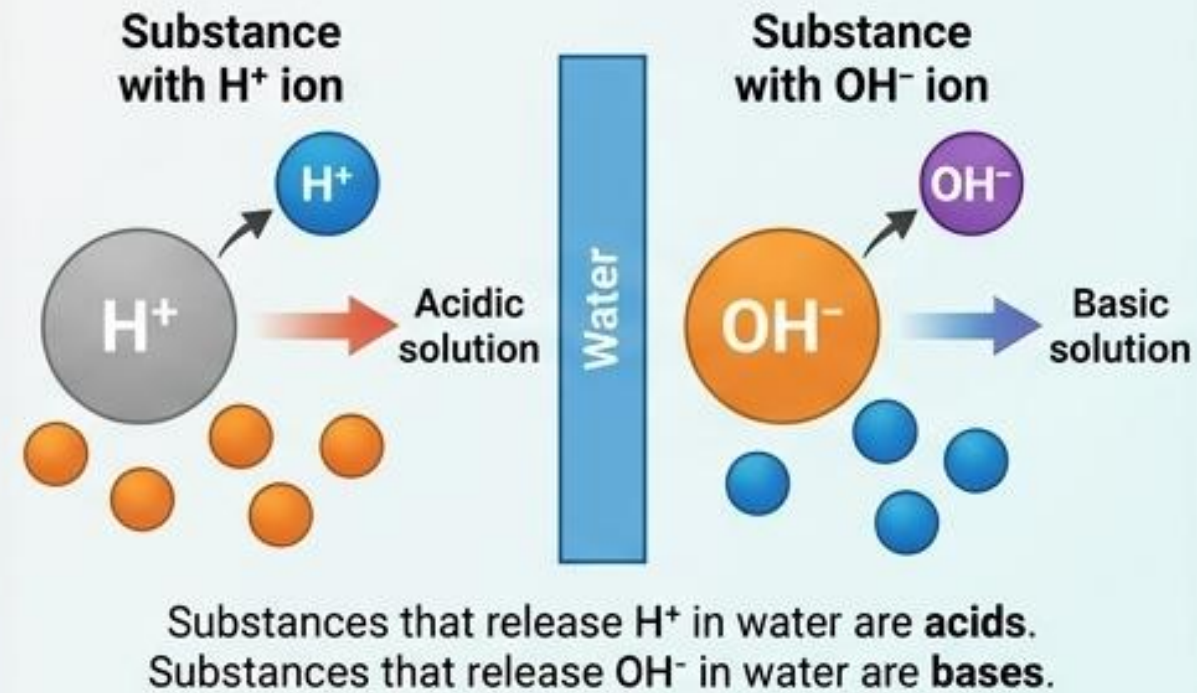


Academic Vocabulary: Suspend - to keep from falling or sinking.

Acids

Release **Hydrogen ions (H^+)** in water. The more H^+ , the more acidic.

Example: Gastric juices.



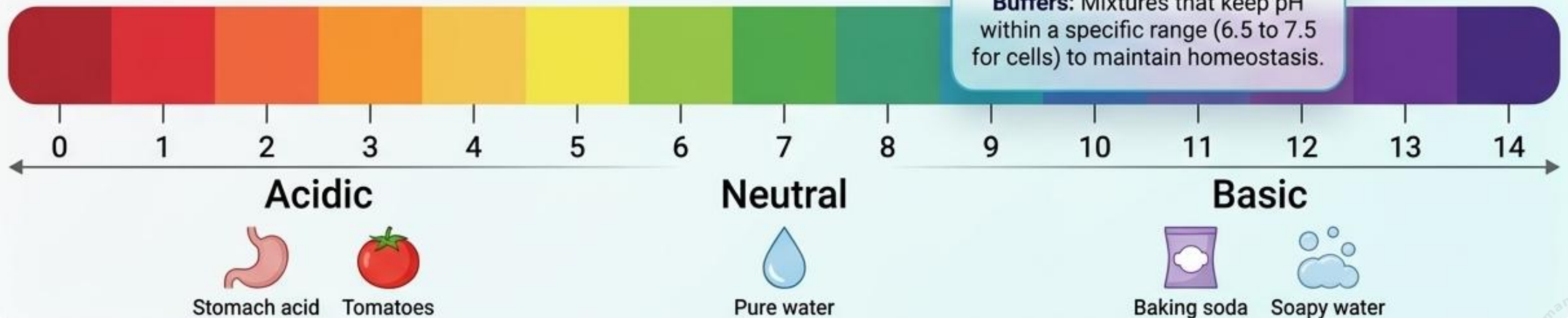
Bases

Release **Hydroxide ions (OH^-)** in water.

Example: Sodium hydroxide ($NaOH$).

Buffers Concept Box

Buffers: Mixtures that keep pH within a specific range (6.5 to 7.5 for cells) to maintain homeostasis.



The Chemistry of Life: Tied Together

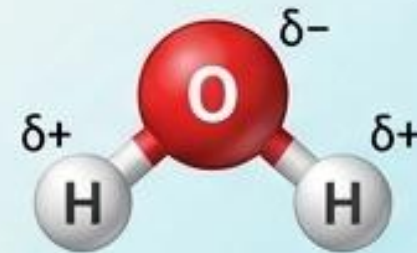
Physics → Movement

Polarity creates H-bonds → enabling capillary action (plants getting water).

Physics → Insulation

H-bonds space out when freezing → ice floats (aquatic life survives winter).

It All Starts
With Polarity



Chemistry → Transport

Polarity attracts other charges → **Universal Solvent** (blood plasma transporting cellular nutrients).

Biology → Homeostasis

Biochemical reactions require strict H⁺ limits → **Buffers** maintain cellular pH at 6.5–7.5.

Assessment: Part 1 (Recall & Comprehend)

Q1 (MCQ): What causes a water molecule to be polar?

- (A) Equal sharing of electrons
- (B) Unequal distribution of charges
- (C) Release of hydrogen ions
- (D) The presence of a solute.

Q2 (True/False): Covalent bonds within a water molecule are weaker than the van der Waals forces between water molecules.

Q3 (Matching): Match the biological phenomenon to its driving force:

- | | |
|---|-------------------|
| [1] Gecko climbing | [A] Cohesion |
| [2] Capillary action in plants | [B] Van der Waals |
| [3] Surface tension for water striders. | [C] Adhesion |

Q4 (Short Answer): Why is water commonly referred to as the 'universal solvent'?

Q5 (MCQ): A substance that releases H^+ ions when dissolved in water is called:

- (A) A base
- (B) A buffer
- (C) An acid
- (D) A colloid

Assessment: Part 2 (Apply & Analyze)

Q6 (Cause & Effect)

Water becomes less dense as it freezes.

Explain the biological effect this has on a frozen lake ecosystem.

Q7 (MCQ)

What is the primary function of a buffer in a biological system?

- (A) To dissolve solutes,
- (B) To increase H^+ concentration,
- (C) To maintain pH within a specific range,
- (D) To create heterogeneous mixtures.

Q8 (Application)

If you mix salt into water and it dissolves completely, which substance is the solvent and which is the solute?

Q9 (True/False)

In a suspension, such as sand and water, the particles will eventually settle to the bottom over time.

Q10 (MCQ)

Which of the following describes a mixture where particles do NOT settle out over time, such as blood?

- (A) Solution,
- (B) Colloid,
- (C) Suspension,
- (D) Solvent.

Assessment: Part 3 (Evaluate & Create)

Q11 (Application):

If baking soda has a pH of 9, is it acidic or basic? Does it have more H^+ or OH^- ions compared to pure water?

Q12 (Compare):

Contrast blood and a mixture of sand/water based on how their particles behave over time.

Q13 (Short Answer):

Explain the difference between cohesion and adhesion.

Q14 (Application):

Predict: If you add hydrochloric acid (HCl) to water, what effect would this have on the H^+ ion concentration? On the pH level?

Q15 (Critical Thinking):

Based on your knowledge of buffers, explain how taking an antacid helps soothe an upset stomach (which contains gastric juices at pH 4).

ANSWER KEY

1. (B) Unequal distribution of charges
2. False (Covalent bonds are stronger)
3. [1]-(B), [2]-(C), [3]-(A)
4. Because its polarity allows it to dissolve many substances.
5. (C) An acid
6. Ice floats on top, insulating the water below so aquatic life (fish) can survive the winter.
7. (C) To maintain pH within a specific range
8. Solvent: Water. Solute: Salt.
9. True
10. (B) Colloid
11. Basic. It has more OH⁻ ions and fewer H⁺ ions than pure water.
12. Blood is a colloid (particles do not settle). Sand/water is a **suspension** (particles settle).
13. **Cohesion** is attraction between identical molecules (water to water). **Adhesion** is attraction between different molecules (water to surfaces).
14. The H⁺ ion concentration would increase, causing the pH level to decrease.
15. The antacid acts as a **buffer**, reacting with the highly acidic gastric juices to raise the pH and restore homeostasis.



Bio zone

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