

Water and Its Solutions



تم تحميل هذا الملف من موقع المناهج الإماراتية

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ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
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التواصل الاجتماعي بحسب الصف التاسع المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف التاسع المتقدم والمادة علوم في الفصل الأول

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Unit 1 – Lesson 3

Water and Its Solutions

Intermolecular Forces

- Polarity is the property of having two opposite poles or ends.
- Molecules that have an unequal distribution of charges are called **polar molecules**, meaning that they have oppositely charged regions.
- Water has a slightly negative end and two slightly positive ends. Therefore, it is a polar molecule.

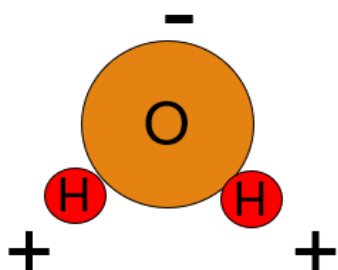
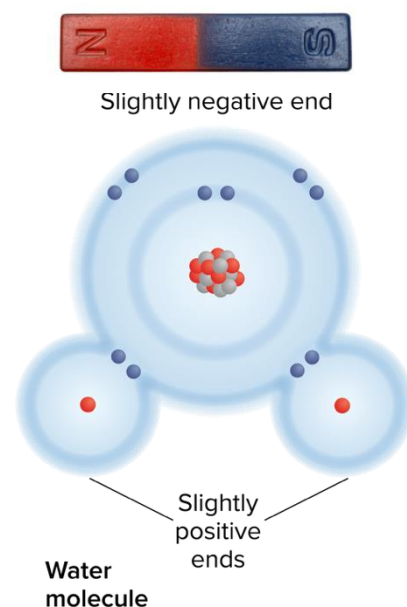
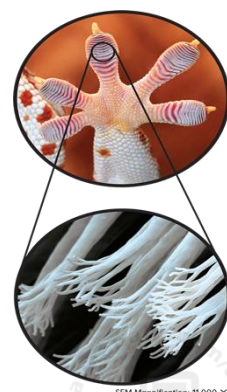


Figure 19 Water molecules have a bent shape, and electrons are not shared equally between hydrogen and oxygen. This results in a molecule with oppositely charged regions.



Van der Waals Forces

- Regions of opposite charge cause weak electrostatic attractions between molecules called **van der Waals forces**.
- These attractions cause intermolecular forces.
- Intermolecular forces determine physical characteristics like boiling and melting point.
- Figure 20 Scientists have determined that geckos can climb smooth surfaces because of van der Waals forces between the hairlike structures on their toes and the surface they are climbing.





Van der Waals Forces in Water

- The attraction of the areas of slight **positive** and **negative** charges around the water molecules hold the molecules together.
- This gives water many of the properties that enable life on Earth.

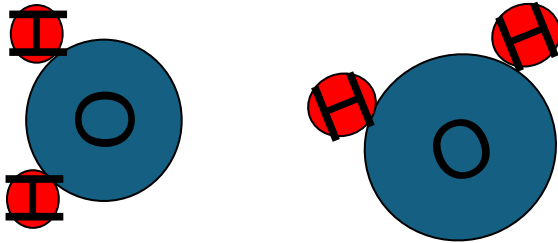


Figure 21 Due to the attractive forces between water molecules, the surface of water supports a water strider.

Hydrogen Bonds

- When a charged region of a polar molecule comes close to the oppositely charged region of another polar molecule, a weak attraction forms.
- A **hydrogen bond** is a weak interaction involving a *hydrogen atom and a fluorine, oxygen, or nitrogen atom*.
- A hydrogen bond is a strong type of van der Waals force.

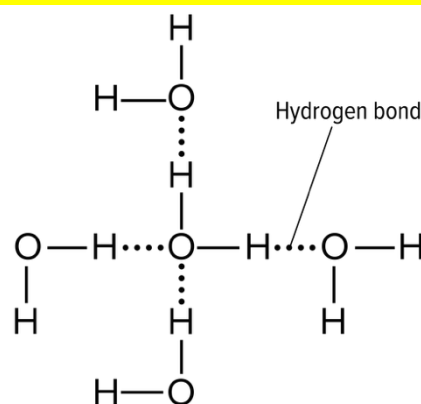


Figure 22 In water, an electrostatic attraction is called a hydrogen bond.





Universal solvent

- Why is water so good at dissolving things?

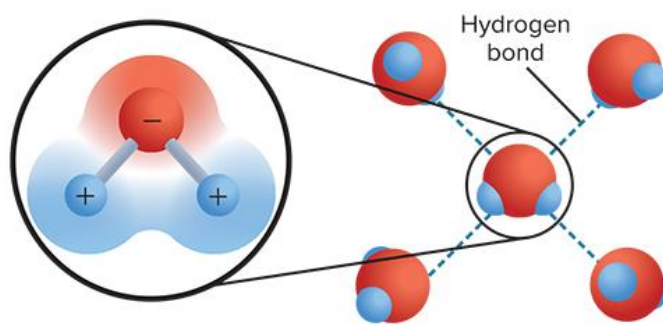
Because water is a polar molecule, and it forms hydrogen bonds. Many substances can dissolve in it.

Other polar molecules and ionic compounds can be dissolved by water.

Non-polar substances DO NOT dissolve in water.



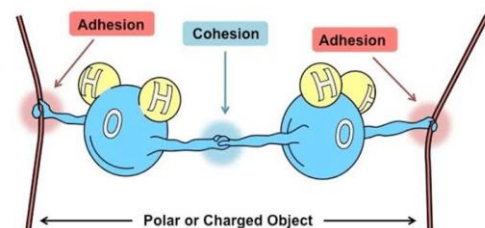
Hydrogen Bonding



A water molecule is made up of one oxygen atom and two hydrogen atoms. A water molecule is polar in nature. Its bent shape results in a slightly positive charge on the hydrogen atoms and a slightly negative charge on the oxygen atom. As a result, it forms hydrogen bonds. Water is called the universal solvent because many substances dissolve in it.

Water has both cohesion and adhesion properties

What is the difference between cohesion and adhesion?



Cohesion is the attraction between the molecules or atoms of the same substance.

Adhesion is the attraction between the molecules of two different substances.





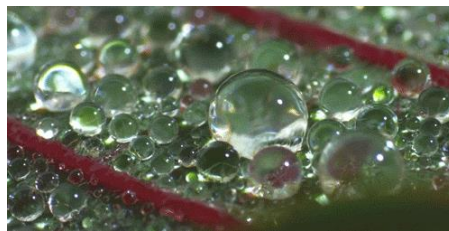
Water has surface tension What is surface tension?

Surface tension is a force which causes a layer of liquid to behave like an elastic sheet or skin.

Note :Cohesion makes a water drop a drop

For water, this state happens when a water molecule is surrounded on all sides by other water molecules, which creates a sphere or ball (perfectly round if it was in outer space).

Cohesion



Water strider



Dew on grass

Water is cohesive—the molecules are attracted to each other because of **hydrogen bonds**. The positive polarity of the hydrogen atom is attracted to the negative polarity of the oxygen atoms.

This **attraction creates surface tension**, which causes water to form droplets and allows insects and leaves to rest on the surface of a body of water.



Adhesion

Water is adhesive—it forms hydrogen bonds with molecules on other surfaces. Capillary action is the result of adhesion; it's why water can travel up the stems of plants. Water travels up the paper, and carries the dye to the middle glass via adhesion.



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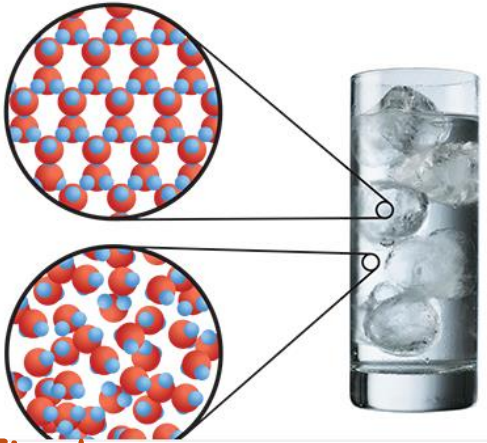


Capillary action in glass tubes



Cups demonstrating adhesion





Ice Floats

Liquid water becomes more dense as it cools to 4°C. Yet, ice is less dense than liquid water. As a result, nutrients in bodies of water mix because of changes in water density during spring and fall. Also, fish can survive in winter because ice floats—they continue to live and function in the water beneath the ice.

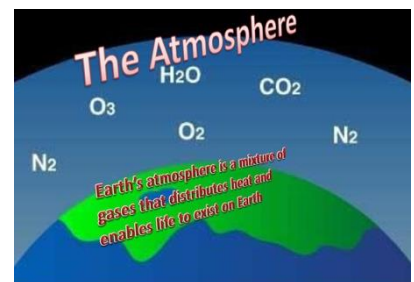
Mixtures with Water

Homogeneous Mixtures

- When a mixture has a uniform composition throughout, it is called **homogenous**.



- ❖ **Saliva** moistens your mouth and begins the digestion of some of your food. Saliva is a solution that contains water, proteins, and salts.
- ❖ The air you breathe is a **solution of gases**.



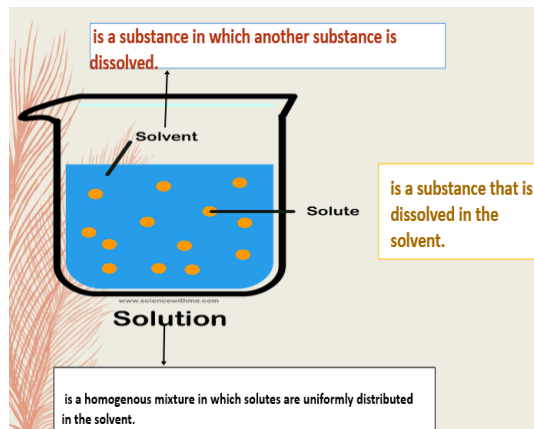
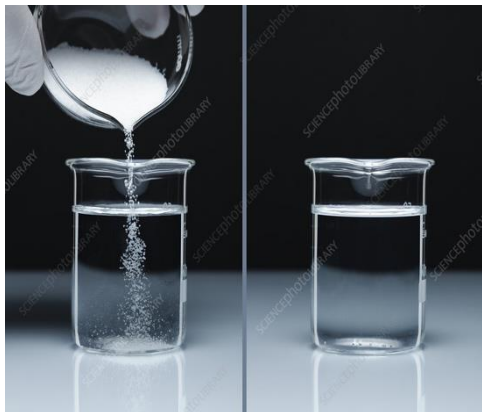
The water retains its properties, and the drink mix retains its properties.

Figure 24 The drink mix forms a homogeneous mixture in water. The particles of the solute drink mix are dissolved and spread throughout the solvent (water).





- A **solution** is another name for a homogeneous mixture.
- In a solution, there are two components:
 - A **solvent** is a substance in which another substance is dissolved.
 - A **solute** is a substance that is dissolved in a solvent.



Heterogeneous Mixtures

- When the components in a mixture remain distinct, it is a heterogeneous mixture.
- A **suspension** is a type of heterogeneous mixture in which the particles settle out over time
- A **colloid** is a heterogeneous mixture in which the particles do not settle out.

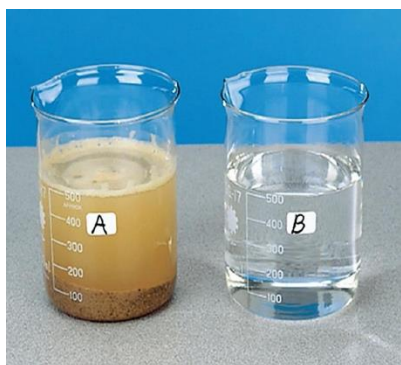


Figure 25 Sand and water form a heterogeneous mixture; you can see both the liquid and the solid. The homogeneous mixture of salt and water is a liquid; you cannot see the salt.





Examples of solution	Example of suspension	Example of Colloidal
a mixture of salt and water	sand and water	smoke, butter, paint, ink,
		
saliva (a solution that contains water, protein and salt)	EXAMPLES OF SUSPENSIONS 	blood is a colloid made up of plasma, cells and other substances 

Acids and Bases

- Many solutes readily dissolve in water because of water's polarity.
- Substances that release H^+ when they are dissolved in water are called acids.
- Substances that release hydroxide ions (OH^-) when they are dissolved in water are called bases.

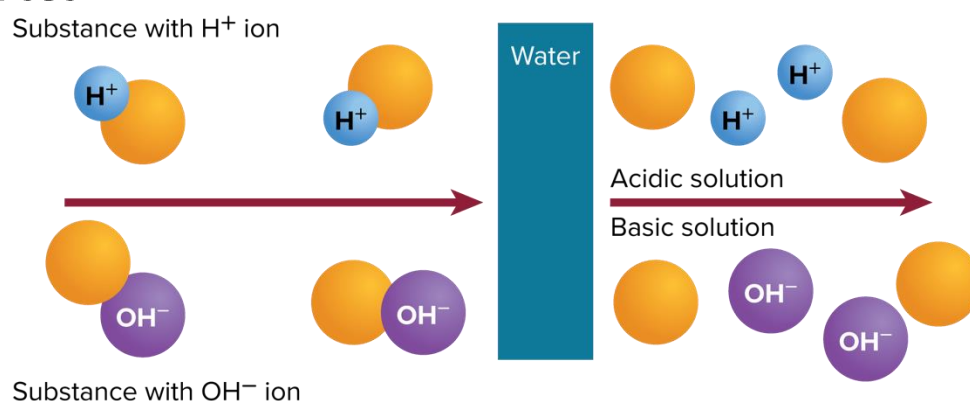


Figure 2.7 Substances that release H^+ in water are acids. Substances that release OH^- in water are bases.





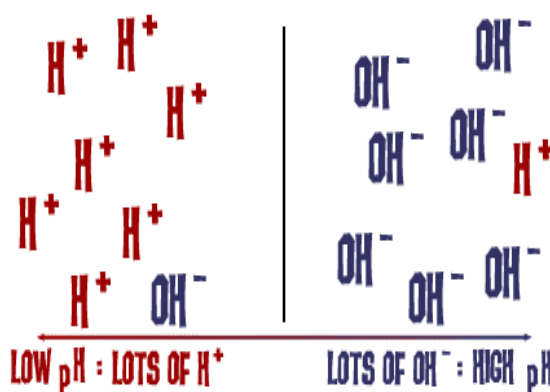
ACIDS	BASES
Substances that release hydrogen ions when they are dissolved in water are called Acids	Substances that release hydroxide ions (OH^-) when they are dissolved in water are called Bases
The more hydrogen ions a substance releases, the more acidic the solution becomes.	The more hydroxide ions a substance releases, the more basic the solution becomes.
HCl, Many food and beverages, gastric juice (stomach)	NaOH, baking soda, soap water

pH and Buffers

- The amount of hydrogen or hydroxide ions in a solution determines the strength of an acid or base.
- The measure of concentration of H^+ in a solution is called pH.
 - Acids have pH values < 7 .
 - Bases have pH values > 7 .
- Buffers are mixtures that can react with acids or bases to keep the pH within a particular range.

$$\text{pH} = -\log[\text{H}_3\text{O}^+]$$

pH	solution
$\text{pH} > 7$	basic
$\text{pH} = 7$	neutral
$\text{pH} < 7$	acidic



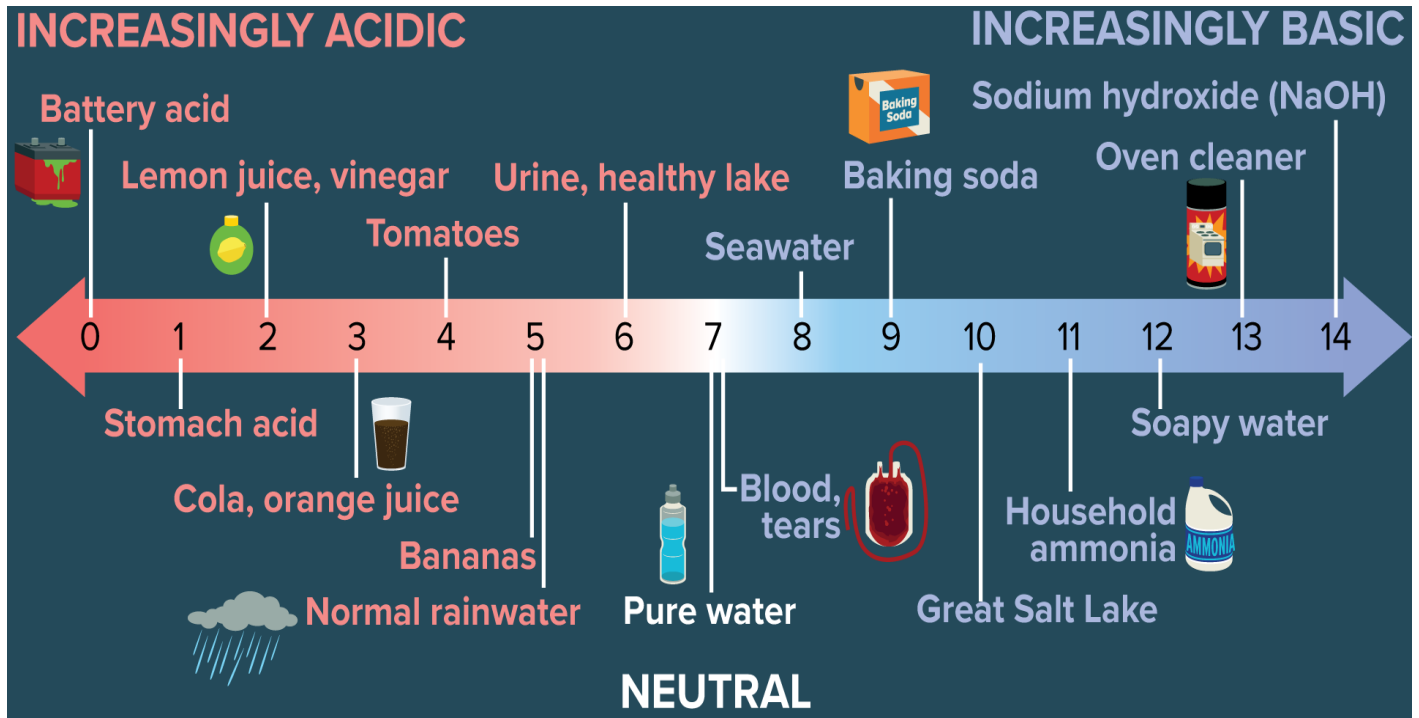
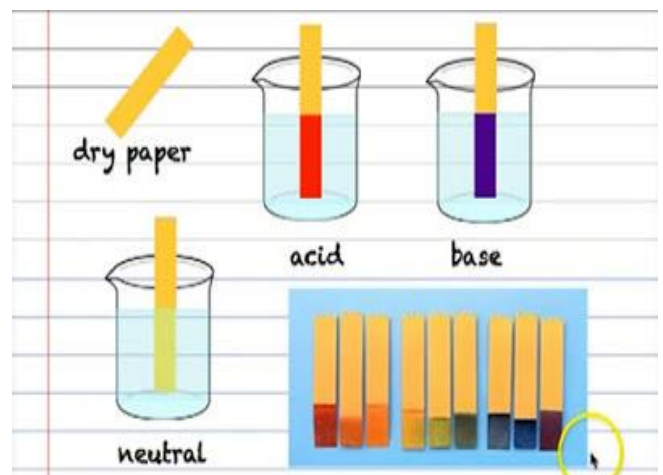


Figure 28 The pH scale is used to indicate the relative strength of acids and bases.

How can we test??



pH test strips

