

تم تحميل هذا الملف من موقع المناهج الإماراتية



## أوراق عمل الدرس الأول bases and acids to Introduction مقدمة الأحماض والقواعد

موقع المناهج ← المناهج الإماراتية ← الصف الثاني عشر المتقدم ← كيمياء ← الفصل الثاني ← أوراق عمل ← الملف

تاريخ إضافة الملف على موقع المناهج: 07:50:35 2025-01-19

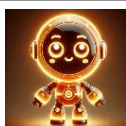
ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل  
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المزيد من مادة  
كيمياء:

إعداد: Gaber Mohamed Tarek

## التواصل الاجتماعي بحسب الصف الثاني عشر المتقدم

صفحة المناهج  
الإماراتية على  
فيسبوك



الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

## المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة كيمياء في الفصل الثاني

شرح وحدة الأحماض والقواعد ووحدة الأكسدة والإختزال

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أوراق عمل الوحدة الرابعة الأحماض والقواعد

2

أوراق عمل الوحدة الرابعة Bases and Acids الأحماض والقواعد منهج انسابير

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مذكرة تأسيس بداية الفصل الثاني

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المزيد من الملفات بحسب الصف الثاني عشر المتقدم والمادة كيمياء في الفصل الثاني

الخطة الفصلية للمقرر الخطة C للعام 2024-2025

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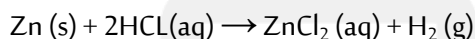
## Lesson 1: Introduction to Acids and Bases

### Properties of Acids and Bases

Acids	Bases
<p><b><u>Physical properties:</u></b></p> <ul style="list-style-type: none"> <li>Carbonic and phosphoric acids give carbonated beverages their <b>sharp</b> taste.</li> <li>Citric and ascorbic acids give lemons their <b>tartness</b>.</li> <li>Acetic acid makes vinegar taste <b>sour</b>.</li> </ul>	<p><b><u>Physical properties:</u></b></p> <ul style="list-style-type: none"> <li>Taste <b>bitter</b>.</li> <li>Soap becomes <b>slippery</b> when it gets wet.</li> </ul>
<p><b><u>Electrical conductivity:</u></b> Acids and bases produce ions that cause the resulting solution to become a conductor.</p>	
Acids cause blue litmus paper to <b>turn red</b> .	Bases cause red litmus paper to <b>turn blue</b> .

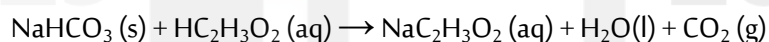
### Acids Reactions with metals

Magnesium and zinc react with aqueous solutions of acids to produce **hydrogen gas**.



### Acids Reactions with metal carbonates

Metal carbonates react with aqueous solutions of acids to produce **carbon dioxide (CO<sub>2</sub>) gas and water**.



Geologists identify rocks as limestone (CaCO<sub>3</sub>) by using a hydrochloric acid solution. If a few drops of the acid produce bubbles of CO<sub>2</sub>, the rock contains limestone.

### Write balanced equations for the reactions between the following.

- aluminum and sulfuric acid
- calcium carbonate and hydrobromic acid

**Challenge** Write the net ionic equation for the reaction between calcium carbonate and hydrobromic acid.

## Hydronium and hydroxide ions

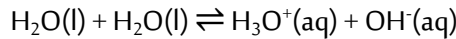
All water solutions contain hydrogen ions ( $H^+$ ) and hydroxide ions ( $OH^-$ ).

An **acidic solution** contains more hydrogen ions than hydroxide ions.

A **basic solution** contains more hydroxide ions than hydrogen ions.

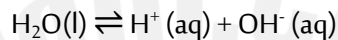
**Neutral solution** is neither acidic nor basic. It contains equal concentrations of hydrogen ions and hydroxide ions.

Pure water produces equal numbers of  $H^+$  ions and  $OH^-$  ions in a process called **self-ionization**, in which water molecules react to form a hydronium ion ( $H_3O^+$ ) and a hydroxide ion.



Water molecules  $\rightleftharpoons$  Hydronium ion + Hydroxide ion

The **hydronium ion** is a hydrogen ion which has a water molecule attached to it by a covalent bond. The symbols  $H^+$  and  $H_3O^+$  can be used interchangeably, as this simplified self-ionization equation shows.



## The Arrhenius Model

An **acid** is a substance that contains hydrogen and ionizes to produce hydrogen ions in aqueous solution.

A **base** is a substance that contains a hydroxide group and dissociates to produce a hydroxide ion in aqueous solution.

When hydrogen chloride gas dissolves in water. HCl molecules ionize to form  $H^+$  ions, which make the solution acidic.



When the ionic compound sodium hydroxide ( $NaOH$ ) dissolves in water, it dissociates to produce  $OH^-$  ions, which make the solution basic.

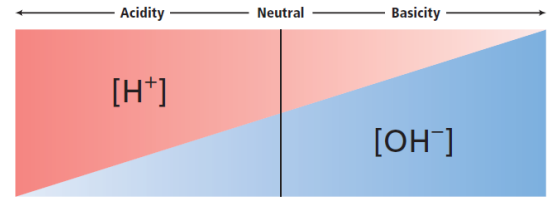


## The shortcomings of Arrhenius model:

Ammonia ( $NH_3$ ) and sodium carbonate ( $Na_2CO_3$ ), can they considered as Arrhenius bases? Why?

Yet both substances produce hydroxide ions in solution and are well-known bases.

Which of the following is correct?	أي مما يأتي صحيح؟
In basic solution $[H^+] > [OH^-]$	$[H^+] > [OH^-]$ في المحلول القاعدي يكون <input type="radio"/>
In neutral solution $[H^+] > [OH^-]$	$[H^+] > [OH^-]$ في المحلول المتعادل يكون <input type="radio"/>
In acidic solution $[H^+] > [OH^-]$	$[H^+] > [OH^-]$ في المحلول الحمضي يكون <input type="radio"/>
In acidic solution $[H^+] < [OH^-]$	$[H^+] < [OH^-]$ في المحلول الحمضي يكون <input type="radio"/>

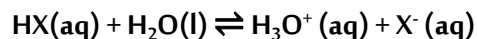


## The Bronsted-Lowry Model

An **acid** is a hydrogen-ion donor. A **base** is a hydrogen ion acceptor.

### Hydrogen ion donors and acceptors

Use this equation to answer the following questions:



Which substance is the acid? ..... Why? .....

The water molecule acts as a ..... because .....

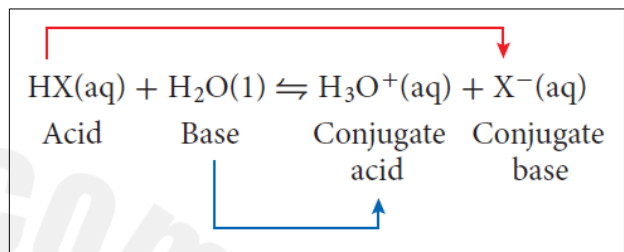
A **conjugate acid** is the species produced when a base accepts a hydrogen ion. (In this example it's .....

A **conjugate base** is the species that results when an acid donates a hydrogen ion. (In this example it's .....

The hydronium ion ( $\text{H}_3\text{O}^+$ ) is the conjugate acid of the base  $\text{H}_2\text{O}$ .

The  $\text{X}^-$  ion is the conjugate base of the acid  $\text{HX}$ .

A **conjugate acid-base pair** consists of two substances related to each other by the donating and accepting of a single hydrogen ion.



Explain how the ion  $\text{HCO}_3^-$  can be both an acid and a base.

### Hydrogen fluoride—a Bronsted-Lowry acid

Hydrogen fluoride is an acid. Why?



Which species is the conjugate base of hydrogen fluoride? .....

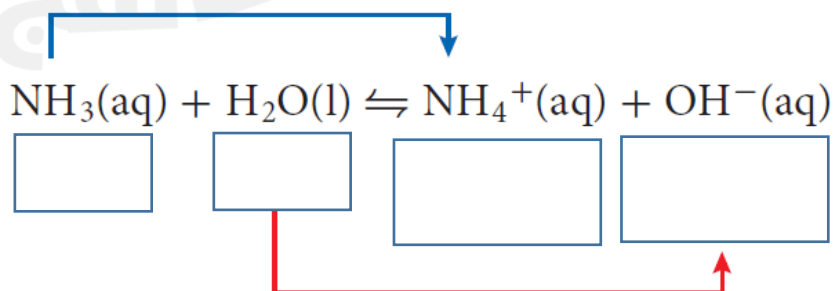
What is the other conjugate acid-base pair? .....

What are the acid and base in the reverse reaction? .....

Hydrogen fluoride is used to manufacture a variety of fluorine-containing compounds, such as the nonstick coating on the kitchenware. It is an acid according to both the Arrhenius and Brønsted-Lowry definitions.

### Ammonia—a Brønsted-Lowry base

Ammonia does not fit the Arrhenius model of bases because .....



Label the next equation:

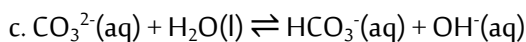
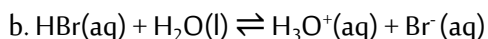
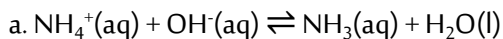
## Water—a Bronsted-Lowry acid and base

When HF dissolves in water, water acts as a .....; when NH<sub>3</sub> dissolves in water, water acts as an .....

Water and other substances that can act as both acids and bases are said to be **amphoteric**.

### PRACTICE Problems

Identify the conjugate acid-base pairs in each reaction.



	Acid	Conjugate base	Base	Conjugate acid
a.				
b.				
c.				

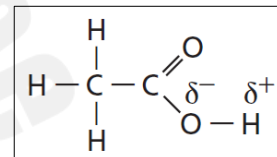
**Challenge** The products of an acid-base reaction are H<sub>3</sub>O<sup>+</sup> and SO<sub>4</sub><sup>2-</sup>. Write a balanced equation for the reaction and identify the conjugate acid-base pairs.

.....  
 .....

### Monoprotic Acids

An acid that can donate only one hydrogen ion is called a **monoprotic** acid. (Examples: .....) )

The formula of acetic acid is often written HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>. why.

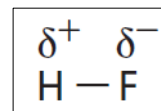


### Ionizable hydrogen atoms

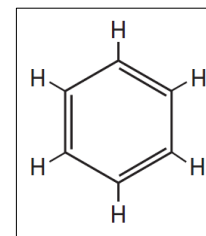
Explain the difference between acetic acid's ionizable hydrogen atom and the other three hydrogen atoms.

.....  
 .....

Hydrofluoric acid (HF) is an acid in solution. Explain.



Explain why benzene is not an acid.



### Polyprotic Acids

Any acid that has more than one ionizable hydrogen atom.

diprotic acids	triprotic acids
Acids that contain two ionizable hydrogen atoms.	Acids with three hydrogen ions to donate.
Examples:	Examples:

Write the three ionizations of phosphoric acid.

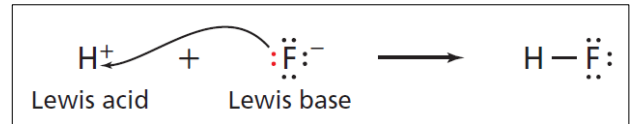
## The Lewis Model

**Lewis acid** is an ion or molecule with a vacant atomic orbital that can **accept** (share) an **electron pair**.

**Lewis base** is an ion or molecule with a lone **electron pair** that it can **donate** (share).

The  $H^+$  ion is the Lewis acid because .....

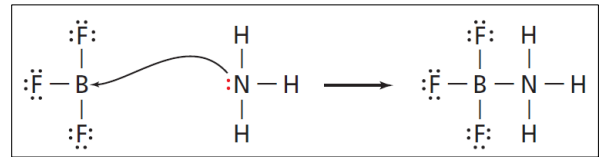
The fluoride ion is the Lewis base .....



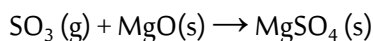
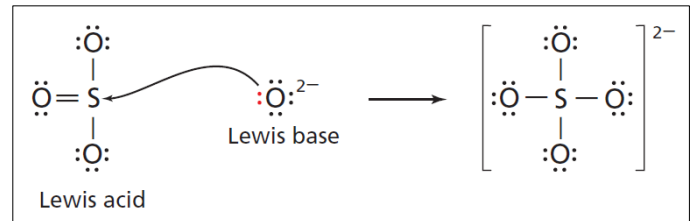
### In this reaction:

What is the Lewis acid? .....

What is the Lewis base? .....



Another Lewis acid-base reaction occurs when gaseous sulfur trioxide ( $SO_3$ ) is brought into contact with solid magnesium oxide ( $MgO$ ).



This reaction is important for some reasons:

- Magnesium sulfate forms the heptahydrate known as Epsom salt ( $MgSO_4 \cdot 7H_2O$ ). Epsom salt has many uses, including **soothing sore muscles** and **acting as a plant nutrient**.
- In environmental applications. When  $MgO$  is injected into the flue gases of coal-fired power plants, it reacts with and removes  $SO_3$ , which can combine with water in the air to form sulfuric acid, which falls to Earth as acid precipitation.

## Anhydrides

An acid anhydride is an oxide that can combine with water to form an acid. (example:  $CO_2$ )

Other oxides combine with water to form bases. (example:  $CaO$ )

$CO_2$  will form .....  $CaO$  will form .....

In general, oxides of metallic elements form bases, oxides of nonmetals form acids.

## Assessment

Which of the following refers to a basic solution?

$[H^+] > [OH^-]$

$[H^+] < [OH^-]$

$[H^+] = [OH^-]$

$[H^+][OH^-] = 1 \times 10^{-7} M$

Which of the following is <b>correct</b> about to the reaction below?	أي العبارات التالية <b>صحيحة</b> بالنسبة للتفاعل أدناه؟
$NH_3(aq) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$	
A. $NH_3$ is considered as Arrhenius base	A. تُعتبر $NH_3$ قاعدة أرهينوس
B. $H_2O$ is considered as a Bronsted - Lowry acid	B. يُعتبر $H_2O$ حمض برونستد - لوري
C. $NH_3$ accepts an electron pair from $H_2O$	C. $NH_3$ تستقبل زوج إلكترونات من $H_2O$
D. $H_2O$ accepts $H^+$ ion in the forward reaction	D. $H_2O$ يستقبل أيون $H^+$ في التفاعل الأمامي

What gas is produced during the reaction between sodium carbonate and acetic acid solution

ما الغاز الناتج خلال تفاعل كربونات الصوديوم الهيدروجينية مع المحلول المائي لحمض الأسيتيك؟

CO<sub>2</sub>

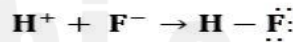
H<sub>2</sub>

O<sub>2</sub>

N<sub>2</sub>

Which of the following is **correct** about to the reaction below?

أي العبارات التالية **صحيحة** بالنسبة للتفاعل أدناه؟



A. F<sup>-</sup> ion accepts an electron pair

A. يستقبل أيون F<sup>-</sup> زوج إلكترونات

B. F<sup>-</sup> ion is considered as acceptor of hydrogen ion

B. يُعتبر F<sup>-</sup> مستقبلاً لأيون الهيدروجين

C. H<sup>+</sup> ion is considered as Arrhenius base

C. يُعتبر أيون H<sup>+</sup> قاعدة أرهينوس

D. H<sup>+</sup> ion donates an electron pair to F<sup>-</sup> ion

D. يمنح أيون H<sup>+</sup> زوج من الإلكترونات إلى أيون F<sup>-</sup>

Which of the following is a property of **acids**?

أي مما يأتي يُعتبر من خصائص **الأحماض**؟

Turn red litmus paper blue

تُحول ورقة تباع الشمس الحمراء إلى اللون الأزرق

Feel slippery

زلفة الملمس

React with zinc to produce hydrogen gas

تتفاعل مع الخارصين لتنتج غاز الهيدروجين

It tastes bitter

طعمها مر

What is the substance that contains hydrogen, and ionizes to produce hydrogen ions in aqueous solution?

ما المادة التي تحتوي على هيدروجين وتتأين لإنتاج أيونات الهيدروجين في المحلول المائي؟

Lewis acid

حمض لويس

Lewis base

قاعدة لويس

Arrhenius acid

حمض أرهينوس

Arrhenius base

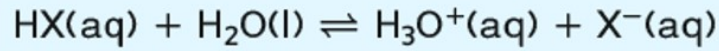
قاعدة أرهينوس



In the reaction equation below, which of the following

في معادلة التفاعل أدناه، أي مما يأتي صحيح؟

is true?



HX donates hydrogen ion to water  $\text{H}_2\text{O}$

يمنح HX أيون هيدروجين للماء  $\text{H}_2\text{O}$



$\text{H}_2\text{O}$  is a Bronsted-Lowry acid

يُعتبر  $\text{H}_2\text{O}$  من أحماض برونشتد - لوري



HX is a Bronsted-Lowry base

يُعتبر HX من قواعد برونشتد - لوري



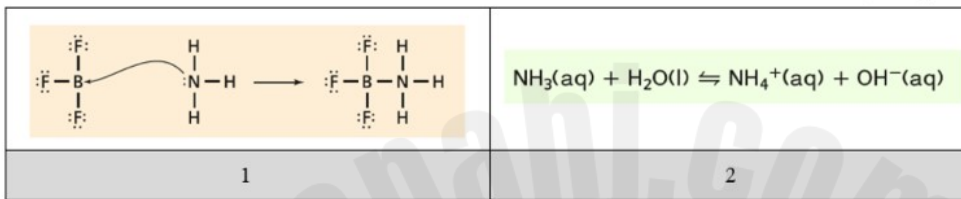
HX accepts a hydrogen ion from water  $\text{H}_2\text{O}$

يستقبل HX أيون هيدروجين من الماء  $\text{H}_2\text{O}$



Which of the following is true?

أي مما يأتي صحيح؟



The ammonia  $\text{NH}_3$  in reaction 2 is an electron pair acceptor

تُعتبر الأمونيا  $\text{NH}_3$  في التفاعل 2 مستقبل زوج إلكترونات



The ammonia  $\text{NH}_3$  in reaction 1 is a Lewis base

تُعتبر الأمونيا  $\text{NH}_3$  في التفاعل 1 قاعدة لويس



The ammonia  $\text{NH}_3$  in reaction 2 is a Bronsted-Lowry acid

تُعتبر الأمونيا  $\text{NH}_3$  في التفاعل 2 حمض برونشتد - لوري



The ammonia  $\text{NH}_3$  in reaction 1 is a Lewis acid

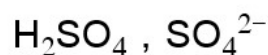
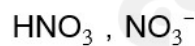
تُعتبر الأمونيا  $\text{NH}_3$  في التفاعل 1 حمض لويس



Which of the following is considered a conjugate

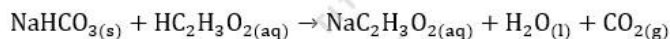
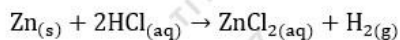
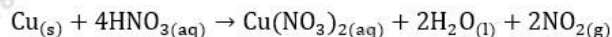
أي مما يأتي يُعتبر زوج حمض قاعدة مرافق؟

acid -base pair?



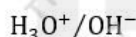
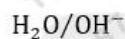
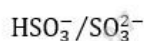
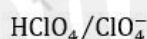
Which of the following chemical equations represents a reaction between the aqueous solution of an acid and metal hydrogen carbonate?

أي المعادلات الكيميائية التالية تُمثل تفاعل بين المحلول المائي لحمض وكربونات الفلز الهيدروجينية؟



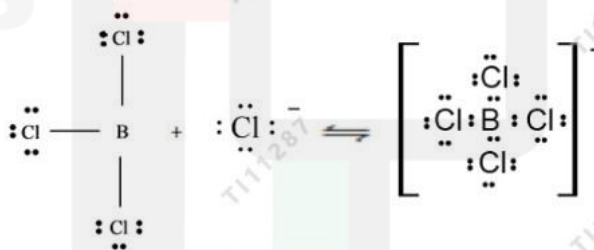
Which of the following is **not** a conjugate acid– base pair?

أي مما يلي **ليس** زوج حمض قاعدة مرافق؟



Why does  $\text{BCl}_3$  represent Lewis's acid in the following reaction?

لماذا يُمثل  $\text{BCl}_3$  حمض لويس في التفاعل التالي؟



Because it is proton acceptor from the base  $\text{Cl}^-$

لأنه مستقبل للبروتون من القاعدة  $\text{Cl}^-$

Because it is proton donor to the base  $\text{Cl}^-$

لأنه مانح للبروتون إلى القاعدة  $\text{Cl}^-$

Because it is an electron pair donor to the base  $\text{Cl}^-$

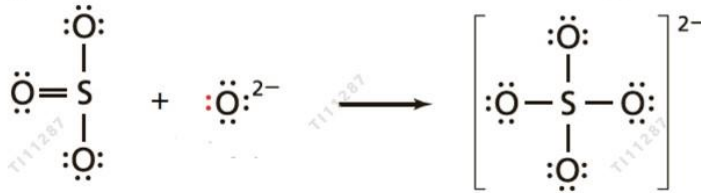
لأنه مانح لزوج إلكترونات إلى القاعدة  $\text{Cl}^-$

Because it is an electron pair acceptor from the base  $\text{Cl}^-$

لأنه مستقبل لزوج إلكترونات من القاعدة  $\text{Cl}^-$

Why does  $O^{2-}$  represent Lewis's base in the following reaction?

لماذا تُمثل  $O^{2-}$  قاعدة لويس في التفاعل التالي؟



Because it accepted a proton from  $SO_3$

لأنها استقبلت بروتونا من  $SO_3$

Because it donated a proton to  $SO_3$

لأنها منحت بروتونا إلى  $SO_3$

Because it donated a pair of electrons to  $SO_3$

لأنها منحت زوجا من الإلكترونات إلى  $SO_3$

Because it accepted a pair of electrons from  $SO_3$

لأنها استقبلت زوجا من الإلكترونات من  $SO_3$

Which of the following is amphoteric substance?

أي مما يلي يُعتبر مادة أمفوتيرية؟



Which of the following chemical equations represents the reaction that geologists use to identify limestone rocks from other rocks?

أي المعادلات الكيميائية الآتية تمثل التفاعل الذي يستخدمه الجيولوجيين للتعرف على الصخور الجيرية من بقية الصخور؟

