

Acids Bases and Salts Made Easy!!

Acid = formula starts with an H e.x. HCl , HNO_3 , H_2SO_4
Base = formula starts with a Metal and ends in $-\text{OH}$ e.x. NaOH , $\text{Ca}(\text{OH})_2$, $\text{Al}(\text{OH})_3$
Salt = formula starts with a Metal and ends with Non-metals e.x. NaCl , CaO , AlPO_4

Properties of Acids:

H - NM

HCl HNO_3 H_2SO_4 etc

-taste sour

-are corrosive

-some foods are acidic e.x. vinegar milk lemons gummy bears

-turn blue litmus red "BRA"

-conduct electricity when dissolved in water

- Rxne
- 1) -react with **bases** to form salt and water $\text{A} + \text{B} \rightarrow \text{S} + \text{W}$
 - 2) -react with **metals** to form hydrogen gas $\text{A} + \text{M} \rightarrow \text{H}_2$
 - 3) -react with **carbonates** to form carbon dioxide gas $\text{A} + \text{NaHCO}_3 \rightarrow \text{CO}_2$

Properties of Bases:

M - OH and NH_4OH (memorize this one!!)

-taste bitter

ammonium hydroxide!

-feel slippery

Not $\text{CH}_3\text{CH}_2\text{OH} = \text{alcohol}$

-most cleaners are bases

CH_3OH

-are corrosive

-turn red litmus blue

$\text{C}_x\text{H}_y\text{OH} = \text{alcohol}$

-conduct electricity in water

-react with acids to form salt and water $\text{A} + \text{B} \rightarrow \text{S} + \text{W}$

Properties of Salts:

M - NMs *eg MgO AlCl₃ Be₃N₂*

-conduct electricity in water

NaNO₃ etc

-neutral salts do not change the colour of litmus

-some salts can be acidic *∴ what do they do?*

-some salts can be basic

Problem: You are given 4 bottles marked W, X, Y and Z.

All 4 contain clear, colourless solutions.

You are asked to determine which one is an acid, which one is a base, which one is a salt and which one contains only distilled water.

In the chart below fill in the tests you would perform and the results you would obtain if:

W = HCl

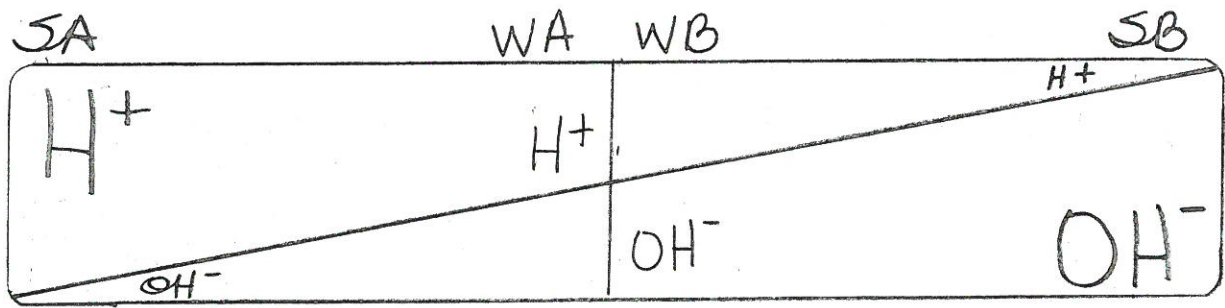
X = NaOH

Y = NaCl

Z = H₂O

	<i>Red lit</i>	<i>Blue lit</i>	<i>conduc.</i>	<i>run w mg</i>	<i>run w CO₃²⁻</i>
W (HCl)	—	<i>Red</i>	+	<i>bubbles (H₂)</i>	<i>bubbles (CO₂)</i>
X (NaOH)	<i>Blue</i>	—	+	—	—
<i>neutral salt</i> Y (NaCl)	—	—	+	—	—
Z (H ₂ O)	—	—	—	—	—

[H⁺]



pH 0

7

14

Acid Base Review

PHTH = phenolphthalein

BTB = bromothymol blue

1. Some foods are acidic.
2. Most cleaners are basic.
3. Bases turn Red litmus Blue.
4. Salts are made up of a M and a NM.
5. Acids produce H^+ ions when dissolved in water.
6. Bases produce OH^- ions when dissolved in water.
7. A pH of 5 indicates a weak acidic solution.
8. A pH of 13 indicates a strong basic solution.
9. Acids react with metals to produce hydrogen gas.
10. Acids react with carbonates to produce carbon dioxide gas.
12. Acids react with bases to produce salt and water.
- * 13. Indicators change colours at different pHs.
- * 14. The turning point of an indicator is really a range.
15. The turning point colour of BTB which starts off yellow in acid and ends up blue is green.
16. Turning points can occur anywhere on the pH scale.
17. A turning pt can be from pH 3.4-6.2.
- * 18. pH 7 indicates a neutral solution but it can still conduct electricity if it's a salt solution.
19. The $[H^+]$ increases in water when Acid is added to the water.
20. The $[OH^-]$ increases in water when base is added to the water.
21. Distilled water does not conduct electricity because it contains very few ions. $[H^+] = [OH^-] = 1 \times 10^{-7} M$
22. The concentration of H^+ ions in distilled water is equal to the concentration of OH^- ions.
23. A leftover beaker of acid could be neutralized by adding base to it.

Electrolyte Demo

Electrolytes: -are substances that will conduct electricity when dissolved in water
 -are substances that form positive and negative ions in water
 -acids, bases and salts (ABS) form ions in water and, therefore, conduct electricity and are, therefore, electrolytes

Name	Formula	Is it an A or B or S?	Conducts	
Table salt	NaCl(s)	S	NO!	Ions Na ⁺ /Cl ⁻
Table salt in water	NaCl(aq)	S	+	
Sugar	C ₁₂ H ₂₂ O ₁₁ (s)	—	—	
Sugar Water	C ₁₂ H ₂₂ O ₁₁ (aq)	—	—	
Ethanol	CH ₃ CH ₂ OH(l)	alcohol	—	
Copper (2) nitrate	Cu(NO ₃) ₂ (aq)	S	+	
Hydrochloric acid	HCl(aq)	A	+	
Potassium hydroxide	KOH(aq)	B	+	
Methanol	CH ₃ OH(l)	alcohol	—	
Sodium hydroxide	NaOH(aq)	B	+	
Pure Acetic Acid	HC ₂ H ₃ O ₂ (l)	A	NO!	
Vinegar	HC ₂ H ₃ O ₂ (aq)	A	+	
Sulfuric acid	H ₂ SO ₄ (aq)	A	+	
Windex (ammonia water)	NH ₄ OH(aq)	B	+	

1. What is absolutely necessary for an ABS to conduct electricity?

they must be dissolved in water

2. What must be present to conduct electricity?

ions

Conclusion:

Acids: Contain an H covalently bonded to a nonmetal e.g. H_2SO_4

Turn blue litmus red. "BRA"

conduct electricity.

React with metals to produce H_2 gas.

React with carbonates to produce CO_2 gas.

Bases: Contain a metal ionically bonded to an OH group e.g. $Ca(OH)_2$

Turn red litmus blue.

conduct electricity.

Salts: Contain a metal ionically bonded to a nonmetal e.g. Al_2S_3

Some salts do NOT change the colour of litmus paper.

conduct electricity.

but some do < acidic salts
basic salts

Distilled Water: Does not change the colour of litmus paper.

Does not conduct electricity.

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Salt = formula starts with a Metal and ends with Non-metals e.x. NaCl, CaO, AlPO ₄

Properties of Acids:

H - NM

H - Cl HNO₃ H₂SO₄ etc

-taste _____

-are corrosive

-some foods are acidic e.x. _____

-turn blue litmus _____ "BRA"

-conduct electricity when dissolved in water

1) -react with **bases** to form salt and water $A + B \rightarrow S + W$

2) -react with **metals** to form hydrogen gas $A + M \rightarrow H_2$

3) -react with **carbonates** to form carbon dioxide gas $A + NaHCO_3 \rightarrow CO_2$

Exne

Properties of Bases:

M - OH and NH₄OH (memorize this one!!)

-taste _____

ammonium hydroxide!

-feel _____

-most cleaners are bases

-are corrosive

-turn red litmus _____

-conduct electricity in water

-react with acids to form salt and water $A + B \rightarrow S + W$

Net CH₃CH₂OH = alcohol
 CH₃OH
 C_xH_yOH = alcohol

Properties of Salts:

M - NMs *eg MgO AlCl₃ Be₃N₂*
NaNO₃ etc

-conduct electricity in water

-neutral salts do not change the colour of litmus

-some salts can be acidic *∴ what do they do?*

-some salts can be basic

Problem:

You are given 4 bottles marked W, X, Y and Z.

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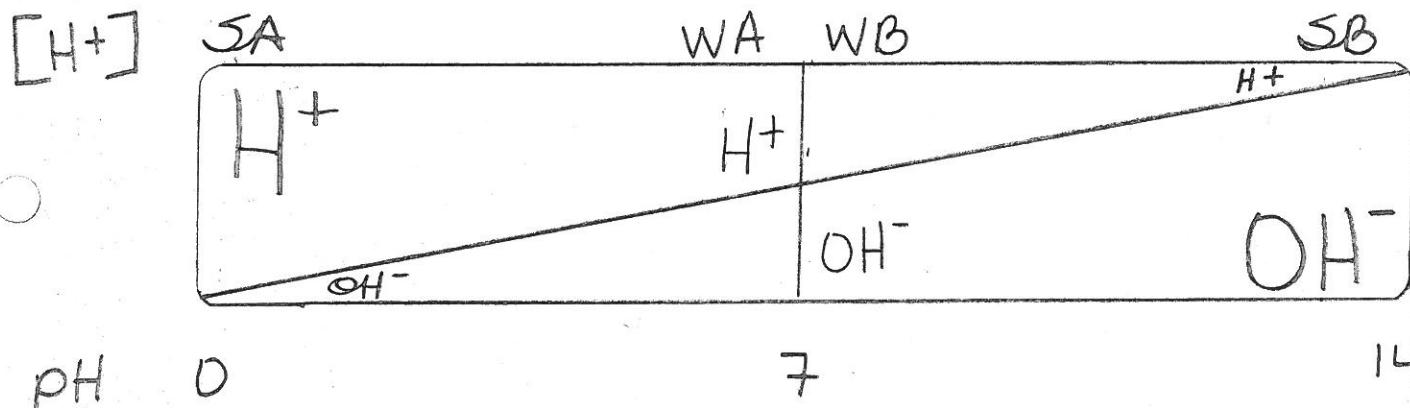
W = HCl

X = NaOH

Y = NaCl

Z = H₂O

W (HCl)					
X (NaOH)					
Y (NaCl)					
Z (H ₂ O)					



Acid Base Review

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BTB = bromothymol blue

1. Some foods are _____.
2. Most cleaners are _____.
3. Bases turn _____.
4. Salts are made up of a _____ and a _____.
5. Acids produce _____ when dissolved in water.
6. Bases produce _____ when dissolved in water.
7. A pH of 5 indicates a _____ solution.
8. A pH of 13 indicates a _____ solution.
9. Acids react with _____ to produce hydrogen gas.
10. Acids react with _____ to produce carbon dioxide gas.
12. Acids react with _____ to produce _____ and _____.
- * 13. Indicators change _____ at different _____.
- * 14. The turning point of an indicator is really a _____.
15. The turning point colour of BTB which starts off yellow in acid and ends up blue is _____.
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19. The $[H^+]$ increases in water when _____ is added to the water.
20. The $[OH^-]$ increases in water when _____ is added to the water.
21. Distilled water does not conduct electricity because it contains very few _____.
22. The concentration of H^+ ions in distilled water is _____ to the _____ ions.
23. A leftover beaker of acid could be _____ by adding _____ to it.

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Hydrochloric acid	HCl(aq)		
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Sodium hydroxide	NaOH(aq)		
Pure Acetic Acid	HC ₂ H ₃ O ₂ (l)		
Vinegar	HC ₂ H ₃ O ₂ (aq)		
Sulfuric acid	H ₂ SO ₄ (aq)		
Windex (ammonia water)	NH ₄ OH(aq)		

Some
Na⁺/Cl⁻

1. What is absolutely necessary for an ABS to conduct electricity?
2. What must be present to conduct electricity?

Conclusion:

Acids: Contain an H covalently bonded to a nonmetal e.g. H_2SO_4

Turn _____ red. "BRA"

_____ electricity.

React with _____ to produce H_2 gas.

React with _____ to produce CO_2 gas.

Bases: Contain a metal ionically bonded to an OH group e.g. $\text{Ca}(\text{OH})_2$

Turn _____ blue.

_____ electricity.

Salts: Contain a metal ionically bonded to a nonmetal e.g. Al_2S_3

Some salts _____ change the colour of litmus paper.

_____ electricity.

Distilled Water: Does not _____ the colour of litmus paper.

Does not _____ electricity.

