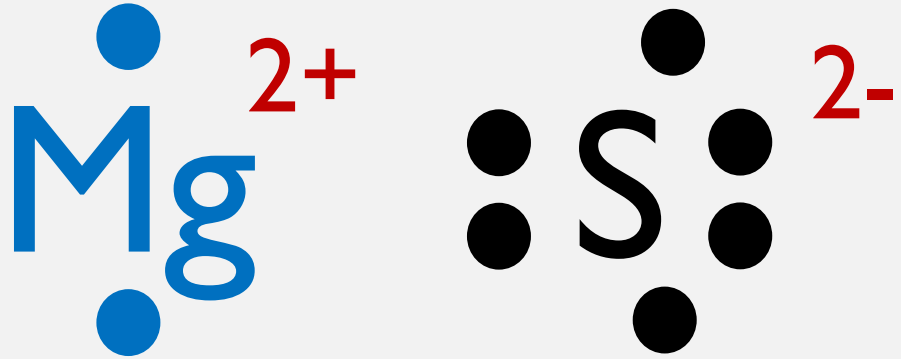
ELECTROLYTES

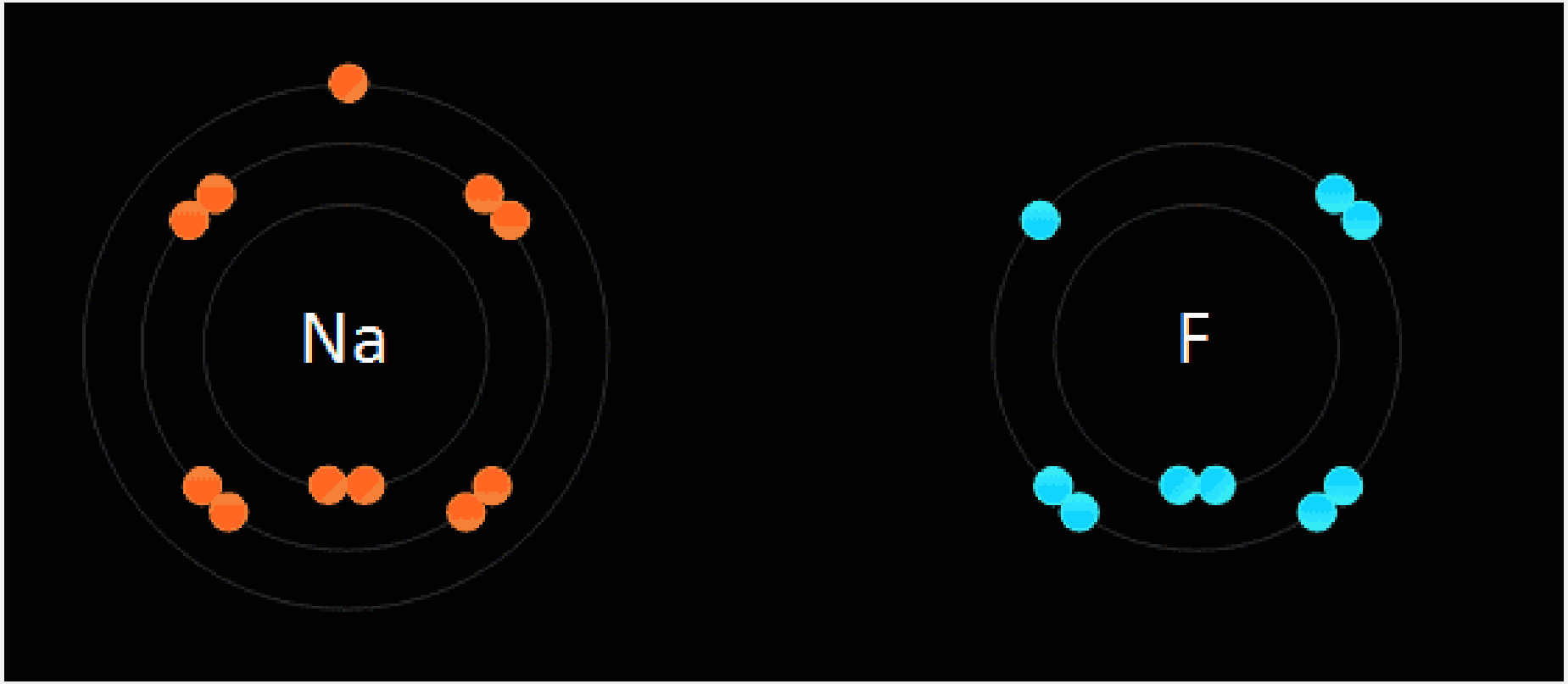
BUT FIRST… LET'S REVIEW IONS AND BONDING

- What is the Lewis dot diagram for Magnesium?



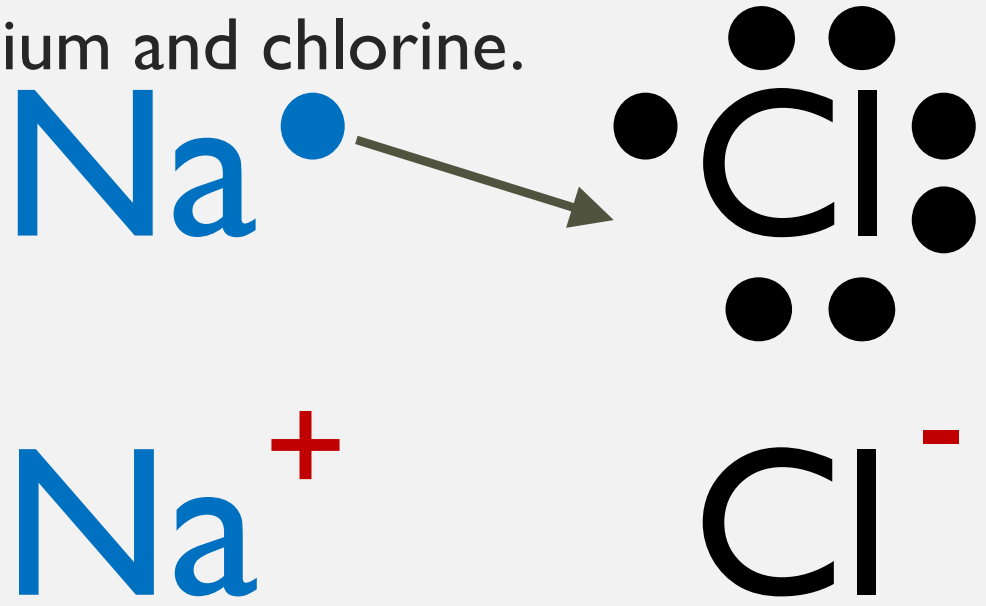
- What is the Lewis dot diagram for Sulfur?
- How would these 2 elements complete the octet rule?
- What charge would each **ion** have?

Remember: ionic bonds are formed through an electrostatic attraction between oppositely charged ions



QUICK PRACTICE

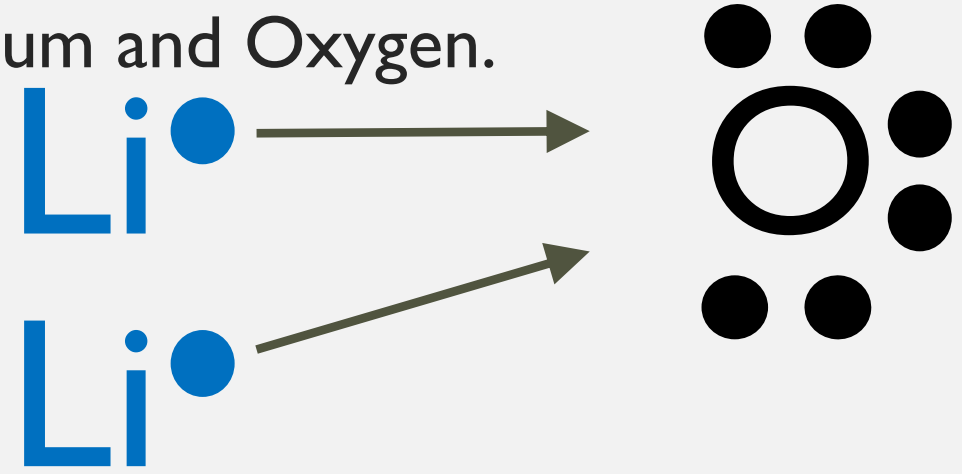
2. Draw the Lewis dot diagram to show how a bond would form between sodium and chlorine.



NaCl

QUICK PRACTICE

3. Draw the Lewis dot diagram to show how a bond would form between Lithium and Oxygen.



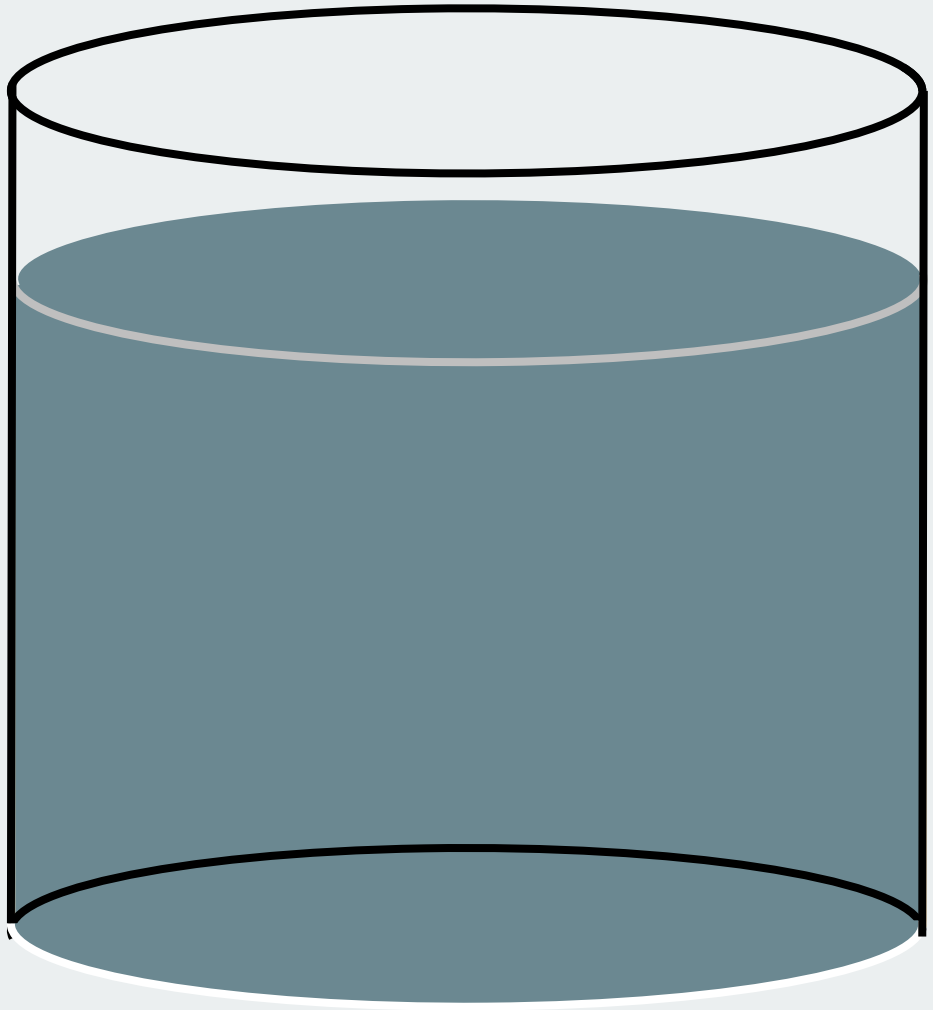
Li_2O

Li^+ O^{2-}

SO FAR WE'VE LOOKED AT SYNTHESIS OF MOLECULES…

NOW LET'S LOOK AT THE REVERSE…

When certain molecules are **dissolved** in water, they split up into **ions**.



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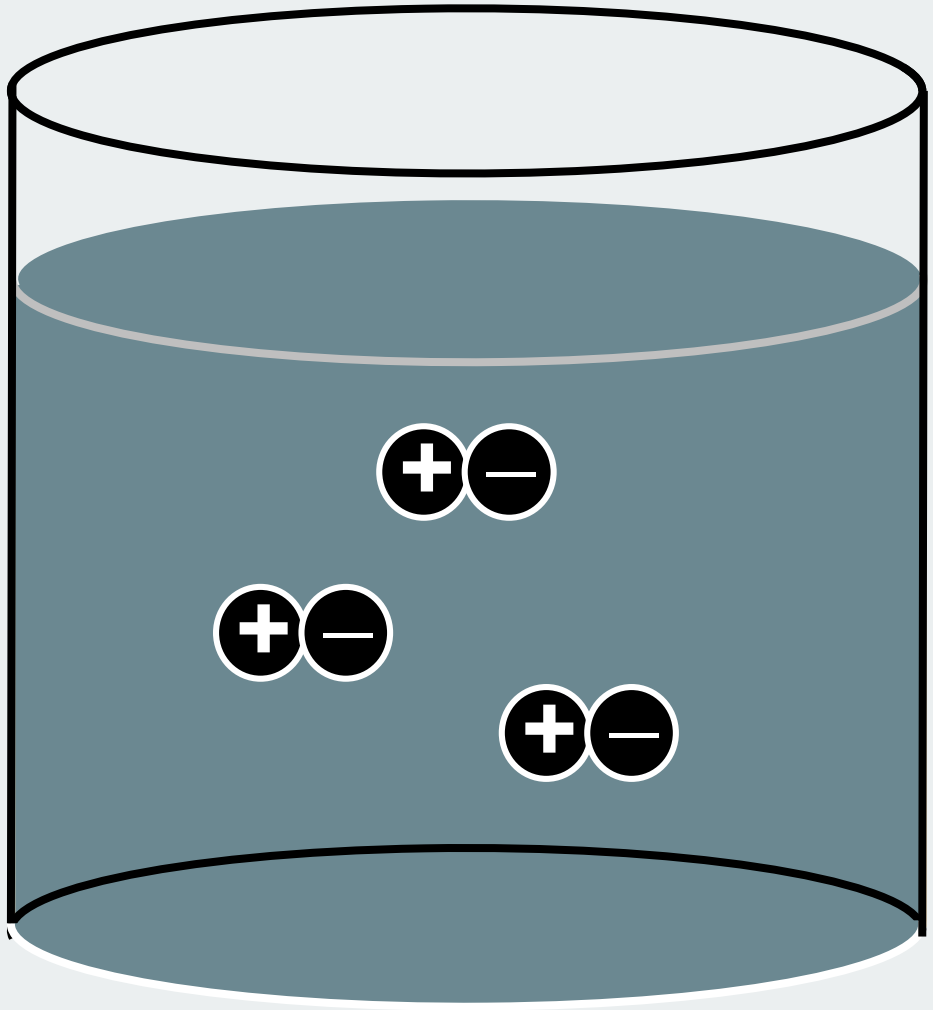

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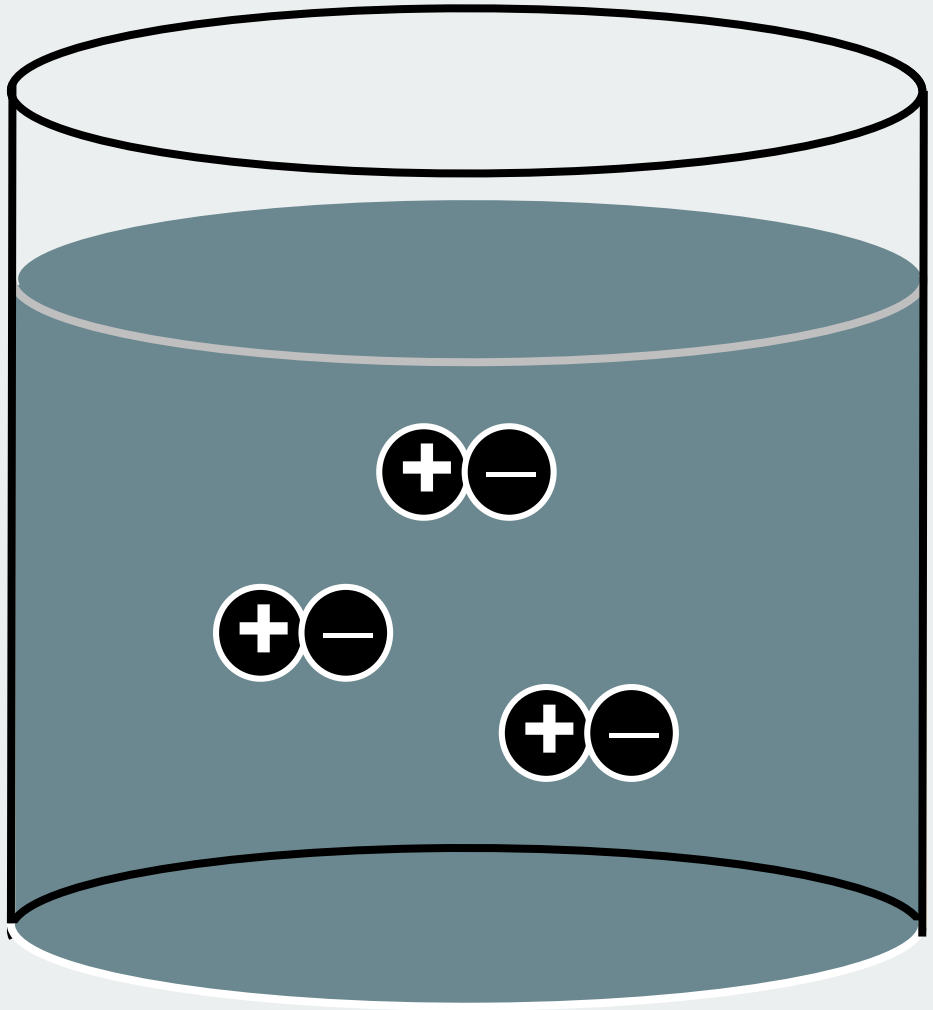
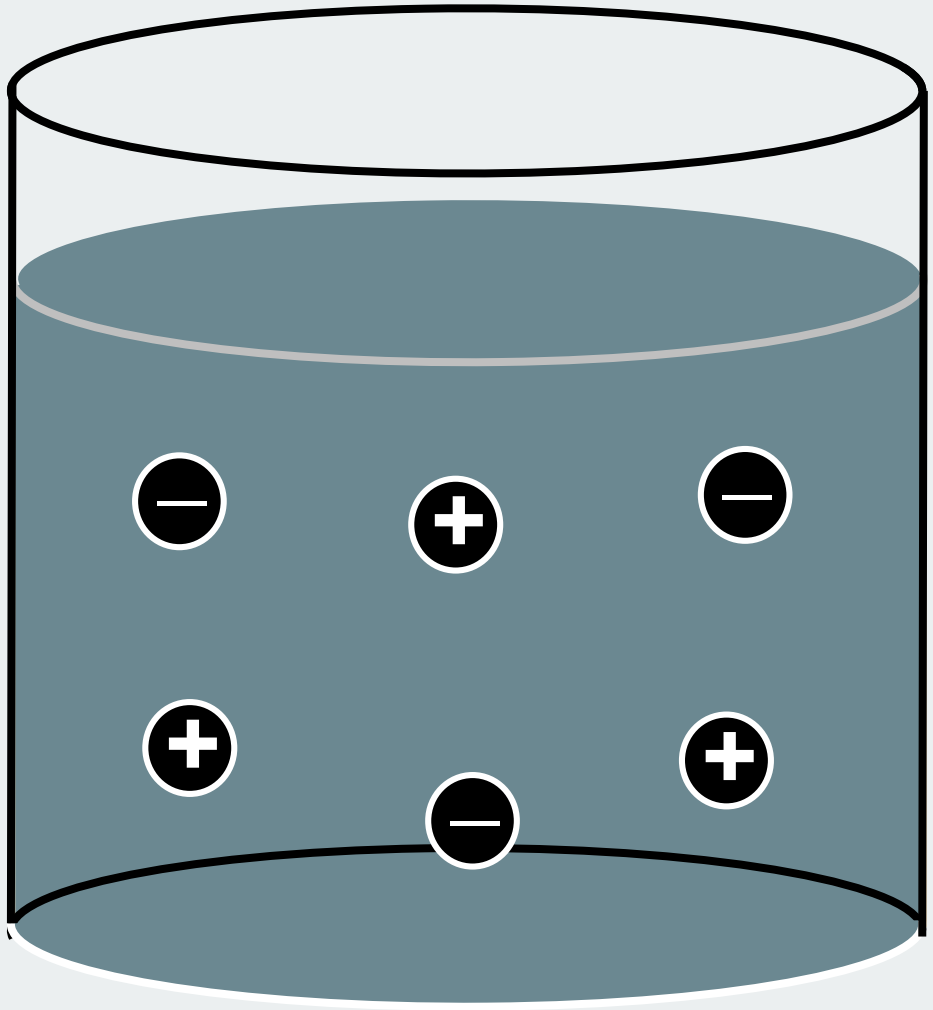
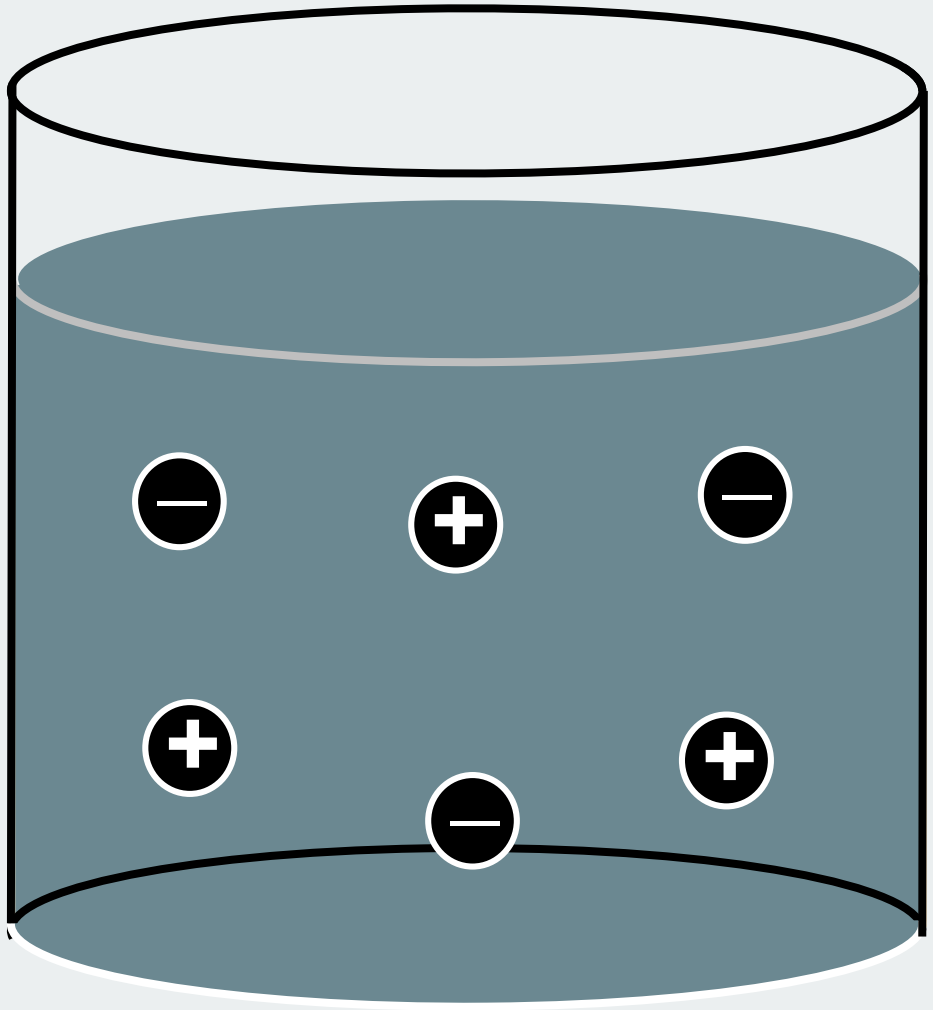


When certain molecules are **dissolved** in water, they split up into **ions**.

This is called **dissociation**.

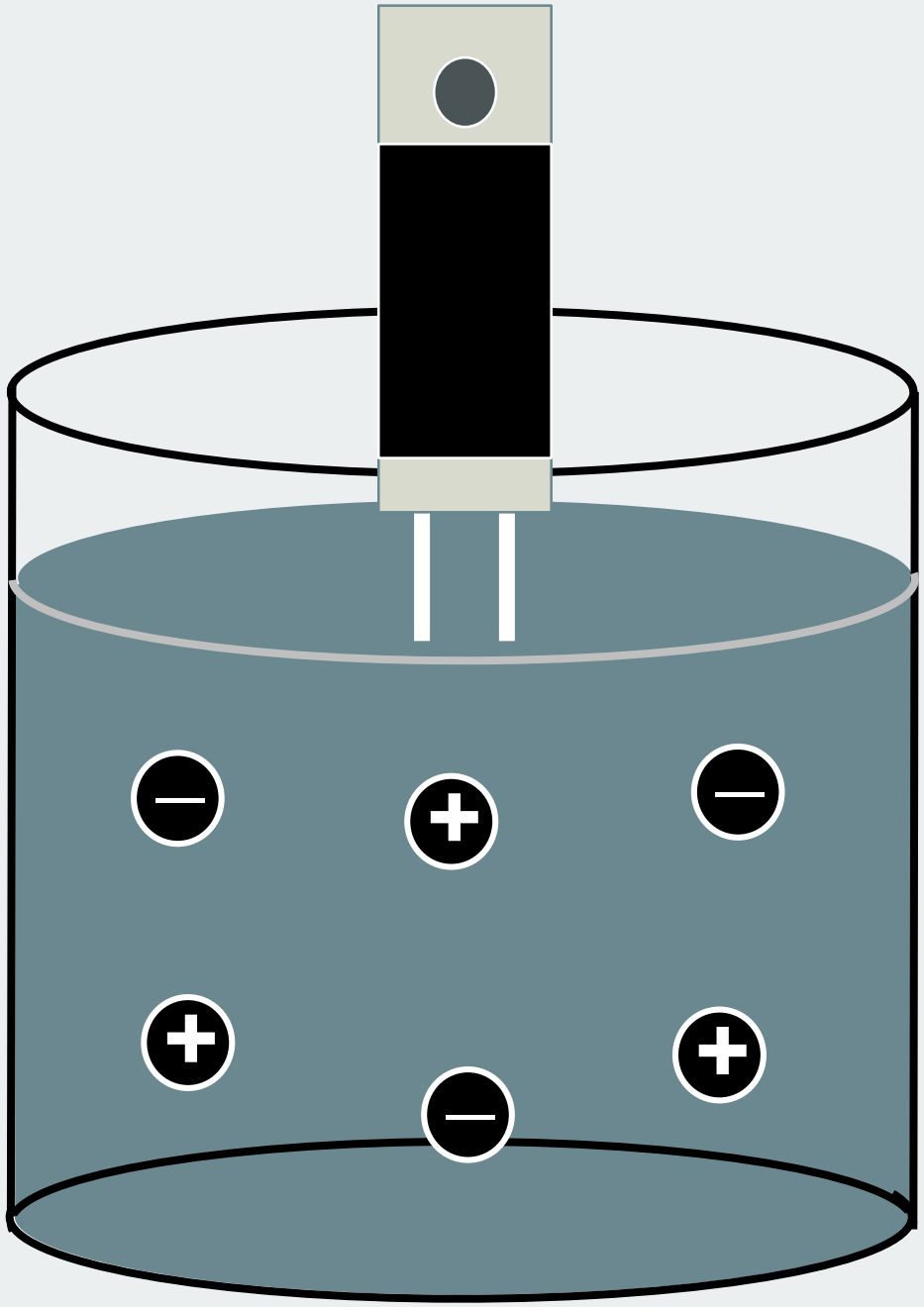


The ions can move around in the water, and they carry an electric charge.



The ions can move around in the water, and they carry an electric charge.

Because of this, the resulting solution can now conduct electricity.



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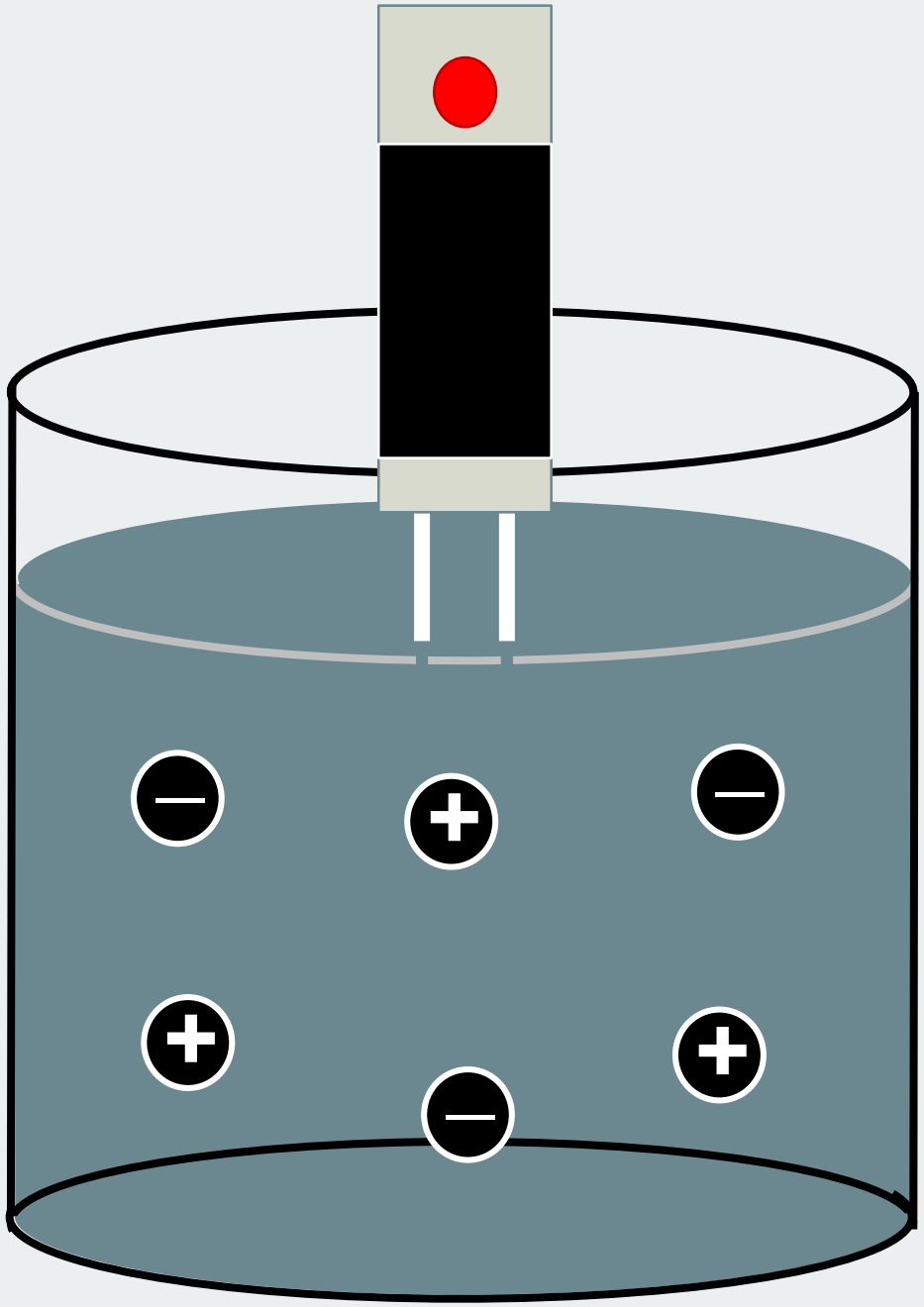
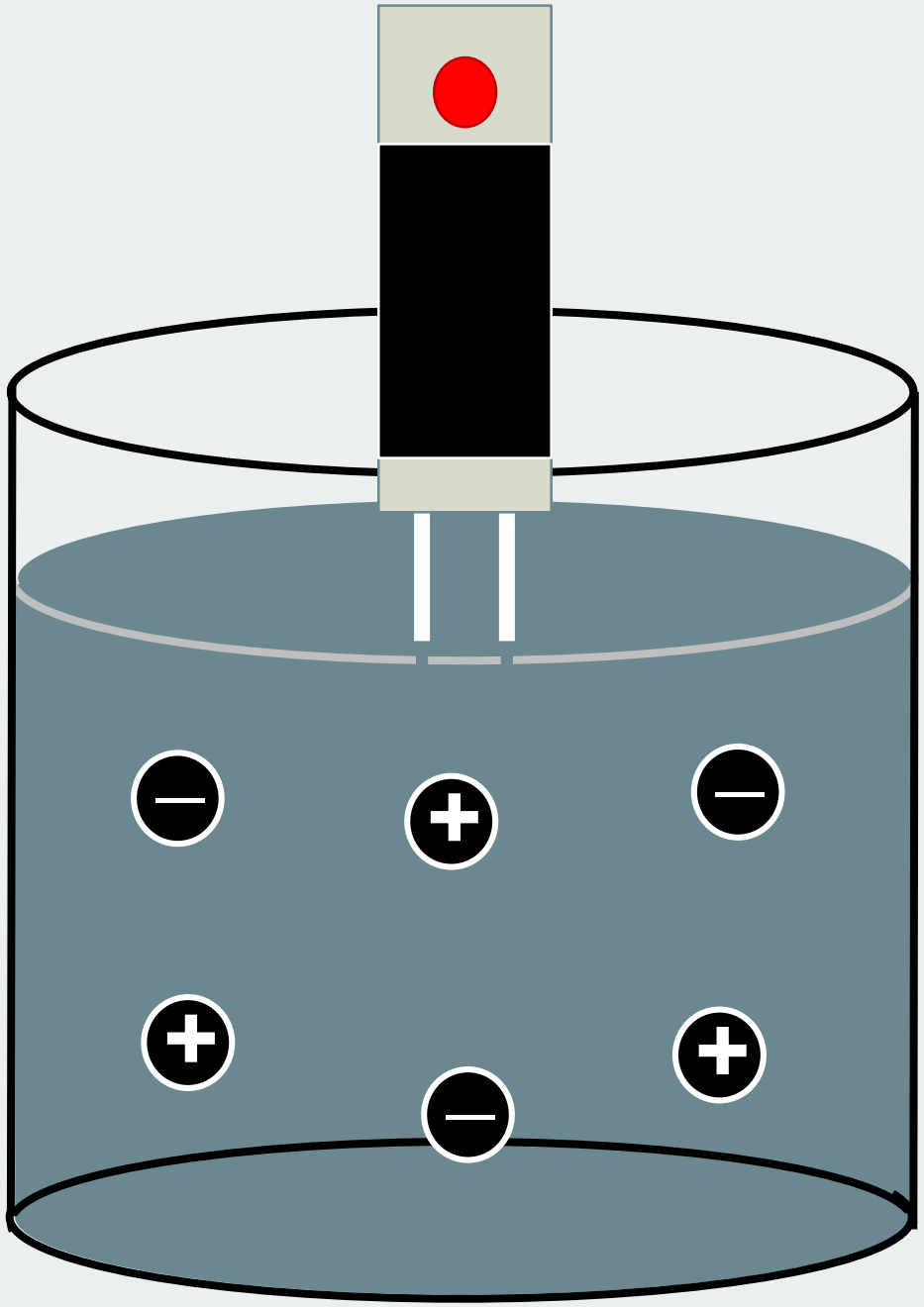
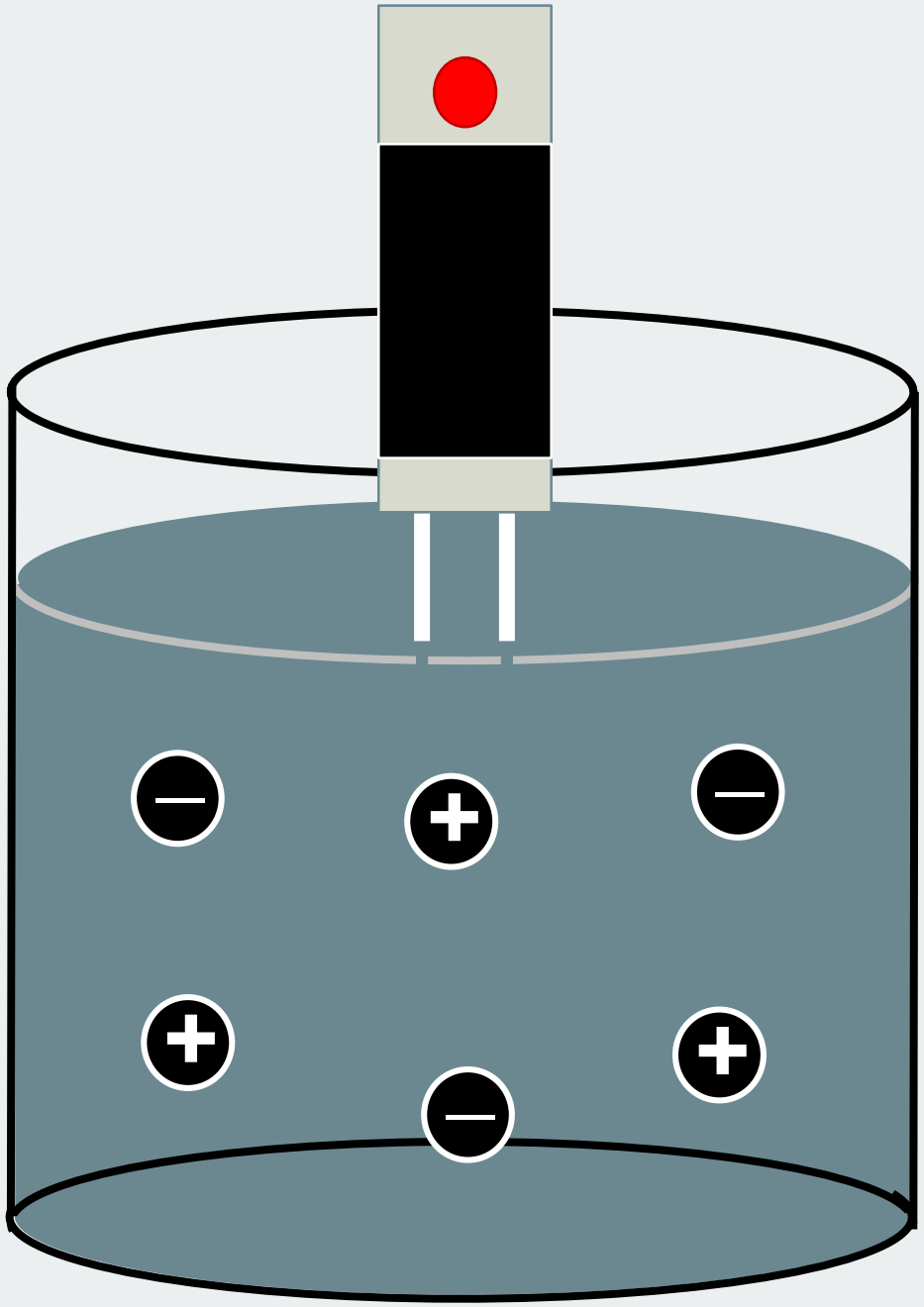


A solution that conducts electricity due to the presence of ions is called an **electrolytic solution**.



All electrolytic solutions can be classified into one of the following 3 categories:

- Acids
- Bases
- Salts

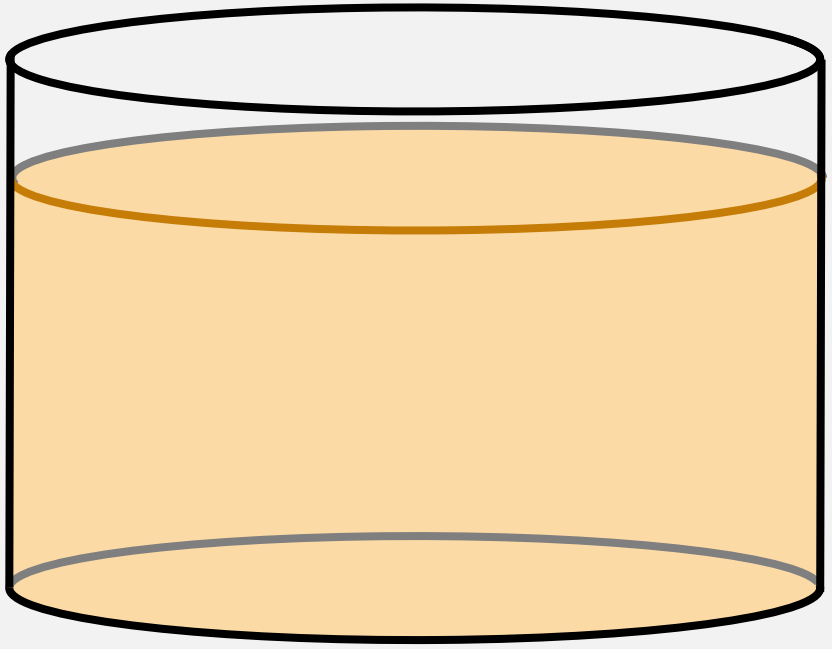


ACIDS

An acid is a substance that releases **hydrogen** ions, H^+, in solution.

Example: Hydrogen chloride

$HCl \rightarrow$



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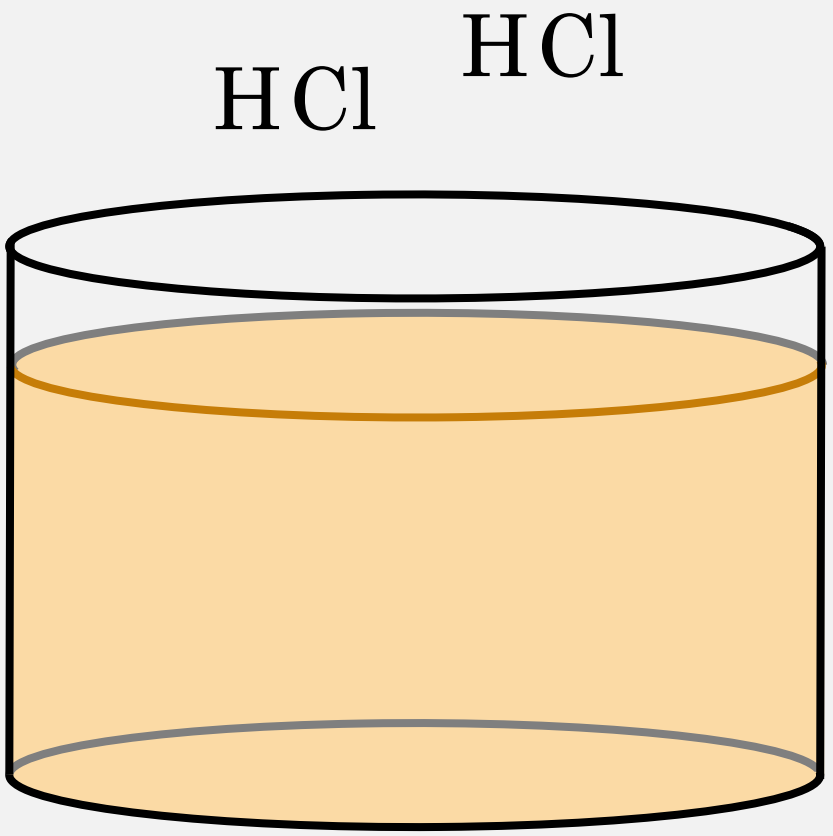

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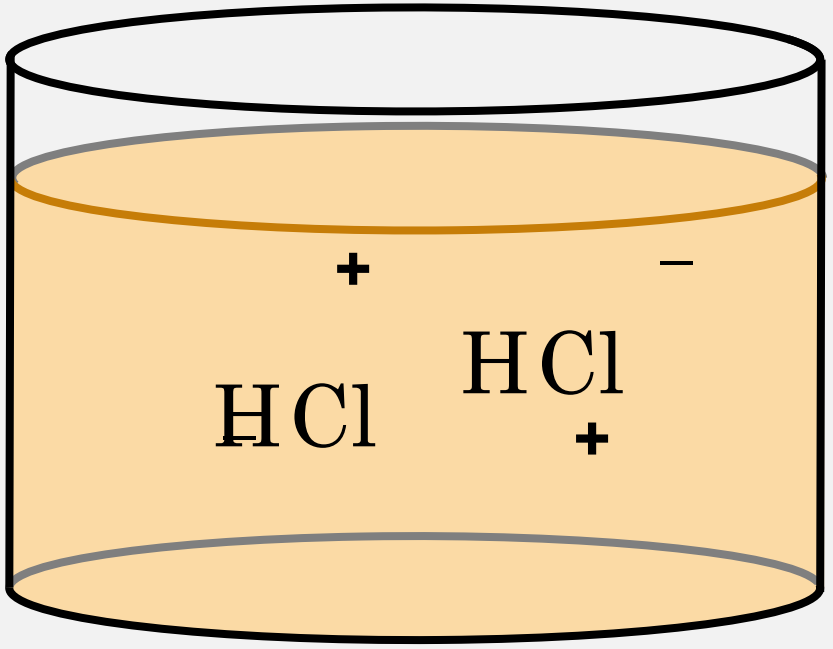
Example: Hydrogen chloride

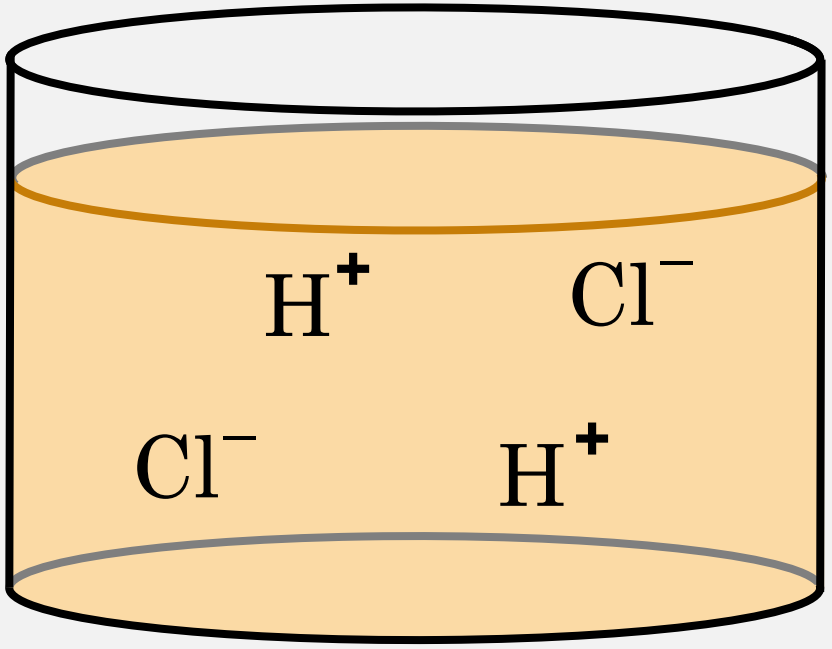
$$HCl \rightarrow H^+ + Cl^-$$

Acids are **electrolytic**; they will conduct electricity when dissolved in **water**.



ACIDS

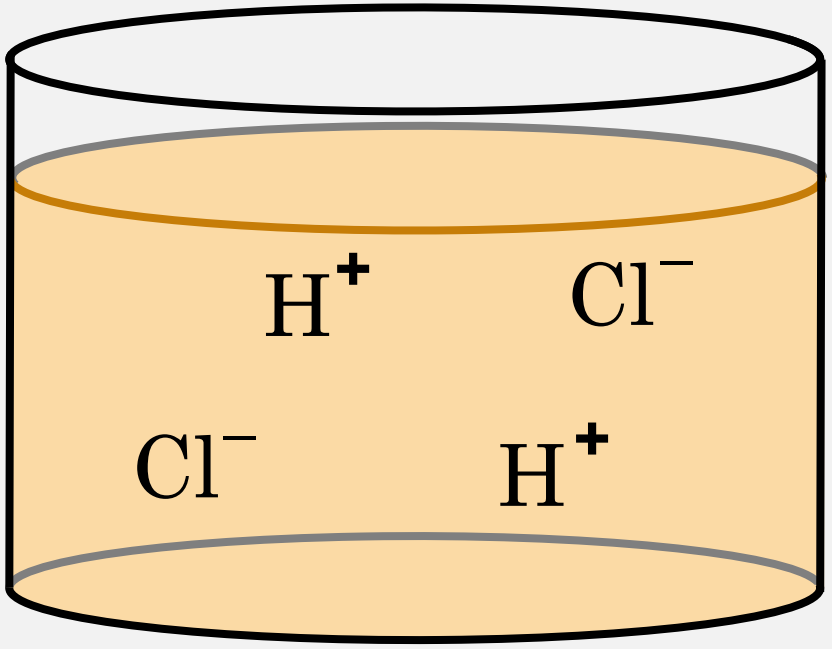
Reaction with litmus paper:



ACIDS

Reaction with litmus paper: pH of an acid is less than 7

- Red litmus **stays**
- Blue litmus **turns**



ACIDS

Acids taste **sour** *(if it doesn't kill you)*

Acids burn

They are **corrosive**

ACIDS

Molecular formulas

The molecular formula of an acid will appear in one of the following two ways:

Starts with H…

Ends with …COOH

CH_3COOH

$C_5H_7O_5COOH$

This is the exception!!

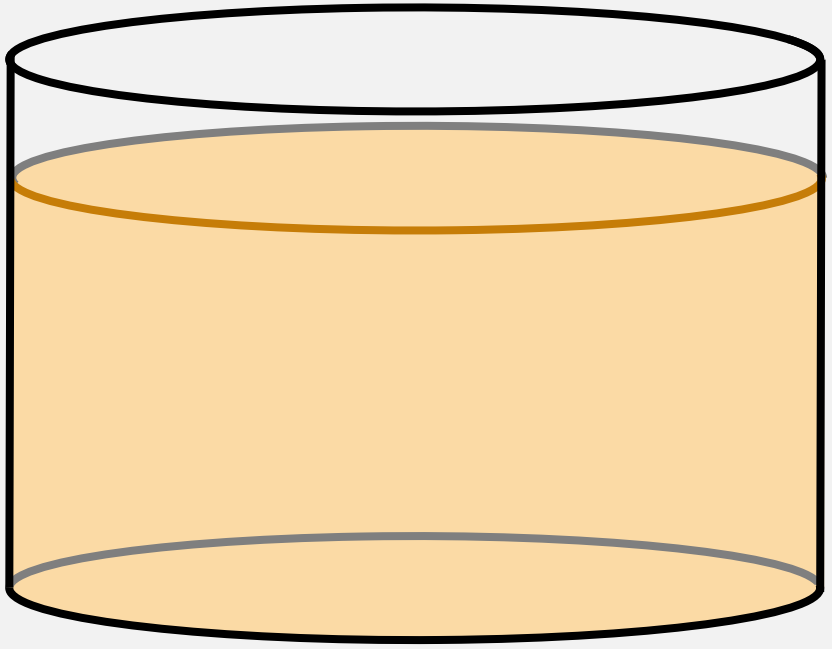
Starts with H, but not an acid: H_2O

BASES

A base is a substance that releases **hydroxide ions**, OH^-, in solution.

Example: Sodium hydroxide

$$NaOH \rightarrow$$



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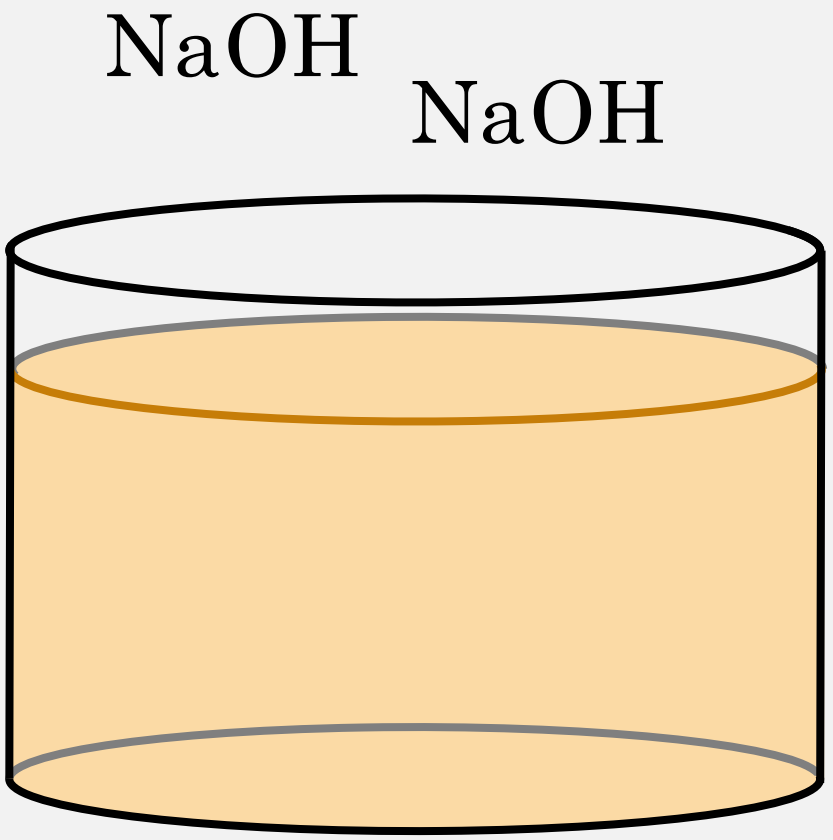

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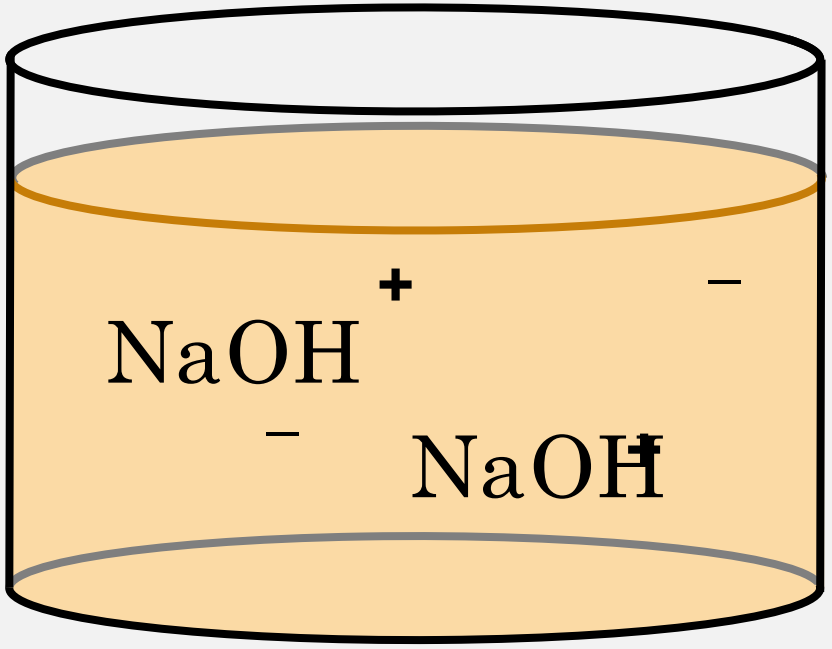
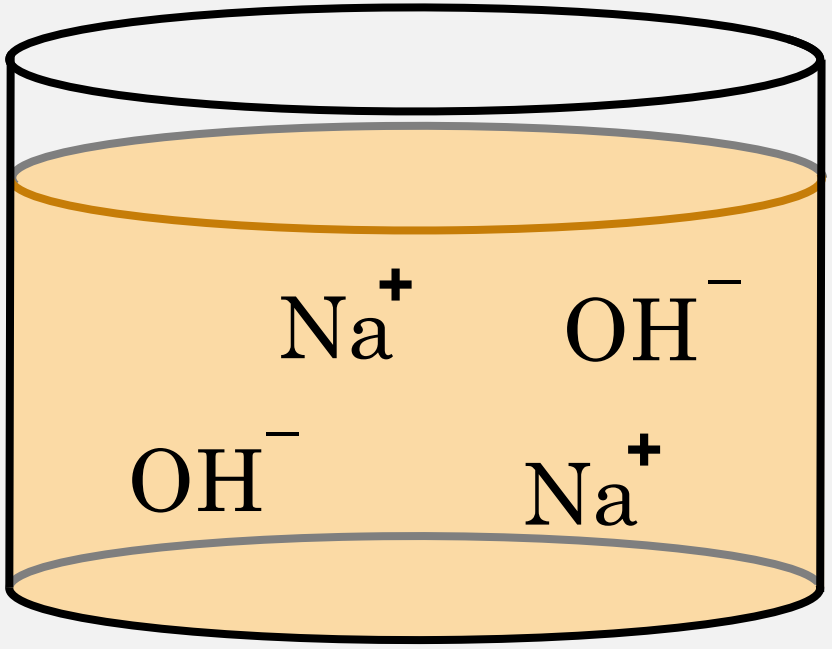
$$NaOH \rightarrow Na^+ + OH^-$$



Bases are **electrolytic**; they will conduct electricity when dissolved in water.

BASES

Reaction with litmus paper:



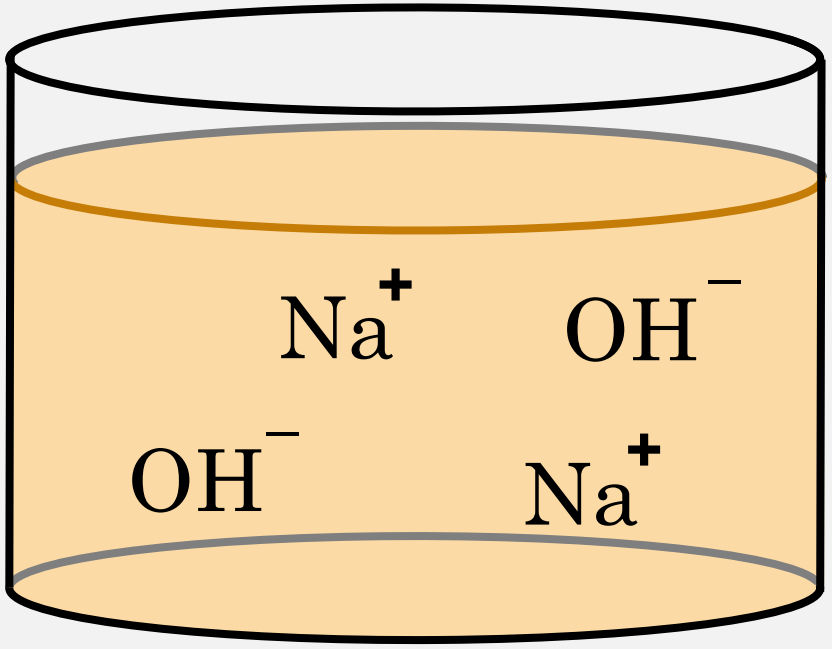
BASES

Reaction with litmus paper:

- Red litmus turns blue

- Blue litmus stays blue

pH of a base is greater than 7



BASES

Bases taste bitter

BASES

Bases feel soapy / slippery

They are caustic

BASES

Bases are also known as **alkaline solutions**

The molecular formula of a base: Metal + OH

Metal + OH

$NaOH$

KOH

$Ca(OH)_2$

$Mg(OH)_2$

Exception *(doesn't start with a metal):*

NH_4OH

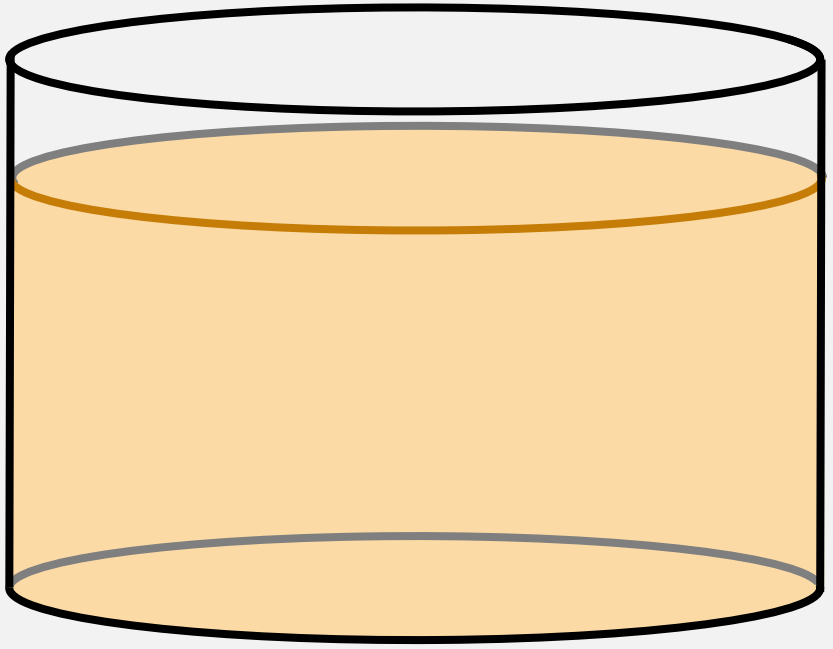
Still a base!

SALTS

A salt is a substance that that is made up of **metallic** and **non-metallic** ions.

Example: Sodium chloride

$\mathrm{NaCl} \rightarrow$



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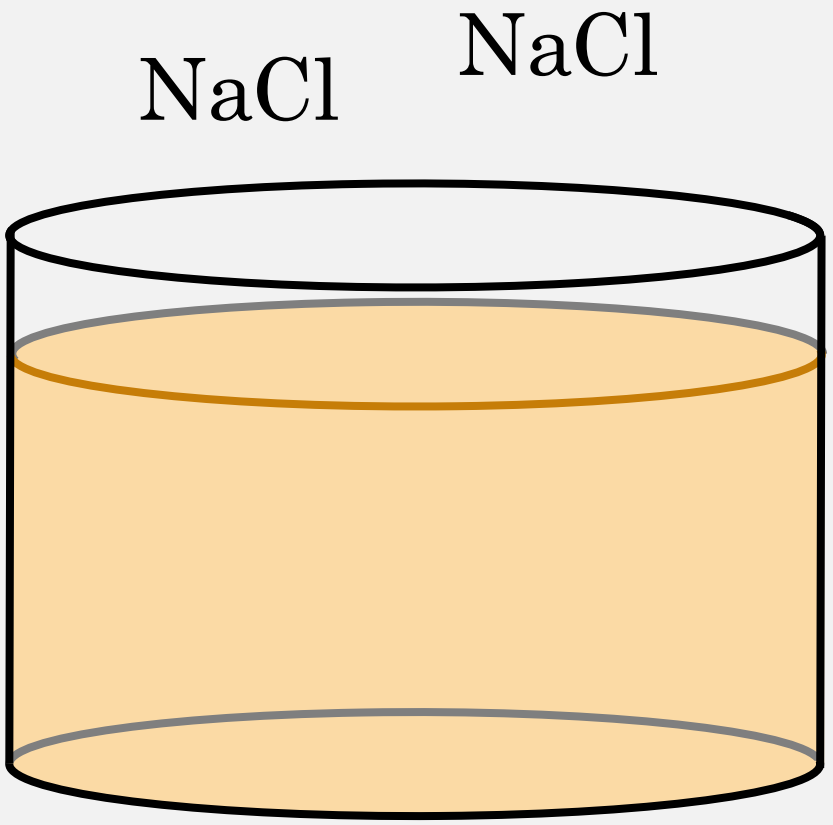

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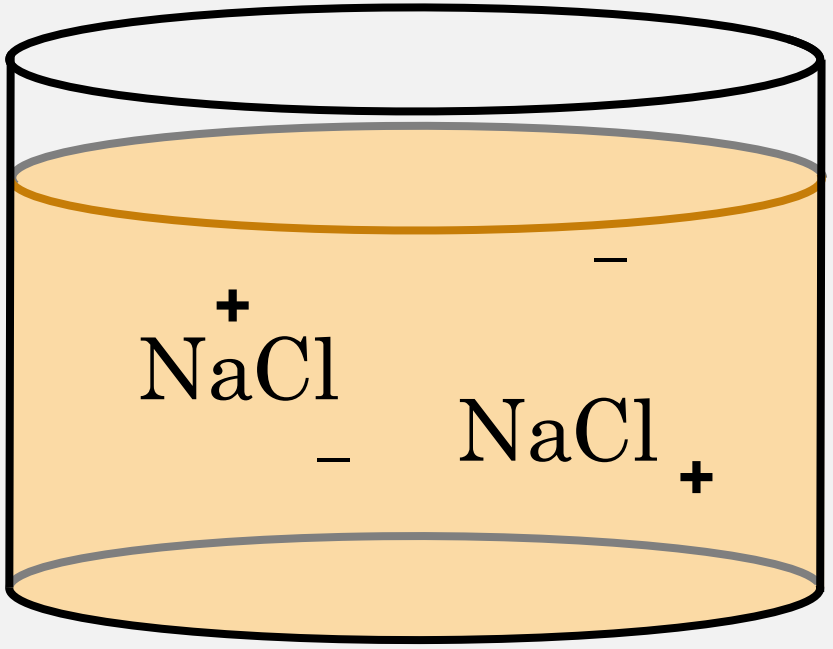

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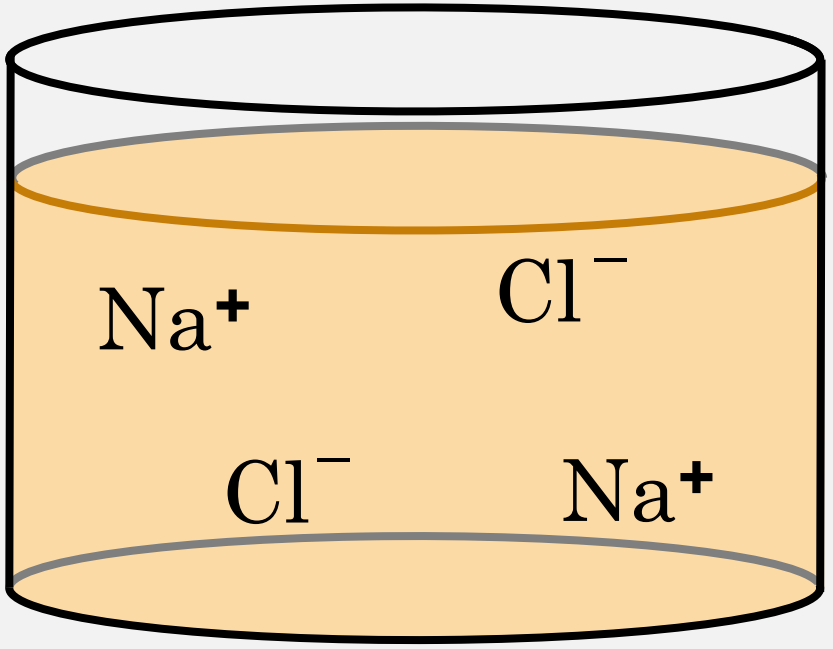
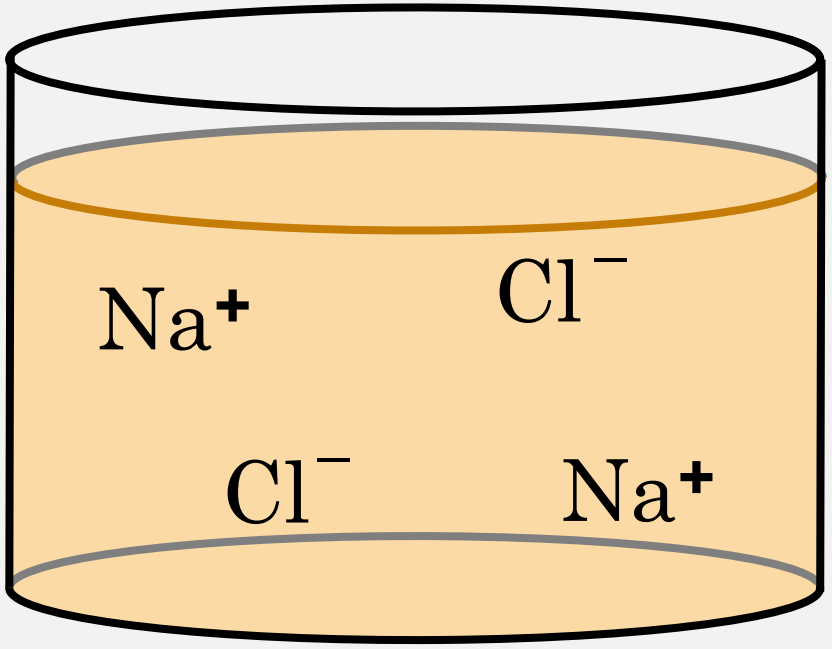
$$NaCl \rightarrow Na^{+} + Cl^{-}$$



Salts are **electrolytic**; they will conduct electricity when dissolved in **water**.

SALTS

Reaction with litmus paper:



SALTS

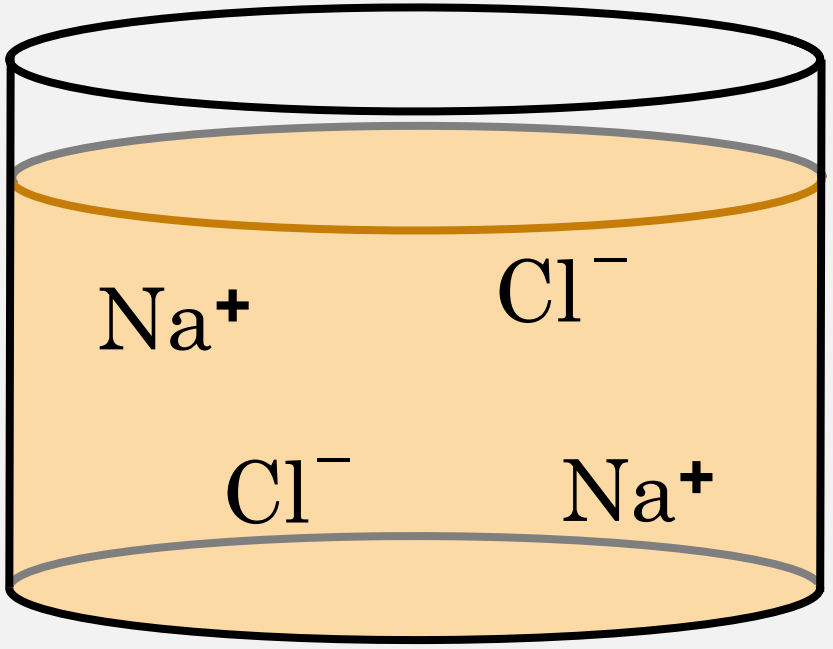
Reaction with litmus paper:

- Red litmus stays red

- Blue litmus stays blue

pH of a salt is 7 (neutral)

(note: there are exceptions)



SALTS

Salts (and water) are formed when acids react with bases.

We call this a neutralization reaction.

We'll be coming back to neutralization later!

HCl $NaOH$

SALTS

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$^{+}HCl^{-}$ $Na^{+}OH^{-}$

SALTS

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H^+ Cl^- Na^+ OH^-

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$H^+ + OH^- \rightarrow H_2O$

Na^+Cl^-

Salt!

SALTS

Salts taste… salty

Salts are itchy

They are an irritant

SALTS

The molecular formula of a salt: Metal + Non-metal(s)

Metal + Non-metal(s)

NaF

$CaCl_2$

KNO_3

$Al_2(SO_4)_3$

Exception *(doesn't start with a metal):*

Can also start with NH_4 …

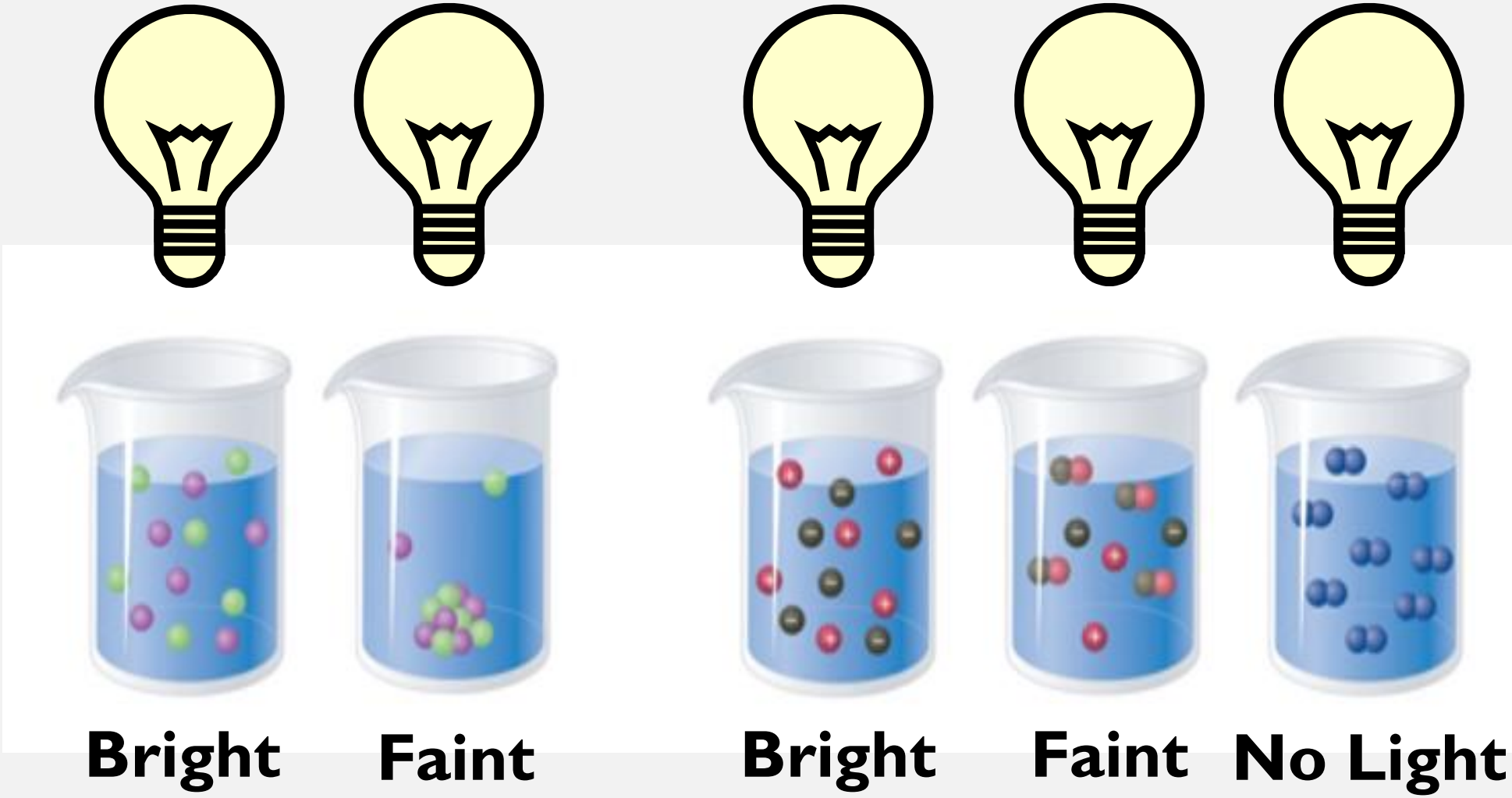
Ex: NH_4Cl

Still a salt!

ELECTROLYTES VS NON-ELECTROLYTES

	Electrolyte	Non-Electrolyte
Definition	Substances that conduct electricity when **dissolved in water**	Substances that do **NOT** conduct electricity when dissolved in water
Why?	Because when dissolved in water, **ions** (+ and - charge) are produced.	Because when dissolved in water, ions are **NOT** produced.
Quick Identification Tip	The 1st element will start with a element from **group 1, 2 or 3** ex- NaCl **Including H**	The first element will start with a non-metal (found in **groups 4-7**) ex- PCl_3

WILL IT CONDUCT?



TYPES OF ELECTROLYTES

	Acid	Base	Salt
Electrolyte?	Yes	Yes	Yes
Litmus paper	Blue → Red BRA	Red → Blue Blue = Base	No change
Found in:	fruits, sodas, vinegar, batteries	Cleaning products blood	Fertilizers Table salt, bath salts
Recognize	1st element = H Or ends in COOH	Metal + OH	Metal + non-metal
Examples	HCl, CH_3COOH, H_2SO_4, H_3PO_4	NaOH, LiOH $Ca(OH)_2$, $Al(OH)_3$	NaCl, $MgBr_2$, $AlPO_3$, $CaCl_2$
Exceptions	H_2O Non-electrolytes	C_2H_5OH, CH_3OH	