



Lect.8.

8.1 How to measuring the pH of solution.

The pH value can be measured using electrochemical measuring systems, litmus paper, or indicators and colorimeters.

The easiest way to take a pH measurement is to use litmus paper or a colorimeter.

The advantage of this type of pH measurement is that the pH range is well known and they are easy to apply.

Unfortunately in many cases litmus paper and colorimeters are not accurate enough to make high quality pH measurements, because the pH value transition point depends on the user.

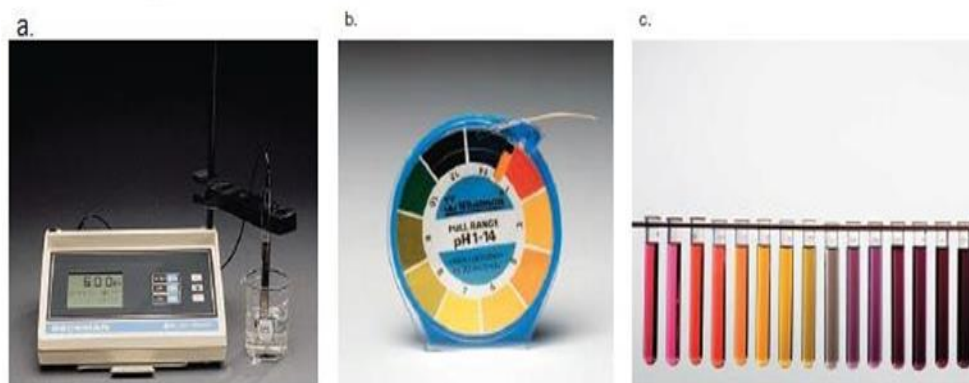


Fig.8.1: Measuring of pH



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A pH meter: is a small electronic device that measures pH when an electrode is dipped into a solution.

Paper strips: called pH paper change color corresponding to a particular pH, when a drop of an aqueous solution is applied to them.

An acid–base indicator can be used to give an approximate pH

The indicator is a dye that changes color depending on the pH of the solution.

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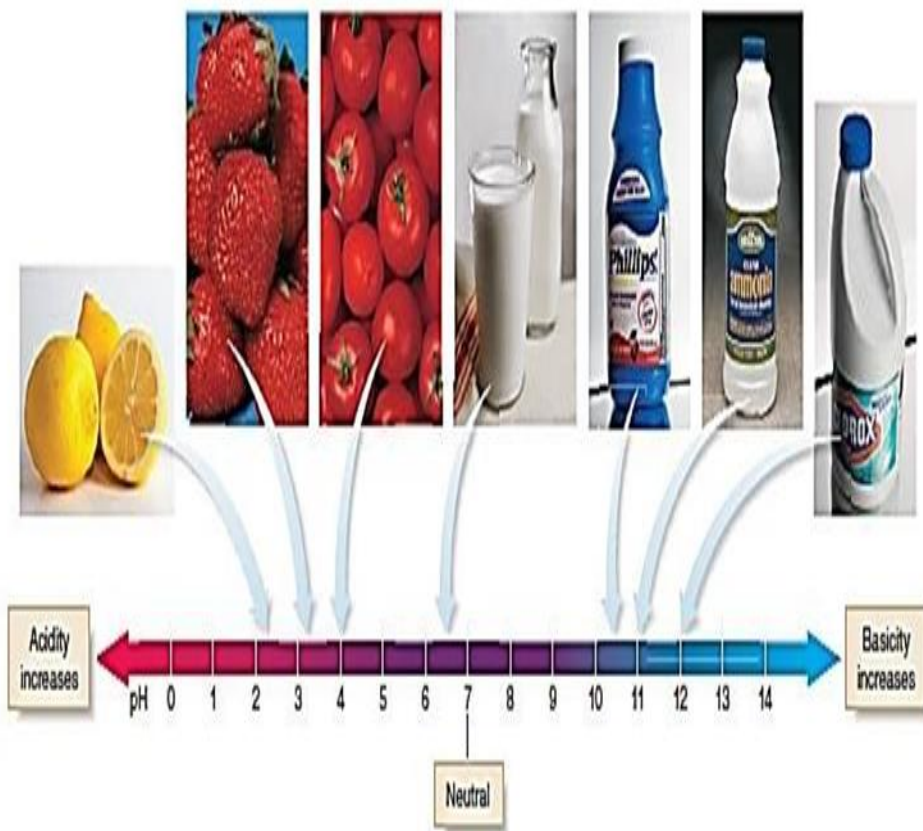


Fig.8.2: The pH of Some Common Substances

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SAMPLE

What is the pH of a urine sample that has an H_3O^+ concentration of 1×10^{-5} M? Classify the solution as acidic, basic, or neutral.

Solution

$$\begin{aligned}\text{pH} &= -\log [\text{H}_3\text{O}^+] = -\log(10^{-5}) \\ &= -(-5) = 5 \quad \text{pH of urine sample}\end{aligned}$$

Answer

The urine sample is acidic since the $\text{pH} < 7$.

PROBLEM

Convert each H_3O^+ concentration to a pH value.

- a. 1×10^{-6} M b. 1×10^{-12} M c. 0.000 01 M d. 0.000 000 000 01 M



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8.2 Focus on the human body: The pH of Body Fluids.

The human body contains fluids that vary in pH as shown in Figure 8.3.

While saliva is slightly acidic, the gastric juice in the stomach has the lowest pH found in the body.

The strongly acidic environment of the stomach aids in the digestion of food. It also kills many types of bacteria that might be inadvertently consumed along with food and drink.

When food leaves the stomach, it passes to the basic environment of the small intestines.

Bases in the small intestines react with acid from the stomach.

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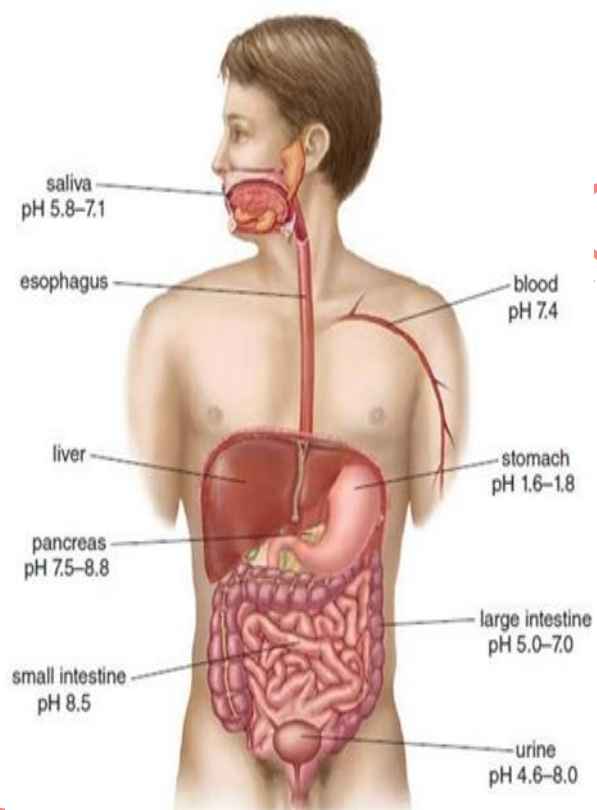


Fig.8.3: Variation in pH Values in the Human Body



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The pH of some body fluids must occupy a very narrow range. For example, a healthy individual has a blood pH in the range of 7.35–7.45.

Maintaining this pH is accomplished by a complex mechanism described in Section 8.9.

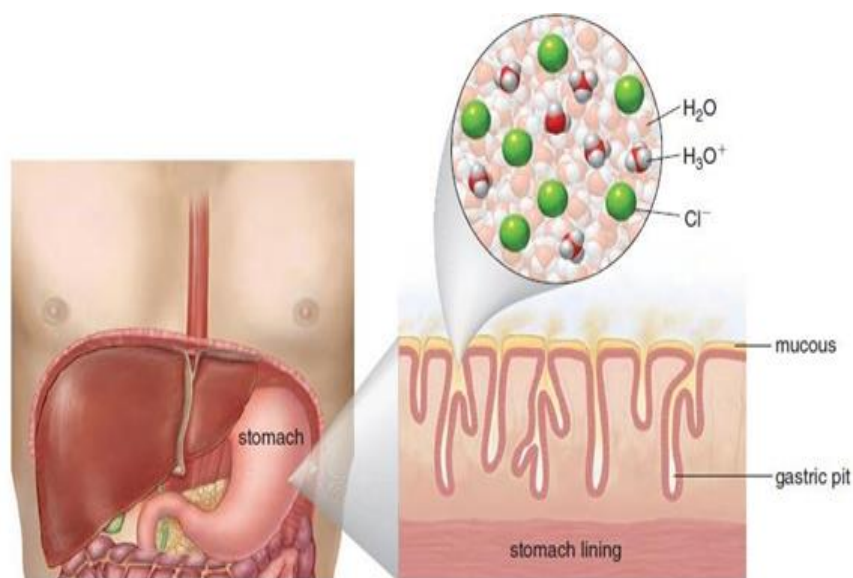
The pH of other fluids can be more variable.

Urine has a pH anywhere from 4.6–8.0, depending on an individual's recent diet and exercise.

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The thick mucous layer protects the stomach lining.

Fig.8.4: Focus on the Human Body: Hydrochloric Acid in the Stomach

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Although HCl is a corrosive acid secreted in the stomach, a thick layer of mucous covering the stomach wall protects it from damage by the strong acid.

The strong acid HCl is completely dissociated to H_3O^+ and Cl^- .

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