

### Blood pH levels

Dependent on H<sup>+</sup> concentration

Normal pH: 7.35-7.45

Alkalosis: 7.45-7.8

Acidosis: 7-7.35

Anything >7.8 or <7 is deadly

### Buffers

Buffering is the primary regulator of acid-base balance.

Buffers act chemically to change strong acids into weaker ones, or bind them to neutralise them

Different buffer systems assume dominant roles in different parts of the body:

**Extracellular Fluid (ECF)** *Major buffer:* Bicarbonate buffer system

*Minor buffers:* Intracellular proteins, Phosphate buffer system

**Blood** *Major buffers:* Bicarb buffer system, Hemoglobin

*Minor buffers:* Plasma proteins, Phosphate buffer system

**Intracellular fluid (ICF)** *Major buffers:* Proteins, Phosphate

*Minor buffers:* None

**Urine** *Major buffers:* Ammonia, Phosphate

*Minor buffers:* None

### Renal

Secretes free hydrogen ions into renal tubules

Excretes weak acid

Excretes HCO<sub>3</sub> (if there is metabolic acidosis)

### Reading arterial blood gases (ABG)

*Respiratory*

*Acidosis*

*Respiratory*

*Alkalosis*

*Metabolic Acidosis*

*Metabolic Alkalosis* Increased pH, normal PaCO<sub>2</sub>, increased HCO<sub>3</sub>

#### Normal ABG figures

pH 7.35-7.45

PO<sub>2</sub> 80-100

PCO<sub>2</sub> 35-45

HCO<sub>3</sub> 22-28

### Acid-base homeostasis

#### How is it maintained?

*Buffers* Bicarbonate (HCO<sub>3</sub>) - reacts rapidly, less than an second. Chemically change strong acids to weaker acids or bind to neutralise effect

*Respiratory system* Reacts rapidly - seconds to minutes

*Renal system* Reacts slowly - hours



### Respiration

CO<sub>2</sub> formed and excreted in lungs

Lungs excrete CO<sub>2</sub> + H<sub>2</sub>O as by-products of cellular metabolism

CO<sub>2</sub> is regarded as an acid

#### Homeostasis cycle of CO<sub>2</sub> in the body:

During exercise or other activity, cell metabolism increases and produces more CO<sub>2</sub>, then:

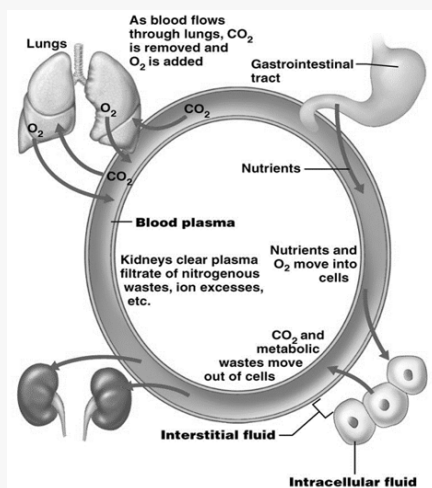
More CO<sub>2</sub> dissolves in blood, forming carbonic acid which lowers blood pH slightly, then:

Receptors in the brain sense the drop in pH and send nerve signals to increase breathing rate, then:

Increased breathing rate quickly removes more CO<sub>2</sub> from blood.

Blood pH rises slightly, returning to normal - cycle starts again

### Continuous mixing of body fluids/gases



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Page 2 of 2.

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