

Blood pH levels

Dependent on H⁺ 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 problems, 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 HCO₃ (if there is metabolic acidosis)

Reading arterial blood gases (ABG)

Respiratory

Acidosis

Respiratory

Alkalosis

Metabolic Acidosis

Metabolic Alkalosis Increased pH, normal PaCO₂, increased HCO₃

Normal ABG figures

pH 7.35-7.45

PO₂ 80-100

PCO₂ 35-45

HCO₃ 22-28

Acid-base homeostasis

How is it maintained?

Buffers Bicarbonate (HCO₃) - 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

CO₂ formed and excreted in lungs

Lungs excrete CO₂ + H₂O as by-products of cellular metabolism

CO₂ is regarded as an acid

Homeostasis cycle of CO₂ in the body:

During exercise or other activity, cell metabolism increases and produces more CO₂, then:

More CO₂ 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 CO₂ from blood.

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

Continuous mixing of body fluids/gases

