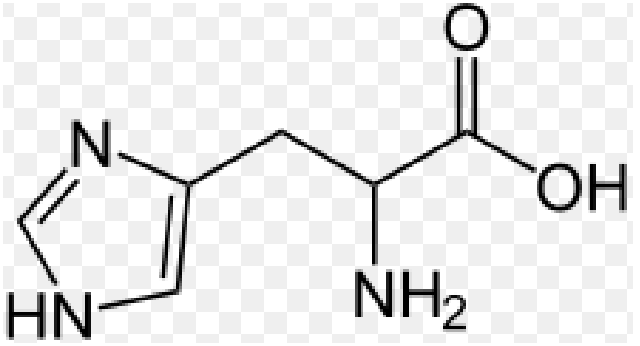
Extra explanatory slides for buffers

Protein Buffers

-Because of the presence of the dissociable acidic (-COOH) and basic (-NH2) groups, proteins act as buffers.

-Particularly the imidazole group of the side chain of histidine residue (pKa = 7.3)

Proteins, specifically Albumin, account for 95% of non-carbonate buffering action in plasma (has 16 His/mole)



Histidine

Phosphate Buffer systems

-Phosphate anions and proteins are important buffers that maintain a constant pH of ICF.

-Intracellular and tubular fluids of kidney

- $H_2PO_4^-$ dissociates to H^+ and HPO_4^{-2}

-pKa is 7.1-7.2

Hemoglobin (Hb) Buffer

-Major intracellular buffer of the blood

-Hb has a high number of His (38 molecules/mole of Hb)

-Works cooperatively with the bicarbonate buffer system

Buffer systems of the body

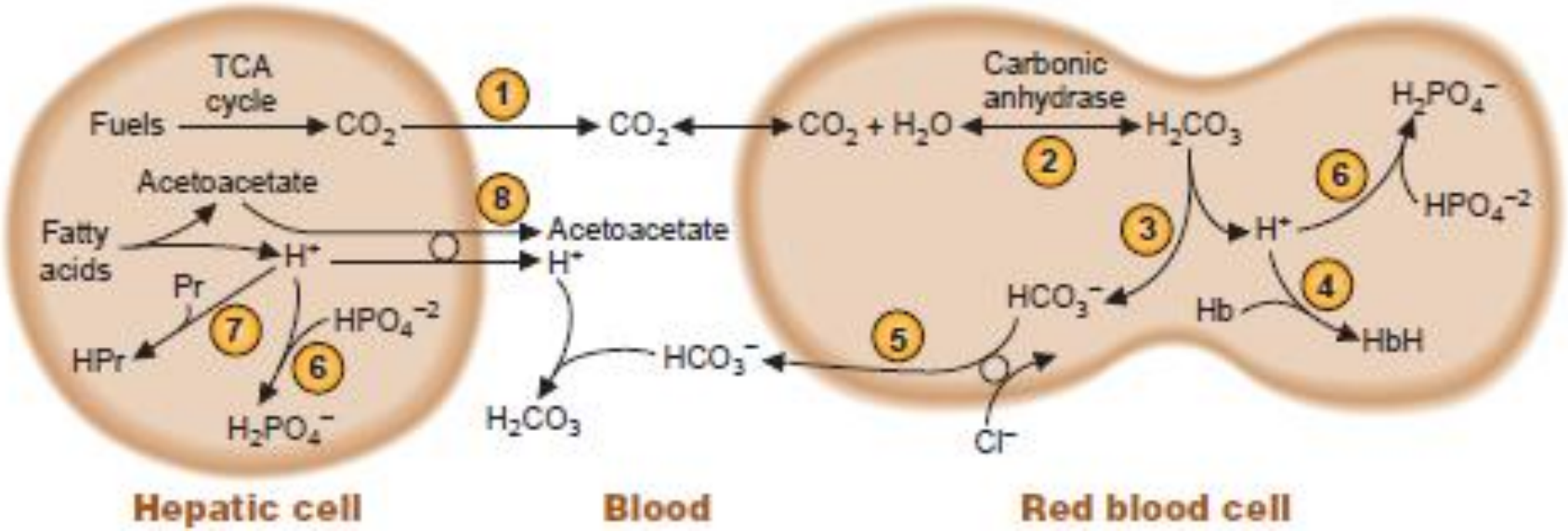


FIG. 4.9. Buffering systems of the body. CO_2 produced from cellular metabolism is converted to bicarbonate and H^+ in the red blood cells. Within the red blood cells, the H^+ is buffered by hemoglobin (Hb) and phosphate (HPO_4^{2-}) (*circles 4 and 6*). The bicarbonate is transported into the blood to buffer H^+ generated by the production of other metabolic acids, such as the ketone body acetoacetic acid (*circle 5*). Other proteins (Pr) also serve as intracellular buffers. See the text for more details.