

Functionally activate oxygen, carbon dioxide and water molecules with high rate protolysis attractors equilibria as Biosphere Self-Organization create perfect order homeostasis irreversible reactions and generate the bioenergetic.

Abstract. The quantitative studies for oxygen, carbon dioxide and water protolysis functional activity reveal multiply generated Self-Organization Attractors: pH=7.36, enzyme Carbonic Anhydrase reactivity, water concentration $[H_2O]=55.3 \text{ mol/Liter}$, air oxygen level 20.95 %, osmolar concentration 0.305 M, ionic strength 0.25 M, temperature 310.15 K degree etc. ^[1] High rate protolysis in water make oxygen fire safe and $CO_{2\text{aqua}}$ functional active for Life Biochemistry. In 2023 are hundred Years of Brønsted - Lowry protolysis, which high rate protonation stay at equilibria while homeostasis continues. Dissolute oxygen forms [arterial concentration](#) $[O_{2\text{aqua}}]=6 \cdot 10^{-5} \text{ M}$ as safe Bioenergetic sustaining isooxia with air oxygen level 20.95 % Attractor 500 MY. ^[3]

For contemporary Thermodynamic Ilya Prigogine declared “This equilibrium state is an “attractor” for non-equilibrium states.” ^[4] The perfect order irreversible non-equilibrium reactions of homeostasis are created by activation with high rate protolysis Attractors. High rate protolysis Attractors stay at equilibrium and activate biosphere molecules for irreversible perfect order reactions of homeostasis. Thermodynamic indicate indispensability to reach activating Self-Organization protolysis Attractor values. Destiny is trend to minimum of free energy change in homeostasis. Attractors made functionally active molecules Self-Organize the perfect reactions order in homeostasis, what generate bioenergetic with concentration gradients for transport down and for osmosis against the concentration gradients, which as Brownian molecular engines drive the organism homeostasis for evolution and for survival. ^[2,3,4] Deviation from high rate protolysis Attractor values disorder the Self-Organization perfect reaction order homeostasis. The create Chaos disorders and stops the homeostasis which disappears as extinct from Biosphere.

High rate protolysis attractors functional activation create perfect order of homeostasis and bioenergetic.

1. The oxygen $O_{2\text{aqua}}$ decreases free energy content from $G_{O_{2\text{aqua}}}=237.2 \text{ kJ/mol}$ to $G_{O_{2\text{Biochemistry}}}=12.2 \text{ kJ/mol}$.

Solubility zero level $O_{2\text{gas AIR}} + H_2O \xrightarrow{\text{Aquaporins}} O_{2\text{Blood}}$ converted to product level increase the $G_{O_{2\text{sp}}}=26.58 \text{ kJ/mol}$:

$$\frac{[O_{2\text{aqua}}]}{[O_{2\text{gas}}] \cdot [H_2O]} = K_{\text{sp}} = 2.205 \cdot 10^{-5}. \quad G_{O_{2\text{sp}}} = -R \cdot T \cdot \ln(K_{\text{sp}}) = -8.3144 \cdot 298.15 \cdot \ln(2.205 \cdot 10^{-5}) = 26.58 \text{ kJ/mol}.$$



$$E_o = E^\circ + \frac{0.0591}{4} \cdot \log\left(\frac{[O_{2\text{aqua}}] \cdot [H_3O^+]^4}{[H_2O]^6}\right) = 1,383 + \frac{0.0591}{4} \cdot \log(6 \cdot 10^{(-5)} \cdot 10^{(-7,36 \cdot 4)} / 55,346^6) = 0.731 \text{ Volts}.$$

$$\Delta E_{H_2O} = E^\circ - E_o = 1,383 - 0,731 = -0.652 \text{ Volts}; \quad \Delta G_{\text{arterial}} = \Delta E_{H_2O} \cdot F \cdot n = -0,652 \cdot 96485 \cdot 4 / 1000 = -251.6 \text{ kJ/mol}.$$

Free energy protolysis decrease is $G_{O_{2\text{Biochem_arterial}}} = G_{O_{2\text{aqua}}} + \Delta G_{\text{arterial}} + G_{O_{2\text{sp}}} = 237,19 - 251,6 + 26,58 = 12.2 \text{ kJ/mol}$ and oxygen becomes fire safe biochemical oxidant, forming [arterial concentration](#) $[O_{2\text{aqua}}]=6 \cdot 10^{-5} \text{ M}$ as safe Bioenergetic sustaining isooxia. ^[3]

2. Carbonic Anhydrase CA increases free energy content from $G_{CO_2+2H_2O}=0 \text{ kJ/mol}$ to $G_{H_3O^++HCO_3^-}=68.38 \text{ kJ/mol}$.

Solubility zero level $CO_{2\text{gas}} + H_2O \rightleftharpoons CO_{2\text{aqua}}$ solute product value 8.379 kJ/mol :

$$K_{\text{sp}CO_{2\text{aqua}}} = \frac{[CO_{2\text{aqua}}]}{[CO_{2\text{gas}}] \cdot [H_2O]} = \text{EXP}(-\Delta G_{\text{sp}CO_{2\text{aqua}}}/R/T) = \text{EXP}(-8379/8,3144/298,15) = 0,034045 \text{ and}$$

$$\text{Free energy increase } \Delta G_{\text{sp}CO_{2\text{aqua}}} = -R \cdot T \cdot \ln(K_{\text{sp}CO_{2\text{aqua}}}) = -8.3144 \cdot 298.15 \cdot \ln(0.034045) / 1000 = 8.379 \text{ kJ/mol}.$$



$$\frac{[\text{HCO}_3^-]_{\text{aqua}} \cdot [\text{H}_3\text{O}^+]}{[\text{CO}_2]_{\text{aqua}} \cdot [\text{H}_2\text{O}]^2} = K_{\text{eqCAHCO}_3\text{aqua}} = K_{\text{a_CO}_2\text{aqua}} / [\text{H}_2\text{O}]^2 = 10^{-7.0512} / 55.3^2 = 2.906 \cdot 10^{-11}. \text{ CA equilibrium constant}$$

accumulate energy: $\Delta G_{\text{eqCO}_2\text{aqua}} = -R \cdot T \cdot \ln(K_{\text{eqCO}_2\text{aqua}}) = -8,3144 \cdot 298,15 \cdot \ln(2,906 \cdot 10^{-11}) / 1000 = 60.14 \text{ kJ/mol}$.

Accumulate free energy total is $G_{\text{H}_3\text{O}^+\text{HCO}_3^-} = \Delta G_{\text{spCO}_2\text{aqua}} + \Delta G_{\text{eqCO}_2\text{aqua}} = 8.379 + 60.14 = 68.52 \text{ kJ/mol}$. [1,8,14]

3. Water free energy content in organism increases from zero to $G_{\text{H}_2\text{O_Biochemistry}} = 85.65 \text{ kJ/mol}$. [1,8].

Distilled water zero level $\text{H}_2\text{O}_{\text{distilled}} \xrightarrow{\text{activation}} \text{H}_2\text{O}_{\text{Biochemistry}}$ biochemical activates to **85.65** kJ/mol value;

$$G_{\text{H}_2\text{O_Biochemistry}} = \Delta G^\circ_{\text{H}_2\text{O_Biochemistry}} - \Delta G^\circ_{\text{H}_2\text{O_distilled}} = -151,549 - (-237,191) = 85.65 \text{ kJ/mol}.$$

Endothermic and endoergic free energy accumulation in biochemical medium: osmolar concentration

$C_{\text{osm}} = 0.305 \text{ M}$, ionic strength $I = 0,2 \text{ M}$, temperature 298.15 K for high rate protolysis attractors create positive water $G_{\text{H}_2\text{O_Biochemistry}} = 85,64 \text{ kJ/mol}$ activation as self-organization Homeostasis.

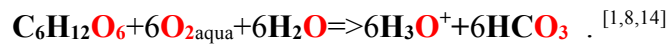
4. Photosynthesis as activation of molecules accumulate in products $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O} + 6\text{O}_2\text{aqua}$ the Bio-Fuel

free energy for homeostasis: $6\text{H}_3\text{O}^+ + 6\text{HCO}_3^- \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2\text{aqua} + 6\text{H}_2\text{O}$; $\Delta G_{\text{Lehninger}} = +2840 \text{ kJ/mol}$.

Start from protolysis products $6\text{H}_3\text{O}^+ + 6\text{HCO}_3^-$ $6 \cdot G_{\text{H}_3\text{O}^+\text{HCO}_3^-} = 6 \cdot 68,38 \text{ kJ/mol} = 410.3 \text{ kJ/mol}$ to quasi state equilibrium

$$\Delta G_{\text{Lehninger}} = 2840 \text{ kJ/mol} = G_{\text{C}_6\text{H}_{12}\text{O}_6} + 6 \cdot G_{\text{O}_2\text{Biochem_arterial}} + 6 \cdot G_{\text{H}_2\text{O_Biochem}} = G_{\text{C}_6\text{H}_{12}\text{O}_6} + 6 \cdot 12,2 + 6 \cdot 85,64.$$

Photosynthesis [6th page](#) generate glucose free energy content is $G_{\text{C}_6\text{H}_{12}\text{O}_6} = 2840 - 6 \cdot 12,2 - 6 \cdot 85,64 = 2253 \text{ kJ/mol}$ and are used by oxidation to generating concentrations gradients with $6\text{HCO}_3^- + 6\text{H}_3\text{O}^+$ ions for bioenergetic transport down and for osmosis against the concentration gradients through membranes channels:



5. [Water protolysis](#) increases free energy content from zero $G_{\text{H}_2\text{O}} = 0 \text{ kJ/mol}$ to $G_{\text{H}_3\text{O}^+\text{OH}^-} = 99.8 \text{ kJ/mol}$.

Water zero level Free energy $\text{H}_2\text{O} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ converted to product level increase $G_{\text{H}_3\text{O}^+\text{OH}^-} = 99.8 \text{ kJ/mol}$:

$$\frac{[\text{OH}^-] \cdot [\text{H}_3\text{O}^+]}{[\text{H}_2\text{O}] \cdot [\text{H}_2\text{O}]} = K_{\text{H}_3\text{O}^+\text{OH}^-} = [\text{H}_3\text{O}^+] \cdot [\text{OH}^-] / [\text{H}_2\text{O}]^2 = 3.26 \cdot 10^{-18};$$

$$\Delta G_{\text{H}_3\text{O}^+\text{OH}^-} = -R \cdot T \cdot \ln(K_{\text{H}_3\text{O}^+\text{OH}^-}) = -8,3144 \cdot 298,15 \cdot \ln(3,26 \cdot 10^{-18}) / 1000 = 99.8 \text{ kJ/mol}.$$

$$G_{\text{H}_3\text{O}^+\text{OH}^-} = \Delta G_{\text{H}_3\text{O}^+\text{OH}^-} + \Delta G^\circ_{\text{H}_2\text{O}} = -R \cdot T \cdot \ln(K_{\text{H}_3\text{O}^+\text{OH}^-}) - 0 = 99.8 \text{ kJ/mol} \quad [1,8,14]$$

6. [Catalase](#) with high rate protolysis increase peroxide molecules activity from $E_a = 79000 \text{ J/mol}$ to $E_a = 29 \text{ J/mol}$.

At absent catalysts reaction: $\text{H}_2\text{O}_2 + \text{H}_2\text{O}_2 \rightarrow \text{H}^+ + \text{HOO}^- \gg \text{OOH}^- + \text{H}^+ \rightarrow \text{O}_2\text{aqua} + \text{H}_2\text{O} + \text{H}_2\text{O}$

for colliding negative charged anions $\text{HOO}^- \gg \text{OOH}^-$ indispensable activation energy is large $E_a = 79000 \text{ J/mol}$ and

at present catalyst: $\text{H}_2\text{O}_2 + \text{H}_2\text{O}_2 + \text{Fe}^{3+} \rightarrow \text{H}^+ + \text{HOO}^- \gg \text{Fe}^{3+} \ll \text{OOH}^- + \text{H}^+ \rightarrow \text{O}_2\text{aqua} + \text{H}_2\text{O} + \text{H}_2\text{O} + Q_{\text{exothermic}} + \text{CAT-Fe}^{3+}$

in [Catalase](#) for colliding negative and positive ions $\text{HOO}^- \gg \text{Fe}^{3+}$ indispensable activation energy is $E_a = 29 \text{ J/mol}$;

$$\text{At absent catalysts velocity constant is: } \vec{k} = A \cdot e^{-\frac{E_a}{RT}} = 0.01 \cdot e^{-\frac{79000}{8,314 \cdot 298}} = 0.01 \cdot 1.419 \cdot 10^{-14} = 1.419 \cdot 10^{-16} \text{ M}^{-1}\text{s}^{-1}.$$

$$\text{Catalase with high rate protolysis increase } \vec{k} = A \cdot e^{-\frac{E_a}{RT}} = 0.131 \cdot e^{-\frac{29}{8,314 \cdot 298}} = 0.131 \cdot 0.988 = 0.1296 \text{ M}^{-1}\text{s}^{-1}$$

$$\text{velocity: } \vec{v} = \vec{k} \cdot [\text{H}_2\text{O}_2]^2 = 0.1296 \cdot [\text{H}_2\text{O}_2]^2 \text{ Ms}^{-1}.$$

At absent catalysts geometric factor is $A = 0.01$ for colliding negative charged anions $\text{HOO}^- \gg \text{OOH}^-$ and

at present catalyst the geometric factor is $A = 0.131$ in [Catalase](#) for colliding ions $\text{HOO}^- \gg \text{Fe}^{3+}$;

At absent catalysts the active collisions fraction is small $1.419 \cdot 10^{-14}$ for colliding anions $\text{HOO}^- \gg \text{OOH}^-$ and at present [Catalase](#) the active collisions fraction is 0.988. So 98.8% of total collisions $\text{HOO}^- \gg \text{Fe}^{3+}$ are active;

7. High rate protolysis attractors [Catalase](#) reactivity is indispensable molecular engine producing the life recourses : **oxygen**+ **water**+ **heat** ($O_{2\text{aqua}}+2H_2O+Q$). [Catalases](#) with hundred percents • 100% efficiency erase peroxide molecules thirty million times faster. So activate perfect order of homeostasis reactions.

$$\vec{v} = \vec{k} \cdot [H_2O_2]^2 = 1.419 \cdot 10^{-16} \cdot [H_2O_2]^2 \text{ Ms}^{-1}; \text{ if } [H_2O_2] = 1 \text{ M}; \sqrt{\vec{v}} = \sqrt{\vec{k}} \cdot [H_2O_2] = 1.191 \cdot 10^{-8}.$$

$$\sqrt{\vec{v}} = \frac{CAT \sqrt{\vec{v}}}{\sqrt{k}} \cdot [H_2O_2] = 0.36 \cdot [H_2O_2]; \text{ So is } \frac{CAT \sqrt{\vec{v}}}{\sqrt{k}} = \frac{0,36}{1,19 \cdot 10^{-8}} = 30 \cdot 10^6 \text{ times greater velocity constant.}$$

8. High rate protolysis attractors pH=7.36, CA, **H₂O** Shuttle Hemoglobin functionally activate **O₂** , **CO₂**.

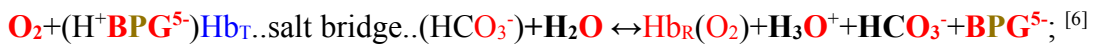
Henderson Haselbalh expression for Brensted protolysis calculates Attractor value 7.36:

$$pH = pK_a + \log \frac{[HCO_3^-]}{[CO_{2\text{aqua}}]} = 7.0512 + \log(0.0154 \text{ M}/0.0076 \text{ M}) = 7.36.$$

Self-Organization Attractors pH=7.36, CA, **H₂O** create functional activity of molecules with charged groups negative and positive: **HPO₄²⁻**, **HCO₃⁻**, **R-COO⁻**, **R-NH₃⁺**, **R-PO₄²⁻** as free and linked in molecules **R**: amino acids, proteins, nucleic acids, carbohydrates, coenzymes. 11th and 12th pages: [BUFFER solution](#).^[1]

Hemoglobin in tissue desorbs oxygen **O_{2aqua}** for exchange to homeostasis generate **HCO₃⁻** and **H⁺**, but in lungs releases **HCO₃⁻** and **H⁺** due to adsorption of oxygen **O_{2aqua}**.^[6] Exchange equilibrium depends on [oxygen concentration in blood](#)

in unoccupied mol fraction 0,04=[(H⁺**BPG⁵⁻**)Hb_T..salt bridge..(HCO₃⁻)] deoxyHemoglobin with Bisphospho glycerate **BPG⁵⁻** and saturated mol fraction [Hb_R(O₂)]=0,96 for arterial concentration [O_{2aqua}]=6·10⁻⁵ M , which designated with [Hb_R(O₂)]=[(His63,58)₄Arg⁺His⁺betaVal1(NH₄⁺)₂Hb_R(O₂)₄]



Venous unoccupied mol fraction 0,37=[(H⁺ **BPG⁵⁻**)Hb_T.. salt bridge..(HCO₃⁻)] and saturate mol fraction [Hb_R(O₂)]=0,63 . In circulation organism consume 0,96-0,63=0,33 oxygen mol fraction maintaining venous concentration [O_{2aqua}]=0,426·10⁻⁵ M. That stabilize homeostasis concentrations [HCO₃⁻]=0,0154 M, [CO_{2aqua}]=0,0076 M keeping Self-Organization multi functional Attractor pH=7.36. Equilibrium constant is:

$$K = [Hb_R(O_2)] \cdot [BPG^{5-}] \cdot [H_3O^+] \cdot [HCO_3^-] / [(H^+ BPG^{5-})Hb_T \dots \text{salt bridge} \dots (HCO_3^-)] \cdot [H_2O] / [O_2] = 2,43 \cdot 10^{(-8)};$$

$$\text{arterial } K = 0,96 \cdot 0,005 \cdot 10^{(-7,36)} \cdot (0,0154) / 0,04 / 55,3 / 6 / 10^{(-5)} = \blacksquare 400000 \cdot 6,078 \cdot 10^{(-14)} \quad \square = 2,43 \cdot 10^{(-8)};$$

$$\blacksquare = 0,96 / 0,04 / 6 / 10^{(-5)} = 400000 *; \quad \square = 0,005 \cdot (10^{(-7,36)}) \cdot (0,0154) / 55,3 = 6,078 \cdot 10^{(-14)};$$

$$\text{venous } K = 0,63 \cdot 0,005 \cdot 10^{(-7,36)} \cdot (0,0154) / 0,37 / 55,3 / 0,426 / 10^{(-5)} = \blacksquare 400000,6 \cdot 6,078 \cdot 10^{(-14)} \quad \square = 2,43 \cdot 10^{(-8)};$$

$$\blacksquare = 0,63 \cdot 0,005 \cdot 10^{(-7,36)} \cdot (0,0154) / 55,3 = 6,078 \cdot 10^{(-14)};$$

$$\text{venous see level air oxygen content is } [O_2] = 20,95\% \quad [BPG^{5-}] = 5 \text{ mM}, \text{ but venous mountains } [BPG^{5-}] = 8 \text{ mM is}$$

$$K = 0,48 \cdot 0,008 \cdot 10^{(-7,36)} \cdot (0,0154) / 0,52 / 55,3 / 0,3692 / 10^{(-5)} = \blacksquare 250020,8 \cdot 9,725 \cdot 10^{(-14)} \quad \square = 2,43 \cdot 10^{(-8)};$$

$$\blacksquare = 0,48 / 0,52 / 0,3692 / 10^{(-5)} = 250020,8 *; \quad \square = 0,008 \cdot (10^{(-7,36)}) \cdot (0,0154) / 55,3 = 9,725 \cdot 10^{(-14)};$$

Blood circulation cycle generate concentration gradients amount [H⁺]=459*6·10⁻⁵ M=0,0275 M=[HCO₃⁻];

Multi functional attractor pH=7,36 normal concentrations are [HCO₃⁻]=0,0154 M, [CO_{2aqua}]=0,0076 M.

Arterial concentrations are [O₂]=6·10⁻⁵ M [Hb_R(O₂)]=0,96 , [(H⁺)Hb_T..salt bridge..(HCO₃⁻)] = 0,04 and venous homeostasis concentrations are [O₂]=0,426·10⁻⁵ M [Hb_R(O₂)]=0,66 , [(H⁺)Hb_T..salt bridge..(HCO₃⁻)] = 0,33.

In blood *plasma* dominate enzyme CA bicarbonate pH=7.36±0,01, phosphate buffer solutions - protein silence.

In sweat, urine and digestive apparatus dominates bicarbonate system and phosphate system is too present.

High rate protolysis attractors pH=7.36±0,01, CA, **H₂O** functionally activate arterial and venous oxygen concentration, driving bicarbonate oxygen Shuttle mechanism work with organism interface to environment.

Homeostasis irreversibly exchange in *lungs* from AIR inhaling **O₂** and exhaling **CO₂**. Attractors activate Brownian molecular engines to drive irreversibly homeostasis for evolution and for survival in biosphere.

Summary:

Attractors **Self-Organizing** create functional active molecules reaction perfect order for homeostasis and bioenergetic. The order of functionally active molecules drives homeostasis under rule Attractors. Reaching of Attractor values create homeostasis order out of disorder. Deviation from attractors disorder the homeostasis.

The homeostasis composition order of enzymatic **reactants** and **products** trends to reach **equilibrium** state, but never reaches as is non equilibrium state (Y. Prigogine 1977th). High rate protolysis attractors stay at equilibrium, while composite order of homeostasis continues irreversibly generate concentration gradients for transport down and for osmosis against the concentration gradients. ^[3,4]

Homeostasis perfect order of reactions generate high rate protolysis Attractors, which stay at equilibrium state. Attractors are two types and multipurpose. The primary Attractors common for Biosphere, the secondary Attractors for individual organisms and multipurpose pH=7.36, water, air oxygen. ^[14]

1. The oxygen **O₂_{aqua}** molecules functional activation in water protolytic decreasing free energy content:

$$\text{from } G_{\text{O}_2\text{aqua}}=237.2 \text{ kJ/mol to } G_{\text{O}_2\text{Biochemistry_arterial}}=12.2 \text{ kJ/mol.}$$

Oxygen O₂_{aqua} decreased power for functional active isooxia Norma solution in blood so in cytosol too driven with four Attractors: water triplet state of oxygen, air oxygen level 20.95 % for five hundred million Years, pH=7.36 for the concentration $[\text{H}_3\text{O}^+]=10^{-7.36} \text{ M}$, water concentration $[\text{H}_2\text{O}]=55.3 \text{ mol/Liter}$. ^[14]

Zero level 0 kJ/mol free energy content molecules **CO₂_{gas}**, **H₂O** accumulate energy in its protolysis products and in Biochemistry environment: **H₃O⁺+HCO₃⁻** ($G_{\text{H}_3\text{O}^++\text{HCO}_3^-}=68.38 \text{ kJ/mol}$), **H₃O⁺+OH⁻** ($G_{\text{H}_3\text{O}^++\text{OH}^-}=99.8 \text{ kJ/mol}$), **H₂O_{Biochemistry}** ($G_{\text{H}_2\text{O_Biochemistry}}=85.65 \text{ kJ/mol}$).

2. Carbonic Anhydrase CA enzyme governed carbon dioxide protolysis with water **CO₂ + 2 H₂O** increases free energy content of products **H₃O⁺+HCO₃⁻** from zero $G_{\text{CO}_2+2\text{H}_2\text{O}}=0 \text{ kJ/mol}$ to $G_{\text{H}_3\text{O}^++\text{HCO}_3^-}=68.38 \text{ kJ/mol}$.

3. Distilled water in organism protolytic medium increases free energy content from zero $G_{\text{H}_2\text{O_distilled}}=0 \text{ kJ/mol}$ to $G_{\text{H}_2\text{O_Biochemistry}}=85.65 \text{ kJ/mol}$. ^[1,8,14]

4. Photosynthesis [6th page](#) generate glucose free energy content is $G_{\text{C}_6\text{H}_{12}\text{O}_6}=2840-6*12,2-6*85,64=2253 \text{ kJ/mol}$ and are used by oxidation to generating concentrations gradients across membranes with **6HCO₃⁻+6H₃O⁺** ions for transport down and for osmosis against concentration gradients sustaining irreversible homeostasis survive.

5. [Water protolysis](#) increases free energy content of products **H₃O⁺+OH⁻** from zero to $G_{\text{H}_3\text{O}^++\text{OH}^-}=99.8 \text{ kJ/mol}$.

6. [Catalase](#) with high rate protolysis increase peroxide molecules activity from $E_a=79000 \text{ J/mol}$ to $E_a=29 \text{ J/mol}$.

7. High rate protolysis attractors [Catalase](#) $\frac{\overset{\text{CAT}}{\sqrt{k}}}{\sqrt{k}} = \frac{0,36}{1,19 \cdot 10^{-8}} = 30 \cdot 10^6$ times greater velocity constant reactivity

is indispensable molecular engine producing the life recourses.

8. High rate protolysis attractors **pH=7.36±0,01**, CA, **H₂O** functionally activate arterial and venous oxygen concentration, driving bicarbonate oxygen Shuttle mechanism work with organism interface to environment.

Homeostasis irreversibly exchange in *lungs* from AIR inhaling **O₂** and exhaling **CO₂**. Attractors activate Brownian molecular engines to drive irreversibly homeostasis for evolution and for survival in biosphere.

CA Carbonic Anhydrase work as primary Attractor for Biosphere which forms dominate bicarbonate buffer of **CO₂_{aqua}** acid protolysis constant $\text{pK}_a=7.0512$. ^[14] Henderson Haselbalh expression Attractor value 7.36, which

corresponds to concentration $[H_3O^+]$. Attractor 7.36 creates functional activity of molecules with charged groups negative and positive: HPO_4^{2-} , HCO_3^- , $R-COO^-$, $R-NH_3^+$, $R-PO_4^{2-}$ as free and linked in amino acids, proteins, nucleic acids, carbohydrates, coenzymes, **R** molecules. Carbonic Anhydrase synthesis solve perfect order of homeostasis and bioenergetic as Self-Organization Attractor. ^[3,4,14]

The Attractors values in organism compartments dissipative structures create the perfect homeostasis order with enzymes clusters on five type complex reactions. ^[14] High rate protolysis attractors stay at equilibrium state, while homeostasis continues generate concentration gradients for irreversible transport, which as Brownian molecular engines drive the organism homeostasis for evolution and for survival. Deviation from Attractor values cause loss the homeostasis order of functional activity. Chaotic reactions waste the resources and stop the homeostasis, the non-equilibrium complex processes. The homeostasis becomes extinct from Biosphere.

Water protolysis is **indispensable** for Attractors sustaining which stay at equilibrium while homeostasis and bioenergetic continue. Attractors destiny are irreversible free energy change $\Delta G_{\text{Homeostasis}}$ transduction between functional active molecules.

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