|  |  |  |
| --- | --- | --- |
| Variable | Physical quantity | Physical unit |
|  | Amount of the substance | mol |
|  | Change of the amount of substance; molar flow | mol.s‑1 |
|  | Volume | m3 |
|  | Change of volume or volumetric flow | m3.s‑1 |
|  | Density | kg.m‑3 |
|  | Mole fraction of the substance | mol.mol‑1 |
|  | Molarity of the substance | mol.m‑3 |
|  | Molality of the substance | mol.kg‑1 |
|  | Molar mass of the substance | kg-1.mol-1 |
|  | Molar volume of the substance | m3.mol-1 |
|  | Mole fraction based activity of the substance | 1 |
|  | Molar enthalpy of the formation of the substance | J.mol‑1 |
|  | Molar entropy of the formation of the substance | J.K-1.mol‑1 |
|  | Temperature | K |
|  | Time coefficient of equilibration of electrochemical potentials | S |
|  | Dissociation coefficient of the chemical reaction | 1 |
|  | Henry’s law coefficient as liquid to gas ratio | 1 |
|  | Mole fraction based activity coefficient of substance | 1 |
|  | Stoichiometry coefficient in the chemical reaction | 1 |
|  | Electrical charge of one particle of the substance | C |
|  | Amount of substance on the surface | mol |
|  | Ratio of specific form of side s inside general form G | 1 |
|  | Pressure | Pa |
|  | Osmotic pressure | Pa |
|  | Donnan’s equilibrium ratio of monovalent ion | 1 |
|  | Electric potential | V |
|  | Relative heat energy; relative total enthalpy | J |
|  | Change of heat energy; heat flow | J.s‑1 |
|  | Mass | kg |
|  | Change of mass; mass flow | kg.s-1 |
|  | Specific heat capacity at constant pressure | J.kg‑1.K‑1 |
|  | Heat conductance of heat convection | J.K‑1.s‑1.m‑2 |
|  | Enthalpy of vaporization | J.mol-1 |
|  | Hydraulic compliance of space with elastic walls | m3.Pa‑1 |
|  | Vertical height between two points | m |
|  | Hydraulic conductance | m3.Pa‑1.s‑1 |
|  | Hydraulic inertia | Pa.s2.m‑3 |
|  | Size of cell population; number of cells | 1 |
|  | Change of cell population; flow of cells | s‑1 |
|  | Change of population per one cell | s‑1 |
| g ≈ 9.8 | Gravity acceleration | m.s-2 |
| R ≈ 8.314 | Gas constant | J.K‑1.mol‑1 |
| F ≈ 96490 | Faraday constant | C.mol‑1 |

|  |  |
| --- | --- |
| Chemical variables definitions | |
|  | Amount of substance A |
|  | Mole fraction of the substance A |
|  | Mole fraction based activity of the substance A |
|  | Electro-chemical potential of the substance A in solution |
|  | Electro-chemical potential of the pure substance A |
|  | Free molar formation enthalpy of the pure substance A |
|  | Free molar entropy of formation of ideal gas substance A at pressure p and temperature T |
|  | Free molar entropy of formation of incompressible substance A at pressure p and temperature T |
|  | Rate of chemical reaction  *0 <->* v1*A1 +* v2*A2 + ...* , where vi is negative for reactants |
|  | Gas dissolution in liquids |
|  | Passive outflow of the substance through the membrane |
|  | Equilibration of the specific macromolecule form S composed from the specific independent primary structure subunits Pi in the macromolecule quaternary structure Q |

|  |  |
| --- | --- |
| Recalculation of chemical parameters to substance properties | |
|  | Relative Gibbs formation energy from the equilibrium coefficient of the reaction  v1*B1 +* v2*B2 + ... <->* vA*A*  at 25°C and 1 bar. |
|  | Relative molar enthalpy of formation from the molar enthalpy of the reaction  v1*B1 +* v2*B2 + ... <->* vA*A*  at 25°C and 1 bar. |
| Water solution: | Recalculation of dissociation constants (Kx mole fraction based, Kb molality based, Kc molarity based) of the reaction  *0 <->* v1*A1 +* v2*A2 + ...,*  where n, V is amount and volume of solution; m is mass of solvent, all activity coefficients are 1. All at 25°C and 1 bar. |
|  | Relative Gibbs formation energy of the dissolved gas in liquid using mole fraction based Henry’s law coefficient  at 25°C and 1 bar. |
|  | Molar enthalpy change of gass dissolution from Henry’s constant C |
| Water solution: | Recalculation of Henry’s coefficients. M is molar mass of solvent in ‘kg/mol’, is Henry’s coefficient in ‘mol/kg\*bar’ as presented by NIST at 25°C and 1 bar. |
|  | Molar volume of the substance from osmotic pressure of the substance  at 25°C and 1 bar. |
|  | Membrane electric potential of equilibrated cell from Donnan’s equilibrium coefficient of ions with charge +1 at 25°C and 1 bar:  D=Cationin/Cationout |

|  |  |
| --- | --- |
| Thermal equations | |
|  | Heat accumulation |
|  | Temperature |
|  | Heat convection through surface S |
|  | Change of heat by vaporization of water |
|  | Ideal radiator (e.g. microcirculation) |
|  | Kirchhoff’s junction rule for heat flows |

|  |  |
| --- | --- |
| Population equations | |
|  | Size of population |
|  | Change of population |
|  | Kirchhoff’s junction rule for population flows |

|  |  |
| --- | --- |
| Hydraulic equations | |
|  | Volume accumulation |
|  | Pressure in container with elastic walls (e.g. blood or lymph vessels) |
|  | Hydraulic conductance/resistance |
|  | Pascal’s law |
|  | Idealized hydraulic valve |
|  | Hydraulic inertia |
|  | Kirchhoff’s junction rule for volumetric flows |