CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

Index

Abromowitz, M. & Stegun, I., 587
absorption coefficient, Bunsen, 95
acethylcholine, 540
  action of, 540
  action of physostigmin/eserine, 540
  cholinesterase, 540
  close arterial injection, 541
  ionophoretic application, 551
  liberation of, 540
  nature of action on postsynaptic membrane, 556
  receptor localization, 553
  release from muscle nerve, 541
  site of action, 553
acetylcholine release
  effect of *Botulinus toxin*, 552
  effect of Ca^{2+}, 552
  effect of curare, 552
  effect of Mg^{2+}, 552
acetylcholine release per impulse, 582
action potential
  local current loops, 507
  conduction velocity, 510
  conduction velocity and external resistance, 511
  intracellular and surface recorded, 641
  local current loops beyond a block, 508
  models of equivalent circuits, 643
  origin of monophasic potential, 507
  recorded with externa electrodes, 507
active transport
  'uphill' direction, 63
  transport molecules T, 62
Adelman, W.J., 475
adrenalin, 540
Adrian, E.D., 426
Agre, P., 257
anionic selectivity, 362
anti–cholinesterase, 555
  native, reversible, 555
  organophosphates (irreversible), 555
Armstrong, C.M., 483
Arrhenius, S., 175
Avogadro's constant, 192, 204, 251, 267
axon, 412

Baker, P.F., 445
Bartlett, J.H., 322
Bass, L., 360
Behn, U., 405
Benzenilla, F., 483
Bernard, C., 541
Bernoulli, D., 246
Bernstein, J., 415, 416, 565
binomial series, 29
bioassay, 541
biology, 1
  quantitative, 1
Bjerrum, N., 243
blocking the Na inactivation, 484
Bockriss, J.O.M., 297
Boltzmann statistics, applied to an osmotic equilibrium, 245
Boltzmann's constant, 140, 203
Boltzmann's law if distribution, 178
Boltzmann, L., 117, 246
Bolzano, B., 8
boundary value problem, 82
Boyd, I.A., 576
Brown, R., 140
Brownian motion, 140
Brownian movements
  crude reconstruction, 141
  square of displacements, 142
Bryan, G.H., 188
Bunsen, R.W., 95

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

Butler, J.A.V., 291
Byrne, J.H., 478

cable analysis
  of spread of end-plate potential, 553
cable properties of nerve, 416
Cajal, Ramon y, 539
Calomel electrode, 301
cationic selectivity, 361
Cauchy, A.L., 5
central nervous system, 413
Chandrasekhar, S., 50
charge number, cation/anion, 262
charge, elementary positive, 262
chemical potential, 207
chemical potential, of a pure substance, 239
cholinesterase, 555
  rate of hydrolysis, 555
  turnover, 555
chord conductance versus slope conductance, 306
Clark, J., 507
Clausius, R., 246
co-ions, 278
Cohen, R., 373
Cole, G.H.A., 246
Cole, K.S., 441
colligative properties, 235
collision experiment of del Castillo and Katz, 557
compartment analysis
  passive influx and unidirected efflux, 224
  stationary situation, 219
  with passive membrane permeabilities, 218
  with unidirectional flux, 221
concentration gradient, 74
concentration profile through a composite membrane, 87
concentration profiles, in diffusion-migration transfer, 230
concentration scales, 646
conductivity, molar, 269
conductivity, specific conductivity, 268
conservative force, 199
constant field, 364
constant field assumption, 277
Cooley, J.W., 373
Coulomb's constant, 261
Coulomb's law, in SI units, 261
Coulomb, C.A., 261
counter-ions, 278
Courant, R., 1
Cramer's rule, 91
Crank J., 237
curare
  action on the postsynaptic potential, 548
  action on the presynaptic potential, 548
Curtis, H.J., 441
cylindrical cell
  analysis of transients, 635
  electric parameters, 638
  measuring electrical parameters, 631
cylindrical coordinates, 99

Dainty, J., 217
Dale, Sir Henry, 540
Daniell cell, 286
Daniell, J.F., 286
Debye, P., 325
Debye length, 325
del Castillo, J., 551, 556, 570, 571
Denbigh, R., 238
depolarization, wave of, 485
derivative, 3
  definition, 4
  differential quotient, 4
  geometric definition, 4
  list of important function, 6
  of the inverse function, 10
  second derivative, 5
  the chain rule, 9
  typographical convention, 4
Dick, D.A.T., 255
differential, 8
  definition, 8
differential calculus, 2
diffusiom
  diffusion equation when $C \equiv C(x, y, z, t)$, 78
diffusion
  characteristic features, 70
  concentration profile and boundary values, 81
  condition of mass conservation, 77
  cylinder civered by a thin membrane, 107
  cylinder with mass consumption, 106
  driving force, 206
  equilibrium- and stationary/quasistationary states, 80
  factors which determine the flux, 72
  in cylinder with radial symmetry, 99
  Krogh's constants for frog muscle, 98
  Krogh's constant of diffusion, 98
  Krogh's cylinder, 108
  membrane covered sphere with interior mass consumption, 115
  molecular description, 140
  of O_2 in a tissue with consumption, 95
  phenemological description, 70
  plate covered with a thin layer, 89
  spectrum of displacements in time t, 143
  sphere with radial symmetry, 111
  stationary, 80

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

diffusion (*contd.*)
stationary diffusion through a cylindrical shell, 103, 114
statistical point of view, 143
the diffusion equation, 77
through two different media, 84
with concurrent mass production, 79
diffusion
concentration profile varies with time and distance, 73
diffusion and migration superimposed, 181
diffusion cell, 70
diffusion coefficient, 74
and mechanical mobility, 201
diffusion coefficient and 'random walk' considerations, 153
diffusion coefficient, temerature dependence, 179
diffusion equation
adjusting the comstants, 82
general solution, 82
in cylinder with radial symmetry, 101
sphere with radial symmetry, 112
sphere, stationary diffusion with radial symmetry, 114
stationary diffusion with radial cylindrical symmetry, 102
diffusion potential
the Planck regime, 342
a binary electrolyte, 337
between solutions of different composition, 341
electric mobilities, 341
elimination using KCl salt bridge, 339
Planck's expression, 348
Planck's general relations, 343
qualitative description, 336
salt bridge once more, 351
separation of positive and negative space charges, 337
single binary electrolyte, 339
the Henderson regime, 349
use of salt bridge, 338
diffusion through a plate, 81
dimensionless potential, 273
distribution coefficient, 209
Donnam regime, collapse of, 336
Donnan, F.G., 313
driving force, 67, 68
Du Bois–Reymond, E., 414
Duhamel, J.M.C., 126
dummy variable of integration, 119
Dutrochet, R., 233

Einstein, 145, 169, 202
Einstein's relation, 269
Einstein, A., 140
Einstein–Smoluchowski equation, 169
Einstein–Smoluchowski relation, 156, 202
Einstein–Stokes' relation, 204
Eistein relation, 203, 272
electric charges, 260
electric conductance, 268
electric conductance, S.I. units, 268
electric current density, 267
electric current, carried by a flux of ions, 267
electric equivalent circuit of the Planck regime, 346
electric field, 262
electric field, action on ions, 266
electric mobility, 267
electric potential, 263
electric potential gradient and field, 265
electric resistance, 268
electrochemical equilibrium, 277, 279
electrochemical potential, 273, 316
electrode current, 295
electrode potential, kinetic treatment, 291
electrode potentials, 289
electrodes, types of, 288
electrodiffusion equations, 274
electrodiffusion through membranes
a single salt, 353
diffusion potential, 354
electroneutrality, 359
equivalent diagram for a single salt, 358
membrane resistance, 356
resistance of a single pore, 356
electromotive force, 286
electroneutrality, departure from, 276
electroneutrality, macroscopic, 259
electrostatic force, Coulomb's law, 261
elegance
Boltzmann and Einstein on, 61
end-plate
action of prostigmin, 555
end-plate, 542
choline acetystransferase, 543
postsynaptic potential, 546
presynaptic potential, 546
structure, 542
synaptic delay, 546
terminal longitudunal axin current, 545
end-plate potential, 548, 549
antagonistic effects of Ca^{2+} and Mg^{2+}, 571
axtion of curare, 548
block caused by increased Mg^{2+}, 571
block caused by reduced Ca^{2+}, 571
effect of spider venoms, 582
effect of sustained depolarization, 582
passive axial spread, 553
quantal fluctuations, 573
time course, 553

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

end-plate potential and acethylcholine
direct exposure to end-plate, 551
end-plate potential and acethylcholine, 549
direct exposure to end-plate, 550
energy barrier separating initial and final states, 176
energy of activation, 175
Engbaek, L., 571
equilibrium potential, 277, 279
Erf (x) and Erfc (x), 586
erythronium, 555
Euler, L., 22
Euler, Ulf v., 541
excitability, 411
exponential function, 24
derivative, 25
integral, 25
series expansion, 31

Falk, G., 544
Faraday's constant, 267
Faraday, M., 411
Fatt, P., 555
Fatt, P., 554, 565, 569, 572, 623
Feldberg, W., 541
Fick's law, 74, 75, 83
derivation, 74
Fick's law and Brownian motion
a more exact derivation, 164
Fick's law in cylinder with radial symmetry, 100
Fick's second law, 78
Finkelstein, A., 256, 257
Fitzhugh, R., 524
Flaherty, B.P., 528
flux, 65, 69
flux ratio and convective diffudion, 409
flux ratio and electrodiffusion, 406
flux ratio criterion, 405
flux ratio, sign convention, 228
Fokker, D.A., 195
FORTRAN 77 program for Erf (x), 587
Fourier, J.B.S., 494
Frankenhaeuser, B., 453
Franklin, B., 261
freezing point depression, 250
freezing point depression and osmotic pressure, 251
Frenkel, J., 176, 246
friction coefficient, 67
frictional force, 67
frog muscle fiber, 544
action potential, 544
active Na^+/K^+ transport, 399
changing extracellular K^+-concentration, 397
changing extracellular Na^+-concentration, 398
constant $C_{Cl}^{(o)} \times C_K^{(o)}$ product, 392
coupling ratio of active Na^+/K^+ tranport, 400
electrogenic/electroneutral pump, 403
equilibrium potentials of Na,K and Cl-ions, 390
input impedance of preamplifier, 387
internal longitudinal resistance, 545
lenght constant, 545
membrane conductances of Na,K, and Cl-ions, 391
membrane potential, 384, 387
membrane potential convention, 385
membrane time constant, 545
microelectrode for impalement, 385
modes of stimulation, 544
origin of membrane potential, 388
resting membrane potential, 544
Ringer's solution, 386
tail of action potential, 544
function, 2
approximate expansion, 32
chain rule for partial derivatives, 47
compound, 9
continuous, 3
dependent variable, 2
discontinous, 3
first-order approximation, 32
geometrical representation, 40
increment approximated, 6
independent variable, 2
integration using approximate expansion, 32
inverse, 2
L'Hospital rule, 33
of several variables, 38
partial derivatives, 41, 42
partial total differential, 44
Fürth, R., 188

Galvani, L., 413
galvanic cell, 286
gas constant, 281
gas tension in a liquid, 97
gas, concentration of molecules dissolved in a liquid, 95
Gauss, C.F., 61
Gerard, R.W., 386, 430
giant axon of squid
resting membrane potential, 428
threshold depolarization, 439
action potential intracellular recording, 428
conductance changes attending the action potential, 441
diameter, 427

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

giant axon of squid (*contd.*)
effect on action potential by changes in external Na^+-concentration, 443
extra- and intracellular ionic content, 431
internal current electrode is anode, 439
internal current electrode is cathode, 437
membrane potential and Goldman regime, 432
perfused axons, 445
ratio of permeabilities $P_{Na}/P_K/P_{rmCl}$, 433
resting membrane potential, 431
giant axon of *Sepia*
mobility of K^+ in axoplasma, 434
Gibbs function, for a pure substance, 239
Gibbs, J.W., 238, 313
Gibbs–Donnan equilibrium, 313
concentration and potential profiles, 322
criteria of equilibrium thermodynamics, 316
Donnan potential, 315
Donnan ratio, 315
heuristic argument of, 315
high polyelectrolyte concenytation, 321
incorporating the macroion, 319
low polyelectrolyte concentration, 320
macroscopic electroneuytality, 319
neglecting individual ionic activities, 318
osmotic pressure difference between phases, 321
osmotic pressure in, 318
Poisson–Boltzman equations, 326
Giebisch, G., 228
Goldman, D.E., 277, 365
Golgi, C., 539
Graham, T., 205
Green, G., 130, 263

half–cell, 288
Hartley, G.S., 237
Hastings, C. Jr., 587
Heaviside, O., 124
Heaviside unit step function, 124
Helmholtz, H. von, 414, 415
Henderson, P., 349
Henry, W., 96
Hermann, L., 415
Hertz's equation, 226
Hevesy, G., von, 176
Hill, A.V., 62
Hille, B., 479–81
Hobson, E.W., 188
Hodgkin, A.L., 365, 392, 397, 416, 428, 431, 433, 434, 440, 443, 445, 449, 454, 459, 462, 464, 466, 467, 471, 472, 499, 504, 508, 511, 517, 554, 623
Hodgkin–Huxley equations
conduction velocity, 504
conduction velocity and stability of solutions, 536
differential equations for m, n and h, 502
empirical equations for h and the rate constants α and β, 521
empirical equations for m and the rate constants α and β, 521
empirical equations for n and the rate constants α and β, 520
examples of computer solutions, 529
functions for activation m, n and inactivation h, 501
membrane action potential, 528
modified cable equation, 502
numerical integration a.m. Runge–Kutta, 525
propagated action potential, 504
quantitative description of H & H, 520
rate constants for m, n and h, 502
reconstructing the propagated action potential, 532
total membrane current density, 521
voltage clamp, calculated membrane currents, 525
voltage clamp, conductance changes, 527
voltage clamp, direct integration, 522
voltage clamp, individual ion currents, 527
Hoff, J.H. van't, 238
Horovicz, P., 392, 397
Hounsgaard, J., 518
House, C.R., 217, 257
Hoyt, R.C., 475
Huang, C., 256
Huxley, A.F., xix, 428, 430, 443, 449, 454, 459, 462, 464, 466, 467, 471, 504, 514
hydraulic conductance, 232
hyperbolic functions, 606

ideal solution, 235
images, method of, 618
inactication of sodium conductance, 462
inactivation process
influence of membrane potential, 467
method of analysis, 465
removal of, 466
time course, 467
instantaneous plane source spreading by diffusion/migration, 182
integral, 11
Cauchy, A.L., 15
definite, 12
definite integral as an area, 13
evaluation of a definite integral, 15
fundamental law, 14
indefinite, 14
mean value theorem, 17
Newton and Leibniz, 14

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

simplified notation, 16
symbol, 12
integral/partial conductance, 270
integration techniques, 34
method of substitution, 35
partial integration, 37
integro-differential equation, 173
ion channel
ligand gated, 565
voltage gated, 565
ion-exchange membrane, 278
ion-selective membrane, 360
ionic-selective membrane, current–voltage characteristic, 303
ionic-selective membrane, equivalent circuit, 309
isotonic transport, 257

Joule, J.P., 414

Katz, B., 365, 443, 449, 471, 537, 538, 551, 554–556, 565, 569–572, 623
Keynes, R.D., 433, 434
Kiehn, O., 518
Kirchoff, G.R., 95, 381
Koefoed Johnsen, V., 408
Kohn, P.G., 256
Kramers, H.A., 201
Kramers' equation, 199, 201, 202
Kramers' transformation, 274
Krnjevic, K., 551
Krogh's cylinder, 111
Krogh, A., 97
Kromhout, R.A., 322
Kuffler, S.W., 548

L'Hospital, Marquis de, 34
Lagrange, J.-L., 4
Laplace, P.S., 584
Larsen, E.H., 257
Lassen, U.V., 385
Le Claire, A.D., 164
Leibniz, G.W., 4, 8
Levi, H., 408
Lewis, G.N., 350
Liley, 576
Ling, G., 430
Ling, G., 386
local current loop, 485
Loewi, O
acethylcholine, 540
vagusstoff, 540
Loewi, O., 539
logarithm, 18
addition theorem, 21
definition, 19
derivative, 19
inverse function, 23
of an exponential, 22
of a product, 20
of a quotient, 21
series expansion, 30
Longair, M.S., 60
Lorende de No, 499
Lucas, K., 426

Marmont, G., 449
Martin, A.R., 576
mass exchange between two phases of finite sizes, 213
Matteucci, C., 414
Mauro, A., 217
Maxwell, J.C., 206, 246
Maxwell–Boltzmann energy distribution, 203
Mayer, J.R., 414
McQuarrie, D.A., 246
mechanical mobility, 196
mechanical mobility as related to crossing an energy barrier, 198
membrane, selectively permeable, 278
Membrane
mosaic, 380
membrane capacitance, 283
membrane conductance, 304
membrane conductance and membrane permeability, 311
membrane conductance, voltage dependent, 308
membrane potential, 260
membrane structures, 62
membrane thickness, 210
MEPP
amount of acetylcholine released, 571
average number of units entering, 575
MEPP
probability for occurence between t and $(t + \mathrm{d}t)$, 567
MEPP: miniature end-plate potentials, 565
migration flux, 69
migration of ions in solution, 266
migration over an energy barrier, 195
Miledi, R., 551
Millman, J.M., 382
mini-computer, 537
miniature end-plate potentials, 566
miniature end-plate potentials, 565
spectrum of interval durations, 565
Mintz, I., 518
mobility
mechanical, 68
molality, 250
mole fraction, 235
molecular chaos, 65

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

molecular chaotic thermal movements of water and suspended particles, 140
Moore, W., 241
Morse, P.M., 601
mosaic membrane, 380
mosaic membrane
  the Millman equation, 382
  equivalent electric cirduit, 380
  Millman equation versus Goldman equation, 382
Mullins, L.J., 400, 475
myelinated nerves
  high resistivity of myelin sheet, 512
  local current flow, 512
  Ranvier nodes, 511
  saltatory conduction, 512

Nastuk, W.L., 550
Neher, E., 475
neostigmin, (prostigmin), 555
Nernst equation, derivation of, 284
Nernst's equation, 365
Nernst, W., 269, 276, 281, 341, 355, 417, 436
Nernst–Planck electroneutrality condition, 277
Nernst–Planck equations, 272
nerve as an electric cable
  cable of finite length, use of mirror images, 500
  characteristic lenght, 490
  characteristic resistance, 492
  charge conservation, 488
  eadial membrane current, 487
  Fourier's transformatiom, 494
  intracellular axial resistance, 487
  Kircholl's second law, 488
  making use of Duhamel's theorem, 495
  membrane capacitance, 487
  membrane current, 487
  membrane potential, 487
  membrane resistance, 487
  membrane time constant, 491
  Ohm's law, in, 488
  stationary potential profile, 492
  time dependent solutions in response to a voltage step, 495
  time dependent cable equation, 490
  time dependent solution in respomse to a current injection, 499
  time depentent cable equation, 491
  equivalent elextric circuit, 486
  incorporating membrane current from the squid axon, 500, 501
nerve gases, 555
nerve impulse
  recorded with expernal electrodes, 417
nerve signal, 537
  'all or nothing' law, 423
  diphasic action potential, 419
  monophasic action potential, 420
  afferent, 537
  efferent, 537
  recorded from a single axon, 423
  spatial extent of potential configuration, 421
  subliminal stimuli, 424
  threshold stimulus, 424
  velocity of propagation, 417
neuromuscular transmission, 542
  sequence of events, 546
  sequence of events in, 542
  summary of events, 583
neuron, 537
  axon, 537
  dendrites, 537
  soma, 537
Newton's second law, 67
Noda, K., 400
non-osmotic equilibrium, 284
noradrenaline, 541
North Atlantic squid (*Loligo pealelii*), 427
Northrop, J.H., 217

Ohm's law, 268
Ohm's law: Longair on, 60
Ohm, G.S., 268
ordinary differential equations, 49
  four first order equations, 50
  Leibniz and Newton, 50
  two secomd order equations, 55
osmolality, of human plasma, 253
osmolar concentration, osmole, 253
osmotic equilibrium, a simple dynamic model, 243
osmosis, 233
osmosis, mechanism of, 236
osmotic coefficient, 243
osmotic pressure, 234
osmotic pressure, ideal and effective, 254
osmotic pressure, of an electrolyte solution, 242
osmotic pressure, thermodynamic exact expression, 240
osmotic pressure, van't Hoff's equation, 240
Ostwald, W., 417
Overton, E., 443

paracellular water transport, 257
partial derivative
  chain rule for, 48
  composite function of variables, 47
  notation for, 42
partial differential equations, 57
partial membrane conductance for Na^+ and K^+
  calculation from voltage clamp, 461

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

dependence on displacement of membrane potential, 463
time course during voltage clamp, 462
particle velocity, 67
passive transport, types of
diffusion, 65
electrodiffusion, 66
migration, 66
patch clamp technique, 475
Pearson, K., 146
permeability coefficient / permeability, 84, 209
permeability, equivalent, 87
Pfeffer, W., 237
physiological salt solution, 254
physostigmin, (eserine), 555
Planck, M., 170, 195, 274, 342
Platzwechslung, 175
Plonsey, R., 507
Poisson's equation, 274
Poisson, S.D., 275, 573
Pollard, E.C., 205
postsynaptic membrane, 543
postsynaptic membrane potential
reversal potential, 557
potential barrier of height U_0 and width λ, 177
potential difference, 264
potential energy, 196, 200
potential, SI units, 264
Press, W.M., 528
pressure gradient, 247, 604
pressure tensor, 246
pressure, in SI units, 231
Prestom, G.M., 257
presynaptic vesicles
diameter, 565
localization, 565
presynaptic membrane, 539
probability
density for displacement x in time t, 143
exponential distribution, 567
mean value of exponential distribution, 567
nean value of Poisson's distribution, 574
no MEPP within time t, 566
normal law of distribution, 143
of observing a particle displacement Δx, 141
Poisson's distribution, 574
probability density for a displacement of a particle, 164
pronase, 484
pseudoforce, 207

radius of curvature, 78
random walk, 146
across an energy barrier, 175
distribution function, 152
in one direction only, 146
in two and three dimensions, 157
mean displacement, 154
probability for arrival, 150
probability of m unidirectional steps, 146
root mean square displacement, 154
random walk and Fick's law
Einstein's simplified treatment, 161
Rasmussen, B.E., 385
rate constant, 215
rate constant for exchange process, 211
rate constants versus membrane permeability, 212
rate constant, determined from a collection of data, 216
rectification, 228
Reddy, A.K., 297
reflection coefficient, 254
reflection of the source
with an absorbing barrier, 136
with an impermeable barrier, 134
repetitive impulse transmission
an underlying mechanism, 519
impulse train fot muscle cells, 516
impulse train from receptor cells, 516
impulse train in a single unmyelinated axon, 517
microelectrode recording from a motor neuron, 518
resulting from sustained depolarization, 516
reversal potential, 557
effects of Na^+, K^+ and Cl^- ions, 562
relative increase in Na^+ and K^+ conductances, 565
Ringer, S., 386
Robbins, M., 217
Rojas, E., 483
Rosenfalck, P., 507
Runge–Kutta fourth order procedure, 528
Rushbroke, G.S., 178
Rushton, W.A.H., 499

Sørensen, J.B., 257
Sørensen, J.N., 257
Sakman, B., 475
Sargent, L.W., 350
saxitoxin (STX), 480
Schultz, S.G., 478
sedimentation layer, thickness of, 189
sedimentation of an instantaneous plane source, 185
selective effects on the Na^+ and K^+ channels, 479
sensory receptor, 537
sequence, 2
converging, 2
infinite, 2
limit, 2

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

series, 2
  finite/infinite, 2
Setlov, R.B., 205
Shaw, T.I., 445
Siemens, E.W. von, 268
silver–silver chloride electrode, 299
single Na^+ channels, 475
single Na^+ channel's statistical regularity, 477
single Na^+ channel's three states, 478
Sjodin, R.A., 475
Smoluchowski, M., von, 140, 145, 188, 189
Smoluchowski equation, 181, 189, 224, 260, 271
Smoluchowski equation derived from random walk statistics, 190, 193
Smoluchowski equation, alternative form, 201
Smoluchowski on aspects on diffusion/Brownian movements, 208
Smoluchowski's transformation, 182
sodium hypothesis
  experimental substantiation, 447
  formulation, 445
  net movements of Na^+ and K^+, 449
solubility of gases, 96
spectrum of displacements, 171
spherical cell
  measuring membrane resistance and capacitance, 628
Stämpfli, R., 514
standard electrode potential, 294
standard hydrogen electrode, 294
standard temperature and pressure, STP, 95
stationary velocity, 67
Staverman, A.J., 254
Sten-Knudsen, O., 322, 409
stimulus
  absolute and relative refractory period, 426
  conditioning, 424
  local response, 440
  test stimulus, 424
  threshold stimulus, 424
Stokes equation, 203
Stokes, G.G., 203
synapse, 413, 537
  active zones, 543
  synaptic cleft, 543
  synaptic vesicles, 543
synaptic transmission
  chemical, 539
  electric, 539
  transmitter substance, 539

Tacheuchi, A., 559
Tacheuchi, M., 559
Takeuchi, T., 512
Tasaki, I., 512
Taylor's theorem, 26
  convergent and divergent series, 26
  expansion of a polynomial, 26
  expansion of an arbitrary function, 27
  MacLaurin series, 28
  trigonometris series expansion, 31
Teorell, T., 259, 405
tetraethyl ammonium (TEA), 481
tetrodotoxin (TTX), 480
Teukolsky, S.A., 528
the Goldman regime, 363
  total current and membrane potential, 377
  basic assumptions, 365
  concentration profiles, 370
  derivation of the Goldman equation, 365
  Goldman equation as given by Hodgkin & Katz, 369
  Goldman–Hodgkin–Katz equation, 365
  ionic currents, 368
  membrane conductances, 372
  permeability P_j, 367
  rectification ratio, 379
the membrane action potential
  qualitative synthesis, 470
  regenerative coupling scheme of Hodgkin, 472
  threshold phenomena, 474
thermodynamic force, 207
Thompson, C., 256
Thomson, William (Lord Kelvin), 264, 416, 487
time–dependent diffusion processes
  an instantaneous surface distribution, 127
  Boltzmann's transformation, 117
  collapse of 'box-shaped' initial distribution, 129
  Duhamel's integral, 126
  from a region kept at constant concentation, 123
  Green's function, 130
  initially extended distribution, 123
  the effect of an impermeable barrier, 133
  variable flow into the half-space, 138
Tosteson, D., 228
total conductivity, resistivity, 269
tranport processes
  active, 62
  passive, 63
transport/tranference numbers, 389

units and physical constants, 648
unstirred layers, 89
Ussing, H.H., 228, 404

vacant molecular positions, "holes", 176
vacuum permeability, 262

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-03635-1 - Biological Membranes: Theory of transport, potentials and electric impulses
Ove Sten-Knudsen
Index
More information

Vettering, W.T., 528
Voigt, M., 541
Volta, A., 414
voltage clamp
  of end-plate region, 559
voltage clamp technique
  delayed outwardly-directed current, 453
  early membrane current and Na^+-equilibrium potential, 457
  eliminate influence of membrane capaciance, 449
  flow sheet of control system, 450
  identification of early inwardly-directed current, 454
  identification of the outwardly-directed current, 459
  initial capacitive current, 453
  membrane current resulting from a step change, 453
  membrane currents at different clamping potentials, 456
  splitting the membrane currents into a Na^+ and K^+ current, 458
  transient inwardly-directed current, 453

Warburg, E.J., 253
water movements, convective and osmotic, 230
water permeability, cell membrane, 255
water permeability, human erythrocytes, 256
water, molar volume, 239
Weber, Eduard & Heinrich, 540

Young, J.Z., 427

Zerahn, K., 404
Zeuthen, T., 257

© Cambridge University Press www.cambridge.org