

INDEX

- absorption cross section, 28, 98
 - see also* inelastic cross section, 15
- absorption potential (V_{abs}), 28, 38
- absorption effects and scattering
 - by a complex potential, 28
- absorption factor, 28
- additivity rule, 36, 90
 - modified, 135
 - screening corrections to, 110, 112, 130, 140
- allowed transitions, 67
- angstrom unit (\AA), 7
- angular momentum, 6, 7, 13
 - orbital, 6, 7, 13
 - total, 6, 7, 13
- astrochemistry, 198, 199
- astrophysics, 198
- atomic number (Z), 6, 9, 211
- atomic radii, 9
- atomic targets, 47
 - Al, 71
 - Ar, 54
 - B, 64
 - Be, 64
 - Br, 67
 - C, 58
 - Cl, 67
 - Cu, 71
 - F, 67
 - Ge, 69
 - He, 49
 - I, 67
 - Kr, 54
 - N, 58
 - Ne, 49
 - O, 58
 - P, 69
 - S, 69
 - Si, 69
 - Xe, 54
- atomic units (au), 7, 35
- atoms, 6
 - alkali, 67
 - halogen, 67
 - inert gas, 48
- aurora, 77, 188, 190
 - on Earth, 77
 - Jupiter, 191
 - Mars, 192
 - Saturn, 191
- biomolecular targets, 208
 - and radiation damage, 208
- Bessel functions, spherical, 38
- Bethe-Born cross sections, 31
- Binary Encounter Bethe (BEB) approximation, 30, 51
- Born approximation, first, 25
 - for electron-atomic hydrogen collisions, 31
- Born approximation, second, 26
 - for electron-atomic hydrogen collisions, 31
- Born series, 25
- boundary conditions, 183
- bound states, 8
- CCCBDB, 9, 11, 105, 131
- collisions (*See also* scattering), 31, 35
 - elastic (*see also* elastic scattering), 15, 20
 - exchange, 20
 - inelastic (*see also* inelastic scattering), 15, 22
 - of electrons with atomic hydrogen, 31

- of electrons with complex atoms, elastic, 217
- frequency (for ionization) (v_{ic}), 181
- comet(s), 190
- complex phase shifts, 28, 174
- complex potential, (*See also* optical potential), 28
- complex scattering potential, 29, 37, 48
 - complex scattering potential-ionization contribution (CSP-ic), 27, 37, 83
- correlation,
 - linear, 81, 129, 175
 - polarization potential (V_{cp}), 33
- cross section (*See also* differential cross section; total cross section), 14, 15, 27, 31
 - absorption, 28, 98
 - defined, 14
 - differential, 20
 - eikonal, 25, 31
 - elastic, 15
 - emission (Q_{emiss}), 87
 - first born, 27, 31
 - with third Glauber term, 26
 - neutral dissociation (Q_{NDiss}), 44, 88, 115, 135, 150, 194
 - total (*see also* Total [complete] cross section [Q_T]), 14, 28
 - parameters of, 41, 51
- density, radial charge, 38
- Deutsch Maerk (DM) formalism, 30, 65
- differential cross section, 15, 28, 36, 153
 - defined, 15
 - in Eikonal–Born series, 25, 31
 - electron–atomic hydrogen, 31
 - elastic scattering, 20
 - elastic, 15
 - first born, for electron, 27, 31
 - atomic hydrogen, 31
- dimers, 90, 106
 - oxygen, and clusters, 106
- dipole allowed transition, 8, 41
- dipole atomic polarizability (α_d), 9, 10, 74, 129
- dipole moment (D), 26
- dipole potential, 26, 103
 - realistic, 27, 103
- dissociative electron attachment (DEA), 3, 23, 139, 179
- distorted wave Born approximation (DWBA), 34
- DNA, 5, 164, 172, 208, 211
- dry ice, 186, 187
- Eikonal approximation, 25
- Eikonal-Born series (EBS) method, 25, 31
- elastic scattering (*See also* collisions, scattering), 15, 20
 - and the optical potential, 28
 - and the partial wave method, 27, 34, 46
 - of electrons by atomic hydrogen, 32, 33
 - of electrons by helium, 23, 49
 - of positrons, 212
- electron scattering (*See* collisions; elastic scattering; inelastic scattering; scattering future of), 217
- electron volt (eV), 7
- electronic states of, 23, 38, 41
 - molecules, 13, 39
- exchange effect, 26, 212
 - H₂ molecule, 36
 - potential (V_{ex}), 33, 47
- exchange scattering amplitude (*See also* scattering amplitude), 17, 25, 27
- excitation, 9, 20, 26
 - of atomic hydrogen by electron impact, 31
 - of helium by electron impact, 49
- excited metastable state(s), 11, 35, 74, 126
- expectation values, 8
- Feynman Richard P. 217
- first Born approximation (*See also* Born approximations, first), 25
- fluorocarbons, 144, 165, 167, 169
- flux, 14, 17, 28, 40, 181
- focused electron beam induced deposition, 5, 179, 204
- forbidden transition, 8
- Franck–Hertz experiment, 1, 17
- Fullerenes, 165
- Furan, 173, 175
- Glauber approximation, 25
 - third term, 26
- grand total cross section (Q_{TOT}), 37, 42
- Hara free electron gas exchange model, 33
- helium, collisions of electrons with, 49
 - elastic scattering of electrons by, 51
- hydrocarbons, 140, 165

- ICSP-ic, 122, 146
 icy solids, 186
 electron scattering from, 186
 independent atom model, 35, 59, 61, 154
 inelastic scattering (*See also* collisions; cross section; scattering), 14
 defined, 15
 of electrons by atomic hydrogen, 31
 of electrons by helium 52
 absorptive, 21, 208
 interstellar medium, 123, 165, 199
 ionization, 16, 18
 ionosphere, 61, 177, 188, 192
 ISRO, India, 187
 low energy scattering, 214
 macroscopic cross section, 181
 mass spectrometry, 5
 mean free path, 183, 194
 inelastic (IMFP), 181
 ionization (Λ_{ion}), 188
 metastable states, 73, 126
 of atoms, H^* , He^* , N^* , O^* , 75, 77
 of molecules, H_2^* , N_2^* , 126
 molecular targets, 5, 14, 83, 89, 140
 Br_2 , 100
 CCl_4 , 153
 CHO, 137
 CH_3OH , 146
 CH_3I , 146
 CF_3I , 146
 C_2H_2 , 140
 C_2H_4 , 140
 C_2H_6 , 140
 C_2F_2 , 144
 C_2F_4 , 144
 C_2F_6 , 144
 C_3H_4 , 165
 C_3H_6 , 165
 C_3H_8 , 165
 C_4H_6 , 167, 168
 C_4H_8 , 169, 171
 c- C_4H_8 , 169
 C_4F_6 , 167
 c- C_4F_8 , 169, 171
 $\text{C}_4\text{H}_4\text{O}$, 173
 $\text{C}_4\text{H}_8\text{O}$, 173, 174
 $\text{C}_6\text{H}_8\text{O}$, 173, 174
 Cl_2 , 100
 CO, 94
 CO_2 , 94
 CF_4 , 135
 CH_4 , 114
 F_2 , 100
 GeH_4 , 150, 151
 GeF_4 , 152, 153
 Ge_2H_6 , 157, 158
 HCOOH, 139
 H_2CO , 137
 H_2O , 105, 186
 H_2S , 120
 H_3PO_4 , 162
 I_2 , 100
 LiH, 103
 NF_3 , 131
 NH_3 , 119
 N_2 , 84
 NO, 96
 NO_2 , 96
 N_2O , 96
 O_2 , 90
 O_3 , 90
 $(\text{O}_2)_2$, 90
 SF_6 , 162
 $\text{Si}(\text{CH}_3)_4$, 157, 158
 SiCl_4 , 153, 154,
 SiF_4 , 150, 151
 SiH_4 , 147
 Si_2H_6 , 157
 SO, 120
 SO_2 , 120
 SO_2XY (X, Y=F, Cl), 159
 molecules, 83
 electronic states of, 13
 of biological interest, 172
 momentum transfer, 15
 cross section, 15
 NIST database, 30, 32, 49
 nanotechnologies, 204
 nanotechnology, 202
 electrons and, 202

- Ochkur amplitude, for elastic exchange electron-atomic hydrogen scattering, 26
- optical model theory (*See also* optical potential), 25, 28, 29, 31
- optical potential (*See also* optical model theory), 28, 48
- optical theorem, 26, 31, 36
 and the optical potential, 31, 36
- orbital angular momentum, 6
- partial wave analysis, 27, 28, 34
- partial wave scattering amplitudes, 27
- partial wave cross section, 28
- phase function (method), 29
- phase shifts, definition of, 27, 28
 and partial wave amplitudes, 27
 and scattering amplitude, 17, 25, 26
 and Ramsauer–Townsend effect, 49
 calculation of, 27
 complex, 28, 174
- plasma, 202, 206
 electron scattering in, 45, 202
- polarizability, 9
 atomic dipole, 47
- polarization effect, 33, 47, 183
- polarization potential, 33, 40, 47
- positron scattering, 212, 216
- positronium, 213
 formation cross section (Q_{ps}), 215
- quadrupole moment, 11
- quantemol–N scattering code, 44, 45
- quantum mechanics, 2, 6, 10, 25
- R-matrix method, 115, 141
- radial Schrödinger equation, 28
 and the partial wave analysis for scattering by a central potential, 27, 34, 49
- radiation therapy, 211
- radicals, 12, 84, 105, 114
 CF_x ($x=1,2,3$), 135
 CH_x ($x=1,2,3$), 117
 H_2O_2 , 110
 HO_2 , 110
 $(H_2O)_2$, 110
 NF_x ($x=1,2$), 131
 NH_x ($x=1,2$), 120
 OH, 105
 $SiCl_x$ ($x = 1, 2, 3$), 153, 154
- radiotherapy, 210
- Ramsauer–Townsend effect, 49
 and RT minimum, 49
- reactive species, 197
 BF, 124
 CN, 123
 C_2N_2 , 123
 HCN, 124
 HNC, 124
- resonances, 23, 83, 172
- rotational excitation, 14, 23, 27, 103
 cross section, 15, 27, 31, 35
- Roothan–Hartree–Fock wave functions, 9
- Rydberg states, 8, 82, 180
- satellite(s), planetary, 177
- S-matrix, 27
- scattering (*See also* collisions, cross section, differential cross section, reaction), 15, 28, 147
 amplitude, 17, 25, 27
 angles, 15, 20
 by optical potential, 28, 29
 elastic, 14, 15
 exchange, 20, 26
 high energy (*see also* high energy collisions), 25, 35
 inelastic (*see* inelastic scattering), 14
 low energy (*see also* low-energy scattering), 3, 214
 of electrons by atomic hydrogen, 31
 of electrons from complex atoms, elastic, 217
 of electrons from helium, 3, 23
 phase shifts, 27, 28, 174
- scattering amplitude (*see also* partial wave amplitudes), 25
 Born approximation for, in electron-atomic hydrogen direct scattering, 15
- scattering cross section (*see also* cross section; differential cross section; total cross section), 14
 for electron–atomic hydrogen scattering, 15
- scattering experiment, 16
- scattering phase shifts, *see* phase shifts, 27, 174
- scattering theory, formal, 26
- scattering wave function asymptotic solution, 17

- Schrödinger equation (*See also* radial Schrödinger equation), 2, 6, 8, 17, 28
- second Born approximation (*See also* Born approximation, second), 25
- solids, 183
 electron scattering from, 186
- spherical complex optical potential (SCOP), 28, 29
- spin, 38
 exchange, 38
 of electrons, 4, 7, 13, 15
- static potential, 31, 33, 28
- super-elastic collisions, 4
- titan, 5, 123, 190, 195
- total angular momentum, 7
- total cross section (Q_T), 14
 absorption, 28
 and the optical theorem, 26, 31, 36
 Bethe-Born, for 1s-2p excitation of atomic hydrogen by fast electrons, 34
 first Born, for electron-atomic hydrogen, elastic scattering, 25
 elastic (Q_{el}), 14, 15
 excitation (Q_{exc}), 14, 16, 29
 inelastic (Q_{inel}), 14, 15
 ionization (Q_{ion}), 14, 16
- uncertainty experimental, 17
 in theoretical evaluation, 68
- variable energy parameter (Δ), 40
- water ice, 186
- wave function (*See also* scattering wave function), 6, 9, 30
- wave vector transfer (*See also* momentum transfer), 25, 26, 31, 36
- X-ray aurora, 192
- X-rays therapeutic, 209, 210
- Young's double slit experiment, 35