

Index

- A_v , 122
 τ -Bootes, 208
 H_2^+ , 124
18S rRNA, 273
21-cm line, 79
22.235 GHz water maser, 78
51-Pegasi, 207
67P/Churyumov-Gerasimenko, 187
- Acasta gneisses, 165
Accretion, 159
Acetylene polymerisation II, 138
Acid–base equilibria, 235
Activation energy, 128
Adiabatic lapse rate, 213
Albedo, 202, 203, 291
ALH84001, 165, 168, 170, 173, 178
Alkaliphile, 275
Amino acids, 238
 Formation, 143
 asymmetric photolysis, 247
Andromeda Galaxy (M31), 3, 31, 106
Aphelion, 183
Archaea, 273
Arrhenius equation, 125, 237
Astrobiology, 260, 274, 283
 Titan, 302, 305
Atmospheres
 Archean, 202
 absorption, 71
 chemistry, 305
 inner planets, 210
 primordial, 238
 Surface pressure, 210
 structure, 221, 305
 windows, 52
Atomic structure, 82
 H atom Absorption spectrum, 57
 Heavy element atomic spectra in stars, 99
 Lyman, Balmer, Paschen, Brackett and Pfund series, 58
 Selection rules, 59
 Spectroscopy, 82
Autumnal Equinox, 27
- Bacillus subtilis, 179
Bacteria, 273, 264
Balmer series, 58, 98
Balmer temperature, 110
Beer–Lambert Law, 82
Big Bang Theory, 1, 34
Big Bang Nucleosynthesis, 2
Binary stars, 103
Binding energy of atomic nuclei, 91
Biogenic fossils, 190
Biogenic structures, 177
Biomarker, 8
Biosynthesis, 154
Black Body Radiation, 15, 291
Black body radiation laws, 38
Black hole, 110, 106
Blue shift, 48
Bond energies, 134

- CAIs, 165
 CNO cycle, 94
 Carbonaceous chondrites, 173
 Cassini–Huygens, 289, 302
 Celestial coordinates, 26
 Cepheid variable stars, 104
 Chapman layer, 216, 218, 221, 300
 odd oxygen, 216
 Oxygen and ozone, 278
 ozone, 213
 Ozone layer, 218
 UVA, UVB, UVC, 216
 Chemical network, 145, 154, 146, 297
 Chemical potential, 228, 283
 Chlorophyll, 19
 CHON, 151
 Chondrules, 162
 Circumstellar medium, 121
 CNO cycle, 110
 CO, 61–64
 CO₂ photolysis, 216
 Coerceive, 172, 262
 Collision rate, 125
 colour excess, 122
 Comet chemistry, 157, 180, 190
 Collisions, 185
 Coma, 181, 183
 dust tail, 180
 Hale-Bopp, 181, 187
 Halley, 181, 291, 300
 Halley, Hyakutake, 187
 ion tail, 180
 Kuiper belt, 180
 Molecular inventory for Hale-Bopp, 184
 Oort Cloud, 180, 195
 surface synthesis, 185
 Common Ancestor, 273
 Cosmic Background Explorer, 20
 Cosmic rays (cr), 136
 Cosmology, 36, 38
 Cretaceous–Tertiary, 245
 Critical Micelle Concentration (CMC), 262
 Cryovolcanism, 292, 305
 Detection of hydrogen, 79
 21-cm line, 79
 Atom hydrogen atom, 57
 Deuterium enrichment, 149, 187
 Diffuse interstellar bands, 80
 Diffuse interstellar medium, 120
 Dissolved gases – Henry’s Law, 233
 DNA, 6, 244
 Doppler Effect, 20, 103
 Broadening, 46
 Shift, 82, 206
 Profile, 48
 Drake equation, 9, 35
 Dust, 154
 Grains, 140
 Structure, 140
 Surface reactions, 142
 Earth, 158
 Earth–Moon, 199, 221
 Formation, 197
 Effective temperature, 203
 Einstein coefficients, 45
 Elastic scatter, 44
 Electronic spectroscopy, 82
 Encapsulation, 263
 Endogenous organic synthesis, 237, 256
 Endolith, 275
 Energy and mass, 90
 Equilibrium, 228
 Escape velocity, 158
 Eukarya, 273
 Europa, 287
 Exogenous delivery of organics, 256
 Extrasolar planets, 206, 221
 Extraterrestrial astronomy, 55
 Extremophile bacteria, 275
 First cellular life, 260
 First point of Aries, 26
 Force constant, 73, 149
 Formose, 242, 292
 Fusarium alkanophyllum, 304
 Galaxies, 3, 31, 38
 Genetic code, 6
 Geological time, 165, 190, 200

- Giant molecular clouds (GMCs), 114,
121, 151
 OMC, 247
 TMC, 118, 146
Glycine, 67
Gravitational lensing, 36
Great Bear, 29
Greenhouse Effect, 212
- Habitable zone, 221
Hadean, 197, 199
Hale-Bopp, 181, 187
Halley, 181, 291, 300
Halley, Hyakutake, 187
Hayatake, 291
Haze layers, 300
Helium flash, 93
Herbig Ae, 90
Herzprung–Russell diagram, 88, 110
HII regions, 116
Homochirality, 8, 256
Hubble constant, H , 33
Hubble Space Telescope, 56, 76,
195
Huygens probe, 287, 293, 300, 303
Hyperthermophile, 8, 276
- Impact frustration, 13, 197
Index Catalogues (IC), 31
Infrared astronomy, 71
Inorganic phosphate, 243
Intensities of rotational transitions, 70
Interaction of radiation with matter, 82
Interplanetary organic material, 178
Interstellar medium ISM, 117, 185
 molecules detected, 117
 Conditions in the ISM, 154
 Glycine, 67, 151
 Organic synthesis in the interstellar ice,
 143
 Prebiotic molecules, 151
 Reactions, 130–131
Ionisation energies, 135
- Kerogen, 164, 171
Krafft temperature, 262
Kuiper belt, 180
- Landé factor, 101
lapse rate, 212
Large Magellanic Cloud, 3
Light harvesting, 38
Line shape, 46
Liposphere, 293, 305
Lipothermal vent, 303
Little warm pool, 199
Local Group, 20, 34, 35
 Large and Small Magellanic Clouds
 (LMC and SMC), 3, 35, 106
Local thermal equilibrium (LTE), 126
Luminosity, 16
Luminous arc, 36
- Magnitude, 22
 Absolute, 26
 apparent, 122
Main sequence, 89
 lifetime, 93
MASER, 77, 78, 82
Mass extinction, 11
Membrane transport, 283
Meteorite, 157, 158, 190
 ALH84001 *see above*
 Allende, 165
 Analysis, 190
 Carbonaceous chondrites, 173
 Kerogen, 171
 Meteor, 157
 Meteoroid, 158
 Leonid meteor, 158
 Murchison, 171
 Stony, 161, 163
 Stony-iron, 161, 163
 Stony, 161
Methanol Maser, 78
Micelles, 261
Microbial Mars, 281
Microprobe laser desorption laser
 ionisation mass spectrometry
 (μ L2MS), 169
Microwave and millimetre wave
 astronomy, 60
 Molecular identification, 68
 Microwave spectroscopy, 60, 82
 microwave spectrum, 68
Mid-ocean tidal rise, 199

- Milky Way, 3, 20, 31, 33, 81, 106
 Minimal genome, 283
 Mineral surface, 265
 Molecular processing, 154
 Moments of inertia, 65
Mycoplasma genitalium, 272
- Natural linewidth, 46, 47
 New General Catalogue (NGC), 31
 Nitrile polymerisation, 300
 non-elastic scatter, 44
 Non-radiative decay, 78
 Novae, 95
 Nuclear synthesis in heavy stars, 94
 Nucleosynthesis processes, 96
- Oort Cloud, 180, 195
 Orbital velocity, 158
 Organic material, 176
 Origin of Life, Theories, 10
 Origin of the elements, 97
 Orion nebula, 57, 68, 89
 Osmosis, 267, 268
- Parallax, 24
 Pathfinder, 281
 Perihelion, 180, 183
 pH of the oceans, 233, 234
 Phospholipid, 261
 Photochemistry, 133
 - Photodissociation, 134
 - Photoionisation, 135
- Photon-dominated regions, 121
 Planck length, 37
 Planck tension, 37
 Planck time, 37
 Planck's Law, 38
 Planet formation, 221
 Planetary atmospheres, 209
 Planetary chemistry, 193
 Planetesimals, 159
 PNA, 244
 Polycyclic aromatic hydrocarbons, 136–7
 Population inversion, 77
 Pressure broadening, 46, 47
 Protocells, 264, 283
 Proton–proton cycle, 110
 protostar, 85
- Purine and pyrimidine synthesis, 240
 pyrite surface, 278
Pyrolobus fumarii, 276
- Quantum mechanics, 41
- r-process, 96
 Radiation trapping, 211
 Radiative decay
 - Isotopes and daughter products dating, 166
 - lifetime, 77
 - decay pathways, 168
 - radioactive clocks, 167
- Rates of chemical reactions, 123, 236, 154
 - Bimolecular reaction, 125
 - rate constant, 123
 - temperature dependence, 125
 - Steady-state approximation, 127, 154
 - total overall order of the reaction, 123
- Rayleigh criterion, 54
 Red shift, 48
 Reddening, 121
 Reduced mass, 61, 149
 Right ascension, 26
 RNA World hypothesis, 244, 253–256
 Ro-vibronic spectrum, 60
 Rosetta mission, 181, 187, 210
 Rotational constant, 61
- s-process, 96
 Saturated adiabatic lapse rate, 213
 Scale height, 211
 Short-wavelength shield, 221
 Snow line, 186, 190
 Solar System
 - Solar nebula, 190
- Spectral mapping, 81, 82
 Spectroscopy, 60, 82
 - Selection rules, 45, 82
 - Spatial Resolution, 54
 - Infrared (IR), 82
 - IR stretching frequencies, 73
 - spin multiplicity, 299
 - Transition moment, 46
- Spontaneous chemical reactions, 256
 Spontaneous emission, 44

- Stars
- Be stars, 90
 - Becklin–Neugebauer (B-N) object, 89
 - Binary stars, 103
 - Birth lines, 89
 - Classification, 86
 - Constellations, 26
 - Cycle of star formation, 108, 110
 - Evolution of heavier stars, 95
 - Exotic stars, 102
 - Helium flash, 93
 - Herbig Ae, 90
 - Herzprung–Russell diagram, 88, 110
 - neutron star, 95
 - Signs of the Zodiac, 28
 - Supergiants, 89
 - T-Tauri, stars, 90, 116, 158, 186
 - white dwarf, 89, 95, 102
- Steady-state approximation, 127, 154
- Stefan–Boltzmann Law, 16
- Steric factor, P , 126
- Stimulated absorption, 44
- Stimulated emission, 44, 78
- Stoichiometric coefficient, 228
- Stratosphere, 213
- Strecker syntheses, 240, 292
- Super string theory, 37
- Supernova, 96, 97, 110
- T-Tauri, stars, 90, 116, 158, 186
- Taurus molecular cloud (TMC), 114
- Telescopes, 52, 82
- James Clerk Maxwell Radio Telescope, 56
 - Jodrell Bank Radio, 56
 - UK Infrared Telescope, 71, 76
- Temperature profile, 212
- Terrestrial planets, 193
- The Standard Model, 1
- Thea, 199
- Titan, 287–305
- atmosphere, 293, 297
 - internal structure, 302
 - Physical data, 289
 - Tholins, 297, 305
- TMC, 118, 146
- Transition intensities, 51
- Transition moment, 46
- Triple-alpha process, 93, 110
- Tropic of Cancer, 27
- Tropic of Capricorn, 27
- Troposphere, 213
- UMIST database, 126
- Universal tree of life, 273, 283
- Urey-Miller, 238
- Ursa Major, 28, 29
- Vernal Equinox, 26, 27
- Visible astronomy, 76
- Visible extinction, 121, 154
- Volatiles inventory, 209
- Water–ammonia ice, 292
- Watson–Crick base pairs, 6, 261
- Zeeman effect, 101–102, 110, 123
- zero point energy, 73, 149
- Zodiac, 28