

Index

Notes: Drug names appear in **bold** type.

Page numbers in *italics* refer to figures. Page numbers in **bold** refer to tables

- A₁ (specific absorbance), 174–175, 195,
 197
absolute configuration, 90
absolute limit, aspirin, 155
absolute molarity, 136
absolute spectrophotometric assays, 175
absorbance, measurement, 170–171,
 193–195, 198
 infrared spectroscopy, 180–181
 wavelength *vs.*, 161–163
 see also specific absorbance (A₁)
absorption, drugs, 36–39
 tubocurarine, 55
acelanilide, aromatic ring oxidation,
 109
acetaminophen *see* paracetamol
acetic acid (C₂H₄O₂)
 ammonium salt hydrolysis, 10
 in buffer solutions, 13
pH, 24, 25
pK_a, 8, 61, 61
 sodium salt, hydrolysis, 25
 sodium salt hydrolysis, 10
N-acetylation, 116
acetyl-β-methylcholine, 238–239
acetylcholine, 260
N-acetylcysteine, 118
acetyl groups, 221
acid(s), 1–9
 buffer solutions, 11–14
 dissociation, 3–9
 as drugs, 59–63
pH, 22
pK_a, 22
 see also pH partition hypothesis
acid-catalysed hydrolysis, 217, 218
pseudo first-order reactions, 235
acid diuresis, forced, 49
acid tartrate, adrenaline, 212
activation energy (*E*), 236, 239, 268
active ingredients, concentration, 138
active mass, 229
active transport mechanisms, 44–45
administration, drugs, 36–37, 72
adrenaline (epinephrine), 227
 enantiomers, 86
 oxidation, 210–211, 212, 267
 sulfation, 115
 synthesis, 86, 87
adrenaline acid tartrate, 212
adrenochrome, 212
ageing, 216–217
alanine, penicillin, 92
aldehydes, 209
aliphatic amines, oxidation, 208
aliphatic heterocyclic compounds, 73
aliphatic hydroxylation, 130
alkaline diuresis, forced, 49
alkylating agents, 223
allyl radicals, 208, 225
aluminium, equivalent weight, 153–154
amber glass, 213
amfetamine(s)
 deamination, 110
 metabolism, 120
amide group(s)
 hydrolysis, 217, 266
 as resonance hybrids, 66–67, 67
amine(s), 209
 aliphatic, oxidation, 208
 aromatic, oxidation, 212
 as basic drugs, 71
 coupling, 213
 hydrolysis, 217

- amino acid(s), 16
 active transport, 44–45
 as buffers, 16–17
 chirality, 91, 91–92
 conjugation, xenobiotics, 115–116
 amino groups (NH_3^+), 16
 5-aminosalicylic acid, azoreduction, 111
 ammonia, as buffer solution, 15
 ammonium acetate ($\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$),
 hydrolysis, 10–11
 ammonium cerium sulfate, REDOX
 reagents, 150–151
ammonium chloride (NH_4Cl)
 forced acid diuresis, 49
 hydrolysis, 9
 amphiprotic salts, 11
 amphotericity
 amino acids, 16–17
 water, 4
ampicillin, 222, 222
 analytical spectroscopy, 159–203
 derivative, 177–179
 instrumentation, 168–170
 quantitative aspects, 172–173
 angiogenesis, thalidomide effects, 98
 angiotensin II, 227, 268
 aniline, 165
 λ_{max} , 164–165
 anions, 1
 aniseed oil, 50
 answers, 253–268
 anthraquinone, 163
 anticancer drugs, 37
 DNA binding, hyperchromic effects,
 166
 antioxidants, 213–214, 216
 aperitifs, 50
 apoptosis, 216
 apparent partition coefficient, 31, 56
 approximate titre calculation, 142
 argentimetric titrations, 154
 aromatic compound(s)
 amines, oxidation, 211
 heterocyclic, 73
 light absorption, 163
 aromatic hydroxylation, 130
 aromatic ring oxidation, 109
 Arrhenius plots, 236–237, 239, 268
ascorbic acid
 antioxidant, 214
 forced acid diuresis, 49
 pK_a, 158, 264
 titrations, 157, 263–264
aspartic acid ($\text{C}_4\text{H}_7\text{NO}_4$), ionisation, 18
aspirin, 62
 British Pharmacopoeia standards, 138
 hydrochloric acid, reaction, 238
 hydrolysis, 220, 227, 238, 267
 limit tests, 155
 pK_a, 62
 warfarin interactions, 40
assay(s)
 British Pharmacopoeia (BP), 175
 design, 138–143
 fats, 215–216
 monographs, 248–249
 spectrophotometric methods, 175–177
asthma, 23
atenolol, 257
 autoprotolysis constant, water (K_w), 2
 autoxidation, 207
 fats, 215–216
auxochrome(s), 164
Avogadro number, 135
azoreduction, 111

 back titration(s), 144–147, 156, 263
 bacteria, penicillin action, 92
barbiturates, 67–68
 ionisation, 26–27, 68, 70
 metabolism, 120
 tautomerism, 69
base(s), 1–9
 dissociation, 3–9
 pH, 22
 pK_a, 22
 see also pH partition hypothesis
 base-catalysed hydrolysis, 219, 219
 pseudo first-order reactions, 235
 baseline technique, infrared spectroscopy,
 181
 base peak, mass spectrometry, 192
 basic drug(s), 71–72
 basicity constant (K_b), 6–8
 bathochromic shift, 164, 166
 Beer–Lambert’s equation, 174, 175, 195,
 265
 Beer’s Law, 173, 173–174, 193
 benzaldehyde, 209
 benzene, 162–163, 163, 265
 λ_{max} , 164–165
benzocaine, 166

- benzoic acid, amino acid conjugation, 116
 benzyl groups, 266
 benzylisopropylamine, 265–266
 benzyl radicals, 208, 225
 β (buffer capacity), 14–15, 28, 254–255
 β -lactam antibiotics, 92, 94
 hydrolysis, 267
 bimolecular reaction, 230
 bioactivation, 106
 bioavailability, 36–50, 223
 biotransformation, 105, 106–107
 environmental factors, 107
 genetic factors, 106–107
 pharmacodynamic factors, 107
 physiological factors, 107
 ‘blanking,’ spectrophotometry, 171
 blank titration(s), 144–147
 blood–brain barrier, drug distribution, 37
 blood plasma
 buffer systems, 16–19
 proteins, drug binding, 40
 blue shift(s), 166
British Anti Lewisite (BAL), 260
British Pharmacopoeia (BP), 139, 141, 246–252
 Appendices, 251
 chemical reference substances, 245
 commission, 245
 drug assay methods, 175
 General Notices, 251
 homeopathic medicine, 252
 infrared spectroscopy, 179, 251
 monographs, 85, 139, 246
British Pharmacopoeia Chemical Reference Substances (BPCRS), 245
 bromine, resorcinol assay, 151–152
Brønsted–Lowry theory, 3, 59
 buffer(s), 11–19, 253–254
 acetate, 14–15
 biological, 16–19
 compleximetric titrations, 152–153
 composition, 11
 partition coefficient measurement, 33
 buffer capacity, 14–15, 28, 254–255
bupivacaine, 46, 46
 burettes, 135
 butylated hydroxyanisole (BHA), 214
 butylated hydroxytoluene (BHT), 214
 caffeine, metabolism, 125
 Cahn–Ingold–Prelog convention, 94, 99, 101, 104
 naloxone hydrochloride, 104
 serine, 96
 calcium
 compleximetric titrations, 153–154
 equivalent weight, 153–154
calcium carbonate (CaCO_3), titrations, 145–147
 calibration graph(s), 171–172, 177, 180
 canonical forms, carboxylate anions, 60–61, 61
capsaicin, 50–51, 51
 carbohydrate(s), stereoisomers, 90
 carbon–carbon bond(s), 162
 carbonic acid (H_2CO_3), buffer systems, 16
 carbonyl groups, hydrolysis, 217
 carboxyl groups (COO^-), 17
 ionisation, 60
 carboxylic acids, 59–63
 ionisation, 61
 carvone, chirality, 89, 89
 catechol O-methyltransferase (COMT), 119
 cations, 1
 cell membrane(s), 37–39, 38
 pH partition hypothesis, 41
 cells, infrared spectroscopy, 181
 Centralised Procedure, European
 licensing, 242–243
 central nervous system (CNS), drug distribution, 37
cephalosporin, hydrolysis, 221–222
 cerium, REDOX titrations, 150–151, 157, 263
 chain initiation, oxidation, 206, 206
 chain propagation, oxidation, 206, 206
 chain termination, oxidation, 207, 207
 chalk (calcium carbonate) (CaCO_3), titrations, 145–147
 chelating agents, 213
 chemical shift, NMR, 186–187, 188, 265
 chemotherapy, 37
 chirality, 84
 drugs, 84–86
chloramphenicol, 225–226
 chloride, reaction with water, 9
 chloroacetic acid, pK_a , 8
chloroamitriptyline, 100

- chloroform
 iodine titrations, 152
 ionisation, 256
- chlorpromazine**, sulfoxidation, 111
- cholesterol, 38, 38–39
- chromatography
 HPLC *see* high-performance liquid chromatography (HPLC)
 thin layer, 35
- chromophore(s), 162–163, 200, 265
 fluorimetry, 182
- cimetidine**
 CYP450 inhibition, 112
 metabolism, 125
- ciprofloxacin**, metabolism, 127
- cis-trans* isomerism, 83, 99–100
- citric acid, assay design, 139–141
- clinical data, Marketing Authorisation applications, 244
- cocaine**, 46, 46
 metabolism, 121
 specific absorbance, 195
- codeine**, separation from drug mixtures, 75–77
- colorimetry, 159
- coloured compound(s), 163
 see also chromophore(s)
- comparative spectrophotometric assay(s), 175–176
- complex cerium salts, REDOX titrations, 150–151, 157, 263
- compleximetric titrations, 152–154
- complexing agents, 152
- concentration (units), 135–137
- conjugate acid, 5
- conjugate base, 8
- conjugated multiple bonds, 162–163
- conjugation reaction(s), 112–119, 131
- Co-Rapporteur, 243
- co-trimoxazole**, 79, 257–258
- counterfeit medicines, 245
- counter ion, drug absorption, 44
- coupling, spin-spin, 187–191, 190
- coupling constant, 190
- curry, 50
- cyanide ions, argentimetric titrations, 154
- cyclophosphamide**, 223
- CYP2D6, 107
- CYP3A4, 107
- coproheptadine**, metabolism, 123
- cysteamine (mercaptamine)**, 224, 224
- cytochrome P450 monooxygenases (CYP450), 107–111
 chirality, 119
 induction, 112
 inhibitors, 112
 paracetamol detoxification, 117–118, 118
- _D configuration(s), 90–94
- N-dealkylation, 109
- O-dealkylation, 110
- S-dealkylation, 110
- dealkylation, oxidative, 130
- deamination, 110
- Decentralised Procedure, European licensing, 243–244
- decomposition reactions, 205–227
- delivery pipettes, 134
- deoxyribonucleic acid (DNA) *see* DNA
- depot injections, 215
- derivative spectroscopy, 177–179
- desipramine**, N-dealkylation, 109
- detectors, spectrophotometers, 170
- detoxification, 106
 paracetamol, 117–118
- deuterium, 185
 exchange, 186
 lamps, 168
- dextrorotatory compounds, 86
- diamorphine**
 hydrolysis, 220–221
 oxidation, 221
- diastereoisomers, 96, 97
- diazepam**
 assays, 201, 265
 metabolism, 123
- diet, ageing and, 216–217
- diffraction grating(s), 169, 170
- diffusion
 facilitated, 44
 passive, 39–40
- digoxin**, 182
- dihydrogenphosphate (H_2PO_4^-), in buffer solutions, 15
- dilutions, spectrophotometry, 171–172
- dimercaprol**, 103, 260, 260
- dimerisation, 222
- dimethylformamide (DMF), 149
- dipeptides, 92
- diphenoxylate**, metabolism, 123

- discovery chemistry, Marketing
 Authorisation applications, 244
- disodium edetate**, 152, 213, 214
- disodium hydrogenphosphate
 $(\text{Na}_2\text{HPO}_4)$, in buffer solutions, 15
- dissociation, weak acids/bases, 3–9
- dissociation constant
 acids (K_a), 3–9, 59–60
 base (K_b), 6–8
- distomer, 98
- distribution, drugs, 36–39
- diuresis, forced, 49
- DNA
 drug binding, hyperchromic effects, 166
 oxidative damage, 216
- double bond(s)
 carbon–carbon, 162
 infrared spectroscopy, 179
- drug(s)
 excretion, 48–50
 ionisation, 19–20
 licensing, 241–252
 metabolism *see* metabolism, drugs
 physicochemical properties, 59–81
 pK_a , 20, 21
 stability *see* stability, drugs
- drug interactions
 aspirin, 40
 enzyme induction/inhibition, 111–112
 warfarin, 40
- drug overdose, 48–49
 paracetamol, 118
- drug resistance, penicillin, 92–94
- drug toxicity, 98
- duplication, assays, 139–140
- dynamic equilibrium, 48
- edetate, disodium**, 152, 213, 214
- EDTA (ethylenediaminetetraacetic acid), 213
- E isomers, 100, 100
- electrochemical detectors, HPLC, 35
- electrolytes, 1
- electromagnetic radiation, 159–164
 infrared spectroscopy, 179
- electronic transition, 162
- electrons, π , 162
- electron transfer, REDOX titrations, 150
- electrophoresis, 17
- electrospray ionisation, 192
- enalaprilate**, 223
- enantiomer(s), 83–84
 glutamic acid, 17
 thalidomide, 97–99
- energy, light absorption, spectroscopy, 161–163
- environmental chemicals, 105
 enzyme induction, 112
- enzyme(s)
 chirality, 107, 119
 DNA repair, 216
 induction, 111–112
 inhibition, 112
- ephedrine**, 23, 178, 180
 chirality, 96
 metabolism, 122
 pH , 24
 solubility, 23, 23, 24
 structure, 23
 titration, 28
- epinephrine** *see* adrenaline (epinephrine)
- ϵ (molar absorptivity), 174, 175
- equilibria
 acids/bases, 7
 dynamic, 48
 salts, 10–11
- equilibrium constant(s)
 assay design, 138
 buffer solutions, 11–12
 electrolyte dissociation, 1–2, 59
 weak acids and bases, 4–7
see also dissociation constant
- equivalent relationships, 139
- equivalent weights, 153
- esters, hydrolysis, 217
- ethanol, pK_a , 61, 61
- ethanolamine, 28, 253
- ethers, oxidation, 209
- ethoxide anion, 61
- ethylenediaminetetraacetic acid (EDTA), 213
- ethyl oleate, 216
- European licensing, 242–244
 Centralised Procedure, 242–243
 Decentralised Procedure, 243–244
 Mutual Recognition Procedure, 243
- European Pharmacopoeia, drug assay
 methods, 175
- eutomer, 98

- excretion, drugs, 48–50
 Expert Advisory Groups (EAGs), British Pharmacopoeia, 245
 external standards, spectrophotometric assays, 176
 extinction, 175
 extractions, partition coefficient measurement, 33–34, 51–55, 57, 256–257
 eye drops, 139, 225–226
- facilitated diffusion, 44
 factor (f), units of concentration, 135–136
 fast acetylation, 116
 fast atom bombardment (FAB), 192
 fats, autoxidation, 215–216
felodipine, metabolism, 128
 ferric chloride, salicylic acid limit test, 155
 Fick's law, 39–40
 fingerprint region, infrared spectroscopy, 179
 first-order reactions, 230–233, 238–239, 268
 Fischer projection(s), 89–94, 101–104
 fixed oils, autoxidation, 215–216
 fixed-wavelength spectrophotometer, 168–169
 fluorimetry, 182–183
 quenching, 182–183
 fluorophore, 182
 food
 monosodium glutamate, 18, 18
 partition effects, 50–51
 forced diuresis, 49
 formulation, Marketing Authorisation applications, 244, 246
 free radicals, stability, 207–211
 substitution, 207–208
 frequency factor, 236
 furosemide, 62
 pK_a, 62
- gas chromatography–mass spectrometry (GC-MS), 192
 General Notices, British Pharmacopoeia, 251
 geometric isomer(s), 83, 99–100
 glassware
 colour, 213
- drying, 149–150
 glomeruli, 48
 glucuronides, 113, 113–114
 glucose, stereoisomers, 86, 88
 glucuronic acid conjugation, 113–114
 glutamic acid, 18
 glutathione, 117
 glyceraldehyde, stereoisomers, 90, 91
 glycine
 conjugation, 115–116
 ionisation, 17
 graduated pipettes, 135
- half-life, 233, 235
 Henderson–Hasselbalch equation
 buffers, 11–12, 14, 254–255
 drugs, 19, 21, 26
heroin *see* diamorphine
 hertz (unit), 161
 heterocyclic compounds, basicity, 73
 heterocyclic ring oxidation, 109
 high-performance liquid chromatography (HPLC)
 chloramphenicol, 225
 partition coefficients, 35–36
 hippuric acid, 116
 homeopathic medicine, British Pharmacopoeia, 252
hydralazine, metabolism, 124
 hydration, 217, 222
 hydrochloric acid
 aspirin, reaction with, 238
 ephedrine, reaction with, 24
 stomach, 41–42
 hydrogen ion(s) (H⁺), concentration, 3
 hydrogen peroxide, 239
 hydrolysis, 130, 217–222, 268
 acid-catalysed, 217, 218
 amide groups, 266
 aspirin, 220
 base-catalysed, 219, 219
 diamorphine, 220–221
 functional groups, 218
 penicillin, 267
 salts, 9–11
 hydroperoxide, 206
 hydroxonium ion, 3, 59
 hydroxyl ion(s) (OH[−]), in buffer solutions, 13
 hydroxymethylaminomethane (tris), 13
 hyperchromicity, 166

- hypochromicity, 166
 hypsochromic effect, 166
- ibuprofen**
 glucuronide, 113
 metabolism, 126
 side-chain oxidation, 108
- imine-imide tautomerism**, 71
- imipramine**
 metabolism, 124
N-dealkylation, 109
- indicator(s)**
 argentimetric titrations, 154
 assay design, 143, 144, 153, 263
 compleximetric titrations, 152–154
 pH, 20–23
- indometacin**, 67, 69
 metabolism, 122
- infrared light, 160, 160, 162
- infrared spectroscopy, 179–181, 198
British Pharmacopoeia, 179, 251
 quantitative analysis, 180–181
- inhibition, enzymes, 112
- initiation, oxidation, 206, 206
- injection vehicles, 215
- insecticides, organophosphorus, 128,
 128–129
- integration, nuclear magnetic resonance, 187
- internal salt(s), active transport, 16, 44
- internal standards, spectrophotometric assays, 176, 185
- intestines, 42, 42–43
- Intraperitoneal Dialysis Solution BPC**, 152
- inverted factor, 137
- iodine, REDOX reagents, 150
- iodine flask, 151–152
- ionic product of water, 2
- ionisation
 ascorbic acid, 264
 chloroform, 256
 drugs, 19–20, 30–32, 31, 41
 mass spectrometry, 191, 192
 spectroscopic effects, 166
- ion pair, 44
- ions, 1
- iron
 cytochrome P450 monooxygenase action, 107–108
 salicylic acid limit test, 155
- isoelectric point (pI), 17
 isomer(s), 83, 83
 geometric, 83, 99–100
see also enantiomer(s)
- isoniazid**, *N*-acetylation, 117
- K_a** (dissociation constant)
 acids, 4–5, 7
 buffer solutions, 12
- K_b** (dissociation constant), 6–8
- kidney(s)**
 drug excretion, 48–50
 drug reabsorption, 48–50
- kinetics**
 drug stability, 229–239
 electrolyte dissociation, 2
- K_w** (autoprotolysis of water), 2
- labetalol**, metabolism, 127
- lactic acid, Fischer projections, 90
- laevorotatory compounds, 86
- λ (wavelength of light), 161
- λ_{max} , 164, 164, 167
- Lambert's law, 174
- lamp(s)**
 deuterium, 168
 tungsten, 168
 xenon arc, fluorimetry, 182
- _L configuration(s), 90–94
- levothyroxine (thyroxine)**, 64
- licensing, drugs, 241–252
- lidocaine (lignocaine)**, 46, 46
 metabolism, 124
- light**, 159–164
 monochromatic, 169
 sources, 168–169
see also lamp(s)
- lignocaine** *see* lidocaine (lignocaine)
- limit test(s), 154–155, 225
- linoleic acid, 225
- linolenic acid, 225
- lipid bilayers, drug distribution, 39
- liquid chromatography–mass spectrometry (GC-MS), 192
- lithium carbonate (Li₂CO₃)**, 155
 assays, 148–149, 263
- local anaesthetic(s), 45–48
 pH partition hypothesis, 45–46
 sink conditions, 47–48
- logarithm(s), 8
- partition coefficients, 32

- lovastatin**, metabolism, 127
- L-series amino acids**, 91, 91–92
- lysine**, 28
 ionisation, 28, 255
- magnesium**, equivalent weight, 153–154
- malathion**, 128, 128–129
- Marketing Authorisation applications**, 244–245
- mass action**, law of, 2, 43, 231
- mass spectrometry**, 191–193
 instrumentation, 191
- mass-to-charge ratio**, 191, 265–266
- mathematical derivative**, derivative spectroscopy, 177
- mechanism-based inactivation**, CYP450, 112
- Medicines and Healthcare products Regulatory Agency (MHRA)**, 241–242
 divisions, 242
- melphalan**, 45, 45
- membrane(s)** *see* cell membrane(s)
- meprobamate**, metabolism, 121
- mepyramine**, 202, 265
- mercaptamine (cysteamine)**, 224, 224
- 6-mercaptopurine**, S-dealkylation, 110
- mesomeric effects**, aniline, 165
- metabolism**, drugs, 105–131, 261
 pathways, 106–107, 120, 120–128
 stereochemistry effects, 119
- metabolite(s)**, 105
- metabolite intermediate complexation**, CYP450, 112
- methadone**, metabolism, 124
- methicillin resistant *Staphylococcus aureus*** (MRSA), 93–94
- methotrexate**, 62
- methotrexate**, p_{K_a}, 62
- N-methylation**, 119
- O-methylation**, 119
- methyldopa**, 119, 156
- 6-methylmercaptopurine**, S-dealkylation, 110
- methyl orange**, 163
- methyl oxidation**, 109
- methyl radicals**, 208
- mevalonic acid**, 119
- MHRA** *see* Medicines and Healthcare products Regulatory Agency (MHRA)
- microvilli**, 43, 43
- millimolar equivalent**, 153
- mixture(s)**
 racemic, 86, 96
 separation, 73–77
- molar absorptivity (e)**, 174, 175
- molarity**, 142–143
- mole(s)**, 135
- molecular ion peak**, mass spectrometry, 192
- molecular ion radical**, mass spectrometry, 192
- molecularity**, 230
- molecular structure**, drugs, 183–193
 NMR, 183–191
- monochromator(s)**, 169–170, 182
- monographs**
 assays, 248–249
 British Pharmacopoeia, 85, 139, 246
 purity, 249–251
 triprolidine hydrochloride, 246–251
- monosodium glutamate (MSG)**, 18, 18
- mordant black**, 153
- morphine**, 64, 114, 114, 212
- MRSA** (methicillin resistant *Staphylococcus aureus*), 93–94
- multiplicity**, 187–191
- mutarotation**, 86, 88
- Mutual Recognition Procedure**, European licensing, 243
- N-acetylation**, 116
- N-acetylcysteine**, 118, 118
- naloxone hydrochloride**, 104, 261
- N-dealkylation**, 109
- nephron(s)**, 48, 49
- nephropathic cystinosis**, 106, 224
- nicotine**, 81, 81
 metabolism, 126
 oxidation, 258, 260
- nitrogen rule**, 266
- N-methylation**, 119
- NMR** *see* nuclear magnetic resonance (NMR)
- v (hertz)**, 161
- non-aqueous titrations**, 149–150
- non-steroidal anti-inflammatory drug(s) (NSAIDs)**
 amino acid conjugation, 116
 warfarin interactions, 40

- non-synthetic (phase 1) reactions, 106–112, 131, 262–263
novobiocin, 226–227, 266–267
N-oxidation, 110
 nuclear magnetic resonance (NMR), 183–191, 198–200, 265–266
 instrumentation, 184
 integration, 187
 internal standards, 185–186
 multiplicity, 187–191
 solvents, 184–185
nucleophilic attack, ester hydrolysis, 217
octanol, partition coefficient
 measurements, 33
O-dealkylation, 110
oils, autoxidation, 215–216
O-methylation, 119
onium ion, 149
optical density, 175
optical isomer(s) *see enantiomer(s)*
order, chemical reactions, 229–230
organophosphorus insecticide(s), 128
overdose, drug *see drug overdose*
oxidation
 ascorbic acid, 263–264
 cytochrome P450 monooxygenases, 107–108
 diamorphine, 221
 drug stability, 205–207, 225
 nicotine, 258, 260
 prevention, 211–215
 REDOX titrations, 150–152
see also autoxidation
N-oxidation, 110
oxidative damage, 216
 DNA, 216
oxidative N-dealkylation, 130
oxidative O-dealkylation, 130
oxygen, exclusion, 211–213
paracetamol, 64, 117–118, 212
 aromatic ring oxidation, 109
 detoxification, 117–118
 glucuronide, 113
 ionization, spectroscopic effects, 166, 166
 metabolism, 127
O-dealkylation, 110
 separation from mixtures, 75–77
 sulfation, 115
paramagnetic molecules, 205
partition coefficient(s), 29–57
 experimental measurement, 33–36
partition law, 30
Pascal's triangle, 189
passive diffusion, 39–40
pastis, 50
patient information leaflet (PIL), Marketing Authorisation applications, 244
penicillin(s), 92–94, 227
 hydrolysis, 221–222, 267
pentazocine, metabolism, 121
pentobarbital
 ionisation, 26–27, 27, 68
 side-chain oxidation, 108
 structure, 26
peptidoglycan, bacterial cell walls
 cross-linking, 92
 penicillin action, 92
percentage(s)
 of stated amount, 148
 units of concentration, 138
percentage transmittance, 174
perchloric acid, 149–150, 157, 263
permanganate, potassium salt, standardisation, 150
peroxide, 206
pethidine, metabolism, 121
pH, 3, 5
 amphiprotic salts, 11
 buffer solutions, 11
 effects on spectra, 164–167
 indicators, 20–23
 partition coefficients, 30–31
pK_a *vs.*, 22
 salt hydrolysis, 9
 urine, 49
pharmacodynamics, 36
pharmacokinetics, 36
phase 1 reactions (biotransformation), 106–112, 131, 262–263
phase 2 reactions (biotransformation), 106, 112–119, 131, 262–263
phenacetin, O-dealkylation, 110
phenmetrazine
 heterocyclic ring oxidation, 109
 metabolism, 122
phenol(s), 63–64
 antioxidants, 214
 oxidation, 210, 210, 266

- phenol(s) (*cont.*)
 spectral shifts, 162, 166, 167
 sulfation, 114–115
- phenothiazines**, metabolism, 120
- phenylalanine, 45, 45
- phenylbutazone**, 67
- phenytoin**, 69, 70, 71
 metabolism, 121
- phocomelia, 97
- phospholipids, 38
- phosphoric acid (H_3PO_4), in buffer solutions, 15
- photomultiplier tubes,
 spectrophotometers, 170
- photon(s), 162
- pH partition hypothesis, 40–44
 limitations, 42–44
- pH titration(s), drug ionisation, 21–22
- physicochemical properties, drugs, 59–81
- pI (isoelectric point), 17
- π electrons, 162
- pipettes, 134–135
 graduated, 135
- piroxicam**, metabolism, 125
- pK_a, 7–9, 28, 254
 acids/bases, 22
 ammonia, 15
 ascorbic acid, 158, 264
 buffers, 15, 253
 drugs, 20, 21
 pH *vs.*, 22
- plane-polarised light, 84
- plasma *see* blood plasma
- pOH, 15
- poisons, environmental, 105
- polarimetry, 84–88, 85
- polarisation, bonds, hydrolysis, 217
- polymerisation, 222
- potassium cyanide (KCN), argentimetric titrations, 154
- potassium iodide (KI), 151–152
- potassium methoxide (CH_3OK), 149
- potassium permanganate ($KMnO_4$), 150
- precipitation, 266–267
- primary standard, 136–137
- prism(s), 169, 169
- procaine**, 72
 ionisation, 72
- prodrugs, 223–224
- propagation, oxidation, 206, 206
- propanolol, metabolism, 122
- prostaglandins**, metabolism, 123
- protein(s)
 as buffers, 16–19
 drug binding, 43–44
 sulfation, 114–115
- pseudoephedrine**, chirality, 96
- pseudo first-order reactions, 235
- purity, 196, 263
 limit tests, 154
 monographs, 249–251
 oils, 215–216
- pyridine, 73
- quantitative analysis, infrared spectroscopy, 180–181
- quantitative structure–activity relationships (QSAR), 32
- quaternary ammonium compounds**, 43–44
- quenching, fluorimetry, 182–183
- quinine**, fluorescence, 183, 184
- quinoneimine, 117–118
- racemate(s), 86, 96
- racemic mixture, 86, 96
- radiation, electromagnetic, 159–164
- rancidity, 215
- Rapporteur, 243
- rate constant(s), 229–230
 first-order reactions, 232, 232
 second-order reactions, 235
 temperature effects, 236–238
- rate-determining steps, 229
- rate equations, 230–233
- R configuration(s), 94–96
 thalidomide, 97
- reabsorption, drugs, 48–50
- recreational drugs, metabolism, 105
- REDOX titrations, 150–152, 263–264
- reduction reaction(s), REDOX titrations, 150–152
- relaxation, 184
- renal tubules, 48
- repair enzymes, DNA, 216
- resonance, 208
 carboxylate anions, 60–61, 61
 pentobarbital, 26–27
 phenoxide anions, 63
 sulfacetamide, 78
 tautomerism *vs.*, 66
- warfarin, 64–66

- resorcinol**, back titrations, 151
reversible inhibitors (enzymes), 112
 rotational transition, 162
- salbutamol**, 212
salicylic acid, limit tests, 155
 salt(s)
 amphotropic, 11
 buffer solutions, 11–19
 hydrolysis, 9–11, 217
S configuration(s), 94–96
 thalidomide, 97
- S-dealkylation**, 110
 secondary standards, 136–137
 second-order reactions, 230, 234–235
 selective toxicity
 malathion, 128–129
 penicillin, 92
 self-quenching, fluorimetry, 183
 separation of mixtures
 ionisation, use of, 73–77
 racemic, 96
 sulfamethoxazole from trimethoprim, 79
 sequestering agents, 152
 serial dilutions, spectrophotometry, 172
 serine, stereoisomerism, 101
 shake flask method, partition coefficients, 33–34
 shelf-life, 233–234
 side-chain oxidation, 108
 silver nitrate (AgNO_3), titrations, 154
 sink conditions, local anaesthetics,
 47–48
 slow acetylation, 116
 small intestine, 43
 pH partition hypothesis, 42–43
 sodium acetate ($\text{CH}_3\text{CO}_2\text{Na}$)
 in buffer solutions, 13
 hydrolysis, 10
 pH, 24–25
sodium bicarbonate (NaHCO_3), buffer
 systems, 16
 sodium channels, local anaesthetics on,
 47, 47–48
 sodium chloride (NaCl)
 argentimetric titrations, 154
 hydrolysis, 9
 sodium dihydrogenphosphate
 (NaH_2PO_4), in buffer solutions,
 15
 sodium hydroxide (NaOH), in buffer
 solutions, 13
 sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$), REDOX
 reagents, 150
 solubility, drugs, 39, 73–74, 266–267
 see also partition coefficient(s)
 solvent(s), 184–185
 infrared spectroscopy, 181
 specific absorbance (A_1), 174–175, 195,
 197
 spectrofluorimeters, 182
 spectrophotometers, 168–169
 spectroscopy, analytical *see* analytical
 spectroscopy
 speed of light, 161
 spin–spin coupling, 187–191, 190
 stability, drugs, 205–227
 free radicals, 207–211
 kinetics, 229–239
 Marketing Authorisation applications,
 244
 standard additions, spectrophotometric
 assays, 176, 177
 standardisation, volumetric solutions,
 136
 starch, iodine titrations, 151–152
 stereochemistry, 83–104
 metabolism, effects, 119
 see also enantiomer(s)
 steroids, 38–39
 stoichiometric ratios, assay design,
 139
 Stoke's law, 182
 structure–activity relationships, 30
 quantitative, 32
 substitution, free radical stability,
 207–208
 suicide inhibition, CYP450, 112
sulfacetamide, 77, 78
sulfamethoxazole
 partition coefficients, 57
 separation from trimethoprim, 79,
 257–258
sulfanilamide, 77, 78, 196–197
 sulfapyridine, azoreduction, 111
 sulfasalazine, azoreduction, 111
 sulfate conjugation, 114–115
 sulfathiazole, 196–197
 sulfation, 114–115
 sulfonamides, 69, 70, 71, 71
 metabolism, 121

- sulfoxidation, 111
 sulfuric acid (H_2SO_4), primary standard solutions, 137
- tamoxifen**, 100
 metabolism, 126
- tandem mass spectrometry (MS-MS), 193
- tautomerism
 keto-enol, warfarin, 65, 65
 phenytoin, 71
 resonance *vs.*, 66
- temperature, effects on reaction rates, 236–238
- terfenadine**, metabolism, 125
- termination, oxidation, 207, 207
- tetrabutylammonium hydroxide ($(\text{N}(\text{Bu}^n)_4\text{OH}$), 149
- tetramethylsilane (TMS), 185
- thalidomide**, 97–99
- theophylline**, metabolism, 126
- thin-layer chromatography (TLC), partition coefficients, 35
- thiopental**, 68, 70
- thyroxine (levothyroxine), 64
- titration(s), 141–158
 approximate titre calculation, 142
 drug ionisation, 21–22
- tolbutamide**, methyl oxidation, 109
- transfer pipette(s), 134
- trans* isomer(s), 83
- transpeptidase, 92
- transport, active, 44–45
- triglycerides, 215, 215
- trimethoprim**, separation from sulfamethoxazole, 79, 257–258
- trimethylamine**, N-oxidation, 110
- tripelennamine**, metabolism, 128
- triple bond(s)
 carbon–carbon, 162
 infrared spectroscopy, 179
- Triprolidine hydrochloride**, monograph, 246–251
- tris (hydroxymethylaminomethane), 13
- trituration, 181
- true partition coefficient, 31, 56, 256
- tubocurarine**, drug absorption, 55
- tubules, renal, 48
- tungsten lamps, 168
- ulcers, tubocurarine, 56
- ultraviolet (UV) light, 160, 160, 162
 deuterium lamps, 168
- ultraviolet (UV) spectroscopy
 chloramphenicol, 226
 fluorimetry *vs.*, 182
- unimolecular reactions, 230
- unit-dose medicine, 147–149
- units of concentration, 135–137
- universal gas constant (R), 236
- unsaturated fatty acids, 215
- uridine diphosphate glucuronic acid, 113
- urine, pH alterations, 49
- US Pharmacopoeia*, drug assay methods, 175
- valproic acid**, metabolism, 125
 vibrational transitions, 162, 179
- visible spectroscopy, 159–160, 160
- vitamin C *see* ascorbic acid
- volume, units of concentration, 138
- volumetric analysis, 133–158
- volumetric flask, 133, 134
- warfarin**, 64–66
 aspirin interactions, 40
- wash bottles, 149
- water
 amphotericity, 4
 dissociation, 2
 as electrolyte, 1
 salt solution(s), 9–11
- wave frequency, light, 161
- wavelength, light (λ), 159–162, 160, 161, 161
- wavenumber, 161
- weighing by difference, 141–142
- weight, units of concentration, 138
- xenobiotics
 enzyme induction, 111–112
 metabolism, 105
- xenon arc lamps, fluorimetry, 182
- zero-order reactions, 236
- Z isomers, 99–100, 100
- zwitterion, 16, 17, 255
 active transport, 44