## Contents

1	States of matter		6	Using moles	
1.1	Everything is made of particles	6	6.1	The mole	76
1.2	Solids, liquids, and gases	8	6.2	Calculations from equations, using the mole	78
1.3	The particles in solids, liquids, and gases	10	6.3	Reactions involving gases	80
1.4	A closer look at gases	12	6.4	The concentration of a solution	82
	Checkup on Chapter 1	14	6.5	Finding the empirical formula	84
-			6.6	From empirical to final formula	86
2	Separating substances		6.7	Finding % yield and % purity	88
2.1	Mixtures, solutions, and solvents	16		Checkup on Chapter 6	90
2.2	Pure substances and impurities	18			
2.3	Separation methods (part I)	20	7	Redox reactions	
2.4	Separation methods (part II)	22	7.1	Oxidation and reduction	92
2.5	More about paper chromatography	24	7.2	Redox and electron transfer	94
	The chromatography detectives	26	7.3	Redox and changes in oxidation state	96
	Checkup on Chapter 2	28	7.4	Oxidising and reducing agents	98
3	Atoms and elements		tem seems	Checkup on Chapter 7	100
3.1	Atoms and elements	30	8	Electricity and chemical change	
3.2	More about atoms	32	8.1	Conductors and insulators	102
3.3	Isotopes and radioactivity	34	8.2	The principles of electrolysis	104
3.4	How electrons are arranged	36	8.3	The reactions at the electrodes	100
	How our model of the atom developed	38	8.4	The electrolysis of brine	108
	The atom: the inside story	40	8.5	Two more uses of electrolysis	110
3.5	The metals and non-metals	42		Checkup on Chapter 8	113
	Checkup on Chapter 3	44	~		7, 12
	Atoms combining		9	Energy changes, and reversible reactions	
			9.1	Energy changes in reactions	114
4.1	Compounds, mixtures, and chemical change	46	9.2	Explaining energy changes	110
4.2	Why do atoms form bonds?	48	9.3	Energy from fuels	118
4.3	The ionic bond	50	9.4	Giving out energy as electricity	120
4.4	More about ions	52		The batteries in your life	12:
4.5	The covalent bond	54	9.5	Reversible reactions	124
4.6	Covalent compounds	56	9.6	Shifting the equilibrium	120
4.7	Comparing ionic and covalent compounds	58		Checkup on Chapter 9	128
4.8	Giant covalent structures	60	10	The speed of a reaction	
4.9	The bonding in metals	62	10	The speed of a reaction	
	Checkup on Chapter 4	64	10.1	Rates of reaction	130
5	Reacting masses, and chemical equations		10.2	Measuring the rate of a reaction	13:
			10.3	Changing the rate of a reaction (part I)	134
5.1	The names and formuale of compounds	66	10.4	Changing the rate of a reaction (part II)	130
5.2	Equations for chemical reactions	68	10.5	Explaining rates	138
5.3	The masses of atoms, molecules, and ions	70	10.6	Catalysts	14
5.4	Some calculations about masses and %	72		More about enzymes	14
	Checkup on Chapter 5	74	10.7	Photochemical reactions	144
				Checkup on Chapter 10	14

11	Acids and bases		16.3	Fertilisers	228
27.	Acids and alkalis	148	16.4	Sulfur and sulfur dioxide	230
11.2	A closer look at acids and alkalis	150	16.5	Sulfuric acid	232
11.3	The reactions of acids and bases	152	16.6	Carbon and the carbon cycle	234
	A closer look at neutralisation	154	16.7	Some carbon compounds	236
11.4		156	16.8	Greenhouse gases, and global warming	238
11.5	Oxides Making calts	158	16.9	Limestone	240
11.6	Making salts Making insoluble salts by presinitation			Checkup on Chapter 16	242
11.7	Making insoluble salts by precipitation	160	(17)		
11.8	Finding concentrations by titration	162	17	Organic chemistry	
~	Checkup on Chapter 11	164	17.1	Petroleum: a fossil fuel	244
12	The Periodic Table		17.2	Refining petroleum	246
121		166	17.3	Cracking hydrocarbons	248
121	An overview of the Periodic Table	166	17.4	Families of organic compounds	250
122	Group I: the alkali metals	168	17.5	The alkanes	252
123	Group VII: the halogens	170	17.6	The alkenes	254
	Group 0: the noble gases	172	17.7	The alcohols	256
12.5	The transition elements	174	17.8	The carboxylic acids	258
126	Across the Periodic Table	176		Checkup on Chapter 17	260
	How the Periodic Table developed	178			
_	Checkup on Chapter 12	180	18	Polymers	
13	The behaviour of metals		18.1	Introducing polymers	262
121	Metals: a review	182	18.2	Addition polymerisation	264
132			18.3	Condensation polymerisation	266
132	Comparing metals for reactivity	184	18.4	Making use of synthetic polymers	268
13.3	Metals in competition	186	18.5	Plastics: here to stay?	270
13.4	The reactivity series	188	18.6	The macromolecules in food (part I)	272
13.5	Making use of the reactivity series	190	18.7	The macromolecules in food (part II)	274
	Checkup on Chapter 13	192	18.8	Breaking down the macromolecules	276
14	Making use of metals			Checkup on Chapter 18	278
14.1	Metals in the Earth's crust	194	19	In the lab	
14.2	Extracting metals from their ores	196			200
14.3	Extracting iron	198	19.1	Chemistry: a practical subject	280
14.4	Extracting aluminium	200	19.2	Example of an experiment	282
14.5	Making use of metals and alloys	202	19.3	Working with gases in the lab	284
14.6	Steels and steel-making	204	19.4	Testing for ions in the lab	286
	Metals, civilisation, and you	206		Checkup on Chapter 19	288
	Checkup on Chapter 14	208			
~			Answ	ers to the numerical questions in this book	290
15	Air and water			Your Cambridge IGCSE chemistry exam	
15.1	What is air?	210			
15.2	Making use of air	212		About the Cambridge IGCSE chemistry exam	291
15.3	Pollution alert!	214		Exam questions from Paper 2	292
15.4	The rusting problem	216		Exam questions from Paper 3	298
15.5	Water supply	218		Exam questions from Paper 6	304
	Living in space	220		Deference	
	Checkup on Chapter 15	222		Reference	
16	Some non-metals and their compounds			Glossary The Periodic Table and atomic masses	310
		224		The Periodic Table and atomic masses Index	314 316
16.1	Hydrogen, nitrogen, and ammonia	224		THUEX	310
16.2	Making ammonia in industry	226			