

Endorsed by  
University of Cambridge International Examinations

SECOND EDITION

Complete

# Chemistry

for Cambridge **IGCSE**

Includes CD

RoseMarie Gallagher  
Paul Ingram

OXFORD

# Contents

## 1 States of matter

1.1	Everything is made of particles	6
1.2	Solids, liquids, and gases	8
1.3	The particles in solids, liquids, and gases	10
1.4	A closer look at gases	12
	Checkup on Chapter 1	14

## 2 Separating substances

2.1	Mixtures, solutions, and solvents	16
2.2	Pure substances and impurities	18
2.3	Separation methods (part I)	20
2.4	Separation methods (part II)	22
2.5	More about paper chromatography	24
	The chromatography detectives	26
	Checkup on Chapter 2	28

## 3 Atoms and elements

3.1	Atoms and elements	30
3.2	More about atoms	32
3.3	Isotopes and radioactivity	34
3.4	How electrons are arranged	36
	How our model of the atom developed	38
	The atom: the inside story	40
3.5	The metals and non-metals	42
	Checkup on Chapter 3	44

## 4 Atoms combining

4.1	Compounds, mixtures, and chemical change	46
4.2	Why do atoms form bonds?	48
4.3	The ionic bond	50
4.4	More about ions	52
4.5	The covalent bond	54
4.6	Covalent compounds	56
4.7	Comparing ionic and covalent compounds	58
4.8	Giant covalent structures	60
4.9	The bonding in metals	62
	Checkup on Chapter 4	64

## 5 Reacting masses, and chemical equations

5.1	The names and formulae of compounds	66
5.2	Equations for chemical reactions	68
5.3	The masses of atoms, molecules, and ions	70
5.4	Some calculations about masses and %	72
	Checkup on Chapter 5	74

## 6 Using moles

6.1	The mole	76
6.2	Calculations from equations, using the mole	78
6.3	Reactions involving gases	80
6.4	The concentration of a solution	82
6.5	Finding the empirical formula	84
6.6	From empirical to final formula	86
6.7	Finding % yield and % purity	88
	Checkup on Chapter 6	90

## 7 Redox reactions

7.1	Oxidation and reduction	92
7.2	Redox and electron transfer	94
7.3	Redox and changes in oxidation state	96
7.4	Oxidising and reducing agents	98
	Checkup on Chapter 7	100

## 8 Electricity and chemical change

8.1	Conductors and insulators	102
8.2	The principles of electrolysis	104
8.3	The reactions at the electrodes	106
8.4	The electrolysis of brine	108
8.5	Two more uses of electrolysis	110
	Checkup on Chapter 8	112

## 9 Energy changes, and reversible reactions

9.1	Energy changes in reactions	114
9.2	Explaining energy changes	116
9.3	Energy from fuels	118
9.4	Giving out energy as electricity	120
	The batteries in your life	122
9.5	Reversible reactions	124
9.6	Shifting the equilibrium	126
	Checkup on Chapter 9	128

## 10 The speed of a reaction

10.1	Rates of reaction	130
10.2	Measuring the rate of a reaction	132
10.3	Changing the rate of a reaction (part I)	134
10.4	Changing the rate of a reaction (part II)	136
10.5	Explaining rates	138
10.6	Catalysts	140
	More about enzymes	142
10.7	Photochemical reactions	144
	Checkup on Chapter 10	146

<b>11</b>	<b>Acids and bases</b>	
11.1	Acids and alkalis	148
11.2	A closer look at acids and alkalis	150
11.3	The reactions of acids and bases	152
11.4	A closer look at neutralisation	154
11.5	Oxides	156
11.6	Making salts	158
11.7	Making insoluble salts by precipitation	160
11.8	Finding concentrations by titration	162
	Checkup on Chapter 11	164

<b>12</b>	<b>The Periodic Table</b>	
12.1	An overview of the Periodic Table	166
12.2	Group I: the alkali metals	168
12.3	Group VII: the halogens	170
12.4	Group 0: the noble gases	172
12.5	The transition elements	174
12.6	Across the Periodic Table	176
	How the Periodic Table developed	178
	Checkup on Chapter 12	180

<b>13</b>	<b>The behaviour of metals</b>	
13.1	Metals: a review	182
13.2	Comparing metals for reactivity	184
13.3	Metals in competition	186
13.4	The reactivity series	188
13.5	Making use of the reactivity series	190
	Checkup on Chapter 13	192

<b>14</b>	<b>Making use of metals</b>	
14.1	Metals in the Earth's crust	194
14.2	Extracting metals from their ores	196
14.3	Extracting iron	198
14.4	Extracting aluminium	200
14.5	Making use of metals and alloys	202
14.6	Steels and steel-making	204
	Metals, civilisation, and you	206
	Checkup on Chapter 14	208

<b>15</b>	<b>Air and water</b>	
15.1	What is air?	210
15.2	Making use of air	212
15.3	Pollution alert!	214
15.4	The rusting problem	216
15.5	Water supply	218
	Living in space	220
	Checkup on Chapter 15	222

<b>16</b>	<b>Some non-metals and their compounds</b>	
16.1	Hydrogen, nitrogen, and ammonia	224
16.2	Making ammonia in industry	226

16.3	Fertilisers	228
16.4	Sulfur and sulfur dioxide	230
16.5	Sulfuric acid	232
16.6	Carbon and the carbon cycle	234
16.7	Some carbon compounds	236
16.8	Greenhouse gases, and global warming	238
16.9	Limestone	240
	Checkup on Chapter 16	242

<b>17</b>	<b>Organic chemistry</b>	
17.1	Petroleum: a fossil fuel	244
17.2	Refining petroleum	246
17.3	Cracking hydrocarbons	248
17.4	Families of organic compounds	250
17.5	The alkanes	252
17.6	The alkenes	254
17.7	The alcohols	256
17.8	The carboxylic acids	258
	Checkup on Chapter 17	260

<b>18</b>	<b>Polymers</b>	
18.1	Introducing polymers	262
18.2	Addition polymerisation	264
18.3	Condensation polymerisation	266
18.4	Making use of synthetic polymers	268
18.5	Plastics: here to stay?	270
18.6	The macromolecules in food (part I)	272
18.7	The macromolecules in food (part II)	274
18.8	Breaking down the macromolecules	276
	Checkup on Chapter 18	278

<b>19</b>	<b>In the lab</b>	
19.1	Chemistry: a practical subject	280
19.2	Example of an experiment	282
19.3	Working with gases in the lab	284
19.4	Testing for ions in the lab	286
	Checkup on Chapter 19	288

Answers to the numerical questions in this book	290
---	-----

### Your Cambridge IGCSE chemistry exam

About the Cambridge IGCSE chemistry exam	291
Exam questions from Paper 2	292
Exam questions from Paper 3	298
Exam questions from Paper 6	304

### Reference

Glossary	310
The Periodic Table and atomic masses	314
Index	316