Cambridge University Press 978-0-521-18117-4 - Cambridge IGCSE Chemistry Workbook, Third Edition Richard Harwood and Ian Lodge Frontmatter More information

Richard Harwood and Ian Lodge Cambridge IGCSE **Chemistry** Workbook

Third edition



CAMBRIDGE

Cambridge University Press 978-0-521-18117-4 - Cambridge IGCSE Chemistry Workbook, Third Edition Richard Harwood and Ian Lodge Frontmatter More information

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi, Tokyo, Mexico City

Cambridge University Press The Edinburgh Building, Cambridge CB2 8RU, UK

www.cambridge.org Information on this title: www.cambridge.org/9780521181174

© Cambridge University Press 2011

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

Workbook first published 2011

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-18117-4 Paperback

Cover image: Peeling paint on rusting steel. © Martyn F. Chillmaid / Science Photo Library

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

NOTICE TO TEACHERS

References to experiments contained in this publication are provided 'as is' and information provided is on the understanding that teachers and technicians shall undertake a thorough and appropriate risk assessment before undertaking any of the experiments listed. Cambridge University Press makes no warranties, representations or claims of any kind concerning the experiments. To the extent permitted by law, Cambridge University Press will not be liable for any loss, injury, claim, liability or damage of any kind resulting from the use of the experiments. CAMBRIDGE

Cambridge University Press 978-0-521-18117-4 - Cambridge IGCSE Chemistry Workbook, Third Edition Richard Harwood and Ian Lodge Frontmatter More information

Contents

Introduction		iv
1 P	lanet Earth	1
	Global warming and the 'greenhouse effect'	1
	Hydrogen as a fuel	4
2 The nature of matter		6
2.1	Changing physical state	6
	Chromatography at the races	8
2.3	Atomic structure	10
3 Elements and compounds		12
3.1	Periodic patterns in the properties of	
	the elements	12
3.2	The chemical bonding in simple	
2 2	molecules	13
	The nature of ionic lattices Making magnesium oxide – a quantitative	15
3.4	investigation	16
4 Chemical reactions		20
4.1	Key chemical reactions	20
4.2	The action of heat on metal carbonates	22
	The nature of electrolysis	23
4.4	Displacement reactions of the halogens	25
5 Acids, bases and salts		27
	Acid and base reactions – neutralisation	27
	The analysis of titration results	28
5.3	Thermochemistry – investigating the	•
Г 4	neutralisation of an acid by an alkali	30
5.4	Deducing a formula from a precipitation reaction	34
	reaction	54
6 Quantitative chemistry		35
	Calculating formula masses	35
	A sense of proportion in chemistry	36
6.3	Calculating the percentage of certain elements	
<i>C</i> 4	in a compound and empirical formulae	37
	Calculations involving solutions	38 40
0.5	Finding the mass of 5 cm of magnesium ribbon	40

7 How far? How fast?	42	
7.1 Terms of reaction	42	
7.2 The collision theory of reaction rates	43	
7.3 The influence of surface area on		
the rate of reaction	45	
7.4 Finding the rate of a reaction producing a gas	47	
7.5 Reversible reactions involving		
inter-halogen compounds	50	
8 Patterns and properties of metals	52	
8.1 Group1: The alkali metals	52	
8.2 The reactivity series of metals	53	
8.3 Energy from displacement reactions	55	
9 Industrial inorganic chemistry	59	
9.1 Metal alloys and their uses	59	
9.2 Extracting aluminium by electrolysis	60	
9.3 The importance of nitrogen	61	
9.4 Making sulfuric acid industrially	65	
9.5 Concrete chemistry	66	
10 Organic chemistry		
10.1 Families of hydrocarbons	68	
10.2 Unsaturated hydrocarbons (the alkenes)	70	
10.3 The alcohols as fuels	71	
10.4 Reactions of ethanoic acid	75	
11 Petrochemicals and polymers 7		
11.1 Essential processes of the petrochemical		
industry	78	
11.2 Addition polymerisation	79	
11.3 The structure of man-made fibre molecules	80	
11.4 Condensation polymerisation	81	
11.5 The analysis of condensation polymers	83	
12 Chemical analysis and investigation		
12.1 Titration analysis	85	
12.2 Chemical analysis	87	
12.3 Experimental design	89	

Contents



CAMBRIDGE

Cambridge University Press 978-0-521-18117-4 - Cambridge IGCSE Chemistry Workbook, Third Edition Richard Harwood and Ian Lodge Frontmatter More information



Introduction

This workbook contains exercises designed to help you to develop the skills you need to do well in your IGCSE Chemistry examination.

The IGCSE examination tests three different Assessment Objectives, which we call 'skills' in this workbook. These are:

- Skill A Knowledge with understanding
- Skill B Handling information and problem solving
- **Skill C** Experimental skills and investigations

In the examination, about 50% of the marks are for Skill A, 30% for Skill B and 20% for Skill C.

Just learning your work and remembering it is, therefore, not enough to make sure that you get the best possible grade in the exam. Half of all the marks are for Skills B and C. You need to be able to use what you have learnt and apply it in unfamiliar contexts (Skill B) and to demonstrate experimental and data handling skills (Skill C).

There are lots of exam-style questions in your coursebook which, together with the material on the accompanying CD-ROM, are aimed at helping you to develop the examination skills necessary to achieve your potential in the exams. Chapter **12** in the coursebook also deals with the experimental skills you will need to apply during your course. This workbook adds detailed exercises to help you further. There are some questions that simply involve remembering things you have been taught (Skill A), but most of the exercises require you to use what you have learned to work out, for example, what a set of data means, or to suggest how an experiment might be improved: they are aimed at developing Skills B and C.

There are a good many opportunities for you to draw graphs, read scales, interpret data and draw conclusions. These skills are heavily examined in Paper 6 of the CIE syllabus and so need continuous practice to get them right. Self-assessment check lists are provided to enable you to judge your work according to criteria similar to those used by examiners. You can try marking your own work using these. This will help you to remember the important points to think about. Your teacher should also mark the work, and will discuss with you whether your own assessments are right.

The workbook follows the same chapter breakdown as the coursebook. It is not intended that you should necessarily do the exercises in the order printed, but that you should do them as needed during your course. There are questions from all sections of the syllabus and one aim has been to give a broad range of examples of how the syllabus material is used in exam questions. The workbook is aimed at helping all students that are taking the Chemistry course. In some exercises, you will see this symbol in the margin:

This indicates that the exercise is intended for students who are studying the Supplement content of the syllabus as well as the Core.

We trust that the range and differing approaches of the exercises will help you develop a good understanding of the course material and the skills to do really well in the exams.

.

Introduction

iv

www.cambridge.org