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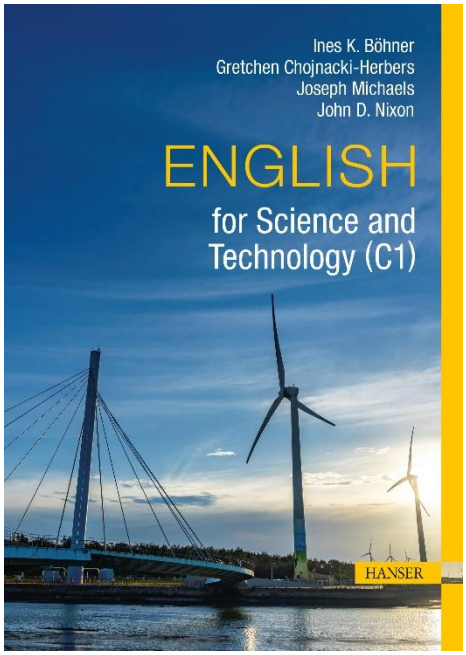

Leseprobe

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English for Science and Technology (C1)

von Ines K. Böhner, Gretchen Chojnacki-Herbers, Joseph Michaels und John D. Nixon

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Contents

Preface ..... **XIII**

1 Water Purification **1**

1.1 Drinking Clean Water 1

1.1.1 Introduction 1

1.1.2 Exercise 2

1.2 Giving Instructions 2

1.2.1 Introduction 2

1.2.2 Exercise 3

1.3 Process Description 3

1.3.1 Introduction 3

1.3.2 Exercises 5

1.4 Writing a Lab Report 8

1.4.1 Introduction 8

1.4.2 Exercises 9

2 Biomimicry **11**

2.1 Bionics, Biomimetics and Biomimicry 11

2.1.1 Text 11

2.1.2 Discussion 12

2.2 Natural Object vs. Technical Product 13

2.2.1 Exercise 1: The Kingfisher and the Shinkansen Train in Japan 13

2.2.2 Exercise 2: Burdock and Hook and Loop Fasteners 15

2.3 Bionics 17

2.3.1 Bionic Penguins – Technology-Bearers as Autonomous Underwater Vehicles 17
2.3.1.1 Text 17
2.3.1.2 Vocabulary 19
2.3.1.3 Comprehension 19
2.3.2 Honeycomb Structure 21
2.3.2.1 Text 21
2.3.2.2 Comprehension 22
2.3.2.3 Vocabulary 23

3 Autonomous Driving 27
3.1 Congressional Report on Autonomous Driving 27
3.1.1 Text 27
3.1.2 Vocabulary 32
3.1.3 Comprehension 33
3.1.4 Tense Review 34
3.1.4.1 Introduction 34
3.1.4.2 Exercise 35

4 Wind Turbines 37
4.1 An Introduction to Gearbox and Direct Drive Wind Turbines 37
4.1.1 Text 37
4.1.2 Comprehension 40
4.2 Academic Register 41
4.2.1 Introduction 41
4.2.2 Exercise 43

5 Green Aviation 47
5.1 Hydrogen: The Fuel of the Future? 47
5.1.1 Text 47
5.1.2 Comprehension 49
5.1.3 Vocabulary 50
5.2 Composite Materials 51
5.2.1 Text 51

5.2.2 Vocabulary 52
5.2.3 Discussion 53
5.3 False Friends 54
5.3.1 Definition 54
5.3.2 Exercise 55
5.4 Describing the Movement of a Graph 57
5.4.1 Introduction 57
5.4.2 Exercise 61

6 Satellites and Space Debris 63
6.1 The Mitigation of Space Debris 63
6.1.1 Text 63
6.1.2 Comprehension 68
6.1.3 Vocabulary 68
6.1.4 Exercise 70

7 Particle Physics 73
7.1 The Fundamentals of Particle Physics 73
7.1.1 Text 73
7.1.2 Comprehension 76
7.1.3 Vocabulary 77
7.2 The Next Model? 78
7.2.1 Research and Writing Task 79
7.2.2 Meditation Task and Speaking Exercise 80
7.3 Common Chemical Elements from the Periodic Table 80
7.3.1 Exercise 80
7.3.2 Comprehension 81

8 Materials 83
8.1 Introduction 83
8.1.1 Warm-Up Exercise 83
8.1.2 Group Work 83
8.2 Concrete 84
8.2.1 Text 84

8.2.2 Exercise 1: Mix and Match ... 86
8.2.3 Exercise 2: Mix and Match ... 86
8.2.4 Comprehension ... 87
8.3 Steel ... 88
8.3.1 Text ... 88
8.3.2 Exercise 1: Mix and Match ... 90
8.3.3 Exercise 2: Definition ... 91
8.3.4 Comprehension ... 91
8.4 Timber ... 92
8.4.1 Text ... 92
8.4.2 Exercise 1: Label the Illustration ... 94
8.4.3 Exercise 2: Mix and Match ... 95
8.4.4 Comprehension ... 96
8.5 Discourse Markers ... 97
8.5.1 Exercise ... 97
8.5.2 Group Work ... 98

9 High-rise and Skyscraper Construction ... 105
9.1 The History of Skyscraper Construction ... 105
9.1.1 Text ... 105
9.1.2 Vocabulary ... 107
9.1.3 Exercise: Label the Illustration ... 108
9.2 The Gherkin – One of the World's Most Iconic Buildings ... 109
9.2.1 Using Prepositions: Introduction ... 109
9.2.2 Using Prepositions: Exercise ... 112

10 Bridges ... 115
10.1 Bridge Elements ... 115
10.1.1 Text ... 115
10.1.2 Exercise 1: Label the Illustration ... 116
10.1.3 Exercise 2: Mix and Match ... 117
10.1.4 Exercise 3: Mix and Match ... 118
10.2 A Bridge for Every Situation ... 119
10.2.1 Listening Comprehension ... 119

10.2.2 Exercise 1: Punctuation 122
10.2.3 Exercise 2: Punctuation 122
10.2.4 Exercise 3: Punctuation 124

11 Appendix 1: James Bond 007—Reading Numbers Aloud in English 127
11.1 Multiple Digits 127
11.2 Zero 127
11.3 The Decimal Point 128
11.4 Plural Forms and False Friends 129
11.5 Dates 129
11.6 Fractions 130
11.7 Percent 130

12 Appendix 2: Mathematical Symbols and Formulae 131

13 Appendix 3: Example of a Lab Report 133

14 Appendix 4: Student's Lexicon 139

15 Answer Key 143
15.1 Chapter 1 143
15.1.1 Section 1.1.2, Exercise 143
15.1.2 Section 1.2.2, Exercise 143
15.1.3 Section 1.3.2, Exercises 144
15.1.4 Section 1.4.2, Exercises 146
15.2 Chapter 2 147
15.2.1 Section 2.1.2, Discussion 147
15.2.2 Section 2.2.1, Exercise 1: The Kingfisher and the Shinkansen Train in Japan 147
15.2.3 Section 2.2.2, Exercise 2: Burdock and Hook and Loop Fasteners 148
15.2.4 Section 2.3.1.2, Vocabulary 148
15.2.5 Section 2.3.1.3, Comprehension 149
15.2.6 Section 2.3.2.2, Comprehension 149
15.2.7 Section 2.3.2.3, Vocabulary 149

15.3 Chapter 3 150
15.3.1 Section 3.1.2, Vocabulary 150
15.3.2 Section 3.1.3, Comprehension 151
15.3.3 Section 3.1.4, Tense Review 151
15.4 Chapter 4 152
15.4.1 Section 4.1.2, Comprehension 152
15.4.2 Section 4.2.2, Exercise 152
15.5 Chapter 5 153
15.5.1 Section 5.1.2, Comprehension 153
15.5.2 Section 5.1.3, Vocabulary 153
15.5.3 Section 5.2.2, Vocabulary 154
15.5.4 Section 5.2.3, Discussion 154
15.5.5 Section 5.3.2, Exercise 155
15.5.6 Section 5.4.2, Exercise 157
15.6 Chapter 6 158
15.6.1 Section 6.1.2, Comprehension 158
15.6.2 Section 6.1.3, Vocabulary 158
15.6.3 Section 6.1.4, Exercise 158
15.7 Chapter 7 159
15.7.1 Section 7.1.2, Comprehension 159
15.7.2 Section 7.1.3, Vocabulary 159
15.7.3 Section 7.2.1, Research and Writing Task 160
15.7.4 Section 7.2.2, Meditation Task and Speaking Exercise 160
15.7.5 Section 7.3.1, Exercise 160
15.7.6 Section 7.3.2, Comprehension 161
15.8 Chapter 8 161
15.8.1 Section 8.1.1, Warm-Up Exercise 161
15.8.2 Section 8.1.2, Group Work 161
15.8.3 Section 8.2.2, Exercise 1: Mix and Match 161
15.8.4 Section 8.2.3, Exercise 2: Mix and Match 162
15.8.5 Section 8.2.4, Comprehension 163
15.8.6 Section 8.3.2, Exercise 1: Mix and Match 163
15.8.7 Section 8.3.3, Exercise 2: Definition 164

15.8.8 Section 8.3.4, Comprehension 164
15.8.9 Section 8.4.2, Exercise 1: Label the Illustration 164
15.8.10 Section 8.4.3, Exercise 2: Mix and Match 165
15.8.11 Section 8.4.4, Comprehension 165
15.8.12 Section 8.5.1, Exercise 166
15.8.13 Section 8.5.2, Group Work 167
15.9 Chapter 9 167
15.9.1 Section 9.1.2, Vocabulary 167
15.9.2 Section 9.1.3, Label the Illustration 168
15.9.3 Section 9.2.2, Using Prepositions: Exercise 168
15.10 Chapter 10 170
15.10.1 Section 10.1.2, Exercise 1: Label the Illustration 170
15.10.2 Section 10.1.3, Exercise 2: Mix and Match 170
15.10.3 Section 10.1.4, Exercise 3: Mix and Match 172
15.10.4 Section 10.2.1, Listening Comprehension 172
15.10.5 Section 10.2.2, Exercise 1: Punctuation 173
15.10.6 Section 10.2.3, Exercise 2: Punctuation 174
15.10.7 Section 10.2.4, Exercise 3: Punctuation 174
15.11 Chapter 12 (Appendix 2) 175

Preface

This book draws on the collective experience and expertise of four English instructors from the University of Stuttgart's Language Center, who have each taught various courses in the areas of English for Specific Purposes (ESP) and academic English for well over a decade. Each instructor has specialized over the years in a particular area of technical English, such as English for Civil Engineering, English for Chemistry or English for Space Engineering. The idea behind the book was to bring together the ample material that we have developed over the length of our careers to create an ESP textbook for technical English courses at a solid C1 level, given that much of the published material already on the market fell short of this advanced level or was not particularly relevant to or appropriate for university students.

The texts contained in this book have either been drawn from authentic material in the respective scientific or engineering fields or been written using scientific and technical information from reputable sources. The goal was to bring together textual material from a variety of fields that was both challenging and accessible to non-experts.

While this book is intended as a textbook to accompany technical English courses at post-secondary institutions across the German-speaking world, if one disregards the occasional contrastive language exercises (English vs. German), it could easily be used for ESP classes anywhere. Students are not expected to have in-depth knowledge of each topic, and it is unlikely that all of the chapters in the book could be covered in one technical English course. Therefore, this book can easily be implemented in different English-language programs requiring technical English by selecting the relevant chapters or individual academic English exercises from throughout the book. Furthermore, this textbook can be used by engineers and scientists who have already begun their careers as part of a structured course or as a means of self-study.

Users of this book should a have a firm grasp of general English. The book is geared towards a C1 level of English as outlined by the Common European Framework of Reference for Languages or UNIcert Level III. Not only are technical English topics

covered, but also elements of academic writing, such as discourse markers and register, are explored throughout. In this way, the book goes beyond simply providing technical jargon by pointing out vocabulary and expressions typical of academic English. As is often the case in ESP classes, the line between technical and academic English cannot be clearly delineated.

The referencing standard in academic writing can vary from field to field and even within one field. For this book, the Chicago and IEEE citation styles were chosen as they can be found in a number of scientific and engineering publications. They are also similar to several other citation styles found in technical texts. Both the author-date system and bracketed number referencing system are used to expose students to these two common practices.

As the material has been taken from a number of sources in its original context or written by instructors of diverse backgrounds, the variety of English differs from chapter to chapter. Consequently, British English spelling co-exists alongside American and Canadian spelling. This should not be viewed as inconsistent, but rather as representative of the global varieties of English that students will encounter in their studies and careers.

This book is a combination of reader and workbook. Space has generally been provided so that students can enter their answers into the book as they work through the exercises under the guidance of an instructor or on their own.

Although there is emphasis on reading comprehension, vocabulary and writing skills, there are exercises throughout the textbook that provide practice for listening comprehension, speaking and mediation. A few task-oriented exercises have also been provided to allow the students to employ all of their English-language resources in authentic, real-life situations.

We would like to thank all of the individuals who provided help and advice along the way and in particular the companies and governmental organizations that granted us permission to use their material as a basis for our exercises. We are also indebted to our students, whose enthusiasm for English and thirst for knowledge have spurred us to research new fields over the years and to compile some of our material in this book. Finally, we would like to express our gratitude to Hanser Publishing for supporting us on this project and publishing this manuscript.

Stuttgart, December 2023

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Gretchen Chojnacki-Herbers

Joseph Michaels

John D. Nixon

1 Water Purification

1.1 Drinking Clean Water

1.1.1 Introduction

The natural water cycle includes processes that help to filter the natural water to make it potable (Figure 1.1). Nevertheless, not all water that has gone through the natural process is fit to be drunk by humans.

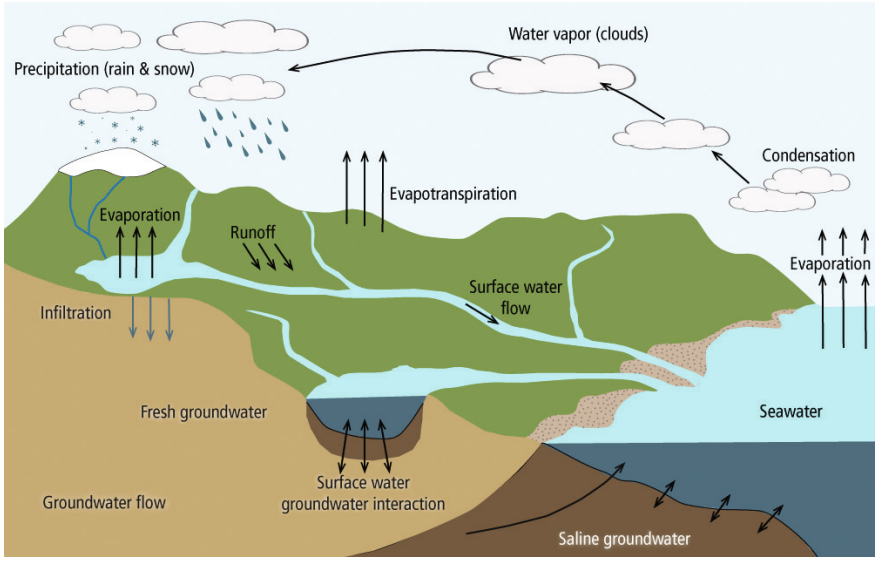


Figure 1.1 The water cycle (source: Cabibbo 2022)

1.1.2 Exercise

1. What technical challenges must be overcome to ensure that all people have access to clean water?

_____

_____

_____

_____

2. What types of systems are in place to maintain the water supply?

_____

_____

_____

_____

Later in this chapter, you will find a process description of a water treatment plant (Section 1.3.2), but first we will discuss the importance of giving clear instructions.

■ 1.2 Giving Instructions

1.2.1 Introduction

Giving clear, concise and appropriate instructions is a necessary skill when working in a lab or in a team. When thinking about what information is required, one must keep the audience and purpose in mind.

Audience: Who is being addressed? Do you know the audience? What previous information (if any) does the audience have about the topic? What type of experience does the audience have regarding the topic? Knowing whom you are addressing will help you when considering what information needs to be included and in what register the information should be written. Register refers to the level of formality in language. A formal register is directed to a professional contact, a person in a high position or a person of authority, such as a judge. An informal register is directed to someone with whom one is familiar, a friend or friendly acquaintance or a person of a lower position.

Purpose: Why are you writing? Are you imparting information? Are you telling someone what to do? Are you expressing your opinion? Are you trying to convince

someone of your point of view? The audience you are addressing as well as the purpose will influence the language you use (vocabulary, grammar, detail), as well as the level of formality.

1.2.2 Exercise

Think about a situation when you were responsible for telling someone what to do. What were some factors that you needed to consider?

_____

_____

_____

_____

1.3 Process Description

1.3.1 Introduction

A process description is a useful way of describing an experiment, explaining how a machine works, or telling a colleague how a task is completed (Focus 2017). There is a simple structure which should be utilized so that the reader is able to follow the description of the task without much difficulty.

Introductory Statement

As in most essay-style texts, it is useful to include an introductory statement, which explains what the process is. This gives the reader an overview of what is happening, why the process is useful and what the outcome should be. The introduction should also incorporate limitations of the process. Information about the number of steps in the process may also be included in this statement.

Useful phrases for an introductory statement:

- This process describes …
- The process of … is useful for …
- An (experiment) is done in order to …
- A (machine) is used to …
- The diagram illustrates …

- The diagram indicates …
- The picture shows …
- The chart depicts how …

Example:

Ground water is often found in aquifers or underground rock layers containing water. The water found in aquifers has undergone a natural filtration process. This process is a part of the water cycle. Water contained in aquifers may still require further filtration and cleaning in order to be suitable for human consumption. This text will describe the natural filtration process. **Natural filtration begins when precipitation hits the ground.**

Ordinal Numbers and Sequential Words

Since a process description is describing a step-by-step process, it is useful to include **ordinal numbers** and **sequential words** to show the reader the order in which the steps should be completed. Remember that after a sequential word, one cannot use an ordinal number again.

Correct: First, take out the supplies. **Second**, add the solvent to the solute. **Next**, mix the solution using a magnetic stirrer. **Finally**, cool the solution using an ice bath.

Incorrect: First, take out the supplies. **After that**, add the solvent to the solute. **Third** (= **incorrect**), mix the solution using a magnetic stirrer. **Finally**, cool the solution using an ice bath.

Ordinal numbers	Sequential words
First, …	Next, …
Second, …	To begin with, …
Third, …	Subsequently, …
Fourth, …	Following this/that, …
Fifth, …	The next step is …
Sixteenth, …	When …
Once[1]	After that, …
	Finally, …
	The final step is …

[1] to show two actions in one sentence

Example using ordinal numbers:

The **first step** in the natural water filtration cycle is precipitation. **Second**, the water infiltrates the soil and reaches a sand and gravel layer. **Third**, the water is filtered as it passes through the sand and gravel layer.

Example using sequential words:

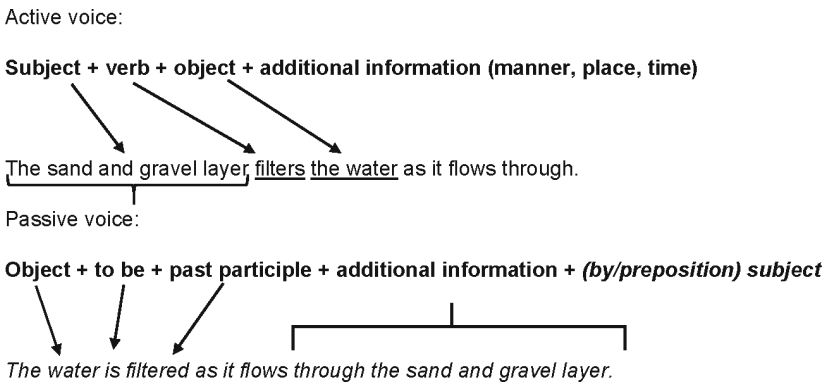
After the rain hits the ground, the water infiltrates the soil. **Next**, the water flows through the soil and reaches a sand and gravel layer. **Following this**, the water is filtered as it flows through the sand and gravel layer.

Example using both ordinal numbers and sequential words:

The **first step** in the natural water filtration cycle is rain. **In the second step**, the water infiltrates the soil and reaches a sand and gravel layer. **Next**, the water is filtered as it flows through the sand and gravel layer.

Grammatical Features

Since a process description illustrates a situation which is always the case, the simple present is used. In addition, the person completing the action is of little to no importance, or as in the case above, there is no actor. That is why the passive voice is a common feature of process descriptions.



1.3.2 Exercises

When it rains, water goes into the soil. First, the water goes into the unsaturated zone. Next, it flows down to the water table and enters the saturated zone. In Figure 1.2, the saturated zone is blue. Third, the dirt and sand in the soil clean the water. After that, it collects in underground cracks and basins. Finally, people can collect the water and drink it. That's how an aquifer forms.

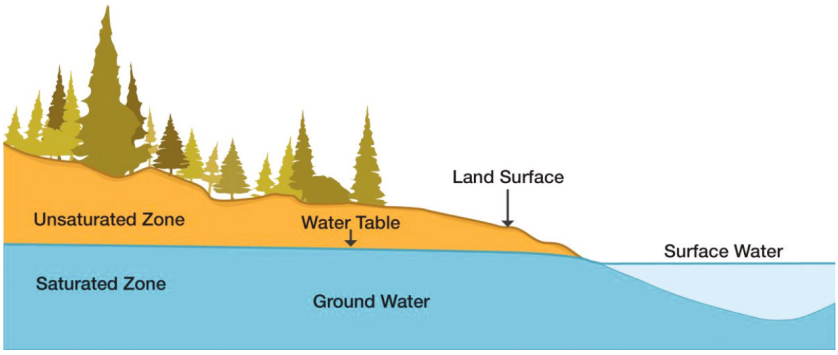


Figure 1.2 Ground and surface water sources (source: Centers for Disease Control and Prevention, Water Sources 2022)

1. The previous process description of natural water filtration based on Figure 1.2 contains a number of errors according to the rules above. With a partner, list all of the errors you can find.
   a) _____
   b) _____
   c) _____
   d) _____
   e) _____
   f) _____
   g) _____
2. Re-write the process description. You may use some of the example sentences presented here.

_____
_____
_____
_____
_____
_____
_____
_____

3. Write a process description for filtering water at a water filtration plant. You can find a diagram (Figure 1.3) as well as important vocabulary below (courtesy of Centers for Disease Control and Prevention, Water Treatment 2022).

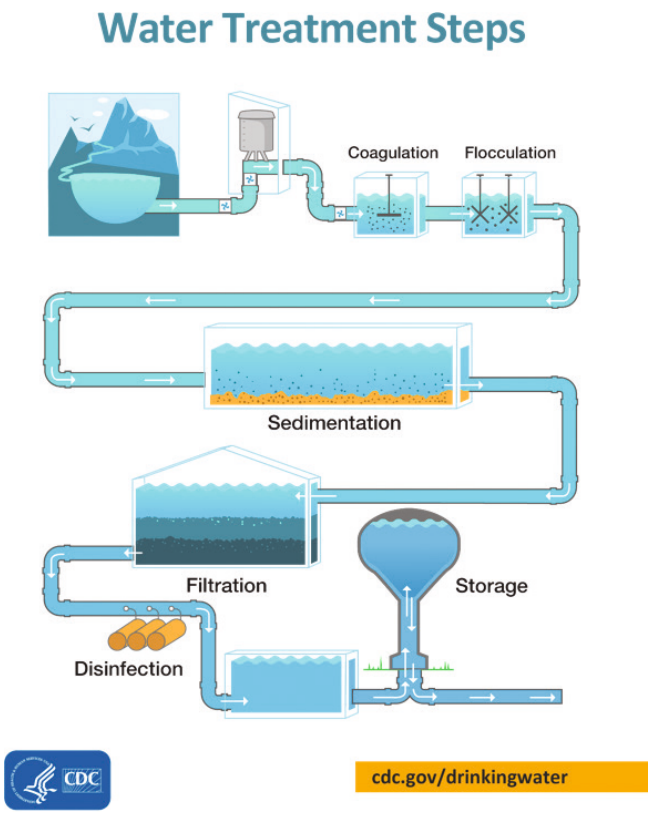


Figure 1.3 Steps in water treatment (source: Centers for Disease Control and Prevention, Water Treatment 2022)

Vocabulary

Adsorption: the adhesion of particles (ions, atoms, molecules) from a fluid or dissolved solid to a surface

Clarification: the separation of formed precipitates using either settlement or flotation techniques

Coagulation: the process whereby positively charged metal salts are added to the water and rapidly mixed to neutralize negatively charged particulates, colloidal and dissolved contaminants, resulting in the formation of floc particle agglomerations[2]

Filtration: the physical process that occurs when liquids, gases, dissolved or suspended matter adhere to the surface of, or in the pores of, an absorbent medium

Flocculation: the gentle mixing of water to form larger, heavier particles called flocs. Often, water treatment plants will add additional chemicals during this step to help the flocs form.

Ground water: water found under the surface, absorbed either in the soil or between crevices in rocks

Mechanisms: a system of parts working together in a machine

Reverse osmosis: the flow of fluids, gases or dissolved fluids that moves from an area of high concentration to one of lower concentration, which is the reverse of the natural flow

Sedimentation: the process whereby heavier particles settle to the bottom

Straining: the flowing of a fluid through a porous material to separate out solid particles

Surface water: water that collects on the surface of the earth in streams, rivers, ponds, lakes and oceans

■ 1.4 Writing a Lab Report

1.4.1 Introduction

A lab report is a written overview of what was completed in the lab during an experiment. It is a necessary aspect of lab work and follows a very specific format. This ensures that all readers are able to follow what was done easily.

[2] accumulations

Purpose: to express what was completed in an experiment, including an overview of the steps performed as well as the results of the experiment and background on why the experiment was conducted, or why this experiment is useful

Audience: lab instructor, classmates, people who would like to complete the experiment (usually all people who have knowledge of the experiment performed)

1.4.2 Exercises

There are a number of considerations when writing a lab report. Use the chart below to guide you in thinking about what needs to be included, and how each section should be written. Work with a partner to complete the chart. Use the lab report in Appendix 3 for help. Alternatively, you can find examples of lab reports in the following links:

- *https://www.reed.edu/writing/paper_help/labreport_good.html*
- *https://www.hamilton.edu/documents/Sample%20Bio%20Lab%20Report.pdf*
- *https://physics.unc.edu/undergraduate/courses-credits-placement/sample-report*

Sections of a Lab Report		
Section	Content	Guidelines

Sections of a Lab Report		
Section	Content	Guidelines

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