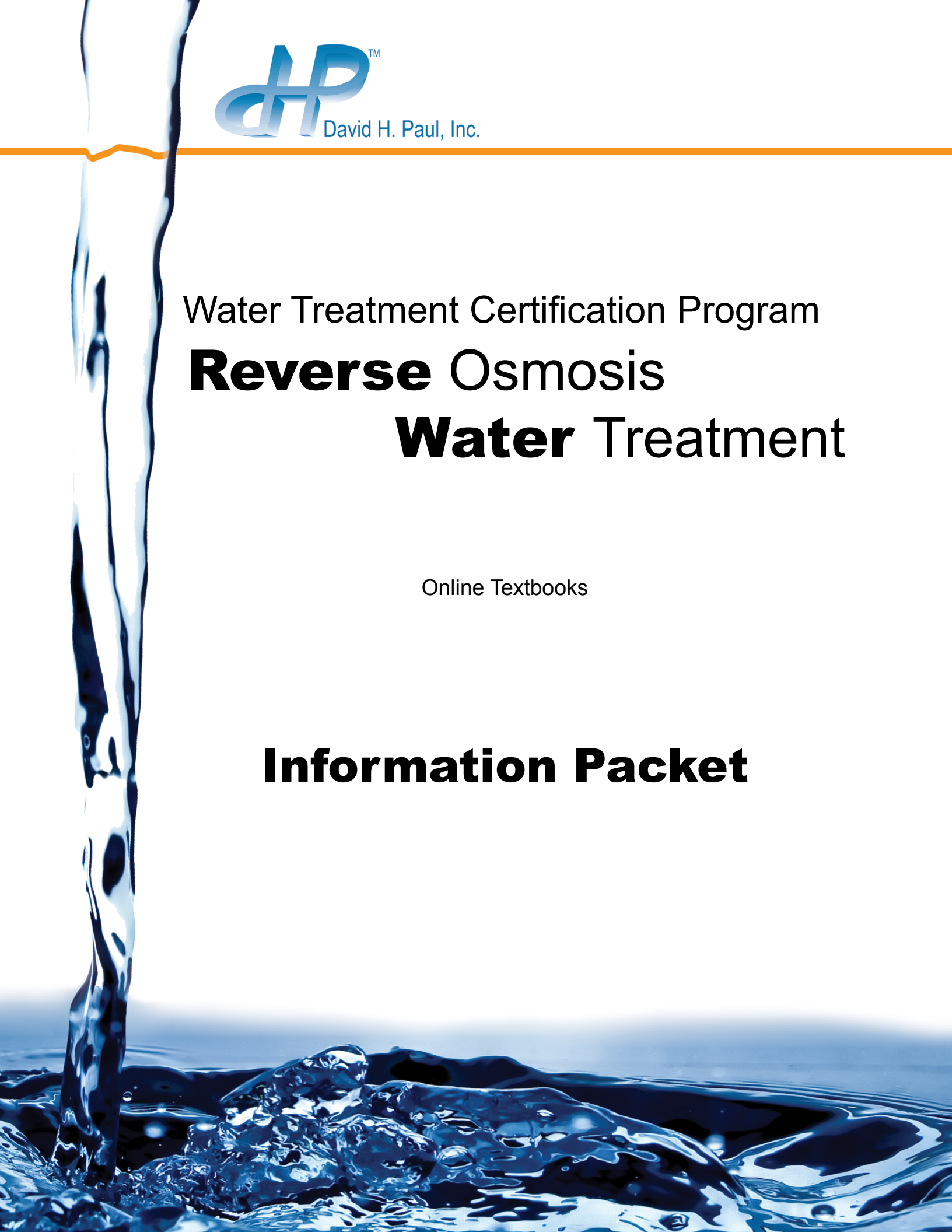
David H. Paul, Inc.

Water Treatment Certification Program

Reverse Osmosis **Water** Treatment

Online Textbooks

Information Packet



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Reverse Osmosis Water Treatment

You should take the Reverse Osmosis Water Treatment program if:

- You work with the reverse osmosis (RO) technology
- You don't need hands-on RO proficiency certification, you only need knowledge certification

The Reverse Osmosis Water Treatment certification program consists of the following:

3 Online Textbooks

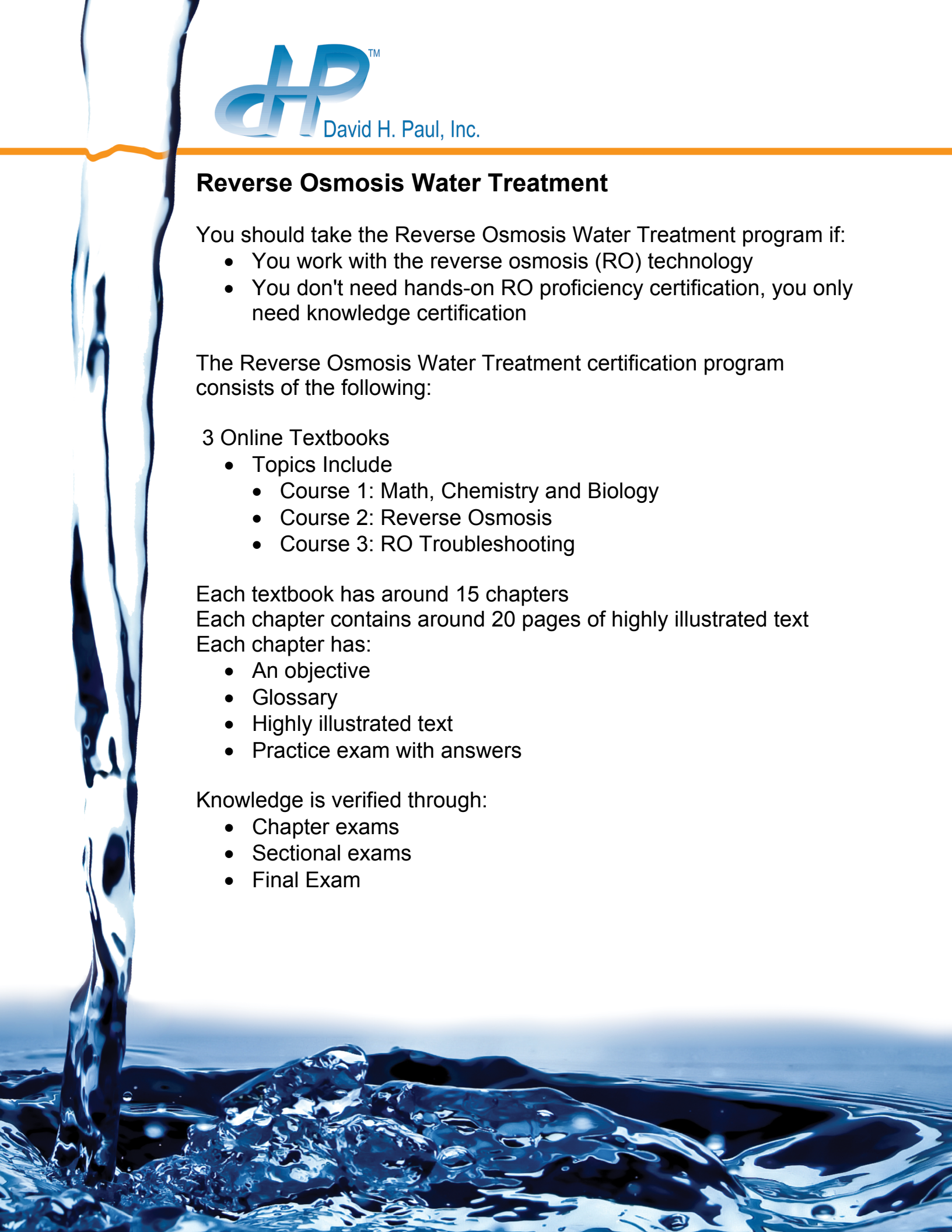
- Topics Include
  - Course 1: Math, Chemistry and Biology
  - Course 2: Reverse Osmosis
  - Course 3: RO Troubleshooting

Each textbook has around 15 chapters
Each chapter contains around 20 pages of highly illustrated text
Each chapter has:

- An objective
- Glossary
- Highly illustrated text
- Practice exam with answers

Knowledge is verified through:

- Chapter exams
- Sectional exams
- Final Exam



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ROWT Course Breakdown

Reverse Osmosis Water Treatment (ROWT)

INWT 145: (3) Math, Chemistry, Biology

1. Whole Numbers, Fractions, Decimals
2. Scientific Notation & Significant Figures
3. Addition & Subtraction
4. Multiplication & Division
5. Solving Equations

Sectional Exam

6. Atoms & Molecules
7. Atomic & Molecular Bonds
8. Properties of Water
9. Dissolved Substances: Ions
10. Dissolved Substances: Other
11. Dissolved Substances: Measurement

Sectional Exam

12. Suspended Substances: Nonliving Particles
13. Suspended Substances: Microorganisms
14. Suspended Substances: Measurement

INWT 146: (3) Reverse Osmosis

15. Pretreatment: Overview
16. Particulate Control: Overview
17. Microbial Control: Overview
18. Scale Control: Overview

Sectional Exam

19. Reverse Osmosis: Theory Of Osmosis
20. Reverse Osmosis: Theory Of Osmosis
21. Reverse Osmosis: Reversing Osmosis
22. Semipermeable Membranes: What Are They?
23. Cellulose Acetate & Thin Film Membranes

Sectional Exam

24. Membrane Performance: Water & Salt Flux
25. Membrane Performance: What Gets Rejected
26. Membrane Elements: Construction
27. Membrane Elements: Characteristics
28. Reverse Osmosis Unit: Equipment
29. Reverse Osmosis Unit: Design Criteria
30. Reverse Osmosis Unit: Unit Operation

Sectional Exam

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INWT 147: (3) RO Troubleshooting

31. Problems: Overview
32. Problems: Biofouling I
33. Problems: Biofouling II
34. Monitoring: Pressures, Flows, Conductivities
35. Monitoring: Instrumentation Calibration & Pressure Drops
36. % Salt Rejection & Normalized Permeate Flow
37. Silt Density Index

Sectional Exam

38. Troubleshooting: Profiling & Probing
39. Troubleshooting: Normalized Permeate Flow
40. Troubleshooting: Salt Rejection & Pressures
41. Chemical Cleaning: Overview
42. Chemical Cleaning: Process
43. Troubleshooting: Chemical Cleaning

Sectional Exam

Final Exam

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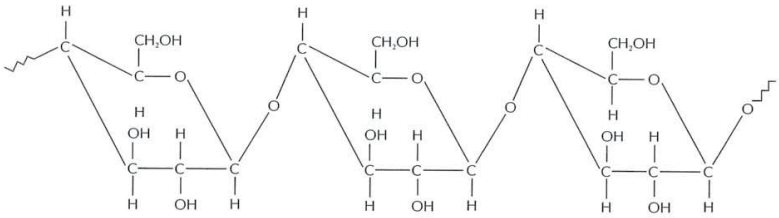
Sample Chapter

Chapter 10: Dissolved Substances - Organics

Molecular weight is important in organic chemistry since most organic molecules are quite large. Some *polymers* can have molecular weights in the millions (Figure 10.7).

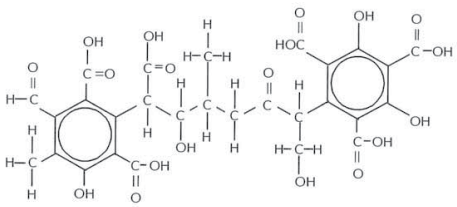


Cellulose is a straight chain polymer of cyclical glucose molecules.

Figure 10.7

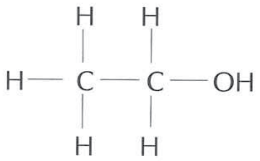
We learned earlier that RO membranes will reject ions because of their charge. The membranes will also reject non-charged compounds (like organics) based upon molecular size. Generally, any organic less than 100 molecular weight will not be well rejected (Figure 10.8). Rejection of organics also depends upon the geometry of the molecule.

Well Rejected



Fulvic Acid (MW = 650)

Not Well Rejected



Ethyl Alcohol (MW = 46)

Figure 10.8