University of Alaska Fairbanks

DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY

STUDENT HANDBOOK
2008-2009

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Introduction to the Department of Chemistry & Biochemistry

This handbook is provided as a source of more detailed information about the Department of Chemistry and Biochemistry at UAF and our course offerings, major and minor programs and tracks of study. Naturally, a single source can never be expected to answer all questions which might arise, so we urge you to seek out members of the department to answer any such questions or visit the department website at www.uaf.edu/chem. This would include specific advisors (listed below) as well as any faculty or other departmental personnel. Generally, if they cannot answer your specific questions, they can direct you to the person who can. Most important, we are interested in you and your questions.

Advisors:		
Undergraduate	William Howard (Chemistry)	REIC 192, 474-6019
	John Keller (Biochemistry)	REIC 161, 474-6042
	Cathy Cahill (Environmental & Forensic)	REIC 182, 474-6905
Graduate Coordinator	William Simpson (Environmental)	REIC 186, 474-7235
	Tom Kuhn (Biochemistry)	REIC Annex 1, 474-5752
	Marvin Schulte (Biochemistry)	REIC 184, 474-5237
Research	All Full-time Faculty (Dept)	907-474-5510
Department Chair	John Keller	REIC 161, 474-6042
Main Office	Mist D'June-Gussak	REIC 194, 474-5510

Note: REIC is the Reichardt Building formerly the Natural Science Facility

If you make an effort, you will find that you - the student - are valued and welcome within the department. If you invest your time and effort in the study of chemistry and/or biochemistry you will be well satisfied with the results. Whether your plans include Graduate study (Master's or Ph.D. level) in these or allied fields, teaching at the primary or secondary level, medical or dental school, a technical career, a career in patent law, science journalism or a host of other opportunities, we are here to help you reach these goals and to provide the opportunity for you to obtain a first-rate education with a major in a highly valued (intellectually and monetarily) field of study.

Because a major in Chemistry is a demanding program, we urge you to seek out an advisor within the Department as soon as possible (from the list above or a faculty member with whom you feel more comfortable) for consultation regarding your course of study and your progress within the Department.

In the following pages, you will find detailed descriptions of the requirements for:

Chemistry major with American Chemical Society (ACS) Certification
Chemistry major (Biochemistry Option)
Chemistry major (Environmental Option)
Chemistry major (Forensic Option)

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Chemistry -- B.A. Degree

1. Complete the general university requirements. (As part of the core curriculum requirements, complete: MATH 200X; PHYS 103X and PHYS 104X, or PHYS 211X and PHYS 212X.)
2. Complete the B.A. degree requirements. (As part of the B.A. degree requirements, complete: MATH 201X.)
3. Complete the following program (major) requirements:*
   CHEM 105X--General Chemistry--4 credits
   CHEM 106X--General Chemistry--4 credits
   CHEM 202--Basic Inorganic Chemistry--3 credits
   CHEM 212--Chemical Equilibrium and Analysis--3 credits
   CHEM 313--Chemical Analysis of Dynamic Systems--2 credits
   CHEM 321--Organic Chemistry--3 credits
   CHEM 322--Organic Chemistry--3 credits
   CHEM 324W--Organic Laboratory--4 credits
   CHEM 331--Physical Chemistry--3 credits
   CHEM 332--Physical Chemistry--3 credits
   CHEM 412--Instrumental Analytical Methods--3 credits
   CHEM 413W--Analytical Instrumental Laboratory--3 credits
   CHEM 434W--Instrumental Methods in Physical Chemistry--3 credits
   CHEM 481--Seminar--1 credits
   CHEM 482O--Seminar--2 credits
4. Complete the following:
   MATH 202X--Calculus--4 credits
5. Minimum credits required--130 credits

* Student must earn a C grade or better in each course.

Chemistry -- B.S. Degree

1. Complete the general university requirements. (As part of the core curriculum requirements, complete: MATH 200X; PHYS 103X and PHYS 104X, or PHYS 211X and PHYS 212X.)
2. Complete the B.S. degree requirements. (As part of the B.S. degree, complete: MATH 201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the program (major) requirements as listed under Chemistry--B.A. Degree.
4. Complete the following:*
   CHEM 402--Inorganic Chemistry**--3 credits
   CHEM 450--General Biochemistry -- Macromolecules--3 credits
   or CHEM 451 General Biochemistry Metabolism -- 3credits
   CHEM 488--Undergraduate Chemistry and Biochemistry Research – 4 credits
5. Minimum credits required--130 credits

* Student must earn a C grade or better in each course.
** Requires CHEM 202, CHEM322 and CHEM 332 as prerequistite.

Suggested Curriculum for an ACS accredited B.S. Degree in Chemistry:

First Year

Fall Semester	*15 credits*
CHEM 105 - General Chemistry I	4
MATH 200 – Calculus	4
ENGL 111 - Methods of Written Communication	3
LS 100X or LS 101X - Library & Information Strategies	1
Core Human Perspective Elective	3

Spring Semester	*17 credits*
CHEM 106 - General Chemistry II	4
MATH 201 - Calculus II	4
COMM 131X or 141X - Fund of Oral Comm, Group	3
2 Core Human Perspective Electives	6

Second Year

Fall Semester	*16 credits*
CHEM 212 - Chemical Equilibrium and Analysis	*3*
CHEM 313 - Chemical Analysis of Dynamic Systems	*2*
MATH 202 - Calculus III	*4*
PHYS 103 or 211 - General Physics	*4*
ENGL 211X or 213X - Intermediate Exposition	*3*

Spring Semester	*16 credits*
CHEM 202 - Basic Inorganic Chemistry	*3*
CHEM 321 - Organic Chemistry I	*3*
PHYS 104 or 212 - General Physics	*4*
Core Human Perspective Elective	*3*
Elective	*3*

Third Year

Fall Semester	*15 credits*
CHEM 322 - Organic Chemistry II	*3*
CHEM 331 - Physical Chemistry	*3*
Core Human Perspective Elective	*3*
2 Electives	*6*

Spring Semester	*17 credits*
CHEM 324W - Organic Laboratory	*4*
CHEM 332 - Physical Chemistry	*3*
Core Human Perspective Elective	*3*
Electives	*7*

Fourth Year

Fall Semester	*18 credits*
*CHEM 402 - Inorganic Chemistry	*3*
CHEM 412 - Instrumental Analytical Methods	*3*
CHEM 434W - Instrumental Laboratory	*3*
Chem 451 – General Biochemistry - Metabolism	*3*
CHEM 481 - Seminar	*1*
*CHEM 488 - Research	*2*
1 Elective	*3*

Spring Semester	*16 credits*
*Other Advanced Chemistry.	*3*
CHEM 413W - Analytical Instrumental Lab	*3*
CHEM 482O - Seminar	*2*
*CHEM 488 - Research	*2*
Electives	*6*

Upon completing the recommended curriculum and fulfilling all general university requirements, the student will receive a baccalaureate degree certified by the American Chemical Society.

The electives for a B.A. must include at least 6 credits at the upper division level (to satisfy the UAF general degree requirements for 39 upper division credits).

Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement for the B.S. degree with a major in Chemistry.

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*Advanced courses in the physical sciences, biological sciences or mathematics may be substituted with permission of the chair of the Chemistry and Biochemistry Department. However, the student will not receive an ACS-certified degree.

Chemistry -- B.S. Degree with Biochemistry/Molecular Biology Option (ACS accredited)

1. Complete the general university requirements. (As part of the core curriculum requirements, complete: MATH 200X; PHYS 103X and PHYS 104X, or PHYS 211X and PHYS 212X.)
2. Complete the B.S. degree requirements. (As part of the B.S. degree requirements, complete: MATH 201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the following program (major) requirements:*
   BIOL 115X--Fundamentals of Biology I--4 credits
   BIOL 116X--Fundamentals of Biology II--4 credits
   BIOL 342--Microbiology (4)
   or BIOL 362--Principles of Genetics (4)
   CHEM 105X--General Chemistry--4 credits
   CHEM 106X--General Chemistry--4 credits
   CHEM 212--Chemical Equilibrium and Analysis--3 credits
   CHEM 313--Chemical Analysis of Dynamic Systems--2 credits
   CHEM 321--Organic Chemistry--3 credits
   CHEM 322--Organic Chemistry--3 credits
   CHEM 324W--Organic Laboratory--4 credits
   CHEM 331--Physical Chemistry--3 credits
   CHEM 332--Physical Chemistry--3 credits
   CHEM 413W--Analytical Instrumental Laboratory** (3)
   or CHEM 434W--Instrumental Methods in Physical Chemistry (3)--3 credits
   CHEM 450--General Biochemistry—Macromolecules--3 credits
   or CHEM 451 General Biochemistry Metabolism—3credits
   CHEM 481--Seminar--1 credits
   CHEM 482O--Seminar--2 credits
   CHEM 488--Undergraduate Chemistry and Biochemistry Research (3)--3 credits
   Major elective (approved by department head)***--6 credits
4. Complete the following:
   MATH 202X--Calculus--4 credits
5. Minimum credits required--130 credits

* Student must earn a C grade or better in each course.
** Requires CHEM 412 as prerequisite.
*** CHEM 202, 402 required for ACS-accredited degree.

Suggested Curriculum for a B.S. Degree in Chemistry with Biochemistry/Molecular Biology Option

First Year

Fall Semester	*16 credits*
BIOL 105 - Fundamentals of Biology I	*4*
CHEM 105 - General Chemistry I	*4*
MATH 200 - Calculus	*4*
ENGL 111 - Methods of Written Communication	*3*
LS 100X or LS 101X- Library & Information Strategies	*1*

Spring Semester	*18 credits*
BIOL 106 - Fundamentals of Biology II	*4*
CHEM 106 - General Chemistry II	*4*
MATH 201 - Calculus II	*4*
COMM 131X or 141X - Fund of Oral Comm	*3*
Elective	*3*

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Second Year

Fall Semester	*16 credits*
CHEM 212 - Chemical Equilibrium and Analysis	*3*
CHEM 313 - Chemical Analysis of Dynamic Systems	*2*
CHEM 321 - Organic Chemistry I	*3*
MATH 202 - Calculus III	*4*
PHYS 103 or 211 - General Physics	*4*

Spring Semester	*17 credits*
CHEM 322 - Organic Chemistry II	*3*
BIOL 342 or 418 or 461 or 362	*4*
PHYS 104 or 212 - General Physics	*4*
ENGL 211 or 213 - Intermediate Exposition	*3*
Core Human Perspective Elective	*3*

Third Year

Fall Semester	*15 credits*
CHEM 324W - Organic Laboratory	*4*
CHEM 331 - Physical Chemistry	*3*
CHEM 451 - General Biochemistry - Metabolism	*3*
Core Human Perspective Elective	*3*
Electives	*3*

Spring Semester	*15 credits*
CHEM 332 - Physical Chemistry	*3*
CHEM 450 – General Biochemistry - Macromolecules	*3*
Core Human Perspective Electives	*3*
Major Elective	*3*
***Electives	*3*

Fourth Year

Fall Semester	*16-19 credits*
CHEM 402 – Inorganic Chemistry	*3*
CHEM 434W - Instrumental Methods in Phys Chemistry (or CHEM 413 spring)	*3*
CHEM 481 - Seminar	*1*
Core Human Perspective Elective	*6*
Major Elective	*3*
***Elective	*3*

Spring Semester	*14 credits*
CHEM 413W - Analytical Instrumental Laboratory**	*3*
CHEM 452W - Biochemistry Laboratory or CHEM 488 - Research	*3*
CHEM 482O - Seminar	*2*
Writing Intensive Elective	*3*
Core Human Perspective Elective	*3*

**This course requires CHEM 412 as a prerequisite.
***9 of these credits must be 300 level or above.

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Chemistry -- B.S. Degree with Environmental Chemistry Option (ACS accredited)

1. 1. Complete the general university requirements. (As part of the core curriculum requirements, complete: MATH 200X; PHYS 103X and PHYS 104X, or PHYS 211X and PHYS 212X.)
2. Complete the B.S. degree requirements. (As part of the B.S. degree, complete: MATH 201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the following:*
   CHEM 105X--General Chemistry--4 credits
   CHEM 106X--General Chemistry--4 credits
   CHEM 202--Basic Inorganic Chemistry--3 credits
   CHEM 212--Chemical Equilibrium and Analysis--3 credits
   CHEM 313--Chemical Analysis of Dynamic Systems--2 credits
   CHEM 321--Organic Chemistry--6 credits
   CHEM 324W--Organic Laboratory--4 credits
   CHEM 331, 332--Physical Chemistry--6 credits
   CHEM 412--Instrumental Analytical Methods--3 credits
   CHEM 413W--Analytical Instrumental Laboratory--3 credits
   CHEM 434W--Instrumental Methods in Physical Chemistry--3 credits
   CHEM 450--General Biochemistry—Macromolecules--3 credits
   or CHEM 451 General Biochemistry Metabolism—3credits
   CHEM 481--Seminar--1 credits
   CHEM 482O--Seminar--2 credits
   CHEM 488--Undergraduate Chemistry and Biochemistry Research (Environmental Topic)--2 credits
4. Complete the following:
   MATH 202X--Calculus--4 credits
   STAT 300--Statistics--3 credits
5. Complete two of the following courses:*
   BIOL 105X--Fundamentals of Biology I--4 credits
   BIOL 106X--Fundamentals of Biology II--4 credits
   GEOS 101X--The Dynamic Earth--4 credits
   GEOS 125X--Humans, Earth, and the Environment--4 credits
   ATM 101X--Weather and Climate of Alaska--4 credits
6. Complete one of the following advanced courses:*
   BIOL 271--Principles of Ecology--4 credits
   BIOL 342--Microbiology--4 credits
   BIOL 443W--Microbial Ecology--3 credits
   BIOL 483--Stream Ecology--3 credits
   ENVE 458--Energy and the Environment--3 credits
   NRM 380W--Soils and the Environment--3 credits
   ATM 401--Introduction to Atmospheric Science--3 credits
   CHEM 402--Advanced Inorganic Chemistry--3 credits
7. Complete one of the following advanced courses:*
   BIOL 442W,O/2--Advanced Microbiology--4 credits
   CHEM 406--Atmospheric Chemistry--3 credits
   CE 441--Environmental Engineering--4 credits
   GEOS 417--Introduction to Geochemistry--3 credits
8. Minimum credits required--130 credits

* Student must earn a C grade or better in each course.

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Suggested Curriculum for a B.S. Degree in Chemistry: Environmental Option

First Year

Fall Semester	*18 credits*
CHEM 105 - General Chemistry I	*4*
MATH 200 - Calculus	*4*
ENGL 111 - Methods of Written Communication	*3*
Course from 5th Program requirement	*4*
Core Human Perspective Elective	*3*

Spring Semester	*18 credits*
CHEM 106 - General Chemistry II	*4*
Course from 5th Program requirement	*4*
MATH 201 - Calculus II	*4*
COMM 131X or 141X - Fund of Oral Comm	*3*
Core Human Perspective Elective	*3*

Second Year

Fall Semester	*16 credits*
CHEM 212 - Chemical Equilibrium and Analysis	*3*
CHEM 313 - Chemical Analysis of Dynamic Systems	*2*
MATH 202 - Calculus III	*4*
PHYS 103 or 211 - General Physics	*4*
ENGL 211X or 213X - Intermediate Exposition	*3*
LS 100X or 101X- Library & Information Strategies	*1*

Spring Semester	*16 credits*
CHEM 202 - Basic Inorganic Chemistry	*3*
CHEM 321 - Organic Chemistry I	*3*
PHYS 104 or 212 - General Physics	*4*
Core Human Perspective Elective	*3*
Elective	*3*

Third Year

Fall Semester	*16 credits*
CHEM 322 - Organic Chemistry II	*3*
CHEM 324W - Organic Laboratory	*4*
CHEM 331 - Physical Chemistry	*3*
CHEM 451 – General Biochemistry - Metabolism	*3*
1 Core Human Perspective Elective	*3*

Spring Semester	*15-16 credits*
CHEM 332 - Physical Chemistry	*3*
STAT 300 - Statistics	*3*
Core Human Perspective Elective	*3*
Course from 6th Program requirement	*3-4*
Elective	*3*

Fourth Year

Fall Semester	*16-17 credits*
Course from 7th Program requirement	*3*
CHEM 412 - Instrumental Analytical Methods	*3*
CHEM 434W – Instrumental Methods in Physical Chemistry	*3*
CHEM 481 - Seminar	*1*
Course from 7th Program requirement	*3-4*
1 Core Human Perspective Elective or	*3*
CHEM 488 Research	*2*

Spring Semester	*16 credits*
CHEM 413W - Analytical Instrumental Lab	*3*
CHEM 482O - Seminar	*2*
CHEM 488 - Research	*2*
Core Human Perspective Elective	*3*
2 Electives	*6*

Chemistry -- B.S. Degree in Chemistry: Forensic Option

(Will count as an ACS accredited Chemistry degree)

1. 1. Complete the general university requirements. (As part of the core curriculum requirements, complete: MATH 200X; PHYS 103X and PHYS 104X, or PHYS 211X and PHYS 212X.)
2. Complete the B.S. degree requirements. (As part of the B.S. degree, complete: MATH 201X. Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement.)
3. Complete the program (major) requirements as listed under Chemistry--B.A. degree.
4. Complete the following chemistry requirements:*
   CHEM 402--Inorganic Chemistry--3 credits
   CHEM 450--General Biochemistry—Macromolecules--3 credits
   or CHEM 451 General Biochemistry Metabolism—3credits
   CHEM 488--Undergraduate Chemistry and Biochemistry Research (Environmental Topic)--2 credits
5. Complete the following justice requirements:*
   JUST 110--Introduction to Justice--3 credits
   JUST 222--Research Methods--3 credits
   JUST 251--Criminology--3 credits
   JUST 300X--Ethics and Justice**--3 credits
   JUST 354--Procedural Law--3 credits
   JUST 454W--Advanced Problems in Procedural Law--3 credits
6. Minimum credits required--130 credits

* Student must earn a C grade or better in each course.
** JUST 300X may not be used to fulfill core ethics requirement.

Suggested Curriculum for a B.S. Degree in Chemistry: Forensic Option

First Year

Fall Semester	*15 credits*
CHEM 105 - General Chemistry I	*4*
MATH 200 - Calculus	*4*
ENGL 111 - Methods of Written Communication	*3*
LS 100X or LS 101X - Library & Information Strategies	*1*
Core Human Perspective Elective	*3*

Spring Semester	*17 credits*
CHEM 106 - General Chemistry II	*4*
MATH 201 - Calculus II	*4*
COMM 131X or 141X - Fund of Oral Comm, Group	*3*
Core Human Perspective Elective	*3*
JUST 110 - Introduction to Justice	*3*

Second Year

Fall Semester	*16 credits*
CHEM 212 - Chemical Equilibrium and Analysis	*3*
CHEM 313 - Chemical Analysis of Dynamic Systems	*2*
MATH 202 - Calculus III	*4*
PHYS 103 or 211 - General Physics	*4*
ENGL 211X or 213X - Intermediate Exposition	*3*

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Spring Semester	*16 credits*
CHEM 202 - Basic Inorganic Chemistry.	*3*
CHEM 321 - Organic Chemistry I	*3*
PHYS 104 or 212 - General Physics	*4*
JUST 251 - Criminology	*3*
Core Human Perspective Elective	*3*

Third Year

Fall Semester	*18 credits*
CHEM 322 - Organic Chemistry II	*3*
CHEM 331 - Physical Chemistry	*3*
CHEM 300 - Research Ethics	*3*
JUST 222 - Research Methods	*3*
Core Human Perspective Elective	*3*
Elective	*3*

Spring Semester	*19 credits*
CHEM 324W - Organic Laboratory	*4*
CHEM 332 - Physical Chemistry	*3*
JUST 300X - Ethics and Justice	*3*
STAT 300	*3*
2 Core Human Perspective Electives	*6*

Fourth Year

Fall Semester	*18 credits*
CHEM 402 - Inorganic Chemistry	*3*
CHEM 412 - Instrumental Analytical Methods	*3*
CHEM 434W - Instrumental Laboratory	*3*
CHEM 451 - General Biochemistry - Metabolism	*3*
CHEM 481 - Seminar	*1*
CHEM 488 - Research	*2*
JUST 354 - Procedural Law	*3*

Spring Semester	*16 credits*
CHEM 452W – Biochemistry Laboratory	*3*
CHEM 413W - Analytical Instrumental Lab	*3*
CHEM 482O - Seminar	*2*
CHEM 488 - Research	*2*
JUST 454W - Advanced Problems in Procedural Law	*3*
Elective	*3*

Upon completing the recommended curriculum and fulfilling all general university requirements, the student will receive a baccalaureate degree certified by the American Chemical Society.

Chemistry foundation courses may be used toward partial fulfillment of the natural science requirement for the B.S. degree with a major in Chemistry.

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MINOR in Chemistry

A minor in chemistry requires 12/13 credits above the foundation courses (CHEM 105-106) approved by the chair of the Department of Chemistry and Biochemistry. The following courses are required:

1. Complete the following:
   CHEM 105X--General Chemistry--4 credits
   CHEM 106X--General Chemistry--4 credits
2. Complete the following approved electives:
   CHEM 212--Chemical Equilibrium and Analysis*--3 credits
   CHEM 321 & CHEM 322--Organic Chemistry--6 credits
   CHEM 331 & CHEM 332--Physical Chemistry--6 credits
3. Complete two of the following chemistry lab courses:
   CHEM 202--Basic Inorganic Chemistry--3 credits
   CHEM 313--Chemical Analysis of Dynamic Systems*--2 credits
   CHEM 324--Organic Chemistry Lab--4 credits
4. Minimum credits required--22-24 credits

* CHEM 324W may be substituted for both of these courses.

MINOR in Biochemistry

A minor in biochemistry requires 15 credits above the foundation courses (CHEM 105-106) approved by the chair of the Department of Chemistry and Biochemistry. The following courses are required:

1. Complete the following foundation courses:
   CHEM 105X--General Chemistry--4 credits
   CHEM 106X--General Chemistry--4 credits
2. Complete the following:
   CHEM 321--Organic Chemistry--3 credits
   CHEM 322--Organic Chemistry--3 credits
   CHEM 331--Physical Chemistry--3 credits
   CHEM 451--General Biochemistry--Metabolism--3 credits
3. Complete two of the following chemistry lab courses:
   CHEM 202--Basic Inorganic Chemistry--3 credits
   CHEM 313--Chemical Analysis of Dynamic Systems--2 credits
   CHEM 324--Organic Chemistry Lab--4 credits
4. Minimum credits required--25-27 credits

Requirements for Chemistry Teachers (grades 7 – 12)

1. Complete all the requirements of the chemistry B.A. or B.S. degree you wish to seek.
2. All prospective chemistry teachers must complete the following:
   CHEM F450—General Biochemistry Macromolecules (3)
   or CHEM F451—General Biochemistry Metabolism—3 credits
   CHEM F488—Undergraduate Chemistry and Biochemistry Research—4 credits
3. All prospective science teachers must complete the following:
   PHIL F481—Philosophy of Science (3)—3 credits

Note: We strongly recommend that prospective secondary science teachers seek advising from the UAF School of Education early in your undergraduate degree program so that you can be appropriately advised of the state of Alaska requirements for teacher licensure. You will apply for admission to the UAF School of Education's post-baccalaureate teacher preparation program, a one-year intensive program, during your senior year. Above requirements apply to all candidates who apply to the UAF School of Education Spring 2006 or later for licensure in chemistry.

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Department of Chemistry & Biochemistry Faculty

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Stock Clerk

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Administrative Assistant

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