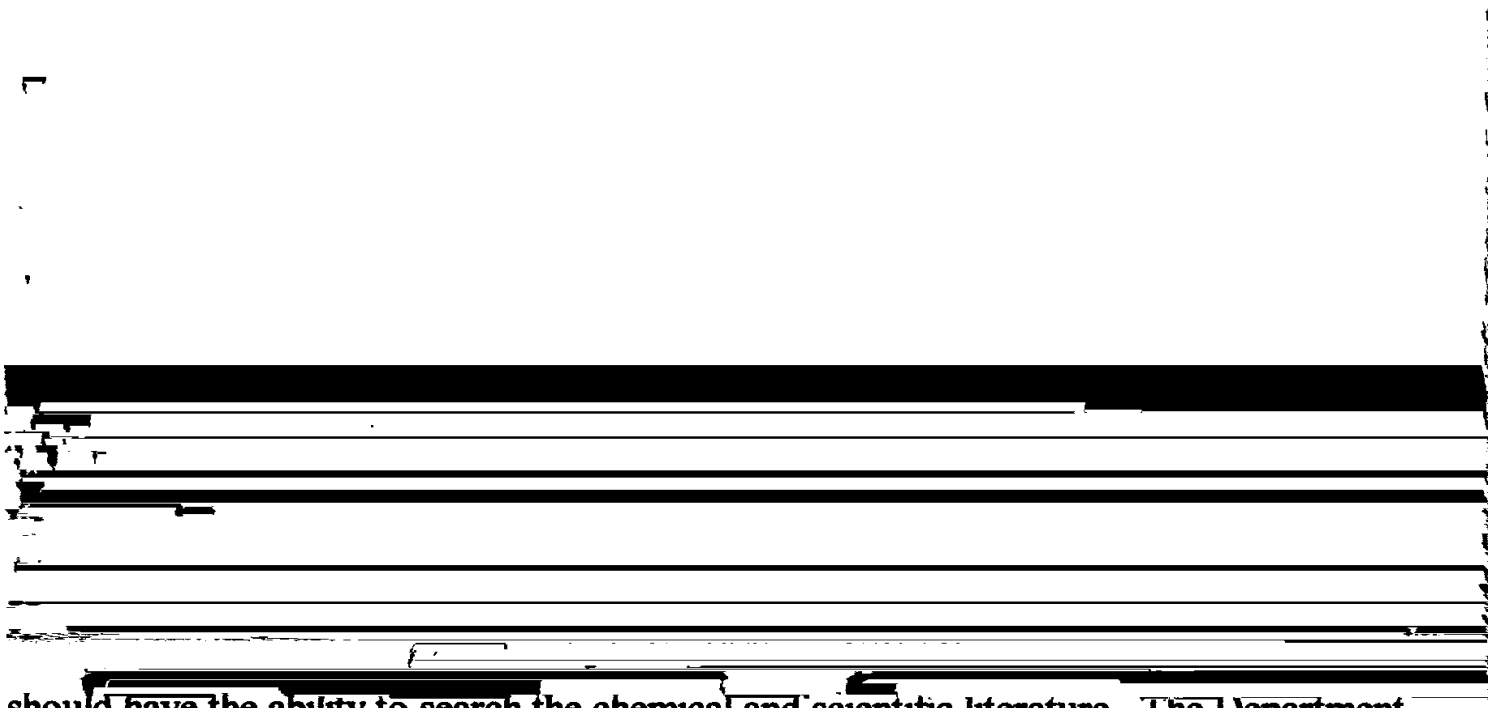
CALIFORNIA STATE UNIVERSITY, HAYWARD

Assessment Plan

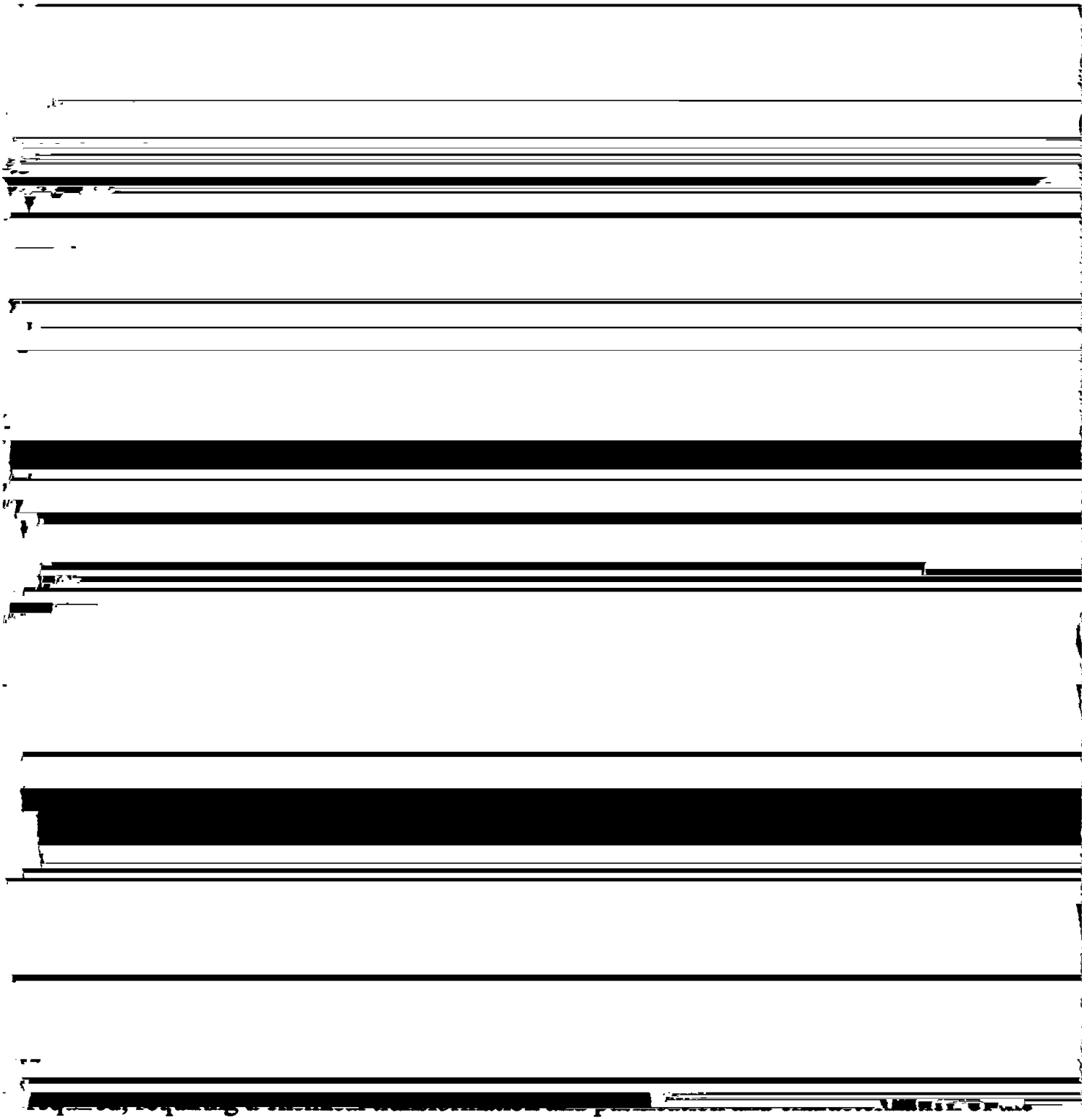
Department of Chemistry and Biochemistry

Richard Luibrand
Department Chair
Winter Quarter 2002



should have the ability to search the chemical and scientific literature. The Department recognizes the importance of the pursuit of new knowledge through research in the development of skilled scientists and productive members of society, and encourages its students to participate in research projects and cooperative educational opportunities.

chemical reactivities and classification tests, the ability to obtain spectroscopic data, especially FT-IR, and the ability to interpret the results. At least one derivative will be



product. A satisfactory criterion will be correct identification by 90% of the students.

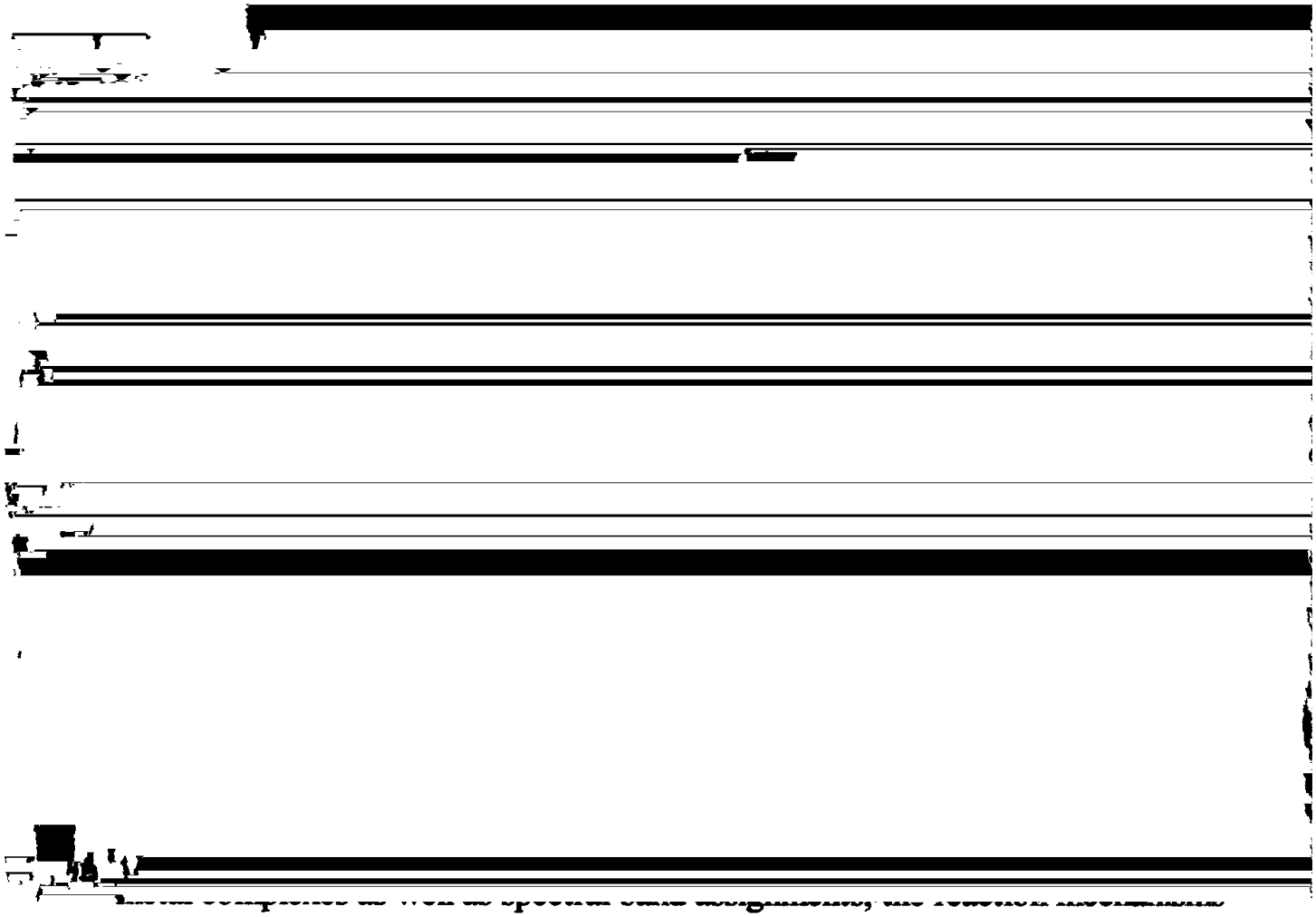
students.

The Outcomes Criteria for objective 9 will be based evaluation of student presentations, scored for quality of literature search, discussion of relevant chemistry, organization, and

above for 90% of the students.

chemistry to describe and understand the two important classifications of chemical reactions (1) acid/base and (2) oxidation/reduction. Concepts that should be learned include the important definitions of acids/bases including protonic and nonprotonic and solvent-based definitions.
Students are also expected to learn how to use emf calculations to predict redox reactions in aqueous solutions.

4. **Coordination Chemistry** – Topics to be learned include nomenclature of coordination complexes, valence bond and ligand field theories of coordination compounds, assignments of ground and excited electronic states of transition



of ligand substitution reactions and the mechanisms of photochemical reactions for transition metal complexes.

5. **Organometallic compounds** - Students are expected to learn the most important types of metal- organic ligand complexes involving pi and sigma metal-carbon coordination bonding.

GC Mass Spec, magnetic susceptibility balance, diode array uv and visible spectrophotometer, and FT-IR. In the process they will practice using some of the basic laboratory procedures important to chemical research including refluxing, distillation, digestion, sublimation, filtration, reagent handling, safety procedures, micropipetting, and melting point measuring. They also are expected to learn how to search the chemical literature for ideas and corroboration of their results and explanations. They are also expected to learn how to write up their results as printed reports that include data and graphs in a style and format that would be acceptable to scientific review.

The outcome criteria are based on careful evaluation of laboratory technique, experiment results, and the laboratory reports. The reports will be returned for correction and rewriting if necessary.

biochemical reations.

2. understand the unique chemistry of Adenosine Triphosphate (ATP) -- including standard and actual free energy change values for ATP hydrolysis.
3. know the structure and properties of biologically-important carbohydrates.

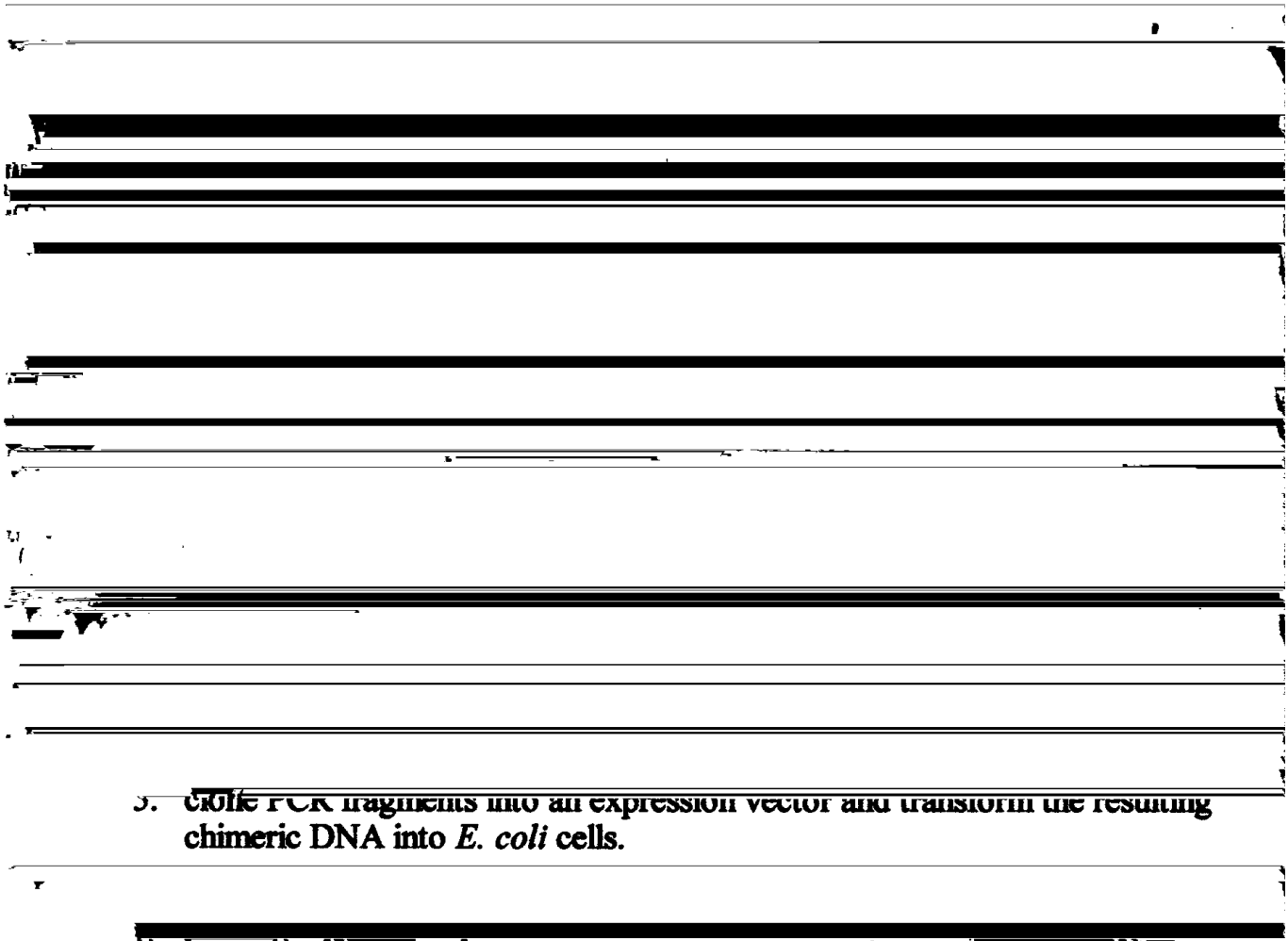
cell --including glycolysis, gluconeogenesis, glycogen metabolism, the citric acid cycle, electron transport system, oxidative phosphorylation, and fatty acid oxidation.

Chemistry 4413 -General Biochemistry (4 units)

Students who successfully complete this course should:

1. know the basics of protein and amino acid metabolism -- including amino acid catabolism and anabolism and the urea cycle.
2. know the structure and properties of the purine and pyrimidine nucleotides.
3. know the structural details of the DNA molecule and how it is able to replicate.
4. know the structural details of the RNA molecule and how RNA synthesis and processing occurs in the cell.
5. know how proteins are synthesized in the cell using ribosomes, tRNA, and mRNA.

1. know how to isolate and quantitate plasmid DNA.
2. understand the theoretical basis for the Polymerase Chain Reaction (PCR) technique and know the important methodologies for cloning PCR products.
3. amplify various segments of a DNA molecule using PCR.
4. analyze the DNA products of a PCR experiment for size and purity using



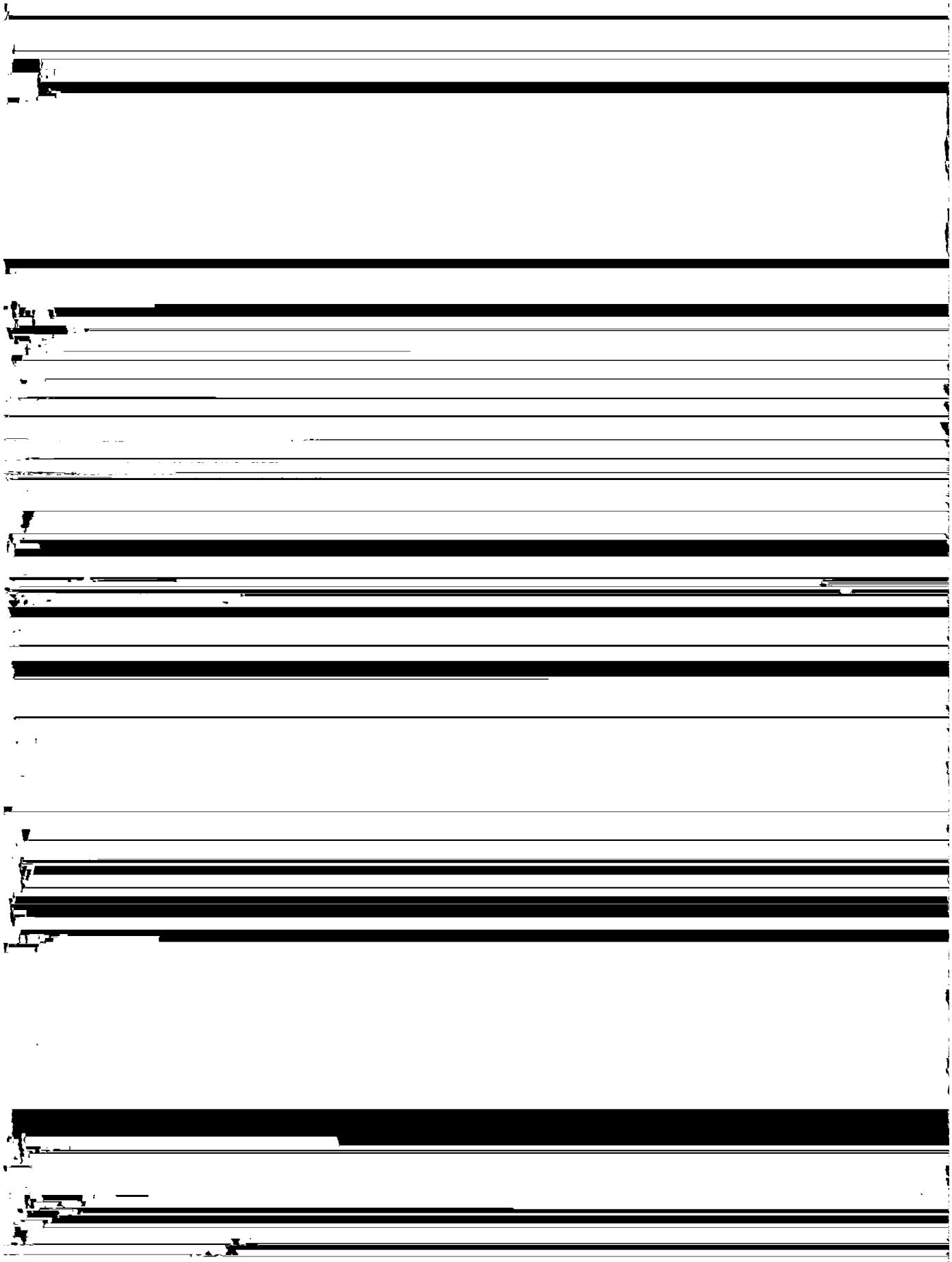
5. clone PCR fragments into an expression vector and transform the resulting chimeric DNA into *E. coli* cells.

6. know the theoretical basis for and practical details of performing a Western Blot using SDS-PAGE, electroblotting and detection with primary antibody and enzyme-conjugated secondary antibody.

Outcomes Criteria for Chemistry 4430 and 4431- Biochemistry Laboratory Courses

Specific questions will be embedded into regular course exams/quizzes . These questions will be either multiple-choice or short-answer/essay or problem-solving questions. The specific embedded questions will assess the theoretical/procedural/analytical Goals and Objectives of each course.

Exams completed by Chemistry or Biochemistry majors will be identified and the responses to the embedded questions will be tallied and recorded.
A specific objective will be considered to be achieved if 70% of the students correctly answer the embedded question(s) pertinent to that objective.



tissue.

3. understand the biochemistry unique to the major organs of the body -- including skeletal muscle, heart, brain, liver, adipose tissue, kidney, and bone tissue.

[redacted]

answer the embedded questions(s) pertinent to that objective.

enthalpy, free energy, and first order decay.

7. understand how chemical pollutants can have complex effects on the environment.
8. understand the chemistry of water equilibria, ozone depletion, and the greenhouse effect.
9. participate in classroom discussions on environmental cleanup sites, ozone hole formation, and alternative energy.

The Outcomes Criteria for objectives 1-5 will be based on evaluation of the laboratory

[redacted]

notebook and of activities in the laboratory, and scoring of written reports. As a capstone project in the second quarter they will perform laboratory research on a topic of their own choosing. This will involve planning, sample collection, sample processing and analysis, evaluation of data in the context of the literature, and presentation of that topic in a poster session. A satisfactory criterion will be a score of 75 % or more on the appropriate portions of the lab report score sheets and poster presentations for 90% of the students.

The Outcomes Criteria for objectives 6-9 will be based on examinations. A satisfactory criterion will be an overall score of 75% or above for 90% of the students. Examinations will include questions based on information students provide in classroom discussions.

Addendum April 3, 2002

The data collection element in this plan will go into effect as of Spring Quarter, 2002. Data will be analyzed by each of the instructors, and a preliminary report will be made to the chemistry faculty in the Fall Quarter, 2002. Hopefully, this will lead to refinement of data collection methods so that meaningful results will be in hand by the end of Spring Quarter 2003.