Required Homework Format

Department of Chemical Engineering
Auburn University

Purpose of this Document

The homework format described below is intended to familiarize you with the way practicing engineers actually do their work. The format includes most of the elements required by professional engineering offices, and it includes common standards for the presentation of computations, tables and graphs.

In professional practice, all written work is kept as a record of the engineering/design/construction process. Such records are needed to show that accepted engineering and design methodologies were employed, to establish professional responsibility for the work, to justify time sheets, to justify client billings, to permit error checking and correction and to provide a record of the as-built facility.

For these reasons, actual engineering worksheets contain information that identifies the responsible worker and checker, the date the work was done, the project name and account number, task name and account number, and page numbers, including the total number of pages in the task, so that missing pages can be detected. All work must be checked by others and must be filed for future retrieval and reference. Also, it may be necessary to excerpt portions of the work for transcription to databases or other reports.

Consequently, it is essential that work results and records be presented in prescribed formats that are familiar to their users. The use of familiar formats makes data recovery and checking faster and more accurate, which enhances the productivity of the firm or agency. The details of the prescribed formats vary from company to company and agency to agency, but these variations do not mean that formats are unimportant.

Herein presented are those format elements which the Department of Chemical Engineering at Auburn University has adopted. These should be used in all courses unless specifically indicated otherwise by the professor.

These same standards apply to examinations and quizzes as appropriate.

WORK WHICH DOES NOT ADHERE TO THESE STANDARDS MAY BE RETURNED UNGRADED OR CREDIT MAY BE DEDUCTED AT THE PROFESSOR'S DISCRETION.

Paper

Paper

- "Engineering paper" (National 42-182, 5 square or equivalent) MUST be used.
- Always use the unruled side of the paper ONLY, keeping holes on the left.
- In the case of large tables or figures, keep holes on top edge.
- Work only one problem per page.
- At the top of the page, indicate the course, student name, and problem

number as well as the page sequencing information (see example).

Folding

- Homework assignments should be turned in at the beginning of class unless the professor announces another procedure.
- Assignments should be stapled if they consist of more than one page.
- LOOSE PAPERS, PAPER CLIPS, DOG-EARS, ETC. ARE NOT ACCEPTABLE.
- Papers should be folded vertically with ruled side out.

Identification

PRINT THE FOLLOWING INFORMATION IN THE FOLLOWING ORDER ON THE BACK OF THE OUTSIDE PAGE OF ALL ASSIGNMENTS:

- Last Name, First Name
- Course/section CHEN 2100 Sect 001
- Assignment Probs: 2-5,7,8
- Date: 12/31/2002

Example

- Doe, Mary
- CHEN 2100 Sect 001
- Probs: 2-5,7,8
- 12/31/2002

Instruments

All writing must be done in pencil and be easily readable (i.e., neatly printed or cursive letters of sufficient darkness). It is suggested a mechanical drafting pencil with grade 2B or softer lead be used. All straight lines are to drawn with a ruler. It is suggested a 6 inch clear plastic ruler be purchased. This is also an aid for reading tables and figures. A template of common drawing shapes (squares, circles, etc.) is also recommended. Circles and other curved shapes should be drawn with a template or compass or other instrument.

FREEHAND CURVES AND FREEHAND STRAIGHT LINES ARE NOT ACCEPTABLE.
WORKING IN PEN (INK) IS NOT ACCEPTABLE.

Answers

Answers are to be clearly identified. There is only to be a single answer submitted for each part of each question. The answer should be underlined twice and an arrow used in the right margin to locate it easily.

Abbreviations

Use standard abbreviations. Use standard engineering notation. Do not invent abbreviations. For reference, use your textbook, AICHE published standards, etc.

Accuracy

Avoid writing down excessive digits from calculations. Most data items should be written down to 4 significant decimal digits (i.e., molecular weights, constants, etc.). Final answers should reflect no greater than 0.1% accuracy (i.e., 3-4 significant decimal digits).

Some examples are:

345.	1.070
3.45	107.0
0.0345	0.0001070

Units

Much credit is lost in failing to use units in calculations. This does not just include writing down the units but "using them" (i.e., canceling units to determine the final units).

References

The source of all data and information used in your solution except that contained in the problem statement should be referenced. References must contain enough information so that the professor or your supervisor could easily look up your referenced data. For example, (McCabe, Table 8.3) or (Perry's Handbook, 7th Ed, p. 15-4) are sufficient if unambiguous. Web references should contain a complete URL, for example, http://www.ultrasmartstudents.com/cornflakes.html.

Sketches and Graphical Information

Provide a neat, labeled definition sketch of the problem.

If the solution is graphical, use the appropriate graph axes (e.g. arithmetic, semilog, log-log, probability) to aid the reader in obtaining accurate data from the graph. Usually this will be obtained by selecting axes which "straighten out" curves as much as possible.

Whenever possible, use the built-in graphing/drawing capabilities in MS Word™ , Excel™, MATLAB™ or other approved graphing/drawing programs. If hand drawing is unavoidable, linework should be drawn neatly using straight edges and curve guides.

Art work shall be oriented with its bottom either to the page's bottom or to the page's right hand edge.

Each sketch or graph must have a descriptive title and a figure number, and the number and title must be placed beneath the art work. Note that most graphics packages place the title above the figure. This is the style preferred by MBA's. It is not the engineering/science style.

Measured data points are indicated by symbols (e.g., circles, triangles, squares).

If no theoretical or regression line is plotted, measured data points may be connected dot-to-dot by straight (not curved) lines. If theoretical lines and regression lines are plotted, they are drawn as smooth curves or straight lines.

Do not show the calculated points used to draw the curve, and do not connect the measured data points dot-to-dot.

Completely label each graph axis, including the plotting variable name, its symbol and its units.

The grid lines on commercial graph paper are printed as an aid to the person plotting data; they are a distraction to people trying to read the graph. Therefore, do not show grid lines unless they are necessary to the usage of the graph-e.g., if it is to be used as a look-up table.

In hand-drawn graphs, plot data on the white back of the printed sheets (you can still see the grid), and draw in only the axes and major subdivisions.

If a calculation is graphical in nature, the method of usage of graphs should be clearly indicated by an example with the appropriate lines sketched in and labelled for illustration.

Tables

Each table must have a number and a title. The number and title are placed above the body of the table.

The body of the table is delimited by horizontal lines above and below it. Sometimes these lines are bold or double.

The body is divided into rows and columns. The columns always have headings, and the headings must include a verbal description of the quantity tabulated and its units. In some tables, the rows also have headings.

The columns and rows may be numbered for ease of reference.

Column and row headings are separated from the tabulated quantities by solid horizontal and vertical lines, respectively. The vertical lines are often deleted if they make the table too busy and interfere with the readers comprehension.

Some of the horizontal lines may also be eliminated to improve legibility, but the lines indicating the table borders and those separating headings from data are retained.

Other suggestions for improved legibility are:

- left-align the heading over the left-most column (called the stub);

- center-align heads and subheads over the column(s) they describe;
- indicate ranges with a dash not a slash or hyphen;
- put dollar signs (or other currency symbols), percentage (%) or permille (o/oo) symbols and units abbreviations only on the first and last lines and align them vertically;
- align single- and multiple-line heads along the bottom line of the multiple-line head's type;
- in financial tables, put negative numbers in parentheses-don't use the minus sign; in technical tables use the minus sign; these usages conform to those of the business and engineering/scientific worlds, respectively;
- use decimal tabs so that all numbers align vertically at the decimal point;
- use lower case letters or non-numerical symbols (e.g., *, †, ‡, §, , in that order) in the body of the table to refer the reader to footnotes; numerical superscripts can be confused with data, especially if engineering/scientific data are tabulated.

TABLE 1. CONCENTRATIONS AND ACTIVITIES OF IONS		
ION	CONCENTRATION C/(mol/L)	ACTIVITY a/(mol/L)
(1)	(2)	(3)
Mg 2+	0.010	0.0035
Na +	0.040	0.0314
SO 2-	0.020	0.0070
Cl -	0.020	0.0150

Problem Solving Methodology

A standardized approach to solving problems often is the best way to develop a problem's solution. These steps constitute a rational approach toward the completion of any engineering problem.

1. Draw a schematic diagram and label its important components to help you understand the physical situation. Use a nomenclature that is convenient and well accepted.

2. Write the general equations describing the physical situation.

3. Write appropriate auxiliary equations (boundary or initial conditions, chemical reactions, equilibrium constraints, physical property correlations, etc.)

4. Simplify the set of equations, stating all appropriate assumptions.

5. Solve the set of equations.

6. Substitute any numerical values required for quantification of the solution.

7. THINK!! What do your solutions indicate, are they reasonable?

In completing this procedure, the following additional considerations will help you to develop a good engineering approach. These will provide you with a better understanding of why you are using a

particular procedure, not just what the steps are for a solution.

1. Write legibly (illegible assignments will not be graded).

2. Always use and keep track of units. Mistakes can frequently be identified through inconsistencies in the units.

3. Annotate or explain each step in the calculations. Do not just provide a series of equations.

4. If your solution involves the use of spreadsheet calculations, describe the logic and equations used in the calculations.

5. Any tables or figures used to present results should be described with text as well. These figures do not speak for themselves.