Appendix B

Coding Six-Minute Items
(Chemical PE)

For each item, decide on the primary subject tested (e.g., “Heat Transfer” or “Kinetics”), then assign the item a code from the item classification codes provided in App. C.

Insert the code for the item directly after the item number, using the following format. Use all uppercase letters. Start with CH for “Chemical,” followed by the primary subject code, followed by the item classification code. Surround the entire code expression in square brackets. For example,

PROBLEM 3 [CH HT HTCN]   or   PROBLEM 21 [CH KN KNTY]

Appendix C

Item Classification Codes
(Chemical PE)

MASS AND ENERGY BALANCES (BA)	
mass/material balances	BAMB
energy balances	BAEB
stoichiometry	BAST
other conservation laws	BACL
other	BAOT
HEAT TRANSFER (HT)	
conservation of energy	HTCN
conduction	HTCD
conduction through insulation	HTIN
convection	HTEA
radiation	HTRA
furnace design	HTFD
evaporation	HTEV
other	HTOT
MASS TRANSFER (MT)	
gas absorption	MTAB
stripping	MTST
distillation	MTDS
liquid-liquid extraction	MTEX
leaching	MTLE
psychrometrics (humidification and dehumidification)	MTHU
drying	MTDR
other	MTOT

FLUIDS (FL)

Bernoulli equation	FLBE
friction/head loss	FLFL
pipes and pipe networks	FLPI
pump selection/design	FLPD
pump analysis/performance	FLPA
compressor selection/design	FLCD
compressor analysis/performance	FLCA
valves and fittings	FLVF
control valve design/selection	FLCV
flow through packed beds	FLPB
two-phase flow	FLTP
gaseous flow	FLGA
other	FLOT

THERMODYNAMICS (TH)

molecular structure	THMS
ideal gas laws	THIG
real gases	THRG
first and second laws	THLA
determination/estimation of physical properties	THPP
chemical equilibrium	THEQ
heats of reaction/solution	THHR
vapor-liquid equilibrium	THVL
combustion	THCO
refrigeration	THRE
other	THOT

KINETICS (KN)

types of reactors	KNTY
interpretation of experimental data	KNDI
reaction rate modeling	KNMD
reactor design from rate model	KNRM
reactor design from product distribution	KNPD
reaction control	KNRC
other	KNOT

PLANT DESIGN (PD)

equipment sizing	PDSZ
equipment fabrication	PDFB
material mechanical properties	PDMP
material chemical properties	PDCP
material science	PDMS
material selection	PDSE
phase diagrams of alloys	PDPD
safety	PDSA
environmental issues	PDEN
HAZOP (hazard and operational) analysis	PDHZ
waste treatment/minimization	PDWT
solids separation	PDSO
vapor-liquid separations	PDVL
flow sheets	PDFS
fault tree analysis	PDFT
simulation	PDSM
scheduling	PDSC
life cycle costing	PDLC
optimization of design	PDOP
process control monitoring electronics/equipment	PDPC
control systems theory	PDSY
other	PDOT

Appendix D

Description of Exam Format and Subjects (Chemical PE)

The NCEES Professional Engineering examination in chemical engineering consists of two four-hour sessions separated by a one-hour lunch period. Both sessions are taken by all examinees.

Both the morning and afternoon session contain 40 questions in multiple-choice (i.e., “objective”) format. As this is a “no-choice” exam, the examinee must answer all questions in each session correctly to receive full credit. There are no optional questions.

Exam Subjects

NCEES has published a description of the examination subjects. Regardless of the published examination structure, the exact number of questions that will appear in each subject area cannot be predicted reliably. There is no guarantee that any single subject will occur in any quantity. One reason for this is that some of the questions span several disciplines. The examinee might consider a pump selection question to come from the subject of fluids, while someone else might categorize it as engineering economics.

Table 1 is the official NCEES listing of the exam format, while Table 2 describes the subjects in detail. Most examinees find the list of subjects to be formidable in appearance. The percentage breakdowns given in Table 1 are according to NCEES, but these percentages are approximate. NCEES adds, “The examination is developed with questions that require a variety of approaches and methodologies including design, analysis, application, and operations. Some questions may require knowledge of engineering economics. These areas are examples of the kinds of knowledge that will be tested but are not exclusive or exhaustive categories.”

Table 1
Subjects on the Exam and
Approximate Percentages of Questions[a]
(Chemical PE)

1. MASS AND ENERGY BALANCES	20%
2. HEAT TRANSFER	15%
3. FLUIDS	15%
4. THERMODYNAMICS	10%
5. MASS TRANSFER	15%
6. KINETICS	10%
7. PLANT DESIGN	15%

[a] Percentages of questions may be adjusted slightly in order to round the number of questions to whole numbers.
Note: The exam is developed with problems that will require a variety of approaches and methodologies including design, analysis, application and operations. Some problems may require knowledge of engineering economics.

Table 2
Detailed Analysis of Tested Subjects
(Chemical PE)

Mass and Energy Balances
Process Stoichiometry and Material Balances
Process Energy Balances
Conservation Laws

Heat Transfer
Industrial Heat Transfer: heat exchanger design and performance, energy conservation, conduction (especially insulation problems), convection, radiation (especially furnace design), evaporation

Fluids
Piping Network Problems
Pump Sizing or Performance
Compressor Sizing or Performance
Control Valve Selection Problems
Fluid Flow Through Beds
Two-Phase Flow
Bernoulli Equation Applications

Thermodynamics
Estimation and Correlation of Physical Properties
Chemical Equilibrium
Heats of Reaction
Application of First and Second Laws
Vapor-Liquid Equilibrium
Combustion
Refrigeration

Mass Transfer
Typical Applications: gas adsorption and stripping, distillation, liquid-liquid extraction and leaching, humidification and dehumidification, drying

Kinetics
Interpretation of Experimental Data and Reaction Rate Modeling
Commercial Reactor Design from Rate Model and /or Product Distribution
Comparison of Reactor Types
Reaction Control

Table 2 (continued)
Detailed Analysis of Tested Subjects
(Chemical PE)

Plant Design

Process and Equipment Design: optimization of design, general safety considerations, environmental and waste treating, solids separation, vapor-liquid separations, flow sheets, HAZOP (hazard and operational) analysis, fault tree analysis, scheduling techniques, sizing and fabrication of equipment, material selection, life cycle cost, process control (such as sensors, transmitters and controllers, control loops, and simulation), material science (as concerned with physical and chemical properties of matter, strength of materials, crystallographic structure, phase diagrams, latent heat, PVT data and relationships, and molecular structure)