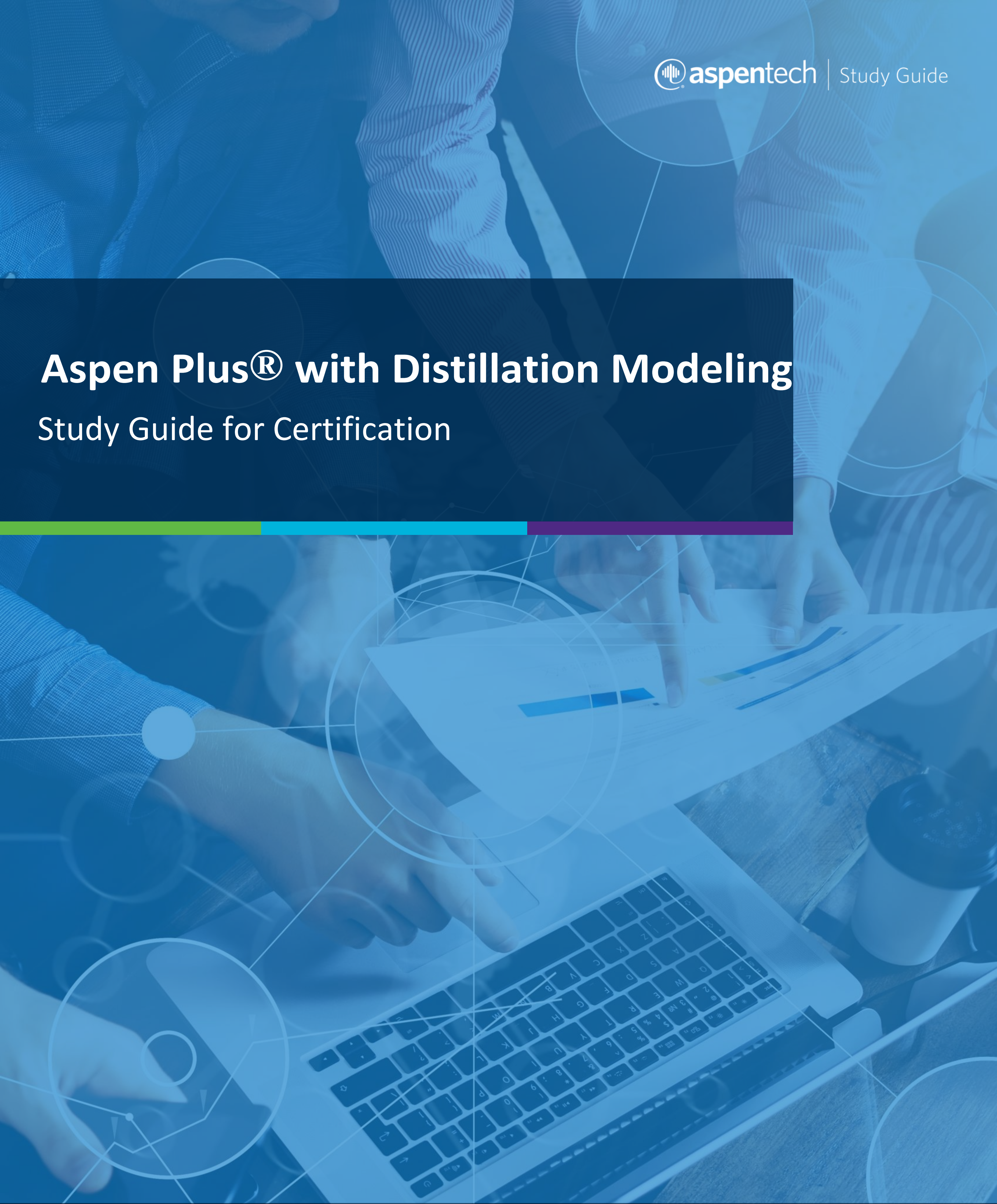

Aspen Plus® with Distillation Modeling

Study Guide for Certification

Prove Your Credibility

An Aspen Plus Certified User demonstrates the practical skills to build models and interpret results using Aspen Plus. This person also demonstrates fluency with some more advanced topics such as convergence, troubleshooting, and detailed distillation modeling.

Practice

AspenTech training is highly recommended though not required.

This guide contains 100% coverage of all objectives for the certification exam. You can use it as both a study tool and an on-the job reference (read pages 2-12).

Get Certified

In-person and remote testing are available. Please make sure that you select the correct Location/Time Zone.

After passing the exam you will receive an email to post your certificate and digital badge on social media, which is a cross-industry recognition of technical skills you may share on LinkedIn, as well as in your email signature. View the instructions on how to post your credentials on LinkedIn profile.

Exam scope for Aspen Plus with Distillation Modeling

- ☐ Properties Environment
- ☐ Simulation Environment
- ☐ Convergence
- ☐ Reporting
- ☐ Distillation Synthesis
- ☐ Models and Design Specification
- ☐ Efficiencies
- ☐ Sizing and Rating
- ☐ NQ Curves
- ☐ Reporting Features
- ☐ Column Configurations
- ☐ Rate-Based Distillation
- ☐ Convergence

Grading

Grade	Weight
Multiple choice questions	40%
Lab task	60%
Total	100%

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SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Properties Environment	Startup Template	**Select** a startup template to begin a new simulation
	Component List	**Create** a component list
		Identify the different component databases available
	Physical Property Method	**List** the steps to establish physical properties
		Identify issues involved in the choice of a property method
		Define a property method
		Identify the different property methods available
		Explain the need for Henry's components
	Reporting	**Summarize** the different types of physical property data
		List the built-in analyses used for reporting physical properties
		Retrieve pure component properties from built in property databases
Explore Simulation Environment	Unit Sets	**Recognize** the default unit sets
		Customize unit sets
	Manipulate Flowsheet	**Explain** how unit operation models are organized
		Add unit operations to the flowsheet from the model palette
		Connect material streams to unit operation blocks
		Configure and customize flowsheet user preferences, options and default settings
	Unit Operations	
	Mixer/Splitters	**Explain** when to use the **SSplit** block in a flowsheet
	Separators	**Identify** the key differences in the three separator blocks **Flash2**, **Flash3** and **Decanter**

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Simulation Environment	Separators	**List** which unit operation blocks can be used to specify how the components split to the outlet streams
		Configure a component splitter to separate component steams based on split fractions specified
	Exchangers	**Identify** the heat exchanger model used to model convective or radiant heat transfer across a surface
		Select the heat exchanger model that can be integrated with Aspen Exchanger Design and Rating (EDR) tools
		Explain how to specify a Heater block outlet stream to the dew point condition
		Recognize how the use of a Heat stream connected to a Heater block affects the input specifications
		Perform rigorous heat transfer calculations using EDR
	Columns	**List** the column unit operations that incorporate shortcut methods for Vapor/Liquid calculations
		Identify which unit operation block is used for most distillation column models
		Determine parameters required to solve a column Identify different types of column specifications available in RadFrac
		Identify different types of column specifications available in RadFrac
		Explain the function of the Column Analysis tool
		List the types of rigorous vapor-liquid fractionation operations that RadFrac can simulate
		Build different types of column using RadFrac and manipulate the column specifications to meet the process objective
		Plot temperature and composition results vs stage for a column
		Explain how to account for non-equilibrium stages in Rad-Frac

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Simulation Environment	Columns	**Describe** the difference between On-Stage and Above-Stage
	Reactors	**List** the classes of reactor unit operations available in Aspen Plus
		Describe the characteristics of balanced based reactor models
		Explain how heat of reaction is calculated in Aspen Plus
		Identify which reactor models allow both equilibrium and kinetic based reactions
		Identify the option in RGibbs to insure both vapor and liquid phases are considered
		Summarize the options for entering custom reaction kinetics
		List the options for entering reaction data for a reversible reaction
		Identify the reactor models that require a Reaction ID to describe reactions
		Recognize which reaction model type that allows a mixture of Power Law, Equilibrium, LHHW and Custom reactions
		Build a Reaction ID to be used in a kinetic based reactor
	Pressure Changers	**List** situations where pressure changer blocks need to be included in a flowsheet
		Explain the difference between design and rating specifications for pump and compressor
		Describe the options for entering performance curve data for pump and compressor models
		Build a simple flowsheet for an expander/compressor
		Identify the main difference between the pipe and pipeline unit operation

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Simulation Environment	Manipulators	**List** unit operations models that manipulate streams
		Build a flowsheet the duplicates a feed stream that is processed in different types of process units
	User Models	**List** the options to write custom unit operation models
		Identify the unit operation block that is a container for simulation objects such as streams, unit operations, etc.
Convergence	Control Panel	**Analyze** error and warning messages
		Recognize simulation sequence
		Identify automatically generated convergence blocks
		Identify tear streams
		Explain the concept of error/tolerance
	Convergence Methods	**Configure** the default tear convergence settings to increase maximum number of iterations
		List the variables tested for tear stream convergence
		List the default convergence methods
		Describe the purpose of the Secant method bracketing strategy
	Tear Stream	**Specify** a tear stream for a convergence block
		Illustrate reconciling of a tear stream

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Convergence	Convergence Results	**Specify** a tighter global flash tolerance
		Analyze the pattern of the graphical convergence history using the convergence monitor
		Identify the number of iterations made to reach convergence
		Illustrate the reduction of simulation time by reconciling a block
	Troubleshooting	**Recognize** the various troubleshooting tips in the Help documentation
		Troubleshoot the prepared simulations using common methods
Documentation	General	**Use** the Help menu
Explore Simulation Environment	Analysis Tools	
	Sensitivity	**List** steps to create a new sensitivity
		Identify variables that can be defined as manipulated variables
		Analyze sensitivity results to find optimal operating conditions
		Identify if a design specification solution is feasible using sensitivity
		Recognize case studies
		Plot the results of a sensitivity block
		Explain tabulated Fortran expressions

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS

Explore Simulation Environment	Design Specification	**Develop** a design specification to get desired results
		Explain why design specification produces iteration
		List the approaches to view design specification results
		Analyze convergence issue caused by design specifications
		Troubleshoot convergence issue by changing default settings
	Calculators	**Develop** a calculator block with either Fortran syntax or Excel functions
		Recognize basic Fortran syntax and Excel functions
		Explain the use of parameters and local parameters
		Identify import variables and export variables
		Define location of a calculator block in an execution sequence
		Resolve errors caused by a calculator
Reporting	Stream Summary	**Customize** stream summary tables and save as new templates
		List steps to create new templates
		Explain how to add additional physical properties to the stream summary
		Explain the use for all options in Edit Stream Summary Template window
		Send stream summary to Excel and to Flowsheet (linked with Aspen Plus)
		Describe Import/Export user stream templates features

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS

Reporting	Custom Tables	**Create** custom tables
		Use custom tables on the flowsheet (as icon)
	Global Data	**Display** global stream data on flowsheets
		Display user-defined global stream data on flowsheets
		Explain how to change global stream data displayed decimal digits
	Property Sets	**List** steps to create new property sets
		Explain the use of property qualifiers
		List where to use property sets
	Model Summary	**Customize** odel Summary table
		Send Model Summary table to Excel (linked with Aspen Plus)
	Miscellaneous	**Use** Check Status to check detailed information about errors or warning
		Report control panel messages in History file
		Report printable text file of input data and simulation results

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS DISTILLATION MODELING
Distillation Synthesis	Physical Properties	**Identify** key component physical properties involved in distillation modeling

		Perform a Binary Mixture Analysis to determine if an azeotrope exists
		Identify property analysis tools used in Distillation Synthesis
	Separation Conceptual Design	**Describe** the purpose of a residue curve
		List the conceptual design tools used to determine distillation column separation sequences
		Explain the significance of a distillation boundary on a ternary analysis plot
		Determine the possible separation sequences of a specified three component stream
		Identify how ternary maps can be used to troubleshoot distillation column operation
		Identify the Aspen Plus unit operation block used for conceptual design of a distillation column
		List the required inputs for a CONSEP block
		Summarize the key results of a CONSEP
Models and Design Specification	Models	**List** the multi-stage separation models in Aspen Plus
		Describe the capabilities of the RadFrac distillation model
		Summarize the key modeling assumptions to the equilibrium stage approach for distillation modeling
	Configuration	**Explain** the difference between the Above-Stage and On-Stage feed convention
		Identify the setup options for modeling an absorber
		Determine parameters required to solve a RadFrac column
	Convergence	**List** the convergence methods for a RadFrac block
	Design Specifications	**Explain** the difference between distillation column Design and Rating
		List possible inputs to a RadFrac block **Design Specification**
		List possible manipulated variables for a RadFrac block **Vary**
		Build a column using RadFrac and manipulate the column specifications to meet the process objective

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS DISTILLATION MODELING
Models and Design Specification	Results	**Plot** temperature and composition results vs stage for a column

Efficiencies	Implementation	**Identify** the different types and methods to implement efficiencies in RadFrac
		Explain the need to implement efficiencies in a RadFrac model
		Identify and **Explain** the preferred efficiency type for RadFrac
		List examples of column parameters that influence efficiency values
		Explain possible sources for determining column efficiencies
		Describe how to implement packing HETP in a RadFrac column input
Sizing and Rating	Column Analysis Capability	**Explain** the calculation basis for the trays and packing s hydraulics
		Describe the options for sectioning a column for Column Analysis
		Describe the difference between interactive sizing and rating of trays and packing
		Summarize the built-in tools available to evaluate hydraulic operability results
		List some of the column operational problems that can be addressed with Column Analysis
		Explain how tray and packing hydraulic calculations affect column separation
		Summarize the elements of the tray stability diagram
		Explain how the diameter is calculated for a tray sizing section
		Perform a hydraulic analysis to rate the performance of a specified column and interpret the results
		List key performance and hydraulic results calculated in Rating mode
		Perform a hydraulic analysis to size a column for trays or packing
	Troubleshooting	**List** some common tray performance issues that need to be addressed in sizing and rating
		List the design and operations options to reduce jet flooding of trays
		Describe the options for reducing tray weeping
		Identify the special weir modification options available to address unusually high or low weir loadings
		List the vendor packages that Column Analysis results can be exported to for additional analysis
SCOPE	**TECHNICAL CONTENT**	**COMPETENCY OBJECTIVE FOR ASPEN PLUS DISTILLATION MODELING**
NQ Curves	Overview	**Explain** the objective of the NQ Curves analysis tool
		List the Objective Function options for a NQ Curves analysis
		Identify the constraint requirements for performing a NQ Curves analysis

		Perform a NQ Curves analysis on a specified RadFrac column
		List the built-in algorithm options for feed tray optimization
Reporting Features	Heat Curves	**Identify** the options for creating Heat Curves within RadFrac
		Summarize the purpose and results of a Heat Curve analysis
		Create a Heat Curve for a specified RadFrac block condenser or reboilers
	Pseudo Streams	**Describe** the uses of Pseudo Streams
		Explain how to create a Pseudo Stream for a RadFrac block
Column Configurations	Complex Configurations	**Describe** the RadFrac setup requirements for modeling a column with zero bottoms flow
		List the configuration options of modeling a column with zero distillate flow
		Identify the specification requirements for a partial drawoff of a pumparound
		Explain how a pumparound can be used to model a double condenser column configuration
		Identify the significance of providing two input specifications for a thermosiphon reboiler
		Create a RadFrac block that represents a "complex" configuration
		Use the Reboiler Wizard to convert a RadFrac reboiler to an external HeatX block for detailed analysis
	Reactive Distillation	**Summarize** the capability of modeling distillation with reactions within RadFrac
		Identify the different types of reactions that can be modeled within RadFrac
		List the steps to setup a Reaction ID to be used in RadFrac
		Setup a RadFrac block that has reactions
		Describe the options for handling solids inside RadFrac

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS DISTILLATION MODELING
Column Configurations	Reactive Distillation	**Explain** how to properly setup the reactions of an electrolyte column simulation that includes reactions in CHEMISTRY and kinetic reactions in REAC-DIST
Column Configurations	3 Phase Distillation	**Identify** how to enable three-phase distillation calculations within RadFrac
		Explain how to select the correct Valid Phases option on the RadFrac Configuration sheet

		Describe the steps for setting up a Decanter in RadFrac
		Explain what to do if the stages that may have two liquid phases is not known
		Explain how a top stage decanter affects the input specifications of a column
		List the options for solving the liquid-liquid phase split calculations
		Summarize the options for specifying efficiencies when modeling two liquid phases
		Calculate a distillation column model using RadFrac that has two liquid phases
	Free Water 3 Phase Distillation	**Describe** the differences in the Free Water options for Valid Phases in RadFrac
		Identify the options to turn on the Free Water system calculations for a flowsheet
		Explain how to determine if two liquid phases are present on a stage
Rate-Based Distillation	Capabilities	**Describe** the differences between equilibrium and rate-based distillation models
		Summarize the basis for the rate-based modeling approach
		List applications where a rate-based approach can more accurately predict actual separations vs the equilibrium approach
		Identity the features not supported in rate-based distillation
		List the key features of rate-based distillation
	Configuration	**Identify** the minimum steps for setting up a rate-based distillation model
		Explain the options for creating a rate-based distillation model
		Describe how to set the reporting options and view the results of rate-based distillation
		List the steps for converting an equilibrium model to a rate-based model
		Create a rate-based distillation model for a specified column configuration

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS DISTILLATION MODELING
Convergence	Algorithms	**List** the RadFrac convergence options
		Recognize the two parts of a RadFrac convergence method
		Explain the purpose of the convergence options on the RadFrac | Convergence | Convergence | Basic sheet
		List types of distillation models that may require additional Maximum iterations to converge
		Identify the default **Error tolerance** for a RadFRac block
		Describe situations where tightening the **Error tolerance** would be

		desirable
		Identify the RadFrac initialization methods and the corresponding typical applications
		Explain the source and order of initialization estimates
	Convergence Method Selection	**Identify** the default convergence method for RadFrac
		List situations where the **Sum-Rates** algorithm may be appropriate when converging RadFrac
		Identify situations where the **Non-ideal** algorithm may be appropriate when converging RadFrac
		Describe situations where the **Newton** algorithm may be appropriate when converging RadFrac
		List where algorithm specific parameter details are located
	Convergence Troubleshooting	**Describe** examples of how to simplify a RadFrac model to aid in convergence
		List the common sources for RadFrac convergence problems
		Explain why column flow ratio specifications are a better choice than flow specifications in large flowsheets
		Identify the favored column specifications when modeling columns with a small reflux or boil-up ratio
		Recognize how improperly specified design specifications can result in column mass balance issues
		Explain why you need to reinitialize a RadFrac model after entering estimates
		Describe where to enter estimates for temperature, flow or composition to aid in convergence
		Explain what to do if the Err/Tol is decreasing steadily but the maximum number of iterations is reached
		Explain what to do if the Err/Tol is oscillating and never reaches tolerance
		List steps to implement when the Err/Tol diverges during convergence
		Converge specified RadFrac models

About Aspen Technology

Aspen Technology (AspenTech) is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster. Visit AspenTech.com to find out more.