



Qualifications

General Certificate in Distilling

Examination Syllabus

Introduction

In advance of their examination, candidates will be expected to have full knowledge of the syllabus as examination questions can be asked from any of the topics as detailed below and in the learning materials. The examination may also include some calculation questions.

1 Overview

Introduction to Distilling

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Introduction to distilling	<ul style="list-style-type: none">• Definitions of the main spirits derived from cereal, molasses, grape and agave• The basic process flows for the production of the major spirits categories

2 Raw Materials

Cereal

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Cereals for whisk(e)y production	<ul style="list-style-type: none">• Why we use cereals for distilling• The key characteristics/qualities of the main distilling cereals

Malting Process

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Cereals and the malting process	<ul style="list-style-type: none">• Key structures within a barley kernel• Key stages within the malting process and associated technology• The structural changes that occur in the barley kernel during the malting process• The key enzymes active during the malting process

	<ul style="list-style-type: none"> • The production of peated malt • Key malt analytical parameters
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Molasses

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Sugar cane and how it is processed to make molasses for rum production	<ul style="list-style-type: none"> • The origin of molasses: sugar cane • Sugar cane properties, areas of sugar cane production and geographical impact on quality • Differences between sugar cane juice and molasses, based on quality and composition • Sugar cane processing methods, and the technology used to make molasses • The various types of molasses • Molasses storage requirements • The chemical and biological properties of molasses • Use of the Brix hydrometer and measurement of sugar content: sugar % (w/w) and degrees Brix (°Brix) • Key molasses analytical parameters

Grape

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Grapes for brandy production	<ul style="list-style-type: none"> • Grapevine cultivation <ul style="list-style-type: none"> ○ general description of a grapevine ○ growth and care from planting to harvest ○ what constitutes terroir • Factors that affect the choice of grape varieties for distillation • Grape and juice composition • Grape selection criteria for distillation • Other fruit brandy

Agave

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Agave for tequila production	<ul style="list-style-type: none">• Agave basic anatomy and composition• Cultivation and growth cycle• Harvesting and where it is grown• Alcoholic beverages from Agave including tequila, mezcal and sotol

Botanicals

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Botanicals for gin production	<ul style="list-style-type: none">• The cultivation, selection, and use of the four primary gin botanicals (juniper, coriander, citrus peel and orris root)• Secondary gin botanicals• Botanicals storage requirements

Water

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Water for use in distilling	<ul style="list-style-type: none">• The various sources of water including borehole, surface, municipal/public• Product water, in terms of:<ul style="list-style-type: none">○ colour, clarity, taste, odour, and pH○ contaminants, including microbiological and taints• Dissolved salts and their importance• The categories of water and their attributes• Water conservation and the reliability and consistency of supply and their importance

Yeast

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Distiller's yeast	<ul style="list-style-type: none">• The major components of the yeast cell and how they function.• The process by which yeast cells multiply.• The various types of yeast used in distilling (cream, pressed and dried)• Yeast selection and storage requirements.• Pure culture yeast for natural fermentation.

3 Raw Material Processing

Cereal – Milling and Mash Conversion

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• The principles of milling• The principles of mashing
Process: Milling	<ul style="list-style-type: none">• The key steps of grain intake and the accompanying safety risks• Calculating the amount of grain required for a batch of whisk(e)y• Important parameters for successful milling• The appearance of milled grain and grist sieve analyses
Technology: Milling	<ul style="list-style-type: none">• Types of milling systems and basics of operation
Process: Mashing and cereal cooking	<ul style="list-style-type: none">• Key mashing process parameters• Key biochemical changes in the grain during mashing and factors that affect this• The role of malt enzymes and factors that affect their efficiency• The use of exogenous enzymes• The purpose and process of grain cooking
Technology: Mashing and cereal cooking	<ul style="list-style-type: none">• Mashing system technology• Grain cooking technology

Cereal – Wort Separation and Cooling

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • The principles of wort separation • The principles of wort cooling
Process: Wort separation	<ul style="list-style-type: none"> • Overview of the wort separation process and the key process parameters. Note – this process is optional for grain whiskey and grain neutral spirit production • The impact of secondary conversion • Key wort composition requirements
Technology: Wort separation	<ul style="list-style-type: none"> • Wort separation systems • Wort separation system selection based on milling system
Process: Wort cooling	<ul style="list-style-type: none"> • Purpose of wort cooling and an overview of the process
Technology: Wort cooling	<ul style="list-style-type: none"> • Wort cooling systems

Molasses

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • Why we need to pre-treat molasses
Process	<ul style="list-style-type: none"> • Various pre-treatment methods for molasses • Sugar content adjustments needed for downstream production stages • How fermentation can be adjusted via the use of stillage or dunder
Technology	<ul style="list-style-type: none"> • Removal of solids and scale by centrifugation • Use of heat treatment (pasteurisation or sterilisation) and/or antibiotics to reduce microbial count

Grape

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Choosing when to harvest for optimum yield and quality
Process	<ul style="list-style-type: none">• Common grape harvesting methods• Choosing when to press the grapes• Key grape processing stages: sorting, destemming and crushing
Technology	<ul style="list-style-type: none">• Pressing systems

Agave

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• The purpose of processing agave prior to fermentation• Inulin and why it is important to the process
Process	<ul style="list-style-type: none">• Agave cooking process• Milling process• Mix to tequila and how it changes the process stream
Technology	<ul style="list-style-type: none">• Agave cooking systems, including pits, ovens, autoclaves and diffusers• Milling systems, including tahona and modern mills

4 Fermentation

Fermentation Theory and Technology

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• The principles of alcoholic fermentation including key fermentable sugars
Process	<ul style="list-style-type: none">• Typical phases of fermentation• The role of other organisms that may be present during fermentation• Factors affecting fermentation• The products of fermentation with emphasis on alcohol yields and flavour congeners• Key flavour compounds developed during fermentation
Technology	<ul style="list-style-type: none">• Fermentation systems and their materials of construction• Key requirements for a typical fermenter

Cereal

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Key stages of a cereals-based wort fermentation• Nutritional requirements of distilling yeast, to be provided by wort: sugars, amino acids, mineral salts, vitamins• Impact of regulations on cereal-based wort fermentation
Process	<ul style="list-style-type: none">• Calculation of yeast inoculation rate• Key stages of a cereals-based wort fermentation cycle• The importance of secondary conversion• Key analytical fermentation parameters
Technology	<ul style="list-style-type: none">• Fermentation systems for cereal-based wort

Molasses

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Differences between fermentation for light and heavy rum production• Selection criteria for different yeast types for molasses fermentation
Process	<ul style="list-style-type: none">• Yeast pitching procedures for molasses fermentation• Molasses fermentation process for light rum production• Molasses fermentation processes for heavy rum production• Yeast nutritional requirements for molasses fermentation• Batch incremental feed fermentation process• Benefits and challenges of yeast recycling

Grape

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Yeast selection for grape juice fermentation to produce brandy• Grape juice fermentation requirements
Process	<ul style="list-style-type: none">• Yeast pitching procedures• Addition of yeast nutrients• Key aspects of the grape juice fermentation process, including the malolactic fermentation• Grape juice fermentation control parameters• The major organisms that contribute to wine spoilage
Technology	<ul style="list-style-type: none">• Grape juice fermentation systems

Agave

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Agave fermentation yeast selection

Process	<ul style="list-style-type: none"> • Agave fermentation requirements and control parameters
Technology	<ul style="list-style-type: none"> • Agave fermentation systems

5 Distillation

Basics of Distillation

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • Key terminology associated with spirits distillation • Theory of distillation, including the liquid/vapour equilibrium and volatility of components using a graphic model
Process	<ul style="list-style-type: none"> • Differences between batch pot and continuous distillation methods • Role of copper in distilled spirits production
Technology	<ul style="list-style-type: none"> • Distillation systems available

Batch Pot Distillation

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • The purpose of pot still distillation in spirits production
Process	<ul style="list-style-type: none"> • The operation of a two-stage pot distillation process using the liquid/vapour equilibrium • Changes to spirit cut points and the effect they can have on spirit quality • Other styles of batch pot distillation, including triple distillation and batch distillation with plates
Technology	<ul style="list-style-type: none"> • The different types of vapour condensing systems • Key batch distillation condensing system technology – worm tub and shell and tube

Continuous Distillation

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• The purpose of continuous distillation in spirits production
Process	<ul style="list-style-type: none">• The basic operation of a two-column continuous distillation process• The inputs and outputs of distillation; describe what a balanced operation is• The material and heat balance• The importance of composition, and of pre-heating still feed materials
Technology	<ul style="list-style-type: none">• Continuous distillation systems

Whisk(e)y

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Differences between malt and grain whisk(e)y processes
Process	<ul style="list-style-type: none">• Malt whisk(e)y batch pot distillation process• Condensate recovery• Grain whisk(e)y Coffey still continuous distillation process• Handling of feints• Fusel oil removal and recovery
Technology	<ul style="list-style-type: none">• Stripping and rectifying columns• How the design of the pot affects product quality and process operations• The different types of vapour condensing systems

Rum

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> Differences between batch and continuous distillation for rum production
Process	<ul style="list-style-type: none"> Operation of the pot still for heavy rum production Operation of column stills for light rum production How the column still can be used for neutral spirits production The importance of rectification
Technology	<ul style="list-style-type: none"> Design of the pot still for heavy rum production Design of column stills for light rum production

Brandy

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> The definition of neutral brandy, cognac and Armagnac What grappa is
Process	<ul style="list-style-type: none"> Continuous distillation processes for producing neutral brandy Double distillation process for producing cognac Semi-continuous distillation process for producing Armagnac The grappa distillation process
Technology	<ul style="list-style-type: none"> The types of stills used in brandy production, including the alembic Charentais and Armagnac stills The grappa vapour still

Agave Spirits

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> Agave distillation techniques
Process	<ul style="list-style-type: none"> Continuous distillation process and its use in twice distilled tequila production Batch pot distillation process for tequila production Mezcal production methods

Technology	<ul style="list-style-type: none"> • Tequila pot still design • Mezcal clay stills design
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Neutral Spirit and Vodka

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • Definition of neutral spirit • Where neutral spirit is used within the distilling industry • Key differences between grain whisk(e)y and neutral spirit • Definition of vodka
Process	<ul style="list-style-type: none"> • The processes involved in the production of neutral spirit • The processes involved in vodka production
Technology	<ul style="list-style-type: none"> • General continuous distillation technology for neutral spirit production

Gin

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none"> • Base spirit selection for gin production
Process	<ul style="list-style-type: none"> • Gin production methods – distilled and compound gin • Key steps in the gin distillation process • Production of flavour extracts • Assessing gin quality
Technology	<ul style="list-style-type: none"> • The vapour basket

6 Maturation

Maturation in Wood

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Purpose of cask maturation
Process	<ul style="list-style-type: none">• Reasons for using wood for spirit maturation• Maturation in wood control parameters• Process/changes during maturation• Characteristics of new and mature spirit• Alternatives to maturation in wood that will give similar flavour changes• Reasons for blending• The various post-maturation processes and treatments that can be carried out prior to bottling, including blending, reduction, caramel addition, filtration and filling temperature control
Technology	<ul style="list-style-type: none">• Manufacture of casks and their use in production• Main types of cask wood• Use of treated casks, or casks used previously to hold another beverage (e.g. port, sherry, wine etc.) to produce whisky 'finishes'

Whisk(e)y

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• What is meant by warehousing and blending in relation to whisk(e)y
Process	<ul style="list-style-type: none">• The term inventory• What legislative requirements apply to Scotch whisky maturation and blending processes
Technology	<ul style="list-style-type: none">• The various types of cask and warehouse design

Rum

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Types of rum – white, amber, dark
Process	<ul style="list-style-type: none">• Rum maturation process and impact on flavour• Rum blending process
Technology	<ul style="list-style-type: none">• Barrel types for rum maturation

Brandy

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Types of wood used in brandy maturation
Process	<ul style="list-style-type: none">• The process of ageing brandy in barrels• Spirit dilution method• Basic blending practices• Barrel warehouse control parameters
Technology	<ul style="list-style-type: none">• How a brandy barrel is made: wood seasoning, toasting, barrel size

Tequila and other Agave Spirits

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	<ul style="list-style-type: none">• Types of aged tequila
Process	<ul style="list-style-type: none">• Tequila maturation process• Basics of tequila blending• The additives permitted for use both during and post-blending• Ageing other agave spirits
Technology	<ul style="list-style-type: none">• The types of casks used for tequila

7 Quality

Process Control

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Process and product consistency	<ul style="list-style-type: none">• Variation and variability• The purpose of a specification• The concept of tolerance for specification ranges• Simple statistical quality control procedures• Simple methods for recording, reporting and the interpretation of data• The key distilling measurable parameters and their influence on quality• The principles of monitoring and adjustment to achieve product consistency• Typical applications for in-line and on-line instrumental process control

Quality Management Systems

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Features of a quality system	<ul style="list-style-type: none">• The definition and benefits of a quality management system• The four main processes to implement a quality management system• Examples of quality management systems and their key principles
Product safety	<ul style="list-style-type: none">• The typical steps in implementing a HACCP system

Sensory Assessment

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Flavour control and sensory assessment of spirits	<ul style="list-style-type: none">• Flavour: What is it and where does it come from?• Importance of flavour control• Role of sensory evaluation in controlling flavour• The sensory assessor (panellist or blender)• Preparing samples for sensory testing• Sensory test room conditions• Types of sensory tests and when to use them:<ul style="list-style-type: none">○ Sample screening○ Difference testing○ Descriptive analysis<ul style="list-style-type: none">▪ Flavour wheels▪ Flavour profiling

8 Hygiene

Microbiological Contamination and Control

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Microbiological contamination	<ul style="list-style-type: none">• Definition of bacteria and fungi and examples of those commonly found in distilleries• Methods for detecting microbiological contaminants
Microbiological control	<ul style="list-style-type: none">• The principle ways to achieve microbiological control in a distillery and in particular to the following key areas:<ul style="list-style-type: none">○ Yeast handling systems○ Product and process waters• The types of chemical, light and heat sanitisers commonly used

Plant Cleaning

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
CIP systems	<ul style="list-style-type: none">• Four key factors for efficient plant cleaning• The different types of detergents used and the reasons for their choice• The types of cleaning head used and reasons for their choice• Differences between single use and recovery systems• The operating principles of CIP systems
CIP cleaning cycles	<ul style="list-style-type: none">• Typical cleaning programmes and cycle times• The function of each of the cleaning cycle stages
CIP plant design	<ul style="list-style-type: none">• Design features that minimise dirt accumulation in vessels and pipelines and encourage efficient cleaning• Design features which promote a hygienic working environment

9 Engineering and the Environment

Engineering and Maintenance

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Approaches and tasks	<ul style="list-style-type: none"> • The business motives for an effective maintenance system • The features, advantages, disadvantages and applications of the following approaches: <ul style="list-style-type: none"> ○ No maintenance ○ Corrective Maintenance ○ Preventative Maintenance • The relationship between corrective and preventative maintenance • The contribution of routine maintenance tasks to plant safety, reliability, quality, economics and environmental impact
Performance improvement	<ul style="list-style-type: none"> • The key features of the following performance orientated maintenance systems: <ul style="list-style-type: none"> ○ Reliability centred maintenance (RCM) ○ Total productive maintenance (TPM) Workplace Organisation (6s) ○ Condition Monitoring

Environment and Utilities

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Sustainability and climate change	<ul style="list-style-type: none"> • The guiding principles of sustainability, and the concepts of a sustainable industry • The role of carbon dioxide and the carbon cycle • The principal sources of carbon dioxide
Steam and energy	<ul style="list-style-type: none"> • The main uses of steam in distilling • The difference between direct and indirect use of steam and explain the implications of steam quality • The potential dangers of steam and steam distribution systems • The principal energy consuming activities in a distillery • Heat recovery systems in distilleries, e.g condensate recovery system

Water	<ul style="list-style-type: none"> • Categories of water: product water, process water and service water • Basic principles of a water treatment plant • Prevention of <i>Legionella</i> infection in cooling towers
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Effluent

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Sources of effluent and measurement	<ul style="list-style-type: none"> • The measurement of effluent volume and strength: biological and chemical oxygen demand, suspended solids, volume, pH and temperature • Control methods used for reducing effluent
Effluent treatment technologies	<ul style="list-style-type: none"> • Aerobic and anaerobic systems and their relevant application • Temperature, flow, copper and pH considerations for consented discharge to sewer

Co-products (General and Whisk(e)y)

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Co-products	<ul style="list-style-type: none"> • The definition of a co-product • The potential value of a co-product to a distiller
Range of distillery co-products and preparation of animal feed	<ul style="list-style-type: none"> • Carbon dioxide recovery process • The recovery process of fusel oil from continuous distillation spirits production • Explaining why cereal residues are ideal as animal feed, or as a source of carbon for biomass • Cereal residue recovery processes

Co-products (Rum)

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Range of distillery co-products	<ul style="list-style-type: none"> • Bagasse and its uses • Waste streams from the rum fermentation and distillation process

Co-products (Brandy)

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Range of distillery co-products	<ul style="list-style-type: none">• Various uses for grape stems• Various uses for grape seeds• Various uses for grape skins

Health and Safety

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Health and safety	<ul style="list-style-type: none">• Flammability and explosion risks of alcohol• Fire and explosion dangers at stills, in storage and operations involving spirits• Hazards and risks from dust and carbon dioxide• The essential precautions needed in the distillery in order to make it a safe working environment
Detergents and sterilants	<ul style="list-style-type: none">• The hazards associated with chemical cleaning and sterilising agents• Good practices for the storage of chemicals• Use of personal protective clothing• Procedures in case of accidental spillage or discharge of chemicals