Chartered Institute of Brewers and Distillers

Diploma in Brewing

Module 1 Syllabus

Version No.	Description	Author	Approval	Effective Date
1	Diploma in Brewing Module 1 Syllabus	Syllabus Portfolio Manager	Chair of Board of Examiners	10/06/2025

UNIT 1: MALT

Candidates are required to have an in-depth understanding of the following:

Barley

1. Demonstrate a basic understanding of the history of barley as used in brewing.
2. Evaluate the cultivation and global use of malting barley varieties.
3. Classify varieties of barley; compare both their differences and uses within the malting and brewing. industry.

    i) Winter Barley versus Spring Barley
    ii) Global Barley Crop Calendar
    iii) Barley Growth on the Ear: Six-row Versus Two-row Barley
    iv) Malting Varieties

4. The importance of barley plant development and varietal selection.
5. Explain the stages of barley Endosperm kernel development.
6. Analyse each key component of the barley kernel structure.
7. Describe the chemical composition of a barley kernel.
8. Evaluate the relevance of the structural components of a barley kernel to the malting and brewing process.

Malting Process

1. Evaluate and explain the purpose of each stage in the malting process.

    i) Overview of the Malting process
    ii) Steeping
    iii) Germination
    iv) Kilning

2. Interpret the physical and biochemical changes that occur during each stage of the malting process. Describe how they will impact malt quality.

    i) Physical and Biochemical Changes during Steeping
    ii) Physical and Biochemical Changes during Germination
    iii) Physical and Biochemical Changes during Kilning
    iv) Key Enzymes and hormones involved in the Malting Process

3. Define and explain how dormancy and water sensitivity impacts the malting process.

    i) Dormancy
    ii) Factors Influencing Water Uptake in Barley Grain

4. Understand the impact of vessel design on the malting process and malt quality.

   i) Plant Design – Steeping
   ii) Processing Factors and Control - Steeping
   iii) Plant Design – Germination
   iv) Processing Factors and Control - Germination
   v) Plant Design - Kilning
   vi) Processing Factors and Control - Kilning

Malt Quality

1. Identify the attributes of malt quality that are most important to the brewer; explain why.

   i) Key Barley Variety Characteristics
   ii) Physical Attributes

2. Understand and discuss the tests conducted on malt in accordance with the IoB, ASBC and EBC.

   i) Key Parameters on a Malted Barley Certificate of Analysis
   ii) Modification Analysis
   iii) Protein
   iv) Enzymes
   v) Other Analyses
   vi) Food Safety

3. Evaluate the impact of the malt analytical results on the brewing process.

   i) Specifications required for Brewing Malts

UNIT 2: SPECIALITY MALTS AND ADJUNCTS

Candidates are required to have an in-depth understanding of the following:

Malt Quality

1. Categorise speciality malt products.

   i) Speciality Malt Categories
   ii) Unmalted cereals

2. Differentiate between the various processes of producing speciality malts.

   i) Speciality Malt Made by Kilning
   ii) Speciality Malt Made by Kilning and Roasting
   iii) Speciality Malt Through Stewing and Roasting

3. Interpret the impact of heat in the production processes on key parameters such as enzyme activity, colour and flavour.

    i) Malt colour – How it affects the final product

4. Understand the ways in which the brewer can use speciality malt products.

    i) Typical Specifications and Importance to Brewers

5. Describe how we produce and utilise malt extract in the brewing process.
6. Define and differentiate between the classes of caramel products; explore how they influence brewing.

Adjunct Composition and Application

1. Describe how we use adjuncts in the brewhouse and explain their impact on the final product.

    i) The advantages of using Adjuncts
    ii) The disadvantages of uAdjuncts

2. Identify typical specifications for adjuncts, their methods of analysis, and their relevance for predicting wort composition, extract efficiency, and brewery performance.

    i) Adjunct Composition
    ii) Malted Adjuncts
    iii) Unmalted Adjuncts

3. Critically evaluate different solid adjuncts and how they are produced.

    i) Solid Adjuncts – Grits
    ii) Solid Adjuncts – Flour
    iii) Pre-gelatinised Cereal Adjuncts

4. Critically evaluate different liquid adjuncts and how they are produced.

    i) Starch-Derived Liquid Adjunct Manufacturing
    ii) Dextrose and Maltose Syrup
    iii) Sucrose Syrup
    iv) Other Liquid Adjuncts
    v) Quality Analysis of Liquid Adjuncts

UNIT 3: INTRODUCTION TO WATER

Candidates are required to have an in-depth understanding of the following:

Brewing water sources and treatment

1. Explain how the water cycle works; describe how it influences the characteristics of brewing water sources.

    i) Water Sources
    ii) Precipitation
    iii) Surface water
    iv) Ground water
    v) Municipal water

2. Summarise the process of converting raw water into potable water; identify what a potable water standard is.

    i) Raw Water Treatment
    ii) Disinfection
    iii) Microbiological parameters

3. Describe and calculate the water hardness and alkalinity of a water sample; explain its potential effects on mash and wort.

    i) Water Hardness
    ii) Water Alkalinity

Brewing water composition and impact

1. Compare the positive and negative effects that various compounds in the water have on final beer quality and the brewing process.

    i) Base-line Product Water
    ii) Minerals in Water

2. Interpret whether a water source is suitable by applying your knowledge of the recommended water composition for various beer styles.

    i) Chloride:Sulphate Balance
    ii) Effects on Yeast
    iii) Mineral Content of Product Water for Beer Styles

3. Adjust water composition by correctly adding the required minerals.

    i) Adjusting Water Mineral Content

Brewing water composition and impact

1. Describe the principles of operation for the equipment that can help us to create the ideal product water.

    i) Removing Solids from the Base Product Water

2. Describe the various treatments that can alter the inorganic content of water, consistent with its various applications.

    i) Ion Exchange
    ii) Weakly Acidic Cation (WAC) - De-alkalisation
    iii) Strongly Acidic Cation (SAC)
    iv) Weakly Basic Anion (WBA)
    v) Strongly Basic Anion (SBA)

3. Explain how the organic and halogen content of water can be reduced/ eliminated to avoid generating potential flavour taints.

    i) Removing Dissolved Solids by Filtration
    ii) Reverse Osmosis
    iii) Removing Organic Contaminants

4. Describe how we sterilise water within the brewery.

    i) Water Sterilisation Techniques
    ii) Brewing Product Water

UNIT 4: HOPS

Candidates are required to have an in-depth understanding of the following:

Hop Biology and Cultivation

1. Identify and provide an overview of the hop cone and how it is commercially grown.

    i) Hop Botany

2. Explain the differences between hop varieties, and their core use in the brewing process.

    i) Hop Varieties

3. Summarise the benefits of hop breeding programs, what they aim to achieve, and describe a typical breeding program.

    i) Hop Breeding

4. Outline hop harvesting times, describing why and how hops are stabilised after harvest.

   i) Hop Cultivation
   ii) Hop Growing Cycle
   iii) Harvest and Drying

5. Identify key hop pests and diseases, as well as their potential impact upon the hops.

   i) Hop Pests and Diseases

Hop Chemistry

1. Be able to give an overview of the key chemical components of hops, and how each core component affects the final beer.

   i) Hop Chemistry Overview

2. Describe how the individual components of the resins are modified during the brewing process, and how they impact the bitterness of the beer.

   i) Total Resins

3. Classify the hop oil composition, their effect on beer flavour and aroma, and general levels in the final beer.

   i) Polyphenols

4. Be able to choose which hops to use in a beer, based upon a hop analysis and intended final beer flavour profile (generally).

   i) Essential Oils

Hop Products

1. Identify which hop products are most suitable to use, depending on the particular beer being produced, and why.

   i) Whole Hop Cones
   ii) Non-Isomerised Hop Pellets

2. Provide an overview of how the various hop products are manufactured, and what the source hop material is for each product.

   i) Non-Isomerised Hop Extract
   ii) Isomerised Hop Pellets
   iii) Isomerised Hop Extracts
   iv) Other Hop Products

3. Detail when the various hop products should be used in the brewing process, and what impact they will have on the final beer.

    i) Hop Aroma/Hop Oils

Brewing with Hops

1. Be able to assess hops by physical examination, in conjunction with a hop analysis, in order to select hops suitable for brewing.

    i) Selecting Hops

2. Understand the different laboratory methods for analysing hops, and be able to use that information in calculating a hop grist.

    i) Analysing Hops

3. Be able to select which hop products to add during the brewing process and determine how this will impact the final beer.

    i) The Bitterness Unit
    ii) Hop Addition Points

4. Identify, understand and utilise different methods of hop addition, dependent upon the stage of the process.

    i) Hop Dosing Equipment – Kettle and Late Hop

5. Calculate hop additions and hop utilisations in order to achieve a desired bitterness level.

    i) Hop Utilisation
    ii) Hop Input Calculations

UNIT 5: MILLING

Candidates are required to have an in-depth understanding of the following:

Malt Intake, Handling, and Storage

1. Describe intake inspection tests, and their importance

    i) The Objectives of Malt Intake, Handling, and Storage
    ii) Malt Intake
    iii) Certificates of Analysis
    iv) Intake Tests
    v) Physical and Organoleptic Analysis
    vi) Rapid Analytical Methods
    vii) Laboratory Testing

2. Identify the requirements of malt storage.

3. Describe the process of malt intake, handling, and storage (including cleaning, screening, and dust handling).

   i) Malt Handling and Storage Technology Overview
   ii) Malt Handling Process Overview
   iii) Malt Storage Conditions
   iv) Silo Fumigation
   v) Destoners
   vi) Screening
   vii) The Weigher
   viii) Working Safely with Dust

4. Discuss the technology used for malt intake operations.

   i) Bucket Elevators
   ii) Conveyors
   iii) Magnets
   iv) Malt Storage Silos
   v) Silo Contents Determination

5. Understand the handling of specialty malts.

   i) Speciality Malts

Milling Principles

1. Identify the objectives of milling.

   i) The Objectives of Milling

2. Describe the operating principles of roller and hammer mills.

   i) Roller Mill Design

3. Outline the important design features of mill rollers.

   i) Roller Speeds and Mill Gap
   ii) The Design of a Hammer Mill

4. Detail how to analyse grist.

   i) Grist Analysis

5. Discuss the process of malt conditioning and its significance to milling.

   i) Malt Conditioning

6. Explain the importance of grist composition to downstream processes.

   i) The Effect of Milling on Downstream Processes

Milling Technology

1. Describe the design and operation of wet mills.

   i) Wet Milling
   ii) Full Steep Wet Mill
   iii) Steep Conditioned Mill
   iv) Underwater Milling

2. Describe the design and operation of dry roller mills.

   i) Dry Milling
   ii) Two-Roller Dry Mill
   iii) Four-Roller Dry Mill
   iv) Six-Roller Mill

3. Describe the design and operation of hammer mills.

   i) Hammer Mill

4. Compare mill types and their selection criteria.

   i) Mill Selection

UNIT 6: MASHING

Candidates are required to have an in-depth understanding of the following:

Mashing Biochemistry

1. Describe the key mashing substrates.

   i) Mashing Substrates
   ii) Starch

2. Explain the nature and function of key enzymes; explain how they affect their substrates.

   i) Amylose
   ii) Amylopectin
   iii) Ends (Termini) of Amylose and Amylopectin
   iv) Protein
   v) Non-Starch Polysaccharides (NSP)
   vi) Lipids
   vii) Polyphenols
   viii) Mashing Enzymes

3. Understand how mashing biochemistry affects successful mashing.

   i) Effect of Temperature and pH
   ii) Starch Degrading Enzymes
   iii) α-Glucosidase
   iv) Protein Degrading Enzymes
   v) NSP Degrading Enzymes
   vi) Lipases and Lipoxygenases

4. Describe the production, purpose and uses of exogenous enzymes.

   i) Exogenous Enzymes

5. Describe the gelatinisation, liquefaction and saccharification of starch.

   i) Starch Gelatinisation and Liquefaction
   ii) Saccharification

The Mashing Process

1. Discuss the objectives of mashing.

   i) The Objectives of Mashing
   ii) Overview of Mashing

2. Understand the influence of ionic composition, pH, time, temperature, and mash thickness on enzyme activity.

   i) Temperature
   ii) Other Effects of Temperature
   iii) pH
   iv) Mash Thickness
   v) Grist Composition
   vi) Oxygen and Mashing

3. Compare and contrast the various approaches to mashing, their technical and operational differences, and their effects on the final product.

   i) Methods of Mashing
   ii) Isothermal Mashing
   iii) Single-Vessel, Temperature-Programmed Mashing
   iv) Decoction Mashing
   v) Double Mashing
   vi) Other Mashing Methods Using Varied Temperatures

4. Detail the components of a typical wort.

   i) Wort Composition

Mashing Technology

1. Discuss how mashing technology achieves the objectives of mashing.

    i) Mashing Technology

2. Describe the various pre-mashing technologies.

    i) Pre-mashing Technology
    ii) Pre-mashing – Steel's Masher

3. Compare the various mash heating technologies.

    i) Mash Heating
    ii) Heating Jackets
    iii) Steam Injection

4. Explain mash agitation and its importance.

    i) Mash Agitation

5. Detail the design of technology used in mash transfer.

    i) Mash Transfer – Mash-out
    ii) Mashing Vessel Design

UNIT 7: WORT SEPARATION

Candidates are required to have an in-depth understanding of the following:

Wort Separation Principles

1. Outline the process objectives of wort separation.

    i) Process Objectives of Wort Separation

2. Explain the role of the grain filter bed.

    i) Forming a Spent Grain Filter Bed and Pre-clarifying First Worts

3. Understand how the grain filter beds are formed differently by the lauter tun, mash filter and mash tun.

    i) Spent Grain Filter bed formation - The Mash Tun

4. Produce a typical wort collection gravity profile with values for gravity and volume. Include the following within this: strong worts, sparge, sparged worts, weak worts and last runnings.

   i) Collection of Strong Worts and Sparge Diluted Worts

5. Describe the removal and disposal of spent grain.

   i) Removal of the Spent Grain Bed

6. Define Darcy's Law for calculating the filtered wort flow rate of a wort separation device; explain each of the variables involved.

   i) Wort Filtration Physics – Darcy's Law

7. Explain why wort viscosity can vary, and how it affects filtered wort flow.

   i) The Effect of Wort Viscosity on Filtration Flow Rate

8. Provide typical grain bed loadings for the different wort separation devices, and then calculate their relative impact on filtered wort flow.

   i) The Effect of Grain Bed Depth and Cross-Sectional Area on Filtration Flow Rate

9. Demonstrate how the different milling requirements for different separation devices affect grain bed permeability; evaluate the impact on filtered wort flow.

   i) The Effect of Grain Bed Permeability (K) on Filtration Flow Rate

10. Explain why a mash separation device has to operate with a low differential pressure limit; describe the consequence for filtered wort flow.

    i) The Effect of Differential Pressure (DP) on Filter Flow Rate

11. Demonstrate, using Darcy's Law, the relative flow rates for each mash separation device for a set grist charge.

    i) Combining the Darcy's Law Variables

Wort Separation Technology

1. Describe the three most common wort separation devices: the lauter tun, mash tun, and mash filter.

   i) Wort Separation Device Outputs

2. Demonstrate how the variables of Darcy's Law affect the design of the three wort separation devices.

3. Draw and explain the key design features of the three wort separation devices.

   i) Lauter Tun Design and Operation
   ii) Mash Tun Design and Operation
   iii) Mash Filter Design and Operation

4. Describe the typical operating steps and times for the three wort separation devices.

   i) Controlling the Lauter Tun
   ii) Mash Filter Cycle Time

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   ii) Mash Tun Design and Operation
   iii) Mash Filter Design and Operation

4. Describe the typical operating steps and times for the three wort separation devices.

   i) Controlling the Lauter Tun
   ii) Mash Filter Cycle Time

5. Demonstrate the automatic control of a lauter tun and a mash filter.

   i) Automated Control of the Lauter Tun
   ii) Mash Filter – Automated Control

Wort Separation Process Control

1. Measure and calculate extract efficiency.

   i) Measuring Extract
   ii) Extract Efficiency
   iii) Calculating the Extract Recovered
   iv) EBC kg Extract Method

2. Investigate and resolve low extract efficiencies.

   i) Low Extract – Troubleshooting

3. Understand how to measure and maintain the key wort quality parameters.

   i) Spent Grain Analysis and disposal
   ii) Wort Quality
   iii) Cycle Time and Brews per Day

4. Investigate and resolve slow wort filtration issues.

   i) Brewhouse Performance
   ii) Sparging Inefficiency

UNIT 8: WORT BOILING

Candidates are required to have an in-depth understanding of the following:

Wort Boiling Theory

1. Detail the physical and chemical changes that occur during wort boiling.

   i) Inactivation of Malt Enzymes
   ii) Sterilisation of the Wort
   iii) Concentration of Wort Gravity by Evaporation

2. Describe how they affect wort and beer quality.

   i) Development of Flavour and Colour
   ii) Extraction and Isomerisation of Hop Compounds
   iii) Formation and Precipitation of Protein/Polyphenol Complexes
   iv) Removal of Unwanted Volatile Flavour Compounds
   v) Acidification of the Wort
   vi) Activation of Foam Positive Proteins

3. Apply this knowledge to manage wort boiling to produce wort of the required quality.

   i) Mass of Steam Supplied during Wort Boiling
   ii) Percentage Evaporation Based on Wort Gravity

4. Calculate evaporation rates.

Wort Boiling Technology and Process Control

3. Describe the various technologies available for wort boiling and energy recovery.

   i) Wort Boiling Technology
   ii) Direct Fired Kettles
   iii) Hot Water Heating (Hydroboiling)
   iv) Internal Wort Heater (Calandria)
   v) External Wort Heater (Calandria)
   vi) High Temperature Wort Boiling
   vii) Dynamic Low Pressure Boiling
   viii) Wort Stripping
   ix) Merlin Boiling System
   x) Wort Boiling Using Electric Immersion Heaters
   xi) Other Methods of Wort Boiling
   xii) Vapour Condensing and Cooling
   xiii) Mechanical Vapour Recompression (MVR)
   xiv) Thermal Vapour Recompression (TVR)

4. Explain why you would select a specific wort boiling system for an application.

   i) Brewhouse Energy Management
   ii) Energy Management Systems

UNIT 9: WORT CLARIFICATION, COOLING AND OXYGENATION

Candidates are required to have an in-depth understanding of the following:

Wort Clarification Technology and Process Control

1. Identify the objectives of wort clarification.

   i) Wort Clarification Objectives
   ii) Wort Clarification Systems

2. Describe hot break removal and Stokes' law.

3. Understand and describe the advantages and disadvantages of different systems, designs and typical operational parameters for the following:

   i) Whirlpool.
   ii) Hop back.
   iii) Hop strainer.
   iv) Coolship and sedimentation tanks.
   v) Hot wort centrifuge.
   vi) Kettle whirlpool.
   vii) Trub Processing and Disposal

Wort Cooling and Oxygenation Technology

1. Describe the design and operational principles of a plate heat exchanger; describe its use of secondary coolants and dilution water addition.

   i) Plate Heat Exchangers (PHE)
   ii) Shell and Tube Heat Exchangers

2. Explain the relevance of controlling cold break formation.

   i) Wort Cooling and Oxygenation Objectives
   ii) Wort Cooling Systems

3. Explain wort aeration for yeast requirements (sterol and fatty acid synthesis). Describe the implications of oxygen deficiency and how oxygen is dissolved.

   i) Cooling Design Options

4. Compare injecting oxygen against injecting air into the wort.

5. Compare injecting oxygen into hot wort against injecting it into cold wort. Discuss the best practice of adding oxygen at cold temperatures.

   i) Wort Oxygenation Systems

6. Describe the typical dissolved oxygen and wort temperatures at yeast pitching for both ales and lagers; recognise the requirements of using dried yeast.

   i) The Importance of Wort Cooling and Oxygenation