



## **Qualifications**

# **The General Certificate in Brewing (GCB)**

## **Examination Syllabus 2021**

## Unit 1: Course Introduction

### Lesson: Introduction to brewing

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Introduction to brewing	<ul style="list-style-type: none"><li>• Definition of beer</li><li>• Beer styles</li><li>• Overview of the beer production process from raw materials intake to packaging</li></ul>

## Unit 2: Raw Materials

### Lesson: Malt

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Barley and malt	<ul style="list-style-type: none"><li>• The importance of barley in brewing</li><li>• Key structures within a barley kernel</li><li>• Key stages within the malting process and associated technology</li><li>• The structural changes that occur in the barley kernel during the malting process</li><li>• The key enzyme activities during the malting process</li><li>• Key malt analytical parameters</li><li>• Pre-acceptance malt intake checks</li><li>• The quality of malt and production optimisation</li><li>• Malt storage requirements</li></ul>

### Lesson: Adjuncts

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Adjuncts	<ul style="list-style-type: none"><li>• The definition of adjuncts</li><li>• Adjuncts used in brewing and their application</li><li>• Speciality malts used in brewing and their application</li><li>• The principles of high gravity brewing</li></ul>

## Lesson: Water

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Water sources and treatments	<ul style="list-style-type: none"><li>• The various sources of water including borehole, surface, municipal/public</li><li>• Treatment methods for brewing water</li><li>• Importance of the ionic composition of water in brewing</li></ul>

## Lesson: Hops

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Hops and hop products	<ul style="list-style-type: none"><li>• The importance of hops in brewing</li><li>• The cultivation of hops</li><li>• Categories of hop products and their application in brewing</li><li>• Impact of hop products on sensory properties of beer</li><li>• Hop product storage requirements</li></ul>

## Lesson: Yeast

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Brewing yeast	<ul style="list-style-type: none"><li>• The importance of yeast in brewing</li><li>• The major components of the yeast cell and how they function</li><li>• The diversity of brewing yeast</li><li>• The process by which yeast cells grow and multiply</li><li>• Key requirements for keeping yeast healthy</li><li>• The reasons for using dry yeast in brewery</li></ul>

## Unit 3: Wort Production

### Lesson: Milling

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"><li>• The principles of milling</li></ul>
Process	<ul style="list-style-type: none"><li>• Overview of the milling process</li><li>• The key steps of grain intake and the accompanying safety hazards</li><li>• Important parameters for successful milling</li><li>• Calculating the amount of grain required for brewing</li></ul>
Technology	<ul style="list-style-type: none"><li>• Types of milling systems and basics of operation</li><li>• Use of pre-milled malt in brewery</li></ul>

### Lesson: Mashing

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"><li>• The principles of mashing</li></ul>
Process	<ul style="list-style-type: none"><li>• The overview of mashing</li><li>• Key mashing process parameters</li><li>• The control of pH and ionic composition of brewing water</li><li>• The role of malt enzymes and factors that affect their efficiency</li><li>• The importance of the liquor to grist ratio</li><li>• The starch conversion test</li></ul>
Technology	<ul style="list-style-type: none"><li>• Overview of the mashing systems</li><li>• Impact of different mashing profiles on wort fermentability</li></ul>

## Lesson: Wort Separation

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"><li>• The principles of wort separation</li></ul>
Process	<ul style="list-style-type: none"><li>• Overview of the wort separation and the key process parameters</li><li>• Factors that affect wort quality</li></ul>
Technology	<ul style="list-style-type: none"><li>• Wort separation systems</li><li>• Wort separation system selection based on milling system</li><li>• The significance of cycle times for brewhouse capacity</li><li>• Extract efficiency calculations</li></ul>

## Lesson: Wort Boiling

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"><li>• The principles of wort boiling</li></ul>
Process	<ul style="list-style-type: none"><li>• The key boiling parameters</li><li>• Wort pH adjustment</li><li>• Hop product application and hop utilisation</li><li>• Characteristics of boiled wort</li></ul>
Technology	<ul style="list-style-type: none"><li>• Wort boiling systems</li><li>• Factors that impact wort boiling efficiency</li></ul>

## Lesson: Wort Clarification, Cooling, and Oxygenation

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"><li>• The principles of wort clarification</li><li>• The principles of wort cooling and oxygenation</li></ul>
Process	<ul style="list-style-type: none"><li>• Basic operation of wort clarification equipment</li><li>• Use of clarification agents</li><li>• Basic operation of wort cooling and oxygenation equipment</li><li>• Wort cooling and oxygenation microbiological risks</li></ul>
Technology	<ul style="list-style-type: none"><li>• Wort clarification systems</li><li>• Wort cooling systems</li><li>• Wort oxygenation equipment</li></ul>

## Unit 4: Fermentation

### Lesson: 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"><li>• The principles of alcoholic fermentation and key outputs</li><li>• Typical stages of fermentation</li></ul>
Process	<ul style="list-style-type: none"><li>• Basic operation of the fermentation vessels</li><li>• The selection of yeast for pitching</li><li>• The calculation of yeast pitching rate for fermentation</li><li>• Key flavour compounds developed during fermentation</li><li>• Factors affecting fermentation</li></ul>
Technology	<ul style="list-style-type: none"><li>• Key requirements for a typical fermentation vessel</li></ul>

## Lesson: Yeast Management

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"><li>• Principles of yeast management</li><li>• Requirements for yeast propagation</li></ul>
Process	<ul style="list-style-type: none"><li>• The purpose and timing of yeast cropping</li><li>• Operation of a yeast propagation plant</li><li>• Monitoring of yeast health</li><li>• Storage and handling of yeast</li></ul>
Technology	<ul style="list-style-type: none"><li>• Design of a yeast propagation plant</li><li>• The production of pure culture of yeast</li></ul>

## Unit 5: Maturation

### Lesson: Maturation

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"><li>• The purpose of warm maturation</li><li>• The purpose of cold maturation</li><li>• The general principles of clarification and stabilisation</li></ul>
Process	<ul style="list-style-type: none"><li>• Typical changes during maturation affecting beer flavour</li><li>• The principles of bottle and cask conditioning</li><li>• Types of clarification and stabilisation agents and their application</li></ul>
Technology	<ul style="list-style-type: none"><li>• Maturation systems</li><li>• Clarification and stabilisation systems</li></ul>

### Lesson: Cooling, Carbonating and Blending

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"><li>• The purpose of beer cooling and carbonation</li><li>• The principles of blending (high gravity dilution)</li></ul>

Process	<ul style="list-style-type: none"> <li>• Beer temperature control</li> <li>• Beer carbonation control</li> <li>• Deaerated water production methods</li> </ul>
Technology	<ul style="list-style-type: none"> <li>• Beer cooling systems</li> <li>• Beer carbonation systems</li> </ul>

## Lesson: Filtration

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"> <li>• The principles of beer filtration</li> <li>• Reasons for using filter aids</li> <li>• The health and safety hazards associated with filtration</li> </ul>
Process	<ul style="list-style-type: none"> <li>• Operational steps and process parameters for beer filtration</li> <li>• Types of filter aids</li> </ul>
Technology	<ul style="list-style-type: none"> <li>• Filtration and separation systems</li> </ul>

## Unit 6: Quality

### Lesson: 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"> <li>• Variation and variability</li> <li>• The purpose of a specification</li> <li>• The concept of tolerance for specification ranges</li> <li>• Simple statistical quality control procedures</li> <li>• Simple methods for recording, reporting and the interpretation of data</li> <li>• The key brewing measurable parameters and their influence on quality</li> <li>• The principles of monitoring and adjustment to achieve product consistency</li> <li>• Typical applications for in-line and on-line instrumental process control</li> </ul>



## Lesson: 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"><li>• The definition and benefits of a quality management system</li><li>• The four main processes to implement a quality management system</li><li>• Examples of quality management systems and their key principles</li></ul>
Product safety	<ul style="list-style-type: none"><li>• The typical steps in implementing a HACCP system</li></ul>

## Lesson: 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	<ul style="list-style-type: none"><li>• What flavour is and where it is developed during brewing</li><li>• Importance of flavour control</li><li>• Role of sensory evaluation in controlling flavour</li><li>• The sensory assessor</li><li>• Preparing samples for sensory testing</li><li>• Sensory test room conditions</li><li>• Types of sensory tests and when to use them<ul style="list-style-type: none"><li>○ Sample screening</li><li>○ Difference testing</li><li>○ Descriptive analysis<ul style="list-style-type: none"><li>▪ Flavour wheels</li><li>▪ Flavour profiling</li></ul></li></ul></li></ul>

## Lesson: Dissolved Oxygen

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
The spoilage of beer by oxygen	<ul style="list-style-type: none"><li>• The impact of oxidation on beer quality</li><li>• Typical flavour compounds from oxidation</li><li>• Typical points in the process where beer can be exposed to oxygen</li><li>• Good practices to minimise oxygen pick-up</li><li>• The use of antioxidants</li></ul>

## Unit 7: Hygiene

### Lesson: 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"><li>• Definition of bacteria and fungi and examples of those commonly found in breweries</li><li>• Methods for detecting microbiological contaminants</li></ul>
Microbiological control	<ul style="list-style-type: none"><li>• The principle ways to achieve microbiological control in a brewery and in particular to the following key areas:<ul style="list-style-type: none"><li>○ Yeast handling systems</li><li>○ Product and process waters</li></ul></li><li>• The types of chemical, light and heat sanitisers commonly used</li></ul>

### Lesson: 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"><li>• Four key factors for efficient plant cleaning</li><li>• The different types of detergents used and the reasons for their choice</li><li>• The types of cleaning head used and reasons for their choice</li><li>• Differences between single use and recovery systems</li><li>• The operating principles of CIP systems</li></ul>
CIP cleaning cycles	<ul style="list-style-type: none"><li>• Typical cleaning programmes and cycle times</li><li>• The function of each of the cleaning cycle stages</li></ul>
CIP plant design	<ul style="list-style-type: none"><li>• Design features that minimise dirt accumulation in vessels and pipelines and encourage efficient cleaning</li><li>• Design features which promote a hygienic working environment</li></ul>

## Unit 8: Engineering and the Environment

### Lesson: 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"><li>• The key business reasons for an effective maintenance system</li><li>• The features, advantages, disadvantages and applications of maintenance systems</li><li>• Familiarity with key maintenance tasks</li><li>• The contribution of maintenance tasks to plant safety, reliability, quality, economics and environmental impact</li></ul>
Performance improvement	The key features of the following performance improvement systems: <ul style="list-style-type: none"><li>• Reliability Centred Maintenance (RCM)</li><li>• Total Productive Maintenance (TPM)</li><li>• Workplace Organisation (6S)</li></ul>

### Lesson: 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"><li>• The guiding principles of sustainability, and the concepts of a sustainable industry</li><li>• The role of carbon dioxide and the carbon cycle</li><li>• The principal sources of carbon dioxide</li></ul>
Process gases	<ul style="list-style-type: none"><li>• The role of air and oxygen as process gases</li><li>• Inertness and the role of nitrogen</li></ul>
Steam and energy	<ul style="list-style-type: none"><li>• The main uses of steam in brewing</li><li>• The principal energy consuming activities in a brewery</li><li>• Heat recovery systems in breweries</li></ul>
Water	<ul style="list-style-type: none"><li>• Categories of water: product water, process water and service water</li><li>• Prevention of Legionella infection in cooling towers</li></ul>

## Lesson: 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"><li>• The measurement of effluent volume and strength: biological and chemical oxygen demand, suspended solids, volume, pH and temperature</li><li>• Control methods used for reducing effluent</li></ul>
Effluent treatment technologies	<ul style="list-style-type: none"><li>• Aerobic and anaerobic systems and their relevant application</li><li>• Temperature, flow and pH considerations for consented discharge to sewer</li></ul>

## Lesson: Co-products

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"><li>• The definition of a co-product</li><li>• The potential value of a co-product to a brewer</li></ul>
Range of brewery co-products and preparation of animal feed	<ul style="list-style-type: none"><li>• Carbon dioxide recovery process</li><li>• Spent grains recovery process</li><li>• Yeast recovery process</li><li>• Potential applications for co-products</li></ul>

## Lesson: 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"><li>• Hazards and risks from dust and carbon dioxide</li><li>• The essential precautions needed in the brewery in order to make it a safe working environment</li></ul>
Detergents and sterilants	<ul style="list-style-type: none"><li>• The hazards associated with chemical cleaning and sterilising agents</li><li>• Good practices for the storage of chemicals</li><li>• Use of personal protective clothing</li><li>• Procedures in case of accidental spillage or discharge of chemicals</li></ul>