General Certificate in Brewing

Examination Syllabus

Version No.	Description	Author	Approval	Effective Date
6.0	GCB Examination Syllabus	Natalie Ferreira	Deborah Kennedy	30/ 01/ 2025

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. The examination may also include some calculation questions.

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	• Definition of beer • Beer styles • Overview of the beer production process from raw materials intake to packaging

2: Raw Materials

Malt

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Barley and malt	• The importance of barley in brewing • 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 enzyme activities during the malting process • Key malt analytical parameters • Pre-acceptance malt intake checks • The quality of malt and production optimisation • Malt storage requirements

Adjuncts

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**

Adjuncts	• The definition of adjuncts • Adjuncts used in brewing and their application • Speciality malts used in brewing and their application • The principles of high gravity brewing

Water

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Water sources and treatments	• The various sources of water including borehole, surface, municipal/public • Treatment methods for brewing water • Importance of the ionic composition of water in brewing

Hops

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Hops and hop products	• The importance of hops in brewing • The cultivation of hops • Categories of hop products and their application in brewing • Impact of hop products on sensory properties of beer • Hop product storage requirements

Yeast

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Brewing yeast	• The importance of yeast in brewing • The major components of the yeast cell and how they function • The diversity of brewing yeast • The process by which yeast cells grow and multiply • Key requirements for keeping yeast healthy • The reasons for using dry yeast in brewery

3: Wort Production

Milling

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	• The principles of milling
Process	• Overview of the milling process • The key steps of grain intake and the accompanying safety hazards • Important parameters for successful milling • Calculating the amount of grain required for brewing
Technology	• Types of milling systems and basics of operation • Use of pre-milled malt in brewery

Mashing

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Overview	• The principles of mashing
Process	• The overview of mashing • Key mashing process parameters • The control of pH and ionic composition of brewing water • The role of malt enzymes and factors that affect their efficiency • The importance of the liquor to grist ratio • The starch conversion test
Technology	• Overview of the mashing systems • Impact of different mashing profiles on wort fermentability

Wort Separation

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The principles of wort separation
Process	• Overview of the wort separation and the key process parameters • Factors that affect wort quality
Technology	• Wort separation systems • Wort separation system selection based on milling system • The significance of cycle times for brewhouse capacity • Extract efficiency calculations

Wort Boiling

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The principles of wort boiling
Process	• The key boiling parameters • Wort pH adjustment • Hop product application and hop utilisation • Characteristics of boiled wort
Technology	• Wort boiling systems • Factors that impact wort boiling efficiency

Wort Clarification, Cooling, and Oxygenation

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The principles of wort clarification • The principles of wort cooling and oxygenation

Process	• Basic operation of wort clarification equipment • Use of clarification agents • Basic operation of wort cooling and oxygenation equipment • Wort cooling and oxygenation microbiological risks
Technology	• Wort clarification systems • Wort cooling systems • Wort oxygenation equipment

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	• The principles of alcoholic fermentation and key outputs • Typical stages of fermentation
Process	• Basic operation of the fermentation vessels • The selection of yeast for pitching • The calculation of yeast pitching rate for fermentation • Key flavour compounds developed during fermentation • Factors affecting fermentation
Technology	• Key requirements for a typical fermentation vessel

Yeast Management

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• Principles of yeast management • Requirements for yeast propagation
Process	• The purpose and timing of yeast cropping • Operation of a yeast propagation plant • Monitoring of yeast health • Storage and handling of yeast

Technology	• Design of a yeast propagation plant • The production of pure culture of yeast

5: Maturation

Maturation

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The purpose of warm maturation • The purpose of cold maturation • The general principles of clarification and stabilisation
Process	• Typical changes during maturation affecting beer flavour • The principles of bottle and cask conditioning • Types of clarification and stabilisation agents and their application
Technology	• Maturation systems • Clarification and stabilisation systems

Cooling, Carbonating and Blending

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The purpose of beer cooling and carbonation • The principles of blending (high gravity dilution)
Process	• Beer temperature control • Beer carbonation control • Deaerated water production methods
Technology	• Beer cooling systems • Beer carbonation systems

Filtration

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Overview	• The principles of beer filtration • Reasons for using filter aids

	• The health and safety hazards associated with filtration
Process	• Operational steps and process parameters for beer filtration • Types of filter aids
Technology	• Filtration and separation systems

6: 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	• 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 brewing 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	• 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	• 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	• What flavour is and where it is developed during brewing
	• Importance of flavour control
	• Role of sensory evaluation in controlling flavour
	• The sensory assessor
	• Preparing samples for sensory testing
	• Sensory test room conditions
	• Types of sensory tests and when to use them
	  ○ Sample screening
	  ○ Difference testing
	  ○ Descriptive analysis
	  ▪ Flavour wheels
	  ▪ Flavour profiling

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	• The impact of oxidation on beer quality • Typical flavour compounds from oxidation • Typical points in the process where beer can be exposed to oxygen • Good practices to minimise oxygen pick-up • The use of antioxidants

7: 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	• Definition of bacteria and fungi and examples of those commonly found in breweries • Methods for detecting microbiological contaminants

Microbiological control	• The principle ways to achieve microbiological control in a brewery and in particular to the following key areas:
	  ○ 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	• 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	• Typical cleaning programmes and cycle times • The function of each of the cleaning cycle stages
CIP plant design	• Design features that minimise dirt accumulation in vessels and pipelines and encourage efficient cleaning • Design features which promote a hygienic working environment

8: 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	• The key business reasons for an effective maintenance system • The features, advantages, disadvantages and applications of maintenance systems • Familiarity with key maintenance tasks • The contribution of maintenance tasks to plant safety, reliability, quality, economics and environmental impact
Performance improvement	The key features of the following performance improvement systems: • Reliability Centred Maintenance (RCM) • Total Productive Maintenance (TPM) • Workplace Organisation (6S)

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	• 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
Process gases	• The role of air and oxygen as process gases • Inertness and the role of nitrogen
Steam and energy	• The main uses of steam in brewing • The principal energy consuming activities in a brewery • Heat recovery systems in breweries
Water	• Categories of water: product water, process water and service water • Prevention of Legionella infection in cooling towers

Effluent

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Sources of effluent and measurement	• 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	• Aerobic and anaerobic systems and their relevant application • Temperature, flow and pH considerations for consented discharge to sewer

Co-products

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Co-products	• The definition of a co-product • The potential value of a co-product to a brewer
Range of brewery co-products and preparation of animal feed	• Carbon dioxide recovery process • Spent grains recovery process • Yeast recovery process • Potential applications for co-products

Health and Safety

Topics	**Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:**
Health and safety	• Hazards and risks from dust and carbon dioxide • The essential precautions needed in the brewery in order to make it a safe working environment
Detergents and sterilants	• 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