



Qualifications

General Certificate in Malting (GCM)

Examination Syllabus

Unit 1: Cereals – uses for malting and beer/spirit production

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Cereals and food	<ul style="list-style-type: none">• Cultivation of cereals for food• Competition for land – food vs energy
Types of cereal	<ul style="list-style-type: none">• Types of cereals• Common cereals and growing regions• Alternative cereals
Malted cereal	<ul style="list-style-type: none">• Uses of malted cereals (including non-brewing/distilling uses) and malt co-products• Malted cereals in brewing• Malted cereals and distilled spirits

Unit 2: Maltings – overview and requirements

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Malting process overview	<ul style="list-style-type: none">• The role of barley as a principal source of starch• The special attributes of barley for malting• The significant changes that occur when the barley grain is malted• The principal constituents of malt
Types of malt plant	<ul style="list-style-type: none">• Traditional methods of malting• Different types of automated malting plant
Requirements for malting	<ul style="list-style-type: none">• Costing – an awareness of the essential cost elements in the manufacture of malt• Malting yield – control and measurement of 'malting loss'

Unit 3: Barley- growing and harvesting

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Barley growing	<ul style="list-style-type: none"> • UK Barley growing regions • Barley growth cycle • Harvesting barley
Barley varieties	<ul style="list-style-type: none"> • Barley varieties and their uses • Development and establishment of new barley varieties
Barley breeding	<ul style="list-style-type: none"> • Plant breeding • UK new variety development and approval process
Barley purchasing	<ul style="list-style-type: none"> • Contracting and purchasing of barley

Unit 4: Malting – barley intake and storage

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Barley evaluation at intake	<ul style="list-style-type: none"> • Sampling techniques • Evaluation of barley at malthouse intake • Laboratory and rapid methods of determining barley quality
Identification of common malting varieties	<ul style="list-style-type: none"> • Hand evaluation and inspection • Morphological characteristics of barley
Barley intake plant and processes	<ul style="list-style-type: none"> • Different elements of barley intake plant • Barley screening • Operating principles of dust extraction plant • Co-products
Barley storage	<ul style="list-style-type: none"> • Storage requirements for barley • Drying of barley • Barley store housekeeping and pest control • Use and control of pesticides • Storage related food safety issues associated with un-malted cereals

Unit 5: Malting - steeping

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Pre-germination tests for barley	<ul style="list-style-type: none">• Predictive tests for germination and their interpretation• Selection of barley for specific malts
Steeping plant and process design	<ul style="list-style-type: none">• Different types of barley steeping plant• Barley washing• Operating principles of steeping plant• Steep programme design
Control of steeping	<ul style="list-style-type: none">• Steep temperature control• Importance of aeration and CO₂ extraction• Process control parameters• Factors affecting moisture uptake

Unit 6: Malting - germination

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Modification – its meaning and control	<ul style="list-style-type: none">• Biochemical changes during germination• Control of the degree of modification
Germination plant and process design	<ul style="list-style-type: none">• Different types of germination plant• Operating principles of germination plant• Germination programme design• Germination plant hygiene considerations
Control of germination	<ul style="list-style-type: none">• Germination temperature control• Importance of air flow and air conditioning• Process control parameters• Use of additives in germination• Hand evaluation

Unit 7: Malting - kilning

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Kilning plant and process design	<ul style="list-style-type: none"> • Different types of kilning plant • Operating principles of kilning, including the phases of the cycle • Kilning programme design
Control of kilning	<ul style="list-style-type: none"> • Planning kilning cycles for specific malts • Importance of air flow, humidity and temperature control • Understanding of the 'break point' • Process control parameters
Effects of kilning on finished malt	<ul style="list-style-type: none"> • Development of malt colour and flavour • Control of finished malt specification – enzyme activity, NDMA, DMSP • Control of moisture levels, and effect on finished malt quality
Cooling off-kiln	<ul style="list-style-type: none"> • Control of cooling off-kiln

Unit 8: Malting – storage and dispatch

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Preparation and storage of finished malt	<ul style="list-style-type: none"> • Operating principles of deculming and screening plant
Malt storage plant and processes	<ul style="list-style-type: none"> • Storage requirements for malt • Different types of malt stores • Mechanical handling – conveyor and elevator types • Malt silo housekeeping and pest control • Food safety issues associated with malted cereals
Malt evaluation at dispatch	<ul style="list-style-type: none"> • Different types of out-loading systems • Dispatch quality checks

Unit 9: Speciality Malt Production

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Types of speciality malts	<ul style="list-style-type: none"> • Different types of speciality malts, their characteristics and their production • Raw materials for roasted malt production • Raw materials for 'other' speciality malts
Plant and processes	<ul style="list-style-type: none"> • Principles and operation of malt roasting equipment • Process control parameters
Uses of speciality malts	<ul style="list-style-type: none"> • Typical uses of roasted and 'other' speciality malts

Unit 10: Malt Quality and Process Control

Note: Key parameters examined in this unit are: Extract (fine and coarse), total and soluble nitrogen or protein, Free Amino Nitrogen (FAN), Diastatic Power (DP), α -amylase (AA), β -glucan (BG), screenings, colour, moisture, homogeneity and friability, steeliness, fermentability, Predicted Spirit Yield (PSY), Dimethyl Sulphide Precursors (DMSP).

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Process specifications	<ul style="list-style-type: none"> • Process adjustments to address the variable nature of the natural ingredients of malt • The purpose of process specifications • Effects of the malting process on the final product value of these key parameters
Process control	<ul style="list-style-type: none"> • The principles of monitoring and adjustment to achieve product consistency • Simple quality control procedures • The concepts of tolerance and range for specification parameter values • Typical specifications which differentiate malt types • Typical process specification ranges, especially those requiring periodic adjustment to achieve product consistency
Laboratory analysis	<ul style="list-style-type: none"> • Principles of the analytical methods for the key parameters

Malt specifications	<ul style="list-style-type: none"> • Sampling of finished malt • Finished malt specifications • Implications of blending of malt to achieve specification
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Unit 11: Beer Types – raw materials and sweet wort production

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Definition of beer and types of beer	<ul style="list-style-type: none"> • A generic, non-legalistic definition of beer in terms of its typical ingredients and methods of production • Characteristics which differentiate lagers, ales and stouts
Barley and malt	<ul style="list-style-type: none"> • The brewer's key malt parameters of degree of modification, extract content, moisture content, extract, and colour • The selection of malt for beer type and mash conversion method • Pre-acceptance checks at malt intake
Adjuncts	<ul style="list-style-type: none"> • Reasons for the use of adjuncts • Types of adjunct and their method of use • Typical usage rate as proportion of the grist
Mash conversion	<ul style="list-style-type: none"> • The respective roles of the amylases and protease, the effect of temperature, pH and time on their activity. • Temperature and wort viscosity. • The influence of the ionic composition (hardness salts) of mashing water in the mash and on beer flavour. • The starch test
Grist composition and extract performance	<ul style="list-style-type: none"> • The extract yield of raw materials

Unit 12: Distilled Spirits – raw materials and wort production

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Definition of potable spirits	<ul style="list-style-type: none"> Definitions of the main spirits derived from cereals
Characteristics of potable spirits	<ul style="list-style-type: none"> The range of spirit types and their respective styles and characters
Mash and its uses, including green malt and peated malt	<ul style="list-style-type: none"> The selection of malt for spirit type and mash conversion method Pre-acceptance checks at malt intake The importance of malt to mashing and fermentation, particularly for yeast nutrients, a source of enzymes and as a filter medium for wash The advantages and disadvantages of the use of green malt in grain whisky distilleries

Unit 13: Safety in the Malt Plant

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Malting plant safety considerations	<ul style="list-style-type: none"> The evolution of carbon dioxide from steeping and germination The hazards associated with carbon dioxide The monitoring / checking of atmospheres for safe working including a quantitative knowledge of exposure limits Safe working practices for malting plant operations
Malt and barley storage plant safety considerations	<ul style="list-style-type: none"> The hazards associated with dust Explosive atmospheres in the workplace Safe working practices for malt storage plant operations
Chemical safety	<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 equipment (PPE) Procedures in case of accidental spillage or discharge of chemicals

Unit 14: Quality Management

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 key features of a quality system: <ul style="list-style-type: none"> ○ written specifications ○ written procedures ○ monitoring of performance ○ corrective actions ○ auditing ○ regular reviews for improvement
Roles, responsibilities and benefits	<ul style="list-style-type: none"> • The impact of individual actions on product and service quality • The control of documentation • The maintenance of conformity • The business benefits of an effective quality management system
Product safety	<ul style="list-style-type: none"> • The control of product safety: <ul style="list-style-type: none"> ○ Hazard Analysis Critical Control Point (HACCP) • The importance of traceability for product recall
Malt related food safety	<ul style="list-style-type: none"> • Potential contaminants from outside the malting plant – field mycotoxins, agrochemicals, heavy metals • Potential contaminants from within the malting plant – storage mycotoxins, NDMA/ATNC, ethyl carbamate

Unit 15: Plant Cleaning – Cleaning in place (CIP), pest control and general cleaning

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Types of cleaning systems	<ul style="list-style-type: none"> • Automatic vs manual cleaning • The general differences between single use and recovery systems: <ul style="list-style-type: none"> ○ advantages and disadvantages • The types of cleaning head used and reasons for their choice • The operating principles and diagrammatic representation of CIP systems
Pest control	<ul style="list-style-type: none"> • General site pest control principles • Insect detection and control

General plant cleaning	<ul style="list-style-type: none"> • Cleaning plant surfaces, walls and floors • The constituents of foam cleaning agents • The use of foaming systems, steam cleaning, chlorinated and high pressure water cleaning associated with the micro-organism
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Unit 16: Engineering Maintenance

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Objectives and approaches	<ul style="list-style-type: none"> • The key business reasons for an effective maintenance system • The features, advantages, disadvantages and applications of: <ul style="list-style-type: none"> ○ no maintenance ○ breakdown maintenance ○ preventive maintenance ○ predictive maintenance • The contribution of maintenance tasks to plant safety, reliability, quality, economics and environmental impact
Maintenance tasks	<ul style="list-style-type: none"> • Familiarity with key maintenance tasks: <ul style="list-style-type: none"> ○ mechanical ○ electrical ○ calibration ○ inspection ○ condition monitoring ○ cleaning of plant ○ health and safety • Maintenance planning and record keeping • Autonomous maintenance
Systems for continuous improvement	<ul style="list-style-type: none"> • The key features of the following performance improvement systems <ul style="list-style-type: none"> ○ Reliability Centred Maintenance (RCM) ○ Total Productive Maintenance (TPM) ○ Workplace Organisation (5S)

Unit 17: Utilities – energy, water and effluent in malting

Topics	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
Types of fuels	<ul style="list-style-type: none"> • Choice of fuels available • Fuel cost control • Combined Heating and Power (CHP) systems
Water sources, treatment and uses in malting	<ul style="list-style-type: none"> • Characteristics and quality of an ideal malt house water supply • Sources of water for a malt house • Differentiation and typical uses of water in malt production
Sources of effluent and its measurement	<ul style="list-style-type: none"> • The nature and characteristics of effluent from principal malt house operations • The components of effluent quality: <ul style="list-style-type: none"> ○ volume ○ suspended solids (SS) ○ chemical oxygen demand (COD) ○ biological oxygen demand (BOD) ○ pH ○ temperature

Unit 18: Malting and the Environment

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 concept of a sustainable industry • The role of carbon dioxide – the carbon cycle • Sources of carbon dioxide emissions
Conservation	<ul style="list-style-type: none"> • Principal energy consuming activities in a malthouse • Typical energy reduction strategies • Principal water consuming activities • Typical water conservation strategies
Waste	<ul style="list-style-type: none"> • Principal waste generating activities in a malthouse • Issues for waste disposal • Strategies to minimise waste and encourage recycling