



# The General Certificate in Malting (GCM)

## Examination Syllabus

This syllabus details the course of study necessary to prepare for examination in the **General Certificate in Malting**.

The specifications to which the respective examination papers are prepared are also shown.





The **General Certificate in Malting** gives international recognition of a basic, under-pinning knowledge and understanding in the principles of malting operations. The qualification is offered by both the Institute of Brewing and Distilling (IBD), as a stand-alone qualification, and the Maltsters' Association of Great Britain (MAGB) as part of their Certificate in Malting Competence (CMC) qualification.

The General Certificate in Malting has been designed for candidates who may have little or no formal academic or technical qualification and will often be employed as a senior operator or technician in a malthouse, or will be graduates or managers new to the malting business. The scope of these examinations will also enable those from smaller malting operations to obtain this recognised qualification, and are open to anybody with interest in malt production. They are a measure of basic knowledge (theoretical and practical) underpinning cereal growing, malt production and associated operations.

- The General Certificate in Malting can be an end in itself, or the start of professional development leading to further qualifications in malting.
- The General Certificate in Malting is accredited at Level 3 of the National Qualifications Framework in the UK (or equivalent internationally recognised standards).
- The General Certificate in Malting takes the form of one multiple choice paper of two hours.
- The General Certificate in Malting is a module forming part of the MAGB's Certificate of Malting Competence.

Candidates can register to sit the exam on-line instead of using the traditional paper format. Candidates sitting within malthouse or university centres will be encouraged to take the on-line version. The exam itself appears on the screen very much like the paper version and with the same number of questions, but there are various different ways of asking the questions which make the exam a more interesting experience. The marking is done electronically and candidates will received a detailed feedback on how each section of the syllabus has been answered.

The pass mark is set at 66% (40 correct answers from 60 questions) for all IBD General Certificate exams.

Candidates attaining 90% or more achieve a Distinction pass and between 80% and 89% achieve a Credit pass.

**The full list of sections in the GCM syllabus is as follows:-**

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| 1. | Cereals; their uses for malting and beer/spirit production. | Page 4 |
| 2. | Malting; overview and requirements.                         | Page 5 |
| 3. | Barley growing and harvesting.                              | Page 6 |
| 4. | Malting – barley intake and storage.                        | Page 7 |
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6.	Malting - germination.	Page <b>9</b>
7.	Malting - kilning.	Page <b>10</b>
8.	Malting - storage and dispatch.	Page <b>11</b>
9.	Speciality malt production.	Page <b>12</b>
10.	Malt quality and process control.	Page <b>13</b>
11.	Beer types; raw materials and sweet wort production.	Page <b>14</b>
12.	Distilled spirits; raw materials and wort production.	Page <b>15</b>
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 <b>Syllabus Section 1: Cereals; their uses for malting and beer/spirit production.</b>		
Ref.	<b>Topics</b>  (No. of questions to be answered = <b>2</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>
1.1	<b>Cereals and Food</b>	1. Cultivation of cereals for food.  2. Competition for land – food vs. energy.
1.2	<b>Types of Cereals</b>	1. Types of cereals.  2. Common cereals and growing regions.  3. Alternative cereals.
1.3	Malted cereals	1. Uses of malted cereals (including non-brewing/distilling uses) and malt co-products.  2. Malted cereals in Brewing.  3. Malted cereals and Distilled Spirits.

 <b>Syllabus section 2: Malting; overview and requirements.</b>		
Ref.	<b>Topics</b>  (No. of questions to be answered = <b>3</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>
2.1	<b>Malting process overview</b>	1. The role of barley as a principal source of starch.  2. The special attributes of barley for malting.

		<ol style="list-style-type: none"> <li>3. The significant changes that occur when the barley grain is malted.</li> <li>4. The principal constituents of malt.</li> </ol>
2.2	<b>Types of malt plant</b>	<ol style="list-style-type: none"> <li>1. Traditional methods of malting.</li> <li>2. Different types of automated malting plant.</li> </ol>
2.3	<b>Requirements for malting</b>	<ol style="list-style-type: none"> <li>1. Costing – an awareness of the essential cost elements in the manufacture of malt.</li> <li>2. Malting yield – control and measurement of ‘malting loss’.</li> </ol>

	<b>Syllabus section 3: Barley growing and harvesting.</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>4</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
3.1	<b>Barley growing</b>	<ol style="list-style-type: none"> <li>1. UK Barley growing regions.</li> <li>2. Barley growth cycle.</li> <li>3. Harvesting barley.</li> </ol>	
3.2	<b>Barley varieties</b>	<ol style="list-style-type: none"> <li>1. Barley varieties and their uses.</li> <li>2. Development and establishment of new barley varieties</li> </ol>	
3.3	<b>Barley breeding</b>	<ol style="list-style-type: none"> <li>1. Plant breeding.</li> </ol>	

		2. UK new variety development and approval process.
3.4	<b>Barley Purchasing</b>	1. Contracting and purchasing of barley.

	<b>Syllabus section 4: Malting – Barley intake and storage.</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>5</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
4.1	<b>Barley evaluation at intake</b>	<ol style="list-style-type: none"> <li>1. Sampling techniques.</li> <li>2. Evaluation of barley at malthouse intake.</li> <li>3. Laboratory and rapid methods of determining barley quality.</li> </ol>	
4.2	<b>Identification of common malting varieties</b>	<ol style="list-style-type: none"> <li>1. Hand evaluation and inspection.</li> <li>2. Morphological characteristics of barley</li> </ol>	
4.3	<b>Barley intake plant and processes.</b>	<ol style="list-style-type: none"> <li>1. Different elements of barley intake plant.</li> <li>2. Barley screening.</li> <li>3. Operating principles of dust extraction plant.</li> <li>4. Co-products.</li> </ol>	
4.4	<b>Barley storage.</b>	<ol style="list-style-type: none"> <li>1. Storage requirements for barley</li> <li>2. Drying of barley</li> </ol>	

3. Barley store housekeeping and pest control.
4. Use and control of pesticides.
5. Storage related food safety issues associated with un-malted cereals.

	Syllabus section 5: Malting – Steeping.		
Ref.	Topics  (No. of questions to be answered = 4)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:	
5.1	<b>Pre-germination tests for barley</b>	<ol style="list-style-type: none"> <li>1. Predictive tests for germination and their interpretation.</li> <li>2. Selection of barley for specific malts</li> </ol>	
5.2	<b>Steeping plant and process design</b>	<ol style="list-style-type: none"> <li>1. Different types of barley steeping plant.</li> <li>2. Barley washing.</li> <li>3. Operating principles of steeping plant.</li> <li>4. Steep programme design.</li> </ol>	
5.3	<b>Control of steeping</b>	<ol style="list-style-type: none"> <li>1. Steep temperature control.</li> <li>2. Importance of aeration and CO<sub>2</sub> extraction.</li> <li>3. Process control parameters.</li> <li>4. Factors affecting moisture uptake</li> </ol>	



Syllabus section 6: Malting – Germination.



Ref.	Topics  (No. of questions to be answered = 4)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
6.1	<b>Modification – its meaning and control.</b>	<ol style="list-style-type: none"><li>1. Biochemical changes during germination.</li><li>2. Control of the degree of modification.</li></ol>
6.2	<b>Germination plant and process design</b>	<ol style="list-style-type: none"><li>1. Different types of germination plant.</li><li>2. Operating principles of germination plant.</li><li>3. Germination programme design.</li><li>4. Germination plant hygiene considerations.</li></ol>
6.3	<b>Control of germination</b>	<ol style="list-style-type: none"><li>1. Germination temperature control</li><li>2. Importance of air flow and air conditioning.</li><li>3. Process control parameters.</li><li>4. Use of additives in germination</li><li>5. Hand evaluation</li></ol>

	<b>Syllabus section 7: Malting – Kilning.</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>4</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
7.1	<b>Kilning plant and process design</b>	<ol style="list-style-type: none"> <li>1. Different types of kilning plant.</li> <li>2. Operating principles of kilning, including the phases of the cycle.</li> <li>3. Kilning programme design.</li> </ol>	
7.2	<b>Control of Kilning</b>	<ol style="list-style-type: none"> <li>1. Planning kilning cycles for specific malts.</li> <li>2. Importance of air flow, humidity and temperature control.</li> <li>3. Understanding of the ‘break point’</li> <li>4. Process control parameters.</li> </ol>	
7.3	<b>Effects of kilning on finished malt</b>	<ol style="list-style-type: none"> <li>1. Development of malt colour and flavour.</li> <li>2. Control of finished malt specification – enzyme activity, NDMA, DMSP</li> <li>3. Control of moisture levels, and effect on finished malt quality.</li> </ol>	
7.4	<b>Cooling off-kiln</b>	<ol style="list-style-type: none"> <li>1. Control of cooling off-kiln.</li> </ol>	

	<b>Syllabus section 8: Malt - Storage and Dispatch.</b>		
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Ref.	Topics  (No. of questions to be answered = 2)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
8.1	<b>Preparation and storage of finished malt</b>	1. Operating principles of deculming and screening plant.
8.2	<b>Malt storage plant and processes</b>	1. Storage requirements for malt 2. Different types of malt stores  3. Mechanical handling – conveyor and elevator types.  4. Malt silo housekeeping and pest control  5. Food safety issues associated with malted cereals
8.3	<b>Malt evaluation at dispatch</b>	1. Different types of outloading systems.  2. Dispatch quality checks.

	<b>Syllabus section 9: Speciality Malt Production.</b>		
Ref.	Topics  (No. of questions to be answered = 3)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:	
9.1	<b>Types of speciality malts</b>	1. Different types of speciality malts, their characteristics and their production.  2. Raw materials for roasted malt production	

		3. Raw materials for 'other' speciality malts
9.2	<b>Plant and processes</b>	<ol style="list-style-type: none"> <li>1. Principles and operation of malt roasting equipment.</li> <li>2. Process Control parameters</li> </ol>
9.3	<b>Uses of speciality malts</b>	<ol style="list-style-type: none"> <li>1. Typical uses of roasted and 'other' speciality malts.</li> </ol>

	<b>Syllabus section 10: Malt Quality and Process Control.</b>		
<b>Ref.</b>	<b>Topics</b>	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
	(No. of questions to be answered = 5)		
		<p><i>Parameters examined in this section are:</i>  <i>Extract (fine and coarse), total and soluble nitrogen or protein, Free Amino Nitrogen (FAN), Diastatic Power (DP), <math>\alpha</math>-Amylase (AA), <math>\beta</math>-Glucan (BG), screenings, colour, moisture, homogeneity and friability, steeliness, fermentability, Predicted Spirit Yield (PSY), Dimethyl Sulphide Precursors (DMSP).</i></p>	
10.1	<b>Process Specifications</b>	<ol style="list-style-type: none"> <li>1. Process adjustments to address the variable nature of the natural ingredients of malt.</li> <li>2. The purpose of process specifications.</li> <li>3. Effects of the malting process on the final product value of these key parameters.</li> </ol>	
10.2	<b>Process Control</b>	<ol style="list-style-type: none"> <li>1. The principles of monitoring and adjustment to achieve product consistency.</li> <li>2. Simple quality control procedures.</li> <li>3. The concepts of tolerance and range for specification parameter values.</li> <li>4. Typical specifications which differentiate malt types.</li> </ol>	

		5. Typical process specification ranges, especially those requiring periodic adjustment to achieve product consistency [see Ref 10.1.above].
10.3	<b>Laboratory Analysis</b>	1. Principles of the analytical methods for the key parameters.
10.4	<b>Malt specifications</b>	1. Sampling of finished malt. 2. Finished malt specifications 3. Implications of blending of malt to achieve specification.

	<b>Syllabus section 11: Beer Types; raw materials and sweet wort production.</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>3</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
11.1	<b>Definition of beer and types of beer</b>	1. A generic, non-legalistic definition of beer in terms of its typical ingredients and methods of production. 2. Characteristics which differentiate lagers, ales and stouts.	
11.2	<b>Barley and malt</b>	1. The brewer's key malt parameters of degree of modification, extract content, moisture content, extract, and colour. 2. The selection of malt for beer type and mash conversion method. 3. Pre-acceptance checks at malt intake.	
11.3	<b>Adjuncts</b>	1. Reasons for the use of adjuncts. 2. Types of adjunct and their method of use. 3. Typical usage rate as proportion of the grist.	

11.4	<b>Mash conversion</b>	<ol style="list-style-type: none"> <li>1. The respective roles of the amylases and protease, the effect of temperature, pH and time on their activity.</li> <li>2. Temperature and wort viscosity.</li> <li>3. The influence of the ionic composition (hardness salts) of mashing water in the mash and on beer flavour.</li> <li>4. The starch test.</li> </ol>
11.5	<b>Grist composition and extract performance</b>	<ol style="list-style-type: none"> <li>1. The extract yield of raw materials.</li> </ol>

	<b>Syllabus section 12: Distilled Spirits; raw materials and wort production</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>2</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
12.1	<b>Definition of potable spirits</b>	<ol style="list-style-type: none"> <li>1. Definitions of the main spirits derived from cereals.</li> </ol>	
12.2	<b>Characteristics of potable spirits</b>	<ol style="list-style-type: none"> <li>1. The range of spirit types and their respective styles and characters.</li> </ol>	
12.3	<b>Malt and its uses, including green malt and peated malt.</b>	<ol style="list-style-type: none"> <li>1. The selection of malt for spirit type and mash conversion method.</li> <li>2. Pre-acceptance checks at malt intake.</li> <li>2. The importance of malt to mashing and fermentation, particularly for yeast nutrients, a source of enzymes and as a filter medium for wash.</li> <li>3. The advantages and disadvantages of the use of green malt in grain whisky distilleries.</li> </ol>	

	<b>Syllabus section 13: Safety in the Malt Plant.</b>		
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Ref.	Topics  (No. of questions to be answered = 3)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:
13.1	Malting Plant Safety Considerations	<ol style="list-style-type: none"> <li>1. The evolution of carbon dioxide from steeping and germination</li> <li>2. The hazards associated with carbon dioxide.</li> <li>3. The monitoring / checking of atmospheres for safe working including a quantitative knowledge of exposure limits.</li> <li>4. Safe working practices for malting plant operations.</li> </ol>
13.2	Malt and barley storage plant safety considerations	<ol style="list-style-type: none"> <li>1. The hazards associated with dust.</li> <li>2. Explosive atmospheres in the workplace.</li> <li>3. Safe working practices for malt storage plant operations.</li> </ol>
13.3	Chemical Safety	<ol style="list-style-type: none"> <li>1. The hazards associated with chemical cleaning and sterilizing agents.</li> <li>2. Good practices for the storage of chemicals.</li> <li>3. Use of personal protective equipment (PPE).</li> <li>4. Procedures in case of accidental spillage or discharge of chemicals.</li> </ol>

	<b>Syllabus section 14: Quality Management.</b>		
Ref.	Topics  (No. of questions to be answered = 4)	Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:	

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

	<b>Syllabus section 15: Plant Cleaning; cleaning in-place (CIP), pest control and general cleaning.</b>	
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>3</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>
15.1	<b>Types of Cleaning Systems</b>	<ol style="list-style-type: none"> <li>Automatic vs Manual cleaning.</li> <li>The general differences between single use and recovery systems – advantages and disadvantages.</li> <li>The types of cleaning head used and reasons for their choice.</li> </ol>

		4. The operating principles and diagrammatic representation of CIP systems.
15.2	<b>Pest control</b>	<ol style="list-style-type: none"> <li>1. General site pest control principles.</li> <li>2. Insect detection and control.</li> </ol>
15.3	<b>General plant cleaning</b>	<ol style="list-style-type: none"> <li>1. Cleaning plant surfaces, walls and floors.</li> <li>2. The constituents of foam cleaning agents.</li> <li>3. The use of foaming systems, steam cleaning, chlorinated and high pressure water cleaning.</li> <li>3. <i>Legionella</i> in cooling water and service water and the health risks associated with the micro-organism.</li> </ol>

	<b>Syllabus section 16: Engineering Maintenance.</b>		
<b>Ref.</b>	<b>Topics</b>	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
	(No. of questions to be answered = <b>3</b> )		
16.1	<b>Objectives and approaches</b>	<ol style="list-style-type: none"> <li>1. The key business reasons for an effective maintenance system.</li> <li>2. The features, advantages, disadvantages and applications of: <ul style="list-style-type: none"> <li>- no maintenance</li> <li>- breakdown maintenance</li> <li>- preventive maintenance</li> <li>- predictive maintenance</li> </ul> </li> <li>3. The contribution of maintenance tasks to plant safety, reliability, quality, economics and environmental impact.</li> </ol>	

16.2	<b>Maintenance tasks</b>	<ol style="list-style-type: none"> <li>1. Familiarity with key maintenance tasks: <ul style="list-style-type: none"> <li>- mechanical</li> <li>- electrical</li> <li>- calibration</li> <li>- inspection</li> <li>- condition monitoring</li> <li>- cleaning of plant</li> <li>- health and safety</li> </ul> </li> <li>2. Maintenance planning and record keeping.</li> <li>3. Autonomous maintenance.</li> </ol>
16.3	<b>Systems for continuous improvement</b>	<ol style="list-style-type: none"> <li>1. 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 (5S)</li> </ul> </li> </ol>

	<b>Syllabus section 17: Utilities; energy, water and effluent in malting.</b>		
<b>Ref.</b>	<b>Topics</b>  (No. of questions to be answered = <b>3</b> )	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
17.1	<b>Types of fuels</b>	<ol style="list-style-type: none"> <li>1. Choice of fuels available.</li> <li>2. Fuel cost control.</li> <li>3. Combined Heating and Power (CHP) systems.</li> </ol>	
17.2	<b>Water sources, treatment and uses in malting</b>	<ol style="list-style-type: none"> <li>1. Characteristics and quality of an ideal malt house water supply</li> <li>2. Sources of water for a malt house.</li> <li>3. Differentiation and typical uses of water in malt production.</li> </ol>	
17.3	<b>Sources of effluent and its measurement</b>	<ol style="list-style-type: none"> <li>1. The nature and characteristics of effluent from principal malt house operations.</li> </ol>	

		<p>2. The components of effluent quality:</p> <ul style="list-style-type: none"> <li>- volume</li> <li>- suspended solids (SS)</li> <li>- chemical oxygen demand (COD)</li> <li>- biological oxygen demand (BOD)</li> <li>- pH</li> <li>- temperature</li> </ul>
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		<b>Syllabus section 18: Malting and the Environment.</b>	
<b>Ref.</b>	<b>Topics</b>	<b>Candidates should understand and be able to explain and describe in simple terms, or demonstrate familiarity with:</b>	
	(No. of questions to be answered = <b>3</b> )		
18.1	<b>Sustainability and climate change</b>	<ol style="list-style-type: none"> <li>1. The concept of a sustainable industry.</li> <li>2. The role of carbon dioxide – the carbon cycle</li> <li>3. Sources of carbon dioxide emissions.</li> </ol>	
18.2	<b>Conservation</b>	<ol style="list-style-type: none"> <li>1. Principal energy consuming activities in a malthouse.</li> <li>2. Typical energy reduction strategies.</li> <li>3. Principal water consuming activities.</li> <li>4. Typical water conservation strategies.</li> </ol>	
18.3	<b>Waste</b>	<ol style="list-style-type: none"> <li>1. Principal waste generating activities in a malthouse.</li> <li>2. Issues for waste disposal.</li> <li>3. Strategies to minimize waste and encourage recycling.</li> </ol>	

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