CIBD Examination Board
Support Pack for Candidates

Version No.	Description	Author	Reviewers	Approval	Effective Date
1.0	Candidate Support Pack	N Jewitt / K Hayes		Chair of Board of Examiners and Council	December 2025

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General Information

This document is divided into two sections:

- General Examination Guidelines – This section covers general support for candidates, exam technique and guidance on the use of command words within examination question
- Appendices – These are Diploma level Long Answer Question (LAQ) examples and suggestions on how to approach different question types

1. General Examination Guidelines

The following points are general advice for candidates when approaching CIBD examinations.

1.1. Read the Paper Carefully

Reading time has been included in the overall time of the examination. Candidate should spend the first 5–10 minutes scanning the exam.

Identify the number of questions, sections, and what the instructions are for each section i.e. Answer all questions **OR** Answer any 4 from 6 questions.

Note the time available for the examination and quickly plan how much time to allocate based on marks.

1.2. Time Management

Work out time per mark. For Example: If you have 3 hours for 80 marks → 135 seconds per mark.

Prioritise high-value questions. Never spend too long on a low-mark question.

1.3. Show Working and Reasoning

For calculation questions, always show key steps even if you make a numerical mistake — you can still earn method marks.

1.4. Answer What is Asked

Pay close attention to command words (see below).

Double check what is being asked; make sure you are answering what is actually being asked rather than what you think is being asked.

Stay focused and avoid adding irrelevant information.

Where multiple command words are used make sure you have answered all parts of the question, rather than just focusing one of the command words.

1.5. Abbreviations

Always write out any abbreviated term / chemical name / acronym in full per question.

Abbreviations can be used after the first full description if writing essay type answers.

2. Command words explained

Examiners use specific terms (words) when writing questions. These words are used to guide the answer they are expecting candidates to respond with. Understanding these terms ensures you provide the right level of response.

Examiners will expect a different level of response depending on the section of the exam and the marks available in a question. Where small numbers of marks are available a shorter response is expected, however where more marks are available a much more detailed response is required, giving more depth of knowledge as well as detailed application of your knowledge to the question being asked.

Examiners do not expect candidates to repeat information across multiple parts / sub-parts so it important that candidates pay close attention to the command words being used in each part / sub-part of a question to ensure they give the correct information for each part / sub-part.

The following terms give a guide of what is expected from a candidate's response:

2.1. Describe

- Give a factual account of what something is, what it looks like, or how it works.
- Focus on *"what happens"* rather than reasons.
- Example: *Describe the process of photosynthesis* → state steps clearly, no analysis needed.

2.2. Explain

- Go beyond description: give *reasons or mechanisms*.
- Often signalled by *"why" or "how"*.
- Example: *Explain why photosynthesis is important for energy ffow* → give cause-and-effect reasoning.

2.3. Discuss

- Explore different viewpoints, arguments, or factors.
- Show balance: present evidence for and against, then come to a reasoned conclusion.
- Example: *Discuss the impact of renewable energy use* → consider economic, environmental, and technical angles.

2.4. Compare

- Identify similarities between two (or more) things.
- Use linking words such as *similarly, alike, both*.

2.5. Contrast

- Identify differences between two (or more) things.
- Use signposts like *however, whereas, unlike*.

2.6. Compare **and** Contrast

- Do both: highlight similarities *and* differences in a structured way.
- Example: *Compare and contrast AC and DC power* → similarities in energy transfer, differences in flow, applications, and advantages.

3. Understanding Marks and Weighting

Examiners may break questions into parts and sub-parts when writing questions. Each of these parts and sub-parts will carry a specific number of marks which can help guide the level of information they are expecting candidates to respond with. Understanding these marks and weightings ensures you provide the right level of response.

3.1. Read mark allocations carefully

- A 2-mark question = a very brief point or two short statements.
- A 10-mark question = extended explanation, possibly essay-style, multiple factors, structured writing, possibly a detailed table with multiple comparable columns/rows.

3.2. Weighting cues

- Questions worth more marks require:
    - More detail, structure, and examples
    - Multiple points or a discussion rather than a single fact
- If part of a question has multiple components (e.g., Q2a = 3 marks, Q2b = 7 marks), make sure the depth matches the marks available for each sub-part.

3.3. Quantity Vs Quality

- A 1–2 sentence response may be enough for 2–3 marks.
- Essays worth 15–20 marks require introduction, main body, conclusion, and balanced argument.

4. Short Answer, Long Answer and Calculation Questions

Questions may be worded in a way that requires an extended / longer answer style response. The number of marks or the section of the examination will indicate if this is expected. For example a question that is worth 10-20 marks, with no sub-parts.

Questions may also require calculations to be carried out. Where a calculation is asked for candidates must include the detailed steps taken to achieve the answer as marks may be awarded for showing working even if the final answer is incorrect.

4.1. Short Answer Questions (SAQ)

- Be precise: correct definitions, formulas, or key terms.
- Look at the mark allocation; Don't waste time writing more than needed.
- Stay focused on the question wording (don't just write everything you know).

4.2. Long Answer Questions (LAQ)

- Plan quickly: jot bullet points on paper or using the notepad function in the assessment platform.
- Use structure: **Introduction → Main arguments → Conclusion.**
- Stay focused on the question wording (don't just write everything you know).

4.3. Calculations

- State formula, substitute values, show working.
- If using a graph, insert a title and units on the axes.
- Underline the final answer and be sure to include correct units.
- Check for sensible results—order of magnitude errors signal mistakes.

Appendices

Example Question 1:

<table>
<tr><td>a)</td><td>Discuss, or construct a table listing the advantages and disadvantages of using an internal vs external wort boiler.

[10 marks]</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td>COMMENTARY SUPPORT FOR CANDIDATES

You are being asked about merits (advantages) and drawbacks (disadvantages) of two technologies compared with each other, therefore it requires you to take some time to think about how you structure your answer.

The examiner is looking for either several paragraphs of text that go through the relative merits and drawbacks of the two technologies that are detailed in their approach, or it could be answered with the use of a table.

The examiner might also appreciate answers that take them through the themes of the technologies. For example, heat transfer efficiency, cleaning and wort quality.

An example of how you could answer this is shown below:</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td>
<table>
<tr><th></th><th>Advantages</th><th>Disadvantages</th></tr>
<tr><td>Internal wort boiler (IWB)</td><td>Lower heat losses due to in-kettle heating. (1)</td><td>More difficult to clean and inspect. (1)</td></tr>
<tr><td></td><td>Compact, simple installation, lower capital cost. (1)</td><td>Higher risk of fouling/burning on heating surfaces. (1)</td></tr>
<tr><td></td><td>No pump required – circulation by natural convection. (1)</td><td>Less efficient heat transfer, limited suitability for very large brews. (1)</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>External wort boiler (EWB)</td><td>Higher heat transfer efficiency through forced circulation. (1)</td><td>Requires pumps, more complex and energy intensive. (1)</td></tr>
<tr><td></td><td>Easier cleaning and maintenance of tubes. (1)</td><td>Higher installation and operating costs. (1)</td></tr>
<tr><td></td><td>Better evaporation control, suited for large-scale operations. (1)</td><td></td></tr>
</table>
</td></tr>
<tr><td></td><td></td></tr>
<tr><td>b)</td><td>Briefly explain TWO (2) methods for calculating the total evaporation for wort boiling. Indicate which method is more accurate and why.

[4 marks]</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td>COMMENTARY SUPPORT FOR CANDIDATES

Explain means you needs to use words to describe the methods.
The second part of the question asks for your statement of which is most accurate and why. It is a 4-mark question therefore not a lot of detail or explanation is needed.

An example of how you could answer this is shown below:</td></tr>
</table>

	Methods of Calculating Wort Evaporation: 1. Mass Balance Method: Calculate evaporation from volume change before and after boiling. (1) 2. Mass Loss (Gravimetric) Method: Determine evaporation by direct weight loss during boiling. (1) Accuracy: Gravimetric method is more accurate (1), as it directly measures evaporated water mass and avoids errors due to volume expansion/measurement inaccuracies. (1)
c)	**Briefly explain how brew kettle calandria design and operations can be optimised to minimise or eliminate fouling on heat exchange surfaces**. **[6 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *As with part **b)**, you need to use words to describe how operations can be optimised for the reduction/elimination of fouling. This must include why you would take these actions as well as the actions themselves.* *This is a c-mark questions therefore providing a list of actions would only gain limited marks, it would be much better to use a series of bullet points or free text to make sure you include the what and the why.* *When using bullet points, it's easy to shorten answers to a format that becomes too abbreviated and is therefore difficult to fully understand or be awarded many marks. The examiner wants to be able to read something that is easy to read and interpret so use the simplest and most understandable English you can while still conveying depth in your response.* *An example of how you could answer this is shown below:*
	Optimisation of Brew Kettle Calandria to Minimise Fouling • Maintain high circulation flow rates to ensure turbulence and prevent deposits. (1) • Avoid excessive surface temperature differences by optimising heat loading. (1) • Use stepwise or controlled heating to prevent local scorching. (1) • Design calandria with smooth tubes and correct geometry for uniform flow. (1) • Apply effective CIP regimes (alkaline/acid) to regularly remove fouling. (1) • Ensure correct pump/kettle design to avoid dead zones and ensure continuous circulation. (1)

Example Question 2:

a)	**Identify the foam-positive components of beer foam and their mechanisms of action.** **[10 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *This is a 10-mark question so you can expect to get 2 marks for 5 components. There are c possible components therefore this improves your chances of getting only 5. Say what each component is and how it works to support foam formation in specific detail, i.e., the chemistry involved.* *A set of bullet points would be acceptable as would a series of short paragraphs. It's always helpful to the examiner to split your answer out in questions like this. As before, listing component of foam with limited explanation would not get you many marks.* *An example of how you could answer this is shown below:*

	Beer foam is stabilized and enhanced by a number of foam-positive components that originate from both malt and hops, as well as brewing conditions:
	• Malt Proteins (Protein Z, LTP1, Hordeins, Albumins):
	  ○ These form the structural framework of the foam. Protein Z and hordeins act as the main "girders," while lipid transfer protein 1 (LTP1) acts as "struts." These proteins unfold during wort boiling, increasing their surface activity and their ability to stabilize bubbles by creating a robust interfacial film around each gas bubble.
	• Hop Iso-Alpha Acids (Isomerized Alpha Acids):
	  ○ During boiling, alpha acids from hops isomerize to iso-alpha acids. These possess hydrophobic regions that bind to foam-active proteins, strengthening the bubble walls and improving foam stability and lacing characteristics.
	• Metal Ions (Zinc, Iron):
	  ○ These bind with proteins and help stabilize network structures in the foam, increasing head retention and lacing.
	• Carbon Dioxide (CO2):
	  ○ CO2 is essential for foam formation. When beer is poured, the pressure release causes CO2 to rise, nucleate, and carry up foam-positive particles, forming foam.
	• Carbohydrates (especially polymers like β-glucans):
	  ○ These increase beer viscosity, helping foam stability by slowing bubble drainage.
	• Gas Composition and Carbonation Level:
	  ○ Nitrogen boosts foam stability due to smaller bubble formation; the right carbonation levels improve foam formation.
	
	Mechanisms of Action:
	1. Surface-active proteins create a viscoelastic film around bubbles.
	2. Hop acids strengthen and connect protein films via hydrophobic interactions.
	3. Metal ions enhance cross-linking in the protein network.
	4. CO2 nucleation propels foam-forming molecules to the beer surface.
	5. The combination of these stabilizes bubbles, slows drainage, resists collapse, and provides lacing on the glass.

b)	**Outline the mechanisms involved in beer foam collapse and the foam negative factors that affect them.** **[10 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *To gain 10 marks, the examiner needs to see a total of 10 specific points relating to the collapse of foam through the mechanisms of collapse and the negative foam factors.* *The word 'outline' means that you need to provide a general description of the mechanisms and the negative factors involved. This would call for a series of bullet points or short paragraphs, again helping the examiner to see a structured approach to your answer.* *An example of how you could answer this is shown below:*
	Beer Foam Collapse: Mechanisms and Foam-Negative Factors Foam Collapse Mechanisms: • Liquid Drainage: Gravity acts to drain liquid from the foam lamellae (bubble walls), thinning and destabilizing the structure. • Bubble Coalescence: As bubble walls thin, gas diffuses from smaller to larger bubbles, causing collapse and merging. • Surface Tension Effects: If the stabilizing layer breaks down, surface tension causes bubbles to pop. • Solubilization of Foam Agents: Ethanol and other solutes reduce protein binding and weaken films around bubbles, leading to collapse. Foam-Negative Factors: • Fats/Oils/Lipids: These disrupt protein networks by weakening the film's surface tension, causing rapid bubble breakdown. • Ethanol: High alcohol content increases solubility of proteins and hop acids, undermining foam stability and shortening foam life. • Residual Detergents/Dirty Glass: Surfactants adhere to bubbles, breaking down the film and accelerating collapse. • Excessively Modified Malt: Higher protease activity leads to lower high-molecular-weight protein content, reducing foam-positive agents. • Yeast Autolysis/Enzymatic Activity: Proteolytic enzymes degrade foam-active proteins, compromising foam structure. • Low CO2/Nitrogen Levels: Poor carbonation means less nucleation, resulting in weak foam formation and stability. • High Temperature: Speeds up foam drainage and evaporation, destabilizing the bubble network. These foam-negative factors either break down the cohesive films formed by foam-positive compounds, speed up liquid drainage, or directly disrupt the structural mechanisms that maintain beer foam.

Example Question 3:

a)	**Describe the manufacturing process for a two-piece aluminium can from raw material to palletised cans.** **[10 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *'Describe' requires both listing out the steps **and** a short description of each one. A sentence for each would be enough as long as it has the correct level of technical detail.* *This is a 10-mark question therefore you could imagine that you get 1 mark for each step and another for the description however, you'll realise that there is more than 5 process steps! You therefore need to get as many steps in as possible and hope you get 2 marks for some and not others.* *An example of how you could answer this is shown below:*
	Manufacturing Process for Two-Piece Aluminium Cans (10 marks) 1. Raw Material Preparation – Aluminium ingots are rolled into thin coil sheet. (1) 2. Blanking & Drawing – Circular blanks punched from sheet; drawn into shallow cups. (1) 3. Redrawing & Ironing – Cup redrawn and ironed through dies to elongate walls to final can height; base formed thicker than walls. (2) 4. Trimming – Top edge trimmed for uniform height. (1) 5. Cleaning & Washing – Oils, lubricants removed by alkaline cleaning, rinsing, drying. (1) 6. Decorating & Printing – Exterior lacquered, printed with branding; inside sprayed with protective lacquer (epoxy or BPA-NI). (2) 7. Necking & Flanging – Top of can progressively reduced in diameter (necking) and outward flanged to accept end. (1) 8. Palletising – Cans inspected, stacked in sleeves, palletised, and shrink-wrapped for delivery. (1)
b)	**Describe FIVE (5) advantages cans have over other primary packaging forms.** **[5 marks]**
c)	**Describe FIVE (5) disadvantages cans have over other primary packaging forms.** **[5 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *Parts **b)** and **c)** are two linked questions (that still need to be answered separately to gain the full marks for each part) and the examiner has been very clear in what's required; 1 mark for each advantage and 1 mark for each disadvantage.*

	Each answer needs to be a sentence so that you provide an explanation for each answer. Without an explanation, you will not get full marks. If you just listed the advantages and disadvantages correctly, you might get half marks at best. *An example of how you could answer this is shown below:*
	Part b) Five Advantages of Cans (5 marks) 1. Lightweight → lower transport/storage costs. (1) 2. Excellent light and oxygen barrier → superior product protection. (1) 3. Rapid chilling and good heat transfer. (1) 4. Recyclable → high consumer acceptance for sustainability. (1) 5. Easy to stack, handle, and store efficiently. (1) **Part c)** Five Disadvantages of Cans (5 marks) 1. Higher capital cost of manufacturing equipment and tooling. (1) 2. Limited reclosability once opened. (1) 3. Potential metal–product interaction if lacquer fails (metallic taints). (1) 4. Perception of "cheap" or "mass-market" packaging compared to glass. (1) 5. Design constraints (fixed shapes vs. glass mould flexibility). (1)

Example Question 4:

a) **Compare and contrast the following types of cereal mill and the selection considerations for each:**

- **4-roll mill**
- **Wet mill**
- **Hammer mill**

[9 marks]

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This is a very clear question. The examiner is looking for you to describe the main mill types, talk through the pros and cons of each and then suggest when each one would be suitable.

With 3 mill types, you will need to provide 4 good points for each mill type and selection for suitability to make sure you get the marks. A table would work well for this type of question response. As always, make it easy for the examiner to see the points you are making and use simple English.

An example of how you could answer this is shown below:

Mill	Operation	Advantage	Disadvantage	Selection
4-roll mill	Grain passes through sequential pairs of rollers; husk, grits, and flour separated in staged grinding.	Produces precise grist profile; good husk integrity; maximises mash house yield.	High capital cost; more complex maintenance. Requires dust suppression	Gives high extract, easy to control and adjust efficiency and consistency. (3)
Wet mill	Grain conditioned/soaked; then milled between rollers while wet.	Intact husk, reduced dust, less oxidation; improved lautering.	Higher water and energy use; risk of microbial growth; more complex equipment.	Used in large Grain distilleries with high adjunct ratios and high wort clarity requirements. (3)
Hammer mill	Hammers impact grain into fine particles.	Simple design, low cost, adaptable to multiple raw materials	Damages husk; creates excessive flour; risk of lauter tun blockages, impact of ground husk on flavour	Favoured for mash filter systems (not lauter tuns) where very fine grist is acceptable. (3)

b)	**It has been noticed there is a shift in grist profile, with an increased percentage in coarse grits. Briefly discuss the possible root causes and corrective actions for a four-roll mill.** **[7 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *A good way to show you understand the technologies by briefly describing the possible root causes and corrective actions for each.* *As with other questions, it's important to fully describe the causes and corrective actions rather than just listing them with little explanation. Explanation always shows the examiner that you truly understand the topic.* *An example of how you could answer this is shown below:*
	Possible Root Causes: • Incorrect roller gap settings (too wide). (1) • Worn or damaged rollers → reduced crushing efficiency. (1) • Inconsistent feed rate or grain bridging in hopper. (1) • Poor grain conditioning (moisture too low, husk not pliable, high friability cereal). (1) Corrective Actions: • Recalibrate and set roller gaps accurately. (1) • Inspect and replace worn rollers; check feed system. (1) • Ensure proper grain conditioning (adjust moisture/conditioning time).(1)
c)	**Explain the key pre-mill parameters necessary to ensure grist quality and operational safety.** **[4 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *As before, a short description of each parameter is needed. As it's a 4 mark question, it will be 1 mark for each parameter.* *An example of how you could answer this is shown below:* *(this is not a definitive list and other actions would be considered. For example – out of specification cereal, have contract in place and check delivery against the specification)*
	Key Pre-Mill Parameters for Grist Quality & Safety (4 marks) • Grain Moisture/Conditioning – Optimises husk pliability, prevents breakage, ensures proper separation. (1) • Grain Cleaning – Remove stones, metal, dust, foreign objects to protect equipment and product. (1) • Magnet Checks – Remove ferrous metals before milling to prevent sparking and equipment damage. (1) • Roller Inspection & Calibration – Safety and consistency; prevents fires, mechanical failures, poor grist. (1)

Example Question 5:

a)	**Describe the essential components of a continuous column still (e.g. a Coffey Still) and explain the primary function of each in the distillation process.** **[10 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *The examiner is looking for a description of the main components and an explanation of their specific functions in separating the components, such as solids, water, ethanol, and congeners. Aim for five key components, dedicating approximately two marks to each – one for naming it and one for explaining its function. A clear, structured list or short paragraphs is the best way to present this information.* *An example of how you could answer this is shown below:*
	The essential components of a continuous column still and their functions are as follows: 1. **Analyser or Stripping Column:** This is the first column where the wash is stripped of alcohol. Its primary function is to separate solids and increase alcohol concentration. This is achieved by injecting steam at the bottom and introducing wash higher up the column, causing the alcohol to vaporise from the descending wash and increase in concentration in the distillate. The spent wash, known as pot ale or stillage, is removed from the base of this column. 2. **Rectifier Column:** This is the second column, where further purification and ethanol concentration occur. Its function is to use the incoming feed from the wash still and other streams and rectify further to higher strength, by allowing higher-boiling components to condense back or be removed or recycled, while enabling ethanol and lower boiling components to continue to rise, and achieve the desired alcohol and congener concentrations on the product plate. 3. **Plates/Trays (in both columns):** These are the horizontal partitions within the columns where vapour and liquid (and solids in the analyser / stripping column) are brought into intimate contact. Their function is to facilitate the repeated vaporisation and condensation steps, needed for (rectification) and separation. Different plates or trays can be used to suit the quality of materials being distilled. E.g. disc and donut in the analyser for separation of solids so the plates don't block, and bubble caps in the rectifier. 4. **Wash Pre-Heater:** These are coils positioned within the rectifier column that pre-heat the incoming wash. Its function is to use the heat from the rising alcohol vapour to increase the thermal efficiency of the overall process before the wash enters the analyser. 5. **Condenser:** This is a heat exchanger located at the top of the rectifier column. Its function is to condense the vapours sufficiently to maintain steady state, allowing them to return to the rectifying column.

b)	**Discuss the advantages and disadvantages of using a continuous column still compared to a pot still for producing spirit.** **[10 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *The command word **Discuss** requires you to explore different viewpoints—in this case, the merits (advantages) and drawbacks (disadvantages) of a continuous still relative to a pot still. You should aim to cover five points for each category, addressing aspects such as product quality, operational efficiency, capital cost, and production capacity.* *An example of how you could answer this is shown below:*
	Advantages of Continuous Still over Pot Still: 1. **High Efficiency:** Continuous operation saves considerable time and energy per litre of alcohol produced, as it does not require batch charging and repeated heating/cooling cycles. 2. **High Strength/Purity:** It can achieve much higher alcohol strengths (over 96% ABV, if required) in a single run due to more effective and extensive rectification. 3. **Lower Running Cost:** The still is more energy efficient overall because of integrated heat recovery systems, such as the wash pre-heater/rectifier design. 4. **Consistent Product:** The steady-state operation of the column still produces a more uniform and generally lighter-bodied spirit profile. 5. **High Throughput:** It can handle and process large volumes of wash continuously, making it highly suitable for large-scale production facilities. **Disadvantages of Continuous Still over Pot Still:** 1. **Loss of Congeners:** The high efficiency and purity achieved tend to strip out many flavourful congeners, often resulting in a spirit with less complexity. 2. **High Capital Cost:** The initial purchase, installation, and associated infrastructure of a column still are significantly more expensive than a simple pot still. 3. **Less Versatility:** Continuous stills are typically designed for a specific product profile, offering less traditional or less marketable spirit characteristics compared to a pot still. 4. **More Complex Operation:** The system requires more sophisticated controls, greater technical knowledge, and extensive instrumentation for optimal performance and management. 5. **Maintenance:** Cleaning and maintaining the numerous internal plates and the column structure is a more complex and time-consuming process than cleaning a simple batch / pot still.

Example Question 6:

a)	**Explain the factors in the spirit-making process (fermentation, distillation, and maturation) that influence the final level of esters and fusel oils in the new-make spirit.** **[12 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *The command word **Explain** requires you to give reasons and mechanisms for the influence of the process factors. You must cover all three distinct process stages (fermentation, distillation, maturation) and the two specific congener groups (esters, fusel oils). Dedicate two marks to each combination (e.g., Fermentation and Esters) to provide the necessary depth of explanation.* *An example of how you could answer this is shown below:*
	Influence on Esters (e.g., Ethyl Acetate): • **Fermentation:** Esters are formed through the reaction of organic acids and ethanol (esterification). **Higher temperatures and longer fermentation times** often increase ester formation. Specific yeast strains or high pitching rates can also promote their production. • **Distillation:** Esters are typically medium-boiling compounds and are therefore concentrated in the **heads** and **early heart** of a batch distillation run. High reflux or a slower distillation rate can be used to help separate or retain them. • **Maturation:** Esterification continues in the cask as **ethanol and higher alcohols react with acids** originating from the wood and the spirit over time. This leads to a long-term increase in their concentration, contributing desirable fruity notes. **Influence on Fusel Oils (Higher Alcohols - e.g., Propanol, Isobutanol):** • **Fermentation:** Fusel oils are produced via the **Ehrlich pathway** (amino acid metabolism). **High temperature, low nitrogen content in the wash, and high-gravity fermentation** tend to stress the yeast and significantly increase fusel oil production. • **Distillation:** Fusel oils are high-boiling point compounds and are therefore more highly concentrated towards the end of the heart and **tails** of the spirit run. A continuous still with high rectification or a pot still with high copper contact can be used to remove or refine these compounds. • **Maturation:** During maturation, some fusel oils are slowly converted into esters, adsorbed into the barrel char, precipitated out, or oxidised. This gradual process helps to mellow their harsh, solvent-like characteristics over time.

b)	**Briefly describe the roles of cut points and spirit strength in achieving the desired flavour profile and quality of a new-make spirit.** **[8 marks]**
	COMMENTARY SUPPORT FOR CANDIDATES *The question asks you to **Briefly describe** the roles of two distinct factors, cut points (4 marks) and spirit strength (4 marks). You need to provide a factual account of what these factors are and how they specifically function to influence flavour profile and quality.* *An example of how you could answer this is shown below:*
	Roles of Cut points (Heads, Heart, Tails): 1. The **heads (fore-shots)** are the first fraction, containing low-boiling, highly volatile and harsh components (e.g., acetaldehyde and many sulphur-containing compounds) that are separated and recycled, or naturally vented, as they are undesirable for flavour. 2. The **tails (feints)** are the final fraction, containing high-boiling, oily components (e.g., fusel oils, fatty acids) which provide body but are also separated to avoid heavy, off-putting flavours. 3. The **heart (potable spirit)** is the middle and desired fraction, which is cut to capture the optimal balance of ethanol and desirable congeners (esters, aldehydes, phenolics etc.). 4. The precise cut points are crucial as they determine the ~~amount~~ concentration of flavour congeners retained, meaning an earlier cut retains more 'heads' notes, while a later cut retains more 'tails' notes. **Roles of Spirit Strength (ABV):** 1. Spirit strength is defined as the concentration of ethanol in the new-make spirit, which is a direct outcome of the degree of rectification during distillation. 2. Spirits distilled to a **low strength (e.g. 65% ABV) retain more water, fatty acids, and high-boiling congeners**, resulting in a heavier, richer, and more complex flavour profile. 3. Conversely, spirits distilled to a **high strength (e.g. 80% ABV for triple distilled whiskies and some light rums, or 94% ABV through continuous stills) have ~~very~~ relatively fewer congeners with a different profile**, which results in a lighter, purer, and more neutral or subtle flavour. 4. The final strength not only influences the flavour profile but also affects the spirit's legal classification and the required strength for subsequent cask filling.