CERTIFIED BEER SERVER WORKBOOK



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INTRODUCTION

Welcome to our geeks guide to passing the Certified Beer Server Exam. We hope you enjoy the learning materials in here and find them super useful on your journey to nailing CBS.

The Cicerone Certification Program is incredibly important to us here in BrewDog and here's why:

So it all started with a dude called Ray Daniels. Ray was something of a man-about-town in the Chicago beer scene. He wrote articles for the Brewers Association, was pals with some of the best and most progressive brewers in the area, and frequented beer bars like the rest of us. Ray also penned a game-changing book called "Designing Great Beers" in 1996. This was one of the books that many home-brewers-turned-micro-brewers in the US will openly admit changed their world.

But Ray had a problem. He was sick to the back teeth of being at bars and no-one seeming to know anything about beer. Not just how styles differ from each other, but also how to keep and serve beer, talk about beer and understand the brewing process. So he decided to get it sorted and created the Cicerone Certification Programme – designed to pull materials together from multiple different sources to focus on five main areas of knowledge and best practice:

- I) The ingredients and brewing process of beer
- 2) The flavours in beer and how we evaluate them
- 3) The categorisation of beer styles from around the world
- 4) How best to keep and serve beer
- 5) The pairing of beer and food together

There really is no role within BrewDog that cannot positively benefit from knowledge in all of the above five areas, and the Cicerone Certification Programme allows us incredible access to a wealth of extraordinary information about the wonderful world of beer that we live in.

We want everyone in BrewDog to become a Certified Beer Server.

The Benefits

I)Further our mission to make other people as incredibly passionate about amazing craft beer as we are

2) Expert knowledge when talking about beer to customers

- 3) Clarity of communications when talking to each other about beer
- 4) Spot bonus for everybody that passes. Kerching!

The Drawbacks

None

The Synopsis

CBS is cool. DO IT!

HOW CICERONE WORKS

There are four levels to the Cicerone Program:

- I) Certified Beer Server Multiple Choice Exam
- 2) Certified Cicerone ® I Day Proctored Exam, Tasting and Demonstration
- 3) Advanced Cicerone [™] I Day Proctored Exam, Tasting , Demonstration + Oral Exam

4) Master Cicerone ® - 2 Day Proctored Exam, Tasting , Demonstration + Oral Exam

Each level increases in difficulty in both exam format and knowledge required. The first level is usually passed by people in BrewDog within the first 2 months of starting. The second after 1.5 years, the third after 3-5 years and the fourth after 5-10 years.

Certified Beer server is a 60-question multiple choice exam, administered online. A grade of 75% is required to pass. Candidates must also pass a short quiz about the Cicerone program. Here at BrewDog we pay for your first two attempts - no strings attached other than that it must be invigilated by an assigned BrewDog invigilator. This is because it is a closed book exam.

The multiple choice format is usually a question followed by a drop-down list of four options. You pick your way through the exam over 30 minutes (that's two questions per minute) and obtain your results immediately afterwards. You will be shown which questions you get wrong (if any) to help you with further learning.

Revision for the CBS exam should come in many forms. Of course you have this wonderful book to read from but the reality is that if you really want to nail it - you need to form little study groups and get engaged with beer! I bet you didn't think when you were growing up that you might one day end up doing homework that involved drinking beer. Well, it's your lucky day.

Instead of pointing you towards the syllabus straight away, we'd rather you learned chunks at a time. This workbook has detailed sections on everything you need to know, little quizzes all the way through, and at the very back a mock exam with answer for you to test yourself.

The mini test throughout are called Five Minute Flex's. These are designed to reinforce your knowledge as you go along. We have not included the answers to these as we want you to mark them yourselves based on research. The mock test at the end however has an answer section at the back. These should be done towards the end of your revision around I-2 weeks before the exam.

Put a little time into this every day and you will absolutely smash it within two months.

Once you have completed CBS you might want to keep your learning mometum and start revising for the Certified Cicerone Exam (8). It's a fairly big step up but entirely achievable if your heart and mind are in the right place. The beery place.

Good luck BrewDog Beer Geeks!

This section will count for 17% of your final mark and will cover the following:

- I) Malted Barley
- 2) Hops
- 3) Yeast
- 4) Water



We'll be delving right down into the core ingredients of beer, and how we use these to make the delicious liquid we love!

Brewing is very similar to cooking. If you wanted to make the same stew (mmm....stew) over and over again you would need to make sure that you were using the same ingredients and measures, the same cooking times and the same cooking temperatures. It's all about consistency.

So, as we know, Beer is made from four main ingredients: water, malt, hops and yeast. These are all specially prepared to bring totally unique results to the finished product.

Disclaimer: Please be aware that in this section we're going to use the word moist at least twice. Fair warning.

MALTED BARLEY

In the majority of beers, Malted Barley is used - Why?

TOP 4 REASONS BARLEY IS AWESOME

STARCH! Barley has tonnes of beautiful starch which is easily converted into tasty sugars for the yeast to ferment and turn into sweet, sweet alcohol.



ENZYMES! Barley also has plenty of enzymes that can convert those delicious starches in the grain, just by adding hot water. An enzyme is essentially a protein that helps the conversion of starch to sugar. The whole process of starting to make beer 100% depends on those enzymes converting starch into sugars – beer wouldn't happen without them!



HUSKS! These are the clothes to barley's naked body. When we create the initial mash these provide the filter bed, without which we'd end up with a gluey mess of sugars and starch. And no-one wants a gluey sticky mess on barleys naked body, right?

OTHER COOL SHIT! Dextrins! Proteins! These help barley provide beer with more body, and an awesome foamy head in the glass.

So Barley is magical, and next we'll cover how we use it to start making beer...

STAGES OF THE MALTING PROCESS

So, now we know how epic Barley is, let's talk about how we use it to make beer! We're going to start from the very beginning by harvesting Barley ...

- I) We cut the grain down in the prime of its life
- 2) We dry that shit out

3) But then we soak the barley kernels to start germination – kicking the enzymes awake again!

4) The moist (eurgh) malt gets laid out and allowed to sprout – turning it over and over to keep it cool and give it some air

5) Little shoots and roots come out called "The Acrospire" its almost like we've tricked the kernel to start growing a new barley plant

6) We then stop the whole process WITH FIRE (sometimes)



So we now have "green malt" and we can make different kind of brewers' malt from toasting it in a kiln.

This will dry the malt up and add differing amounts of colour by producing melanoidans in the malt – This is called the Maillard process – the same thing that browns food when



cooking.

Kilning malt is applying heat to the malt with a bit of ventilation, so it dries out rather than cooks – we don't want to burn up all of the awesome starches and proteins!

Maltsters (this is a real job, honest) adjust lots of things here to give different flavours to the malt, sometimes without even changing the colour of the grain – kilning the malt for longer, adjusting the moisture of the kiln, changing

the temperature - all these things will change

the taste and appearance! There's tonnes more info on this in the next section.

We measure the colour of malt by degrees Lovibond (°L)

Pilsner malt is the lightest, at 2 °L, but it can fly all the way up to 500 °L with Black Patent malt!



We'd typically use a lightly kilned base malt in a beer recipe, then add speciality malts (sometimes darker, more complex, different flavours) in small quantities to change the overall taste and colour of the beer.

Much like Bubba Gump do with their shrimp... we can use different cooking methods to produce difference Speciality Malts.

STAGES OF THE MALTING PROCESS

Stewing Malt – Once again, using a moist (double eurgh) environment to kiln the malt – this pre-activates the enzymes and starts the conversion process from starch to sugars early, giving malts like Crystal and Caramel crunchy bits of sugar in the middle!

Roasting Malt – These are put into a drum or barrel roaster and heated up to create emo and gothy dark colours and a whollIlle lot of roasty flavours to the malt.



So, that's barley – but you can use other stuff to brew with! These are called Adjuncts.

Examples of adjuncts:

Un-malted wheat

Rye

Corn

Rice

Plain Sugar

Bicycles

Telephone Poles

*Note – probably not the last two

Adjuncts will give different flavours, textures or mouthfeel to the beer, and all in different ways – but not always a good way... Let's learn more about the two most commonly used.

CORN & RICE

These are basically the losers of the adjunct world. They thin beer out, they're cheap as hell to brew with, and add fuck-all flavour to the end beer.

Most US-style Light Lagers have the above in them *cough*Coors*cough* and in some cases up to 40% of the total malt will be either Rice or Corn. Making these beers some of the lightest bodied and lowest flavoured beers.



<u>5 MINUTE FLEX</u>

I. What in Barley is converted into Sugars for fermenting?

2. What measurement do we use to describe malt colour?

3. What malt is the lightest?

4. Name three ways of creating different styled brewing malt.

5. Name three brewing adjuncts.

<u>Hops</u>

HOPS ARE AWESOME

To be honest, if that was all you needed to pass Certified Beer Server, we at BrewDog would be happy, however it's sometimes useful to know a tiny bit more....ah, go on then.

AND THIS IS WHY

So, Hops are the female flowers the bud on the BINE (not VINE) of the hop plant. They grow naturally as cones (or Catkins), which are then partially dried and used for brewing. They look a lot like Pinecones



Hops are used in loads of ways, and they can give different characteristics to beer – this is why they rock!

<u>Bitterness</u>: Hops provide the bitterness in beer – and that balances the sweetness from the malt – without hops, beer would be like a coffee with 42 sugars in, something roughly 3 people on the planet might enjoy.

<u>Flavour / Aroma</u>: Depending on what part of the world the hops come from, they'll have loads of different flavours, from spicy to floral, from tropical to herby!



Scientific name: Humulus Lupulus.

First used: Around 1000 AD, taking over from Gruit (an old-old-school mix of bitter herbs and spices) in around 1400 AD – Widely used from 1600 AD onwards!

Glands: That's right, glands. The female hop plants make catkins (the cones) that contain the hop resins that brewers desire and lust after – the cones contain the Lupulin Glands where all the sexy resins, oils and acids are found.

Alpha Acids: Responsible for the bitterness in hops! Boiling these Acids changes them into compounds that dissolve in the watery wort – this is called Isomerization, and the longer they're boiled, the more alpha acid is released, making the beer bitterer!

Essential Oils: Gives aroma to beer, but no bitterness. Not for the bath tub, they're super volatile and boil off quickly!

IBUs - IBUs are International Bittering Units—it's a way to measure the amount of bitter alpha acid in beer.



Brewing with Hops

We add hops at the Boil stage of the Brewing process. Depending on when we add them, and for how long, they give beer different flavours and aroma! The boil time will vary from style to style and brewery to brewery as will the number of hop additions. We'll start with the basic 90 min boil with 3 hop additions

BITTERNESS ADDITION : Hops added to the boil at 60 minutes, give us the major bitterness components in beer.

FLAVOUR ADDITION: Hops added to the boil at 60-75 minutes. This is the time when the hops will give the big flavours to beer! Flavour Flav, droping hop bomb rhymes in yo'beer.

AROMA ADDITION: Hops added in the final 15 minutes give out major aroma – the oils in hops are super volatile so can't take too much of the heat before leaving – much like Elsa in Frozen – true story, that film is all about the brewing process.

DRY HOPPING: This is when the brewer adds hops to the beer after fermentation. Allowing them to soak (almost like brewing tea) in the beer and give it their aromatic oils. This kicks flavour up a notch like a spice-weasel, but gives off no more bitterness!



HOP GROWING REGIONS

Although we love hops, they are unfortunately picky bastards that only grow between the 35-55 degrees of the worlds north and south hemispheres – This is the perfect amount of climate, warmth and moisture to enable the sweet sweet bitter plants to grow!

There's four main regions where hops grow – and depending on where they grow, they have certain trademark aromas and flavours.

Continental Europe

Key Hops - Germany – grows the most hops in the woooooorld! Famous for the range of "Noble Hops" it produces – Spalt, Tettnanger and Hallertau/Hersbrucker

Key Hops - Czech Republic – famous for the one other "Noble Hop" Saaz – definitive hop for Bohemian Pilsners

Profile: Low bitterness, Lots of aroma, floral and spicy

<u>Britain</u>

Key Hops: East Kent Goldings, Fuggles, Challenger

Profile: Earthy, Woody & Grassy

USA

Key Hops: Mostly grown in the Northwest of the US, the big "Cs" – Cascade Centennial and Columbus (Citrusy), Chinook, Northern brewer (Piney) and Nugget, Columbus and Liberty (Resinous)

Key Areas: Washington states Yakima Valley, Oregon's Willamette Valley, Idaho's Western Canyon County

Profile: Citrusy, Piney, Grapefruity, Resinous

Australia & New Zealand

Key Hops: Galaxy, Vic Secret, Nelson Sauvin (the key hop in Punk IPA).

These offer a tropical, passion fruit and pineapple like flavour and aroma, and a slight white wine character to the aroma

Profile: Tropical Fruits – like Opal Fruits…Or Starbursts as some people call them.









<u>5 MINUTE FLEX</u>

I. What do hops contribute towards a beers flavour?

2. What is responsible for the bitterness in hops?

3. When should you add Hops to a boil if you're looking to create more aroma?

4. Where in the world would you find citrus and piney flavoured hops?

5. What is a key hop of Australasia?



We use two main types of yeast in most brewing – depending on the style of beer we're making. These are Ale, and Lager yeast.



<u>Ale Yeast</u>

I) Fancy pants name is Saccharomyces Cerevisiae – don't try to either spell or pronounce this, as part of your brain will fall out of your left ear.

2) It often likes to ferment around 20°C – it's a "Top-fermenting" yeast as the healthy stuff gathers at the...you guessed it...TOP of the beer it's working on.

3) Ale yeast is pretty fruity and full of sexy character, however some are considered "clean"... this means they are flavour neutral – there's tonnes of variety though. The kinds of flavours it makes are called "Esters" and they can be like apples, pears, bananas, organes and loads of others!

4) Some ale yeast strains are genetic mutant freaks! They have gene mutation (know as POF+ or PAD+) which causes them to hulk out and shoot laser beams from their bodies... and to create spicey "phenolic" flavours and aromas like clove, nutmeg and white pepper! They're normally found in German Weissbiers, and will usually also be full of banana flavour

Lager Yeast

I) Lager also has a fancy schmancy name – this time Saccharomyces Pastorianus...

2) Lager yeast doesn't like it as hot as Ale yeast and ferments away at a lower 48-55°F /

9-13°C. As it's almost an opposite to Ale yeast, it's a "bottom-fermenting" yeast preferring

the cooler temps at the bottom of the fermentation tank.

3) Lager yeast, despite "anus" hidden within it's scientific name, is described as a "clean" yeast, because it doesn't produce as much crazy aroma esters and phenols, allowing the malt and hops to be front and center with flavour and aroma

4) There's only a few strains of Lager yeast as



its newer and shinier – we've only been using it for a few hundred years!

Wild Yeast

Wild Yeast is where things start to get FUNKY with beer – and it's usually describing a variety of Brettanomyces yeast (or Brett for short...not like Brett an Australian surfer dude though). There's also wild non-brewing strains of either Ale or Lager yeast too.



This is often used to get weirdly desired off-flavours into beer – infecting the beer on purpose to get a sour tang for example!

BRETTANOMYCES – this is a slow growing "wild" yeast, used to ferment awesome historical styles of beers like Lambics, Gueuze and Flanders Reds. They give off real fruity flavours but also combine with something that's described as "Horse Blanket" or "Barnyard" characters. If you're at the start of your beer education, these probably sound like f*cking

AWFUL ideas – however you train your palate and you'll really appreciate the depth and flavour these things can offer....honest! A great example of this is Orval– it's a super awesome beer that will likely make your tongue fall off the first time you try it!

Bacteria

This takes the Wild Yeast stuff a WHOLE step further and looks for very specific strains that kick out specific funky off-flavours. These are used to make weird and wonderful Belgian beer styles and some USA style sour beers, as well as historical styles that are



making a huge comebacks like Saisons. However, if any of these are present in draft beer that isn't a "sour" style, then it's likely the draft lines aren't clean, and you should leave the bar immediately, and set it on fire as you leave.

There are three specific bacteria that you need to be aware of....

PEDIOCOCCUS – this one is a fully paid up member of the bacteria family, producing tonnes of tart lactic acid and buttery diacetyl. This would normally be an off-flavour again, except in beer styles where it's used on purpose to sour them...urgh.

LACTOBACILLUS – again, produces tart lactic acid, and is a spoiler in any other beer other than sours. Lacto is also used to ferment yoghurt and make sourdoug bread which is a great way to frame the kind of sour taste in your head....just don't think that beer tastes like yoghurt....or the other way around. Think Berliner Weiss.





ACETOBACTER – This one makes a real harsh vinegary acetic acid – again, normally would spoil beer but very desirable in a few styles – but not in high levels. This oxidises alcohol into vinegar, so beer it's in must be kept away from exposure to oxygen. Rodenbach Grand Cru is a key example of a beer with this stuff in – go find one NOW!

<u>5 MINUTE FLEX</u>

I. Is Ale yeast Top or Bottom fermented?



2. Is Lager yeast Top or Bottom fermented?

3. What tastes or aromas can Ale yeast add to fermented beer?

4. Name the bacteria used to create sour, tart Berliner Weisse Beers.

5. Which bacteria can add vinegary acetic acid to a beer?



Over 90% of beer is water, meaning that beer is mainly water. Brewers try to keep this a secret by calling it "liquor" but we know their game!

Water is awesome for beer not just because of the whole being a liquid thing, but because of the variety of mineral ions dissolved into it from the ground it moved through.

This can change the water's pH level and the "flavour" of water (and then the beer it's brewed with of course). Certain ions are good for brewing specific styles, and therefore water can be adjusted chemically to match these water profiles.... NERDGASM STUFF! Scientists learnt how to do this in the early 1900's.

Many classic beer styles were created, just because the water in the local area was a very specific chemical make-up – Burton Pale Ales are a key example of this!

So there you have it! You are now a CBS-level beer ingredients geek. We'd love to waffle on for pages and pages about the brewing process, BUT - for the purposes of this exam it is not really a key focus. Don't worry, all in good time.

For now, enjoy this highly BrewDog-esque photo of the bits and bobs that make up our beer.



This section will count for 15% of your final mark and will cover the following:

- I) Flavour perception
- 2) Flavour evaluation
- 3) Identification of common flavours
- 4) Off flavour knowledge

FLAVOUR PERCEPTION

It's all about the aroma. Beer geeks will always say that it is the most important indicator of what type of beer you have in the glass. This is because our sense of smell is very finely tuned. We are able to smell things thanks to our olfactory system. Humans have about 9 million aroma sensing neurons in their olfactory systems and can sense about 10,000 different aromas.



Did you know that we actually have two sets of nostrils? One set you can see at the front, the other is at the back of your nose tubes where they connect to the mouth. By the way



the term "nose tubes" is not a real science term.

Our olfactory system is made up of two separate sensing systems. The orthonasal system smells aromas you sniff through your nose, while the retronasal system smells aromas in the back of your mouth, throat, and the space between the mouth and nose (the retronasal system actually experiences aromas more as a taste than as smell).

Aroma signals travel through the old Limbic System in the brain. This is the bit which is usually associated to memories or emotions, which is why aroma is often associated with evoking memories. We all remember the smell of that sweet shop when we were growing up yeah?

Taste is obviously a big part of the picture. Whilst aroma will always come first in terms of importance, the science and categorisation of ways to taste things appears to be slightly more developed. Don't worry – we'll get there with aroma, it's just that it's f*cking complicated.

When we are talking about taste, it's always best to start with the five established flavours:

Sweet - Present in beer as a balancing element, the sweet sugar in beer typically comes from the malted barley. There is nearly always some residual sugar left in beer after fermentation.

Salty - Saltiness is generally not present in large amounts in beer. Except with a beer like Westbrook Gose!

Sour - Beer is an acidic liquid. Belgian style sour beers can very acidic. Acidity in beer gives it a bright character. Acidity is a big feature of sours and fruit beers

Bitter - Bitter signals to the brain are complex and take longer to be processed than other flavours; bitterness also tends to be perceived as lingering on the palate. Bitterness in beer comes predominantly from the hops which contain Alpha Acids. When the hops are boiled the Alpha Acids go through a process called Isomerisation. This renders them bitter to taste. You can also perceive bitterness from some darker roasted grains.

Umami – this is the Japanese word meaning "pleasant savoury flavour". We stole it because it's perfect as the fifth flavour attribute! Basically, it's a pleasant "brothy" or "meaty" taste with a long lasting, mouth-watering and coating sensation over the tongue

> There is one final flavour that we want to talk about. Fat. Fat is what we would call an "emerging" flavour. It is one of the most recently discovered flavours. American scientists (clever buggers) discovered a fat receptor in 2012 while conducting research on obesity (some humans appear to be genetically inclined to strongly taste and enjoy fat!). Beer doesn't have fat (lipids is the posh science word for this), so it is not an important element of beer flavour. When lipids do find

their way into beer, they typically serve to kill the beer's head and give it an oily character. Lipids typically find their way into beer due to improperly cleaned glassware. This sucks.

Scientists are still discovering all the flavours our tongues can detect at the we know its between 5-8.





Our sense of touch is also a way that we can detect properties in a beer. You may have heard the term "mouthfeel" banded about when people talk about wine or beer. It refers mostly to the "weight" on the beer, and the amount that it coats the inside of the mouth.

One of the major drivers of mouthfeel is how much sugar the yeast leaves after fermentation. See, the rate and amount of sugar that yeast munches, and the resulting "mouthfeel" of the beer is often referred to as the rate of "attenuation". Highly attenuated beers have very little sugar and are therefore quite dry. Beers where the yeast has left loads of sugar present at the end have a 'low rate of attenuation' and are therefore sweeter and more full-bodied.





Finally, time for a bit of the old bubbly!

Fizz (or carbonation) gives beer that little extra bite. To be sciencey it is known as "carbonic bite" – classified as a gentle sourness. Carbonation is also detectable by the little bubbles popping on your tongue. Kinda like popping candy but for adults.

FIVE MINUTE FLEX

I) Of the five – taste, aroma, touch, hearing and sight, which tells us the most about a beer?

2) Name all five established taste attributes.

3) What name do we give the flavour attribute to carbonation in beer?

4) What are the two most common causes of bitterness in beer?

5) Briefly describe attenuation and its effect on mouthfeel.

FLAVOUR EVALUATION

Now that you have a good understanding of the terminology behind beer flavours and perception, let's think about how we evaluate this. This is so, so important as it helps us start from the same point every time we taste a beer and can assist when we wish to describe beers to other people.

The basics are that the following things can be used for evaluating beer: Appearance, Aroma, Taste, Mouthfeel and Aftertaste.



<u>Appearance</u> is very important for casual evaluation by consumers because it gives hints of what to expect from the beer. Note the beer's colour, clarity, head character, and head retention.

Aroma

I) Always smell beer as soon as you get your paws on it. Some aromas dissipate rapidly.

2) Swirl the beer in the glass before sniffing – this releases amazing fresh aroma compounds

3) A few short quick sniffs are better than long sniffs. Longer inhalations dry membranes and interfere with aroma receptors. #science

4) Smell yourself (sounds gross but works) to reset your receptors when they are getting knackered. Don't go mad here – just the back of your hand will suffice thank you very much.

5) Connect aromas to things that you already know – flowers, spices, fruits, grains, breads, sweeties or cake, woods, plastic, vinegar, anything at all! Seriously – get used to doing this - It takes practice but when aromas click, it's like the beer tasters superpower!





<u>Taste</u>

I) Sip the beer and let it linger in your mouth. Look for basic flavours like sweetness, acidity, and bitterness. Again, try to connect what you're tasting with the aromas and flavours of other foods and items. Bridge connections in your mind. Be at one with the Matrix of flavour. Become the Neo of craft beer.

2) Sometimes the flavours you get will match up well with the aroma and sometimes they will be shockingly different. Worth noting.

<u>Mouthfeel</u>

Be aware of the "richness" of the body, and the carbonation levels.

Aftertaste

I) Near the end of a sip certain flavours or sensations can linger. Think about whether they are smooth or harsh and what likely created them, be it hops, malt, yeast, or something else weird that we have put in the beer like bacon.

2) Some beers are crisp and leave the palate

refreshed with almost no aftertaste, other beers may



have a long rich sweet aftertaste, and others may have bitterness that lingers after swallowing. Jack Hammer for example is an upfront face-melter when it comes to bitterness but also has a long, bitter aftertaste. The posh wine word for aftertaste is "finish". Pffft. Ours is better.

Other awesome evaluation techniques

I) Short quick sniffs are most effective for sensing aroma. Makes you look weird but works every time. (we thought we'd mention this again)

2) Use a white background for assessing the colour and clarity of the beer. Basically carry a white sheet of A4 with you wherever you go.

3) The beer should reach all parts of your tongue and mouth during tasting. Not doing this is like meeting someone and not shaking hands; weird, upsetting and down-right rude.

4) Your perception of the beer's flavour will continue after swallowing. Note the beer's aftertaste—it can be very revealing.





FIVE MINUTE FLEX

I) Name the five flavour evaluators of beer?

2) In wine they call it finish – in beer we call it?

3) Which part of the inside of your mouth should beer touch when tasting?

4) Why do beer tasters make sure that they swallow the beer?

5) Find a beer right now. RUN. Go through the flavour evaluation process. Write your notes below. Learning can be really quite tough sometimes huh?

IDENTIFICATION OF COMMON FLAVOURS

Let's dig a little deeper and find out exactly where specific flavours come from in beer. We'll look at Malt/Grains, Hops and Fermentation derived flavours.

Malt is cooked or kilned at different levels in order to create different colours and flavours. Just like a piece of toast, if it is cooked for longer it gets darker and the flavours become more intense. Untoasted bread (or "bread" as it is sometimes known) has a soft, doughy and lightly sweet flavour.

PALE BEER = FLOUR AND DOUGH

Common flavour and aroma descriptors for very pale beers include uncooked flour and bread dough-like. SEE! Very pale beers are often made solely with very lightly kilned malts such as pilsner malt. Pilsner malt is the palest malt; it is used to make the pilsner beer style and serves as the base malt for many continental European beer styles.





GOLDEN BEER = WHITE BREAD, CRACKERS, LIGHT BISCUITS

Pale malt is used as the base malt for many of the world's pale ales, especially those from England and the US. These malts are kilned just enough to give them an aroma and flavour of baked bread and some of the more mellow biscuits out there. We suggest you go and eat like a million biscuits now... you know just for research purposes.

LIGHT AMBER BEER = BREAD CRUST, DARKER BISCUITS, CHEESECAKE BASE

These beers are most probably made with either a darker base malt such as Vienna or Munich, or it's being made with one of the paler base malts plus an addition of "specialty malt" that is more highly coloured. Specialty malts are added in small doses to give the beer a particular colour, flavour, and aroma. There are sh*tloads of specialty malts that can be added to a beer's malt bill in order to give it an amber colour and the common aroma and flavour descriptors for light amber beers. Pretty cool.





AMBER BEER = TOAST, CARAMEL AND GOLDEN PIE CRUST

Amberer (is that a word?)* beers may be made with purely Munich base malt (the darkest base malt), but in most cases amber beers are made with light base malt and small amounts of darker specialty malt. These specialty malts are kilned or roasted enough to have developed a rich toasty or caramel character. 5AM Saint is an excellent example of an Amber Beer.

*it's not

BROWN BEER = NUTTY, TOFFEE, CHOCOLATEY, AND DARK OR DRIED FRUIT

Brown beer – sometimes associated with old British pubs, old men with beards like rhododendrons, socks and sandals as a combination, and the weird stuff from Newcastle. BUT! It's not to be scoffed at, and more often than not has an incredible malt profile. Made using dark roasted specialty malts or grains that give them lots of deep colour and, depending which is used, give the beer some of the flavours and aromas of toffee, chocolate (milk or dark), or dried fruit.





BLACK BEER = ROASTY, BURNT, ESPRESSO, AND COFFEE

Like the brown beers, black beers are always made with some roasted specialty malts or grains. This is a more intense level of roast than you'll typically get in a brown beer. In the case of a black beer, these will often impart a burnt, roasty, or coffee character to the beer. Stouts and Imperial Stouts often feature these character traits. Basically they are the flavour equivalent of Darth Vader.



OK that's the Malts and grains out the way for the time being. Let's look at how our beloved hops affect beer flavour.

Bitterness

This comes from the isomerisation of Alpha Acids in the hops. This occurs during the boil. The longer you boil hops, the bitterer (definitely a word!) they become.

Flavour and aroma

These come from the essentials oils in hop cones. If these are boiled they evaporate (volatilise is the fancy term here). So, we need to make sure that hops used for the purposes of these flavours are put into the boil right towards the end. Or even better during dry hopping.





Regional hop traits

USA hops are known for their citrusy (especially grapefruit), piney (as in pine trees), and resiny (like *coughs* cannabis *coughs*) characteristics.

English hops are described as herbal, woody, and earthy. Like a hippy.

German and Czech hops are often described as floral, perfumey, peppery, minty, and woody.

So with malts and hops out of the way, it's time to look more closely at the yeast. There are many different strains of yeast, which like to munch sugar at different temperatures. This produces a wide range of unique flavours in beer known as "fermentation-derived flavours". Sounds gross but is actually amazing.

Ale vs Lager

Imagine two humans running on a treadmill.

One is taking it easy, you know, taking in the scenery. This human is producing little body heat, and is not sweating much so probably smells clean and fresh.

The other is totally hammering it. Like a full on 400m sprint, during which body temperature rises sharply, sweat and smell is produced.

This deeply unpleasant analogy should help you to understand the difference between Ale and Lager yeast. Lager ferments slow and at low temperatures producing clean and crisp flavours.

Ale has a warmer fermentation temperature and produces more intense flavours and aromas known as "esters".

We also should consider Weissbier. This is a German Wheat Beer brewed with a unique type of yeast. Bavarian Weissbier is made with a special strain of ale yeast that produces clovelike phenols and the banana and bubble gum esters that typify the German wheat ales styles.

Last but not yeast (haha) – let's look at spontaneous fermentation derived flavours. You don't need to go crazy on this knowledge for CBS – just get a good overview.

Wild yeast and bacteria that cause acidic fermentation are typically considered horrid organisms in beer. There are, however, some styles in which they are used to make tart "sour" beers such as Gueuze, Flanders Red, and Lambic (with fruit or without). A variety of bacteria and yeast create acidic fermentations. Here's a quick look at the little buggers:

Lactobacillus (LACK-TOE-BAAH-SILL-US)

Lactobacillus debruckki is bacteria that during fermentation produce lactic acid that lends beer a crisp dry acidity. This is what we use to make our Blitz! Range.





Pediococcus (PEE-DEE-OH-

COCK-US) this one is tough to say without getting laughs

Pediococcus is bacteria that produce lots of lactic acid sourness during fermentation. It can also contribute lots of buttery diacetyl and in some cases can give beer a sweaty sock or "goaty" character. Ewww. Sometimes it's nice though.

Acetobacter (ASS-EAT-O-BACK-TER)

Acetobacter is bacteria that oxidizes alcohol and turns it into vinegar. Acetic acid is sharper and more intense than lactic acids, and tastes vinegary and pickle-like. Acetobacter is commonly found in oak-aged beers since barrels allow some oxygen exchange. It is important to the tart, acidic profiles of Gueuze and Flanders red.





Brettanomyces (BRET-TAN-O-MICE-CEES)

Brettanomyces is slow growing "wild" yeast often found on the skins of fruits (i.e. that dusty white stuff on the skins of grapes). It is used to create many of the unique fermentation characteristics of Gueuze and other sour beers. Have you guys tried Orval before? If not, you must pay for your crimes against craft beer and go and do this now. Quickly in case it all runs out.

FIVE MINUTE FLEX

I) Describe the malt flavour commonly found in Pale Beer.

2) Describe the malt flavour commonly found in Brown Beer.

3) Describe the malt flavour commonly found in very dark beer.

4) Name the three wild bacteria strains that can be used for beer.

5) What does Wheat Beer produce that that can taste like bananas or bubblegum?

WHEN OFF FLAVOURS ATTACK!!! (Cue scary music)

Off flavours can occur in beer for a number of reasons but usually it is down to lack of control. There are so many tiny things that can go wrong that it would take us years to explain it all to you, so let's keep it nice and simple and focus on the most common one; oxidation, lightstruck and dirty lines.

Oxidation

Oxidation, put simply, is oxygen interacting with various compounds in beer. If too much oxygen gets into the bottle, can or keg during packaging the results of this will become more obvious. That said there is always some oxygen in there so over time, the beer will become "oxidised". If beer is not stored cold, the heat will accelerate this oxidation and make the beer go manky fatser.

As soon as you see the word "oxidation" you should think of "packaging" or "ageing".

Flavour-wise, the first thing you will notice is a sharp drop in the level of hop flavour and aroma. The malt flavours will shift towards honey, caramel and toffee. Eventually a chemical called "trans-2-nonenal" will pop up and make the beer taste like wet cardboard, paper or lipstick.

Some heavily oxidised beers can also end up tasting like sherry. Now, we all like a glass of sherry at Christmas but we don't think the flavours work in an IPA.

So! To avoid oxidation, be careful when brewing, packaging and storage. Keep your beer like you keep your milk -> COLD.



<u>Lightstruck</u>

Sunlight is a mortal enemy of beer. In particular hoppy beer. Here's why:

The UV rays pass through the glass and into the beer, attacking the delicate hop compounds and smashing them into little bits. These bits get scared and bind to the nearest thing they can, in many cases its trace elements of sulphur in the beer. This gives the beer a very distinct aroma.

Have you ever been sprayed on by a skunk in North America? No? Lucky you. Well, if you had – it would smell like that.

Have you ever walked passed a particularly lively house party and smelled the unmistakable waft of a certain combustible herb? Well, if you have – it would smell like that.

Lightstruck beer sucks – this is why we always use brown glass to bottle our beers, as it blocks out the majority of the UV light.

Dirty Draft Lines

Those who fail to correctly clean their beer lines will end up with a nasty buttery, or vinegary flavour. These are both caused by wild bacteria growing inside the lines. The butter comes from "diacetyl" that leaks out of healthy yeast cells, and the vinegar – as you learned before- comes from acetobacter. Both are horrible and a clear sign that someone is being a lazy Lenny.

FIVE MINUTE FLEX

I) Briefly describe how oxidation occurs in beer, and what flavour it can produce.

2) Briefly describe Lightstruck beer, how it occurs and what flavours you get from it.

3) Explain to two flavours commonly associated with dirty draft lines.

A FINAL LOOK AT WHAT YOU WILL BE TESTED ON

Beer Flavour & Evaluation: 9 questions - 15%

- I) What general flavours are commonly associated with malt, hops, or yeast.
- 2) What general flavours are commonly associated with malt, hops, or yeast from particular beer cultures such as English, German, Belgian, or American.
- 3) What is aftertaste, mouthfeel, and perceived bitterness.
- 4) What are the common off-flavours, including those you'll encounter if draft lines are not properly cleaned (butter and vinegar), if beer is stored poorly and/or for long periods of time (papery), if beer is light struck (skunking).
- 5) What are the fundamental flavours, such as sweet and bitter.
- 6) What is the effect of overly cold beer for the drinker (massive reduced flavour)

Tips for further revision.

Stop and think next time you pick up a beer. Which are the malt-derived flavours? Which are the hop-derived flavours? Which are the fermentation-derived flavours? Think about the colour, aroma, mouthfeel, carbonation and aftertaste. Get geeky!

Go back through this section and highlight key words and concepts. Keep it concise and it should act as a reminder in case you need a bit of cramming just before the exam!



This section will count for 35% of your final mark and will cover the following:

- I) Understanding Beer Styles
- 2) Style Parameters
- 3) History, characteristics and flavour attributes of styles by world region



Beer styles are the categorisation of beer into easily distinguishable types. When doing this we look at history, colour, carbonation, bitterness, ingredients, mouthfeel... the list goes on. But why must we have beer styles? Why must we as human beings pigeon-hole every single thing we look at, touch or think about? Well this is going a little deep but we guess people are just trying to make sense of the world around us.

We have noticed on our journey through craft beer that the definition of beer styles has helped our customer really geek-out about certain types of beer. We massively encourage all of our staff to really go to town on their styles knowledge. It is one of the key areas of knowledge that support our mission to make people go as nuts for awesome craft beer as we do.

Two key points to get you into the right mind set:

- I) Styles help brewers communicate what consumers should expect in beer.
- 2) Styles honour traditions and provide order to a vast selection of beers.

So you are not gonna get tested heavily on the reasons for beer styles existing below, but it's a very important step to go through as it will make more sense of the detail you do need to know about each style. So put your feet up, grab a beer and have a nice leisurely read whilst listening to Death Metal or Lounge Jazz.



How has the historic development of beer styles occurred?

Back in the day, beer styles were driven by limitations in available ingredients, technology, and local water profiles. Some of those limitations included:

The grape/grain line defined where beer could be easily made. It's like a cool belt around the world which contains the countries where certain beery ingredients like malt and hops can be grown.

Weather and climate limited when brewing could be done and what fermentation temperatures were. It was difficult to make good beer in the summers in most areas because it soured quickly. A common practice in many parts of Europe was to brew strong beer near the end of the yearly brewing period to store through the hot season and be consumed in the fall before new beer was ready. The Oktoberfest/Märzen and Bock styles come from this tradition. Clever buggers!



Hops only grow in certain areas due to climate and soil. For instance, hops grow in southern England (ESB) but not in Scotland, so not surprisingly Scottish beer styles tend to be malty (Scotch Ale). That said – our beers are fucking hoppy and we are from Scotland...



Local water sources had a big impact on the development of styles. Harder alkali water is best suited for making dark malty beers, like those that originated in London (Porter), Dublin (Stout), and Munich (Dunkel). Hoppy beers are best made with either soft water or hard acidic water with lots of gypsum in it, like those crisper styles that originated in Plze (Pilsner) and Burton-on-Trent (English Pale Ale).

How has technology affected beer styles?

By about 1700, improvements in kilning (or cooking) technology allowed brewers to stop making most beer smoky and brown. Some areas chose to keep making smoky beer (Bamberg's Rauchbier). If you haven't tried one of these you should. It's like liquid smoky goodness.

Developments in affordable and accurate hydrometers and thermometers allowed much greater control of the brewing process beginning in the I800s. Thermometers measure the temperature at different stages, and hydrometers measure the density of the liquid.





Refrigeration became useful for brewing in the 1870s and led to fermentation temperature control, year-round brewing, and wider distribution of beer.

Louis Pasteur in the 1860s discovered much about yeast and invented Pasteurization, increasing the shelf life of beer and allowing it to be shipped to a wider consumer base. Clever sod!

Modern technology has allowed any beer to be made anywhere, unlinking brewing traditions from the places they arose. By about 1900, brewers could make beer all

year round and ship it wherever they wanted in the world.

Basically – as technology has got more awesome, and research into beer making has got more intense – more styles and concepts have been refined.

How have taxes & laws affected beer styles?

The 2225 BC Code of Hammurabi, the first set of written laws, included laws about how much taverns could charge for beer!

In medieval Europe, beer was heavily taxed. Bastards.

In many locations, brewers were only allowed to bitter their beers with a mix of herbs they were required to purchase from the local authorities. This herb mix and the beers made with them were called gruits, you can still find them on occasion (and some modern beer styles still use herbs and spices, such as witbier, but they are also made with hops). Later, when hopped beer became the norm, the authorities just started taxing malt and hops. Pffft, if it makes people happy – tax it.



The German Reinheitsgebot (RINE-HEIGHTS-GER-BOAT) "purity" law was largely about taxing beer production, and it restricted the ingredients brewers were allowed to use to just malt, hops, and water (and yeast, but they didn't know about that yet). Only certain brewers were licensed by the German authorities to make wheat beer! This had a huge effect on the classic German beer styles.

British brewers today are taxed by the original gravity of their beer, giving them the incentive to make weak session beers, which are the popular British styles.



In Belgium, brewers were taxed by how big their mash tuns were, regardless of how full they were. The Belgian authorities allowed for the use of a second untaxed tun for unmalted grain and Belgian brewers were happy to take advantage of this, which led directly to the way they make lambics and witbier today with lots of unmalted wheat.

How have cultural attitudes & tastes affected beer styles?

A particular era of American culture, combined with technologies of modern corporate greed and marketing, took a huge toll on beer and nearly wiped out traditional styles until the recent explosion of interest in "microbrews" and now "craft beer." By far the most popular beers worldwide are cheap, thin, diluted, American style adjunct lagers. They were meant to be inexpensive to makeand easy to drink. They fit in with a certain cultural attitude in America and the world for a period, but cultural attitudes are now changing to more interesting flavours and pride in craftsmanship, rather than industrial icons.



Even in countries with long brewing traditions like Belgium, Germany, and England, the light lager style dominates sales, but the trend is reversing. Many beer styles have gained a new lease of life.

Who catalogues all these beer styles?



The BJCP (Beer Judge Certification Program). The Cicerone Syllabus relies heavily on this amazing company's classification of beer styles. At CBS level they simplify it, but at Certified level they really go for it!

The Brewers Association (BA) creates their own beer style guidelines that are used for judging the Great American Beer Festival and the World Beer Cup festivals. You don't need to look at this until you get to Advanced Cicerone level so just chill OK.



Defining Beer Styles

What are the knowledge requirements regarding each beer style for the Certified Beer Server test?

Quantitative information is given with a measurable number. You will want to be familiar with the general quantitative limits for ABV, IBU, and SRM for all styles. These are measurable numbers. You don't need to have them all memorized for the exam, but you should be familiar with them as a way to differentiate between styles.

ABV = Alcohol by Volume (a measure of booziness created y the yeast)

IBU = International Bitterness Unit (the bitterness of a beer from the hops)

SRM = Standard Reference Method (the colour of a beer from the malt)

<u>ABV</u> for the CBS exam is listed as low, normal, elevated, high, or very high. Alcohol level descriptors correspond to the following ABV ranges:

- (a) Lower is 4.4% or less.
- (b) Normal is 4.4% to 5.9%.
- (c) Elevated is 6.0% to 7.4%.
- (d) High is 7.5% to 9.9%.
- (e) Very high is 10.0% and up.

<u>IBU</u> is a measurement of bitterness in beer. It describes how much bitter alpha acid is dissolved into the beer. The alpha acids get into the beer when the brewer puts hops in the boiling wort during the brewing process. Bitterness from hops balances the sweet sugary malt character in beer. Beers range in IBU from about 5 to well over 100. That said, for the CBS exam, you'll only need to be able to describe the perceived bitterness of common beer styles as low, moderate, pronounced, assertive, or highly assertive.

<u>SRM</u>

SRM is the Standard Reference Method. European Beer Convention (EBC) is another way to measure colour but we are going to stick with SRM

3 SRM = Straw

5 SRM = Gold

I2 SRM = Amber

20 SRM = Brown

40 SRM = Black

For the beer styles section we have added the colour palettes in for you in the background to make this easier. But do remember the above 5 milestones in beer colour as it will help you with this exam!

What are the qualitative parameters of a beer's character?

Qualitative features of a beer can't be measured but are described with words and are more subjective to the taster. That said, there are generally agreed upon clever terms for flavour



and aromas as well as generally agreed upon properties that are appropriate to each beer style.

<u>Aroma</u> is the smell of the beer. All the ingredients including the malt, hops, and yeast create aroma. In some beer styles, one of these may dominate the aroma; in others, it is a wellbalanced mix. A good head helps send aroma molecules into the air and to the nose of the drinker.

When tasting a beer, always smell it first. Smell it immediately upon receiving it, as the most volatile aromatics are only present directly after the beer is poured. Also, keep in mind that much of the flavour comes from aroma.

<u>Flavour</u> is what the beer tastes like. After you've experienced the beer's aromas, go ahead and take a sip. Look for flavours that are different than what the aroma contained, look for flavours where the aroma delivered exactly as promised. Flavour is related to aroma.

<u>Aftertaste</u> is what flavours linger after you've swallowed the beer. Some beers leave a lasting flavor impression that may change over time, others are crisp and clean and disappear rapidly. Often, the finish and aftertaste is very different from what you experience when you first taste the beer. The aftertaste may be a harsh roastiness or bitterness, it may be a smooth rich caramel flavor, or it may be almost nothing at all.

<u>Mouthfeel</u> is created by the beer's body, carbonation, warmth, creaminess, and astringency.

The <u>body</u> of a beer is largely the result of dissolved solids, such as proteins and sugars that weren't attenuated by the yeast, and other compounds in the beer giving it body.

<u>Alcohol</u> can be warming or even hot in your mouth and throat.



<u>Astringency</u> is that sensation of having the moisture sucked out of your mouth that you get from a tannic red wine or strong tea. It is rarely appropriate.



<u>Creaminess</u> is fullness on the palate—the opposite of astringency

The level of <u>carbonation</u> affects mouthfeel. Generally, less carbonated beers, such as British cask ales, seem smooth and full. High carbonation beers seem crisp.

<u>Perceived bitterness</u> is the perception of how bitter the beer is. It is the balance of the sweet malt and the bitter hops. A 20 IBU beer that is very dry may taste more bitter than a 60 IBU Barleywine that has loads of sweet sugar in it. Bitterness is a balancing act: the IBUs may be high but if balanced by the malt then a beer may be very smooth. IBU alone doesn't tell you about the beer's balance without more information.



For the CBS exam, you'll need to be able to describe the

perceived bitterness of common beer styles as low, moderate, pronounced, assertive, or highly assertive.

Right that's all the background work done. Now on to the really important bit. It's time to learn the beer styles. OK let's be honest here – this bit can be a little tough for some people. We have done our best to make it visually stimulating but really you will need to come up with your own awesome method for remembering all these styles. Some people draw tables, some people create imaginary characters for them, some people remember them visually and so on...

The one piece of advice that is guaranteed to help you with across beer styles learning is:

BUY THE STYLE -> TRY THE STYLE -> AND LEARN THE STYLE

If you can put a real life beer to the style – you will always remember it!

You will find many examples of amazing beer styles in our bars and on our online shop. If you are struggling to find a good example of style – speak to a CBS and a Certified Cicerone®


BER STYLES





GUEUZE

HISTORY

Spontaneously fermented wild ale from the Brussels region. Originated from farmhouse brewing and blending traditions. Traditionally produced by blending, one, two and three-year-old lambics.

FLAVOUR PROFILE

A complex, pleasantly sour but balanced wild Belgian wheat beer that is highly carbonated and very refreshing. The spontaneous fermentation character can provide a very interesting complexity, with a wide range of wild barnyard, horse blanket, or leather characteristics intermingling with citrusy-fruity flavours and acidity.



📀 straw to gold

Commercial Examples Boon Oude Gueze Cantillon Gueuze.

FRUIT LAMBIC Kriek, Framboise etc.

HISTORY

Spontaneously fermented wild ale from the Brussels region. Originated from farmhouse brewing and blending traditions. Added fruit post-fermentation to sweeten and make more palatable to a wider audience. Fruit traditionally added to increase variety of beers available in local cafes.



FLAVOUR PROFILE

Pleasantly sour, wild wheat ale, showcasing the fruit contributions blended into the beer. Aroma should be dominated by the fruit used.





FLANDERS RED ALE

HISTORY

Distinctive to the West Flanders region of Belgium and symbolised by the Rodenbach brewery. Aged in Oak barrels, which contain bacteria required to sour the beer, for two years.

FLAVOUR PROFILE

Sour, fruity, red wine like ale with complex malt flavours to support and balance the fruitiness and sourness. Can have an acidic bite. and fruit flavours including plum, black cherry and red currant.

ABV



normal to elevated OW



Commercial Examples **Rodenbach Grand Cru** Duchesse De Bourgogne

BELGIAN DUBBEL

HISTORY

First brewed by Trappist Abbey Westmalle in 1856. Brewed by most of the Trappist brewers in Belgium and the Netherlands. Name referred to the fact the beer was twice as strong as the standard beers brewed by the monastery.

FLAVOUR PROFILE

Rich, malty complex Trappist ale. Dried fruit esters, raisiny flavours with a dry finish. Some alcohol and phenol notes with balance being towards the malt.







Commercial Examples Westmalle Dubbel Trappistes Rochefort 6

SAISON

HISTORY

Originated in Wallonia, the Frenchspeaking part of Belgium for consumption during the active farming season. Was a low strength beer so as not to debilitate farm workers, but tavern-strength versions also existed. Modern saison first produced by DuPont in the 1920's.

ABV normal to Elevated moderate

FLAVOUR PROFILE

Ability to ferment at extremely high temperatures, giving off loads of phenolic characters. Peppery and spicy aroma with high carbonation. Extremely dry as they are highly attenuated.



Commercial Examples Saison DuPont Fantome Saison

WITBIER

HISTORY

400-year-old Belgian style that died out in the 1950's. Revived by Pierre Celis at Hoegaarden. Becoming a popular fruity summer beer. Often spiced with freshly ground coriander and citrus peel and typically uses 50% unmlated wheat with the rest being pale barley malt and even a small amount of oats.

ABV normal Cow

FLAVOUR PROFILE

Malty-sweet grain flavour with a dense white moussy head that lasts. Orange citrussy fruity flavour and sometimes a very light lactic sourness. Crisp with a dry, often tart finish.

📀 straw to gold, made white with haze

Commercial Examples Hoegaarden Wit St. Bernardus Witbier

BELGIAN BLONDE ALE

HISTORY

Relatively recent development to further appeal to European Pils drinkers, becoming more popular as it is heavily marketed and widely distributed. Just think Leffe Blond.

FLAVOUR PROFILE

A moderate-strength golden ale that has a subtle fruity-spicy Belgian yeast complexity, slightly maltysweet flavor, and dry finish.

Often described as having a "grainysweet" malt flavour.



light gold to gold

Commercial Examples La Trappe Blond Leffe Blond

BELGIAN GOLDEN STRONG ALE

HISTORY

Moortgat brewery after WWI to compete with the growing popularity of Pilsner style beers. devil in the name of the beer.

FLAVOUR PROFILE

Highly attenuated and features fruity and hoppy notes compared over phenolics. Lots of fruity esters in the aroma, very high carbonation and extremely effervescent.







Commercial Examples Delirium Tremens

BELGIAN TRIPEL

HISTORY

Also popularized by the Westmalle Trappist Monastery. Brewed by most of the Trappist brewers in Belgium and the Netherlands. Name referred to the fact the beer was three times as strong as the standard beers brewed by the monastery.

FLAVOUR PROFILE

Pale in colour unlike Dubbel, spicy, dry and strong Trappist ale. Very aromatic and drinkable for high alcohol levels. Fruity esters, spicy, peppery and clove like phenols. Grainy sweet or honey like light malt character.





Commercial Examples Westmalle Tripel Chimay Triple









BEST BITTER

HISTORY

Traditionally Real Ale, served at cellar temperatures through a hand pump. British bitter category developing from the English Pale Ale. Crystal malts commonly used after WWI.

FLAVOUR PROFILE

High bitterness but low hop character and some fruity esters. Bready, biscuit malt profile with a dry finish. Some low levels of diacetyl acceptable.





Commercial Examples Fuller's London Pride Young's Special

ENGLISH I.P.A. HISTORY

Increased hopping compared to pale ales to be used as natural preservative to last long boat journeys to India in the late 1700-1800's. George Hodgson of the Bow Brewery became well known for exporting IPA in the early 1800's. Breweries in Burton could successfully brew the beer with their high sulphate water.

ABV -0 0----normal to elevated assertive

FLAVOUR PROFILE

Generally use classic English ingredients and have a hoppy aroma and flavour, well attenuated with a dry finish. Low to medium hop flavour with toasty, toffee-like flavours.

O gold to amber

Commercial Examples Fuller's Bengal Lancer IPA Meantime India Pale Ale

BRITISH BROWN ALE

HISTORY

Has been brewed to different strengths over time, but modern versions tend to be stronger. Predominately but not exclusively a bottled product.

FLAVOUR PROFILE

Similar in appearance to porter but without the roasted flavours. Has a malty, caramel character and is slightly sweet. Hop flavours are low to none with moderate fruity esters.



lower to normal moderate



Commercial Examples Newcastle Brown Ale Wychwood Hobgoblin

SWEET STOUT HISTORY FLAVO

Historically known as 'milk' or 'cream' stout, no longer legally allowed in the UK. 'Milk' name comes from use of lactose or milk sugar used as a sweetener. Once marketed as a tonic for invalids and nursing mothers.

FLAVOUR PROFILE

Sweet in flavour due to low hopping levels and use of unfermantable sugars. Can have coffee and cream like flavours or sweetened espresso.



Oark brown to black



Commercial Examples Left Hand Milk Stout Young's Double Chocolate Stout

CATMEAL STOUT

HISTORY

Some English brewers would throw a handful of oats in the grist to create a 'healthy' oatmeal stout for marketing purposes. Popular between World Wars and revived recently in the craft beer world.

FLAVOUR PROFILE

Between sweet and irish dry stouts in terms of bitterness. Full bodied with silky, smooth, velvety mouthfeel from use of oats.

This beer should contain at least 5% oats!





Commercial Examples Anderson Valley Barney Flats Samuel Smith Oatmeal Stout

WEE HEAVY Scotch ale

HISTORY

More related to historical brews than modern lower strength versions. A premium product, often made for export (hence the high strength).

FLAVOUR PROFILE

Rich, malty and caramelly sweet, almost dessert-like. Strength and maltiness varies, although should not be cloying or syrupy. Medium to full body with a thick, chewy viscosity.







Commercial Examples Alesmith Wee Heavy Oskar Blues Old Chub

IRISH STOUT

HISTORY

Brewed to capitalize on the success of London porters. Guinness began brewing porter in 1799 and a 'stouter kind of porter' around 1810. Guinness was among the first breweries to use black patent malt, and started using roasted barley after WWII.

FLAVOUR PROFILE

Made using roasted barley, flaked barley and pale malt, can also have chocolate or other dark speciality malts. Black in colour with pronounced roasted flavour similar to coffee. Balance can be quite even to very bitter, with the balanced version have a slight sweetness and the bitter versions being quite dry.



ABV

lower to normal pronounced

📀 brown to black



Commercial Examples Guinness Draught Brooklyn Dry Irish Stout



GERMAN/ CZECH BEER STYLES





GERMAN PILS

HISTORY

Adapted from Czech Pils (Premium Pale Lager) to suit German brewing conditions, as German water has a higher mineral content. First brewed in the 1870's.

FLAVOUR PROFILE

Lighter in body, colour, drier and crisper compared to Czech Premium Pale Lager. Medium to high hop bitterness dominates and also has a clean fermentation profile.



📀 straw to light gold

Commercial Examples Holsten Pilsener Firestone Walker Pivo Pils

MUNICH HELLES

HISTORY

Created by the Spaten brewery in 1894 to compete with popularity of pale pilsner style beers. Currently most popular beer style in Southern Germany.

FLAVOUR PROFILE

Grainy sweet malt flavour with a low-medium hop bitterness and a soft, dry finish. Clean fermentation profile with malt dominating the balance.



💿 straw to light gold

Commercial Examples Augustiner Lagerbier Hell Weihenstephaner Original

CZECH PREMIUM PALE LAGER

HISTORY

First brewed in 1842 by Josef Groll. Desire to produce a clean beer due to the poor quality and standards of beer brewed in Plzen at the time, the beer is typically associated with Pilsner Urquell, uses locally sourced ingredients.

FLAVOUR PROFILE

Soft water, gives a distinctively rounded hop profile despite large amounts of hops used. Saaz hops typically used to give a spicy, floral, herbal aroma. Rich, bready malt flavour.





Commercial Examples Pilsner Urquell Oskar Blues Mama's Little Yella Pils



HISTORY

Munich origin. Brewed in March and lagered in cold caves over the summer. German amber version first served at Oktoberfest in 1872 until 1990 when Festbier was adopted as the standard beer for the festival.

FLAVOUR PROFILE

Malty amber lager, clean with a toasty and bready malt flavour. Little hop flavour and a moderate bitterness and a dry finish.





Commercial Examples Paulaner Oktoberfest Weihenstephaner Oktoberfestbier

HELLES BOCK

HISTORY

Recent development in relation to other beers with the Bock name. **Essentially a Munich Helles brewed** to Bock strength. Also known as Mai Bock as it is typically consumed in May.

FLAVOUR PROFILE

Paler than other 'Bock' beers but still strong. Lighter malt varieties typically used allows the hops to become more apparent.





Commercial Examples Ayinger Maibock Rogue Dead Guy Ale

DOPPELBOCK

HISTORY

First brewed by the monks of St Francis of Paula in Munich. Historical versions less attenuated, hence nickname 'liquid bread' used by monks. Commonly the name of the beer ends in the suffix 'ator'.

FLAVOUR PROFILE

Rich and malty flavour. Toasty malt flavours but never roasty or burnt. Generally low hop profile and a sweeter flavour due to low hop usage, allowing malt to dominate.



📀 gold to brown



Commercial Examples Ayinger Celebrator Paulaner Salvator

WEISSBIER

HISTORY

Wheat beer was once a monopoly, reserved for the Bavarian royalty. Schneider began production in 1872, with pale weissbier becoming popular in the 1960's. At least 50% of grist must be malted wheat. Historically uses German weizen ale yeast for that special flavour.

FLAVOUR PROFILE

High carbonation, dry finish and fluffy mouthfeel. Banana and clove character from the yeast dominates the aroma.

You can always tell a Weissbier from a Witbier... Weissbier is the one that tastes like bananas and clove!



📀 straw to gold

Commercial Examples Weihenstephaner Hefeweiss Franziskaner Weissbier

BERLINER WEISSE

HISTORY

Regional specialty of Berlin. Referred to by Napoleon's troops in 1809 as the 'champagne of the north'. Fermented with Lactobacillus to provide the sharp sourness. Sometimes served with Woodruff syrup to sweeten and balance the sourness.

FLAVOUR PROFILE

Very pale, refreshing and low strength German wheat beer. High carbonation and a clean lactic sourness. A light bread dough character to balance the sourness.





Commercial Example Berliner Kindl Weisse Westbrook Weisse Weisse Baby

GOSE

HISTORY

Originating in the middle ages in the town of Goslar on the Gose River. Associated with Leipzig as 1900 there were 80 Gose houses. Production declined after WWII and ceased in 1966. Slowly being revived by craft beer breweries.

FLAVOUR PROFILE

Highly carbonated, tart and fruity wheat ale. Has restrained coriander and salt character with low bitterness, very refreshing and dry.

So a sharp, salty, fruity beer that smells like a sea breeze!



💿 straw to light gold

Commercial Examples Westbrook Gose Anderson alley Gose

KÖLSCH

HISTORY

Cologne has had a top fermenting brewing tradition since the middle ages. The Kölsch beer style was developed in the late 1800's to compete with the popularity of pale lagers. The name Kölsch is appellation protected and is restricted to 20 or so breweries in Cologne.



FLAVOUR PROFILE

Uses traditional German hops, German Pils or pale malt. Clean, crisp and well balanced. Subtle fruit aroma from fermentation. Intensity of aromatics is generally very subtle and they have a clean, crisp, fresh and balanced flavour.









AMERICAN LIGHT LAGER

HISTORY

appeal to diet-conscious drinkers, the beer to sports fans with the label 'tastes great, less filling'. Can use up to 40% rice or corn as

FLAVOUR PROFILE

Very light, sometimes watery body. Highly carbonated with a slight carbonic bite. Low to no malt aroma. Clean fermentation is desirable although low levels of DMS are not





Commercial Examples Coors Light

INTERNATIONAL PALE LAGER

HISTORY

bit more bitterness and flavour than German pils and other European

FLAVOUR PROFILE

High carbonation, crisp finish. Malt flavour is quite neutral. low floral - spicy hops. They tend to use less corn and rice than American Lagers







Commercial Examples Heineken Corona

AMERICAN BLONDE ALE

HISTORY

Designed as the least challenging introductory beer. Commonly America, particularly those that do

FLAVOUR PROFILE

Soft malty sweetness with some low fruity esters. Light to moderate hop flavour but not overly aggressive. Can include up to 25% wheat malt or some sugar adjuncts.





Commercial Examples Victory Brewing Summer Love Kona Brewing Big Wave Golden Ale

HISTORY

Adaption of German wheat beer styles, but has a clean yeast profile. (Portland, ORE) in the mid 1980's.

AMERICAN WHEAT BEER **FLAVOUR PROFILE**

Doughy, grainy or bready wheat flavour. Well balanced with a low hop profile, typically American, German or New World hop varieties.

Does not have the same banana and clove flavour as Weissbier!



💿 straw to gold

Commercial Examples Goose Island 312 Modern Times Fortunate Islands

AMERICAN PALE ALE

HISTORY

An adaption of English Pale Ales using local ingredients. Was the predominant beer in craft beer before the rise of IPA.

FLAVOUR PROFILE

Refreshing, hoppy ale with a slight malty backbone to provide balance. Big hop character from high levels of hopping, typically New World and American hop varieties.



light gold to light amber

Commercial Examples Sierra Nevada Pale Ale Stone Pale Ale

AMERICAN AMBERALE HISTORY **FLAVOUR PROFILE**

Modern American craft beer style developed from American Pale Ales. Typically, same hopping levels as American Pales Ales but a bigger malt flavour, character and colour.

Amber, hoppy and moderate strength beer with a caramelly malt character and a citrusy hop character from New World of American hop varieties. Medium to dark crystal malt used to give an amber colour and a caramel malty sweetness.



light amber to dark amber **Commercial Examples** New Belgium Fat Tire Amber Ale Anderson Valley Boont Amber Ale

AMERICAN LPA.

HISTORY

Anchor Liberty Ale believed to be the first of this style, first brewed in 1975 using whole cascade hops. Again based on English versions using local ingredients and also an increase in hop usage.

FLAVOUR PROFILE

Hoppy and bitter, moderately strong American ale. Balance is hop forward with a clean fermentation profile, dry finish, and some malt character to slightly balance the bitterness. Hop flavour reflects that of the characteristics of American and New World hop varieties.





Commercial Examples Stone IPA Sierra Nevada Torpedo

NEW ENGLAND IPA

HISTORY

This style is still new and evolving. Hazy IPAS are currently more popular than Regina George. Often written as NEIPA they will be more full bodied and less bitter than American IPAS

FLAVOUR PROFILE

Intense hop aromas that are "fruity" and "juicy". Smooth moutfeel and usually opaque with haze. Light Bready malt.





Pronounced



Commercial Examples Alchemist Heady Topper Hill Farmstead Susan

DOUBLE I.P.A.

HISTORY

American craft beer innovation first created in the mid-late 1990's. Continued American trend of pushing the boundaries for hop heads wanting increasingly intense products.

FLAVOUR PROFILE

Intense, hoppy and strong pale beer with a malty sweetness to balance the big hop character. Strongly hopped but clean and dry.



💿 gold to dark amber



AMERICAN BROWN ALE

HISTORY

American style from the modern craft beer era. Derived from English brown ales but with more hops. Very popular among home brewers.

FLAVOUR PROFILE

A malty but hoppy beer with flavours of caramel and chocolate. Hop flavour enhances and compliments the malt flavour rather than overpowering it. Dark malt character is quite robust but falls short of what is typical of a porter.



light brown to dark brown



Commercial Examples Brooklyn Brown Ale Anchor Brekle's Brown

AMERICAN PORTER

HISTORY

A stronger and more aggressive version of English and preprohibition porters, but not quite as strong as American stouts.

FLAVOUR PROFILE

Substantial, malty dark beer with complex and intense dark malt character. Lightly burnt malt character, medium to high hop bitterness, accentuated by the dark malt.





Commercial Examples Anchor Porter Founders Porter

AMERICAN STOUT

HISTORY

Homebrew version previously known as west coast stout. Modern craft beer homebrew style that has extremely aggressive hopping regime compared to traditional stouts.

FLAVOUR PROFILE

Highly roasted, strong, bitter stout. Same body and dark malt flavours as a traditional stout with more hop flavour, bitterness and aroma. Can sometime be slightly creamy with the addition of oats.



📀 dark brown to black

Commercial Examples Sierra Nevada Stout Rogue Shakespeare Stout

IMPERIAL STOUT

HISTORY

Traces roots to English porters brewed for export in the 1700's. Said to have been popular with the Russian Imperial Court. Had died out and is being revived in the craft beer era.

FLAVOUR PROFILE

Intensely flavoured, dark ale with a roasty burnt malt character. They have dried fruit flavours with a warmness and bittersweet finish. Ageing impacts the intensity, balance and smoothness, improving over time.



high to very high pronounced



Commercial Examples North Coast Old Rasputin Great Divide Yeti Imperial Stout

AMERICAN BARLEY WINE

HISTORY

Usually strongest beer made by a brewery and associated with the winter/holiday season. Derived from English examples using American ingredients. One of the first made was Anchor Old Foghorn in 1975.

FLAVOUR PROFILE

Like an English barley wine with an emphasis on hop bitterness. Rich, strong malt flavour and a malty sweetness. High level of hop bitterness and aroma but will be well balanced with the sweet malt profile.

ABV



high to very high pronounced

light amber to light brown



Commercial Examples Sierra Nevada Bigfoot Victory Old Horizontal

This section will count for 33% of your final mark and will cover the following:

- I) The three-tier system
- 2) Serving alcohol
- 3) Beer storage
- 4) Draft Systems
- 5) Beer Glassware
- 6) Serving Bottled Beer
- 7) Serving Draft Beer



THE THREE-TIER SYSTEM

By law, alcoholic beverages sold in the United States must move through the three-tier system.

This means that a brewer/importer can only sell to a wholesaler (i.e. distributor), who can only sell to a retailer, who can only sell to consumers. It also requires legal separation between each of these tiers. In other words, a company can't brew beer and own a bar (except where there's a state exception, such as for brewpubs).



Some people reckon it sucks, some people like it. The main reasons for its original setup were twofold:

- To make it hard for "tied houses". Massive breweries buying up massive pub chains and dominating the market (as they did in the UK).
- 2) To make tax collection easier.

As if they really needed any help there!

There are a few exceptions where breweries can sell direct to their customers:

- I) Brewery tap rooms.
- 2) Brewpubs that produce on site.

4. KEEPING AND SERVING BEER Serving Alcohol

Here we will take a look at how grog affects the body, including some usually obvious indicators that someone has had a bit too much. Then we'll look at some solid serving practices for serving alcohol. Remember that we are selling potentially dangerous stuff, so this section should be helpful to anyone in any area of the business.

What are the effects of alcohol on the body?



<u>Alcohol absorption</u> - Alcohol is absorbed in the gastrointestinal tract by simple diffusion into the blood. The small intestine is the most efficient region for absorption because of its large surface area.

10-20% of alcohol will be absorbed in the stomach, 75-80% will be absorbed in the small intestine.

Alcohol elimination

- the liver metabolizes and eliminates 95% of ingested alcohol. Remaining alcohol is eliminated in breath, urine, sweat, faeces, milk, and saliva.

Science can be really seriously gross sometimes.

For typical healthy people, alcohol is eliminated at a rate of about one average drink of alcohol per hour.



abdominal

inferior

SO, ALOCHOL IS ABSORBED INTO THE BLOOD THROUGH THE SMALL INTESTINE, AND ELIMINATED BY THE LIVER!

BAC stands for <u>Blood Alcohol Content</u>.

This next statement will 100% definitely come up on the exam so please memorise:

"AT 0.08 BAC... A PERSON IS CONSIDERED TOO INTOXICATED TO DRIVE".

Don't say we didn't warn you.

Here are some basic responsible serving practices:

- Tell customers what the ABV of the beer is Give your customers the information they need to make smart decisions about the beers you offer. IPAs like Jack Hammer hit 7.2% ABV and go up from there. You'll be surprised as to how many customers will order it without even looking at the ABV.
- 2) Offer high ABV beers in smaller serving sizes two things are achieved here: one is the focus on responsible serving of alcohol, the other is helping people understand that stronger beers have stronger flavours, and that there is definitely too much of a good thing. That said – in BrewDog we use our common sense. If someone really wants a larger serving of strong beer and you are sure that they will be OK, it's fine to serve it. Just use your common sense!

FIVE MINUTE FLEX

I) In the three tier system, which is the only part that importers can sell to?

2) At what BAC level is someone considered not fit to drive?

3) Where is alcohol absorbed?

4) Where is alcohol eliminated?

5) What are two ways to demonstrate responsible retail of alcohol?

BEER STORAGE

Beer is best consumed fresh! This statement may seem a little odd at first but is definitely what Cicerone want to hear. And to be fair they are pretty much bang on. Beer should be consumed as close to it leaving the brewery as humanly possible (without breaking drink driving laws). This is because the brewers know best, and would not release a beer unless it was ready to go.



That said, some strong or intensely flavoured beers may age nicely if cellared properly (out of direct sunlight and sources of heat).

What can a wholesaler or retailer do to ensure a beer's freshness is preserved?

- I) Rotate inventory.
- 2) Sell the older beer first.
- 3) Remove any out of date product from the service inventory.

How long does fresh beer last before tasting crap?



- -Kegs of non-pasteurized beer 45-60 days.
- -Kegs of pasteurized beer 90-120 days.
- -Bottles in a fridge up to 6 months.

-Bottles that are not refrigerated may taste off after just 3 months.

How do you know if bottled beer has gone gross?

First step is to taste the older beer against the new one! If it tastes gross - remove it.

Secondly, train staff appropriately to sell through stock evenly. That way you'll not have any stragglers.

How to store beer correctly

Keep your beer like you keep your milk – refrigerated. Storing beer warm quickens aging and the creation of off-flavours such as:

Oxidation - Over time, all beer will develop oxidation off-flavours that taste papery or like wet cardboard.

Infection – Sometimes, horrid bugs can ruin the beer from within (like a dirty yeasty Trojan Horse). These can come across as a buttery, vinegary sourness, smoky or plastic, or sometimes even a bit meaty. No thanks.

Lightstruck (or skunked) - Skunking is caused by exposing the beer to light including sunlight, incandescent, or fluorescent light. Skunked beer is typically referred to as "light-struck."



Cans, kegs, ceramic bottles, and other vessels that shield the beer from light are the best protection from skunking (100% protection).

Brown glass bottles block around 98% of light attempting to ravage our hops.

Green glass bottles only block out around 20% leading to hopdevastation.

Clear glass bottles are crap, achieving 0% light block-out. Lame.

SERVING DRAFT BEER

Draft beer must be served using CO2 or CO2 Nitrogen mix and at the correct pressure to maintain carbonation. Temperature-wise, the beer should be 38°F.

Compressed air should never be used to serve beer from a draft system. Contact with oxygen causes beer to immediately begin to oxidize (papery).

Party pumps, (the hand pumps that you see those gents from US university frat parties using) limit the flavour stability of the beer to less than one day because the beer comes into contact with air which oxidizes it. Not cool but it figures that frat party beers are unlikely to last very long.



FIVE MINUTE FLEX

I) True or false: beer is best served fresh?

2) How long can non-pasturised beer last in the keg?

3) How long can pasteurised beer last in the keg?

4) How long can bottled beer last if kept in the fridge?

5) What temperature should draft beer be served at?

DRAFT SYSTEMS

You are likely to get a few questions on draft systems. In particular US keg sizes seems to come up almost every time.

<u>Kegs</u>

HALF barrel = 15.5 US gallons

SIXTH barrel = 5 US gallons

There are many different types of keg, but most use a "Sankey" coupler and fitting to connect to the draft system.





<u>Couplers</u>

These little dudes are what we connect to kegs to allow gas to flow in, and beer to flow out.

When a keg is tapped, gas fills the space inside and pushes down on the beer. The only way for the beer to escape is through the tube in the middle, and through the coupler to the faucet.

FOB detectors

When an FOB is installed on a long draw beer line and the keg empties, the beer flow is stopped immediately. The beer line remains full of beer, instead of filling with foam. This helps us when switching between kegs – if we didn't have FOB detectors the beer would come out super-foamy at the faucet end.



Faucets

This is the fancy American word for "tap". It's the device in the beer tower that beer is poured into a glass from.



Draft System Operation

Temperature is a key factor. The draft system should operate at around 38°F (3.3°C).

Kegs must be allowed to cool down to this temperature for 24 hours before serving.

Gas pressures should only ever be adjusted by trained professionals as they can ruin the carbonation of the beer if set wrong. Perhaps more importantly, there are many safety risks involved and you don't want to end up in little pieces in the cellar!



Draft System Troubleshooting

Remember, temperature control is the most common source of draft system problems (and one of many problems that cause foamy beer).

Here are some cool tips for troubleshooting a system that is not behaving:

- Beer should be placed in the cooler 24 hours prior to service: If beer is overly foamy when it comes out of the faucet, the most likely cause is that it's too warm. Make sure that the keg is chilled to 38°F by putting it in the fridge at least 24 hours before it is served.
- 2) Coupler must be properly engaged: If the coupler isn't properly connected to the keg, there may be no CO2 flowing in to keep it pressurized and/or there may be no beer flowing out of the keg.
- 3) Check for kinks or pinches in the hose connected to the coupler: If the beer line or gas line going from the wall to the coupler is kinked or pinched then there may be no beer flow or foamy beer at the faucet.
- 4) FOB must be set for service (if the system has foam on beer detectors): Every time a keg is changed, the FOB (if there is one) has to be reset. If the person who changed the keg hasn't reset them, there will be no beer at the faucet.
- 5) If you check for those basic issues and beer is still pouring improperly (or not at all), contact a draft system professional for help. Draft systems work at dangerously high-pressure levels and use gases that can be deadly if leaking in enclosed spaces, so leave it to the pros to fix it!

Draft System Maintenance

There are three things to remember here:

- I) If a draft system is not kept clean, we get nasty off-flavours and foaming beer. FOB stands for "Foam On Beer" and we hate it.
- 2) Cleaning draft systems must be done every 14 days. This is to reduce the risk of horrid bacterial growth, unpleasant off-flavours and this weird shit called "beer stone". Basically beer has calcium deposits that build up in beer lines over time and mess up the beer's carbonation
- 3) Beer line cleaning chemicals are extremely hazardous and poisonous, and as such great care must be taken when cleaning lines. Worst case scenario: someone tries to serve a customer a beer and it's actually line cleaner. Dark results.



You'll probably also get a question on changing kegs so here is the low-down:

- I) Allow kegs 24 hours in the cooler to chill to the draft system's operating temperature.
- 2) Grip the keg coupler handle, pull it out and raise it to the up or off position to disengage it.
- 3) Turn the coupler a quarter turn counter clockwise.
- 4) Remove the coupler from the keg.
- 5) Seat the coupler on the new keg, turn the coupler clockwise a quarter turn, and then lower the coupler handle to the down or on position.
- 6) If your draft system is a long draw system that uses FOBs, then you will need to reset the FOB after changing the keg by venting the FOB to release foam and gas and allow it to fill with beer from the new keg.



FIVE MINUTE FLEX

I) How many gallons make up a US half barrel?

2) How many gallons make up a US sixth barrel?

3) True or false, beer must be kept in the cooler for 24 hours prior to service?

4) Why must beer lines be cleaned every I4 days?

5) What does FOB stand for?

<u>GLASSWARE</u>

We drink beer.

We drink it out of glasses, cans, squirrels and bottles.

In this section we are going to look at size, shape, cleaning and pouring.

Size

Size of the glass is the first thing to consider! Choose glassware based on the beer style and its alcohol content stronger beer = smaller glass. Size should also be considered to allow for enough head.

<u>Shape</u>

The shape of a beer glass is often defined by tradition for that style, and to enhance certain flavours or aromas in the beer. Different countries and even individual beer styles have their own glassware. The most familiar may be the curvy Belgian "tulip" or the large dimpled "seidel" mug for German session beers.



Let's look at some traditional beer glasses.







English Tulip Pint - Recommended for Irish stouts like the G-word.



Nonic Imperial Pint - The common British pint glass with the bubbled out section under the rim.





Stemmed Tulip - The glass commonly associated with Belgian beer. This question comes up right at the end of the exam.

STEMMED GLASS = BELGIAN STYLE.



Tapered Pilsner Glass - The tall "V" shaped glass perfect for pilsners.



Weissbier Vase - The tall and curvy glass commonly used for hefeweizen and other wheat beers. This question also comes up at the end of the exam. "WHICH BEER STYLE HAS A TYPE OF GLASSWARE USUALLY ASSOCIATED WITH IT"?

It's Weissbier. 100%.

CLEANING GLASSWARE

Beer must always be served in "beer clean glassware". This cunningly worded phrase refers to glass that is deemed clean enough to serve amazing beer into. But how the fudge do we know if glassware is clean or not? And how the hell do we get it to that point in the first place?

The Cicerone Syllabus disscusses a variety of glass cleaning methods

THREE-SINK METHOD

I) Empty glass into the open drain.

- 2) Wash with sudless detergent soap in the first sink.
- 3) Rinse in cold water in the second sink.
- 4) Rinse in sanitizer in the third sink.
- 5) Dry the glassware upside down on a rack so that air can circulate inside it.

6) Rinse the glassware with cold water right before pouring beer into it. This rinses any remaining sanitizer or dust out of the glass and allows for better head formation and retention. It also serves to cool and wet the inside of the glass, which could still be warm.



TWO-SINK METHOD

Same as the above but without the sanitiser.

GLASS WASHING MACHINE

- I) Empty glass into the open drain.
- 2) Place glass upside down in glasswasher rack
- 3) Run the cycle according to the instruction manual
- 4) Dry the glassware upside down on a rack so that air can circulate inside it.

You probably already knew that didn't you? In UK we do predominantly use glasswashers. It's pretty easy right?
YES... but it's also easy to fuck it up catastrophically, glasswashers have one golden rule;

BEER GLASSWARE ONLY.

No coffee cups, no milky products, anything with fat will leave residues on glassware killing the head on our beer. Flat pints with no head are worse than



<u>SPÜLBOY</u>

The Spülboy is a European invention, it's portable, doesnt require electricity and can attach to most standard sinks

- I) Set up with appropriate detergent
- 2) Empty glass into open drain
- 3) Clean glass in brush bucket
- 4) Rinse glass using Spülboy glass rinser

5) Dry the glassware upside down on a rack so that air can circulate inside it.



There are several cool ways that you can check if a glass is "Beer Clean". We use most of them regularly at our bars!

Without beer in the glass:

To perform the Sheeting Test, dip the glass in water and lift back out. If the water is evenly coated inside then the glass is beer clean. If the water forms droplets on the inside then the glass, it is not beer clean. Perfect sheeting = beer clean. Spots = not beer clean.



To perform the Salt Test, first wet the glass, then sprinkle salt throughout the inside of it. Places where salt does NOT adhere are NOT beer clean. Salt will not adhere to greasy film. If salt adheres evenly everywhere then the glass is beer clean; if there is uneven cover, the glass is poorly cleaned. An even layer of salt adhered to the inside of glass = beer clean.

With beer in the glass:

<u>Bubbles</u> - any area where tiny bubbles form is a dirty surface to which liquid cannot adhere. The glass is not beer clean.

<u>Head size, shape, and retention</u> - a beer clean glass will allow for a proper head to form and be retained. Greasy film in the glass will rapidly collapse the head.

<u>Lacing as beer is consumed</u> - If the glass is beer clean rings of foam will form on the glass after sips. If the lacing pattern is random or there is no lacing, the glass isn't beer clean.



FIVE MINUTE FLEX

I) Put these elements of cleaning glassware in the three-sink system into the correct order:

Dry inverted on a rack to allow air to circulate

Empty glass into drain

Wash with sudsless soap

Rinse with sanitiser - heel-in, heel-out

Rinse in cold water sink

2) Name two ways of testing for beer clean glassware if there is beer in the glass:

3) Name two ways of testing for beer clean glassware if there is no beer in the glass:

4) Which type of glass is usually associated with Belgian Beer?

5) Briefly describe "lacing":

POURING FROM A DRAFT TAP

Just before we learn how to pour beer in the most awesome way possible, just a small point as per the syllabus – beer should be served in room temperature or very lightly chilled glassware. If it's too cold it can ruin the flavour or cause the beer to freeze a little. Also as we mentioned above, it's good to rinse the glass right before serving to create even head retention, ambient temperature and cleanliness of aroma. In our bars we always do this using "glass refreshers". Some of the more amusing names the staff have given them are: "zappers", "jackpots", "whizzy water things", and "don't go chasing waterfalls".

Here's how to properly pour from a glass:

- I) Hold the glass at a 45-degree angle one inch below the faucet.
- 2) Grab the tap handle near the base and fully open the tap.
- 3) Pour down the side of the glass until it is half full.
- 4) Once the glass is half full, tilt it upright and pour down the middle to create the I-inch collar of foam (or 2-4 inches for a Belgian or weizen).
- 5) Close the faucet as the foam reaches the top of the glass.
- 6) Don't let the faucet touch the glass, or allow it to be submerged in the beer...it can cause your glassware to break and transfers microorganisms feeding on dried beer on the faucet into the customer's glass.

Pouring from a bottle

Inspecting a bottle:

Bottles should be stored at the ideal serving temperature for the style. It's best to store the bottles in a refrigerator (43°F or less) or cool cellar. Examine the bottle first! White flakes in

it means it's probably a very old and unstable beer. Do not serve it to a customer. A "ring of gunk" (technical term) at the liquid level in the neck of the bottle usually means the bottle has been infected by foreign microbes. Do not serve. Unless you are into that sort of thing.

If there is yeast on the bottom of the bottle just leave it in when you pour, unless the customer requests the yeast be poured, or that style of beer is traditionally poured with the yeast, such as for a hefeweizen. Ausgezeichnet!



Opening a bottle. Yes, believe it or not there is a clear set of instructions for this! As you read you will probably realise that there is more than meets the eye - and a lot that can go wrong...

For twist-off bottle caps...twist the cap off by hand or use a napkin or clean towel to protect your hand and get a better grip.

For lift caps use a bottle opener that's at least 1/4 inch wide to prevent the possibility of breaking the glass during opening. Lift the cap off in one motion. You've probably done this before.

For cap with cork this is the same as above, except that you'll need a corkscrew for the cork after removing the lift cap.

For a mushroom cork just remove the wire cage, then remove the cork by hand. You can use a napkin or towel to aid your grip, plus it will keep the cork from flying off. For safety, point the cork away from people like you would with a fancy bottle of champagne. Cool thing here: If the beer you're serving is rare, unusual, or new, you should always present the cork and/or bottle cap to the customer with their beer. Same with particularly rad bottle-caps.

Check the bottle's lip to ensure it hasn't been damaged during opening, creating the possibility that there's broken glass being poured into the customer's glass. Never serve beer poured from a bottle with a broken lip.

Also examine the bottle's lip for brown rust, dried beer gunk, or crusty yeast that indicates a negative effect to the beer's flavour or appearance.

FIVE MINUTE FLEX

I) What angle should glassware be held at when pouring beer?

2) What's a cool thing to do for a customer if you have opened a bottle with a fancy cork or cap?

3) What should you do if you find a ring of gunk around the liquid level of a bottle of beer?

4) Roughly how many inches of head should be poured with a Weizen?

5) True or false – you should always pour residual yeast in a bottle into the customers glass

A final look at what you will be tested on

Keeping & Serving Beer: 20 questions - 33%

Proper serving and pouring technique for bottles and draft.

The steps for cleaning glassware in a 3 part sink.

Reasons beer may pour overly foamy at the faucet.

What glassware is appropriate for certain beers, including stemmed glasses, snifters, and imperial pint glasses.

The inappropriate use of compressed air in draft systems.

How keg couplers work and what they do.

What a bar should do with out-of-date beer.

What glass refreshers at bars are used for.

The reasons for, and frequency of, cleaning draft lines.

How to test glassware to check if it is "beer clean."

Why it is inappropriate to dunk the faucet in beer when pouring from a tap.

That a BAC level of 0.08 is the level at which a person is considered too intoxicated to drive.

That kegs should be cooled for 24 hours prior to service.

That ABV is the common measure for alcohol content.

What a FOB detector draft system device is and how it works.

Tips for further revision.

Head to your nearest BrewDog Bar. Speak to the nearest BrewDog Bartender. Ask them for a quick run-down of the above. The best way to learn is to do!

If you really wanna go bat-shit crazy on this draft system: stuff read the "Brewers Association Draught Quality Manual". Be warned, it goes deep.

Pre-Test - 5 questions, untimed

- I. The four levels of the Cicerone Certification Program are:
 - a. Beer Server Cicerone; Certified Cicerone; Cicerone Advanced; Master Cicerone
 - b. Certified Beer Server; Certified Cicerone; Advanced Cicerone; Master Cicerone
 - c. Certified Beer Server; Certified Cicerone; Universal Cicerone; National Cicerone
 - d. Certified Beer Cicerone; Certified Cicerone; Advantage Cicerone; Master Cicerone
- 2. If you pass the first level of the Cicerone Certification Program you may refer to yourself as a:
 - a. Cicerone
 - b. Certified Cicerone
 - c. Certified Beer Server
 - d. Master Cicerone
- 3. A person who passes the second level of the Cicerone Certification Program may refer to themselves as:
 - a. Cicerone or Certified Cicerone
 - b. Certified Master
 - c. Master Cicerone
 - d. Ultimate Cicerone
- 4. A person who passes the fourth level of the Cicerone Certification Program may refer to themselves as:
 - a. Cicerone or Certified Cicerone
 - b. Certified Master
 - c. Master Cicerone
 - d. Mega Cicerone
- 5. Are you likely to be tested on "writing beer reviews"?
 - a. Hell yeah
 - b. Nah

Certified Beer Server Exam - 60 questions, 30 minutes

- I. In the three-tier system for alcohol sales, an Importer can sell to:
 - a. Retailers
 - b. Wholesalers
 - c. Breweries
 - d. Consumers
- 2. Which of these beers has the highest perceived bitterness:
 - a. Kölsch
 - b. Helles Bock
 - c. Doppelbock
 - d. German Pilsner
- 3. A common exception to the three--tier system for alcohol sales is:
 - a. A bar that runs out of a certain beer can buy it at a grocery store and sell it to consumers.
 - b. A bottle shop can go to a special bottle release at a brewery, purchase bottles, and sell them to consumers.
 - c. A brewery can operate a taproom where they sell to consumers.
 - d. Saying "It's cool just keep that shit on the down-low".
- 4. If beer is pouring foamy at the tap, which of these could not be the cause:
 - a. A kink in the beer line.
 - b. The beer is too cold.
 - c. The keg is not under enough pressure.
 - d. The beer lines are too clean.
- 5. Which is not an aspect of mouthfeel:
 - a. Thinness
 - b. Body
 - c. Bitterness
 - d. Carbonation

- 6. Which beer style typically has the highest ABV:
 - a. Hellesbock
 - b. Doppelbock
 - c. Munich Dunkel
 - d. American IPA
- 7. Which of these beer styles is straw-gold in color:
 - a. Marzen
 - b. Munich Dunkel
 - c. Tripel
 - d. Berliner Weisse
- 8. When a beer is light struck, it will have an off--flavor described as:
 - a. Buttery
 - b. Skunky
 - c. Papery
 - d. Vinegary
- 9. A general description of the flavor contribution of common American hops is:
 - a. Floral & perfumey
 - b. Earthy & woody
 - c. Tropical fruit--like
 - d. Citrusy & piney
- 10. Which beer style has a yeast profile typically described as peppery:
 - a. Saison
 - b. American Brown Ale
 - c. Hefeweizen
 - d. Gueuze
- II. It's primarily better to drink beer from a glass rather than a bottle or can because:
 - a. The presentation is nicer for the consumer
 - b. The beer is less likely to skunk
 - c. The consumer will experience more of the aroma
 - d. It's less likely to spill

- 12. Which is not a primary flavor:
 - a. Bitter
 - b. Roast
 - c. Sour
 - d. Sweet
- 13. Which off-flavour are you most likely to encounter if a draft system has not been properly cleaned:
 - a. Buttery
 - b. Skunky
 - c. Papery
 - d. Astringent
- 14. How often must a draft system be cleaned:
 - a. Once a week
 - b. Every two weeks
 - c. Once a month
 - d. Every three months
- 15. What's an affect of serving beer too cold:
 - a. The consumer will experience less aroma and flavor
 - b. It will be overly foamy at the tap
 - c. The retailer is wasting money on their electrical bill
 - d. It will taste sweeter
- 16. What should a retailer do when they discover they have beer in inventory that is beyond its best by date:
 - a. Put it on sale to move it quickly
 - b. Rotate the inventory so there is fresher beer for sale
 - c. Remove it from the inventory
 - d. Blend it with fresh beer and put it on draft
- 17. Why shouldn't you dunk the faucet in the glass of beer when pouring draft beer:
 - a. You won't get enough head on the beer
 - b. You may accidently pour some beer over the side of the glass and create waste
 - c. It's lazy and looks bad to the customer
 - d. There will be cross contamination, it creates a breeding ground for bacteria

- 18. What is one way to check if a glass is beer clean when it is full of beer:
 - a. Check for buttery and vinegary off-flavours in the beer
 - b. Check to see if salt will stick evenly to the inside of the glass
 - c. Check to see if water will sheet evenly off the inside of the glass
 - d. Check for the formation of tiny bubbles along the inside of the glass
- 19. At what BAC level is a person too incapacitated to drive (anywhere in the US and in most other countries):
 - a. 0.80 BAC
 - b. 0.08 BAC
 - c. 0.008 BAC
 - d. 8.0 BAC
- 20. At least how long should a keg be put in the cooler before it is served from:
 - a. 4 hours
 - b. 10 hours
 - c. 24 hours
 - d. 48 hours
- 21. One of the most common causes of beer that is overly foamy at the tap is:
 - a. The beer is too warm
 - b. Bartenders dunking the tap in the beer
 - c. The beer is too cold
 - d. Bartenders pulling the tap all the way open
- 22. Which statement is the most accurate:
 - a. American ale yeast strains are typically quite "clean," British ale yeast strains commonly create more fruity character, while many Belgian ale yeast strains are extremely characterful and create fruity and spicy characteristics
 - b. British ale yeast strains are typically quite "clean," German ale yeast strains commonly create more fruity character, while many American ale yeast strains are extremely characterful and create fruity and spicy characteristics
 - c. Belgian ale yeast strains are typically quite "clean," American ale yeast strains commonly create more fruity character, while many British ale yeast strains are extremely characterful and create fruity and spicy characteristics
 - d. German ale yeast strains are typically quite "clean," British ale yeast strains commonly create more fruity character, while many American ale yeast strains are extremely characterful and create fruity and spicy characteristics

23. Which glass is most appropriate for a Barleywine:

- a. Stemmed tulip
- b. Shaker pint
- c. Snifter
- d. Nonic imperial pint

24. Which glass is most appropriate for a British Mild:

- a. Stemmed tulip
- b. Shaker pint
- c. Snifter
- d. Nonic imperial pint

25. Which glass is most appropriate for an American IPA:

- a. Stemmed tulip
- b. Shaker pint
- c. Snifter
- d. Nonic imperial pint

26. Which glass is most appropriate for a Belgian Tripel:

- a. Stemmed tulip
- b. Shaker pint
- c. Snifter
- d. Nonic imperial pint

27. Hops grow on:

- a. Catkins
- b. Vines
- c. Bushes
- d. Bines

28. The primary purposes for cleaning draft lines is to:

- a. Rid them of foreign microbes and beer stone
- b. Rid them of the flavor of the previous beer that was on draft and beer stone
- c. Rid them of skunky and papery off-flavours
- d. Rid them of foreign microbes and the flavor of the previous beer that was on draft

29. In the three--tier system for alcohol sales, a Wholesaler can sell beer to:

- a. Consumers
- b. Retailers
- c. Breweries
- d. Importers

30. Keg couplers:

- a. Must be vented each time you change the keg on that beer line
- b. Must to be cleaned every three months
- c. Let gas into the keg and beer out of the keg
- d. Attach to the faucet
- **31.** Which of these beers is a showcase for flavors that come from malt:
 - a. British Bitter
 - b. Wee Heavy
 - c. Saison
 - d. American IPA
- 32. Which is a style associated with Trappist breweries:
 - a. Saison
 - b. Doppelbock
 - c. Dubbel
 - d. Flanders Red
- 33. This dark UK ale has low to moderate perceived bitterness, is dark brown to black in color, and has a lower to normal ABV:
 - a. British Mild
 - b. Sweet Stout
 - c. Irish Stout
 - d. Brittish Brown Ale
- 34. This Belgian style is typically made with coriander and orange peel:
 - a. Saison
 - b. Dubbel
 - c. Belgian Blond
 - d. Witbier

- 35. This American ale has highly assertive perceived bitterness, is dark gold to dark amber in color, and has a high ABV:
 - a. American Barleywine
 - b. Double IPA
 - c. Imperial Stout
 - d. American Brown Ale
- 36. What are some malt flavors typically associated with pale beers:
 - a. Uncooked flour, bread dough
 - b. White bread, wheat bread, water cracker
 - c. Toast, caramel, piecrust
 - d. Nutty, toffee, chocolate, dark/dried fruit
- 37. This American ale has a pronounced perceived bitterness, is light amber to light brown in color, and has a high to very high ABV:
 - a. American Barleywine
 - b. Double IPA
 - c. Imperial Stout
 - d. American Brown Ale
- 38. Which of these is a yeast derivied flavour
 - a. Caramel
 - b. Grapefruit
 - c. Pear
 - d. Coffee
- 39. Which style is associated with the Rhine Valley of Germany:
 - a. Kölsch
 - b. Marzen
 - c. Helles Bock
 - d. Hefeweizen

40. Which style is typically the least tart, sour, or acidic:

- a. Gueuze
- b. Kriek
- c. Flanders Red
- d. Dubbel
- 41. What flavors and aromas would most likely come from hops:
 - a. Roasty, chocolaty
 - b. Floral, earthy
 - c. Bread dough, bread crust
 - d. Banana, clove
- 42. What flavors and aromas would most likely come from malt:
 - a. Nutty, toast
 - b. Citrusy, resinous
 - c. Peppery, tart
 - d. Banana, clove
- 43. What flavors and aromas would most likely come from yeast:
 - a. Roasty, chocolaty
 - b. Citrusy, piney
 - c. Peppery, banana
 - d. Bread dough, bread crust
- 44. Which is most true about the primary differences between lager and ale yeast:
 - a. Lager yeast prefers to ferment at a lower temperature than ale yeast and results in a less characterful yeast profile in the final beer, allowing the malt or hops to play the central role.
 - b. Ale yeast prefers to ferment at a lower temperature than lager yeast and results in a less characterful yeast profile in the final beer that allows the malt or hops to play the central role.
 - c. Lager yeast prefers to ferment at a higher temperature than ale yeast and results in a more characterful yeast profile in the final beer that often plays the central role.
 - d. Lager yeast prefers to ferment at a lower temperature than ale yeast and often results in a spicy yeast profile in the final beer that balances perfectly with malt character.

- 45. A bartender would use a glass rinser before pouring a draft beer into a glass in order to:
 - a. Clean remnants of old beer from the glass
 - b. Cool the glass and rinse out any remaining sanitizer and dust
 - c. Rinse off any lipstick or other oily residue on the glass
 - d. To impress the consumer
- 46. Which beer is not an example of an American style that originated in Europe:
 - a. American IPA
 - b. American Pale Ale
 - c. Robust Porter
 - d. Double IPA
- 47. Frozen frosted glassware:
 - a. Is acceptable, especially for pale lagers
 - b. Is not recommended, can cause foaming and makes beer too cold
 - c. Is recommended if the draft system temperature is too warm
 - d. Is not recommended, causes glassware to break more easily
- 48. To change a common keg you must:
 - a. Grip the keg coupler handle, pull out and raise to the "up" or "off" position to disengage. Turn the coupler a quarter turn (90 degrees) counterclockwise to unseat it. Lift it off of the keg and seat it on the new keg and do the same in reverse.
 - b. Unscrew the keg coupler counterclockwise to disengage. Lift it off of the keg and seat it on the new keg and do the same in reverse.
 - c. Grip the keg coupler handle and turn it a quarter turn (90 degrees) counterclockwise to unseat it. Lift it off of the keg and seat it on the new keg and do the same in reverse.
 - d. Wait for the bar back to get to it.
- 49. If a draft system has foam-on-beer (FOB) detectors:
 - a. They will fill the draft line with beer when the keg runs out
 - b. They need to be reset after a keg change, usually by venting to release foam and gas from the chamber
 - c. They give beer it's head
 - d. It is most likely a direct draw draft system.

50. The most popular beer style in the world:

- a. German Pilsner
- b. Czech Premium Pale Lager
- c. American Light Lager
- d. IPA
- 51. A brown to black roasty beer inspired by the english version but hoppier. It has pronounced perceived bitterness and a normal to elevated ABV.
 - a. American Porter
 - b. Irish Stout
 - c. Sweet Stout
 - d. Dark Mild
- 52. This gold colored beer has a low perceived bitterness and an elevated ABV of 6-7.5%. It typically features a subtle spicy phenol character.
 - a. American Blond
 - b. Belgian Golden Strong Ale
 - c. American IPA
 - d. Belgian Blond
- 53. What are some malt flavors typically associated with amber beers:
 - a. White bread, wheat bread, water cracker
 - b. Toast, caramel, piecrust
 - c. Nutty, toffee, chocolate, dark/dried fruit
 - d. Roast, burnt, coffee
- 54. What are some hop aromas and flavors typically associated with German and Czech hops:
 - a. Earthy, woodsy
 - b. Piney, citrus
 - c. Resiny, herbal
 - d. Floral, perfumey
- 55. Water typically makes up about this much of beer:
 - a. 60%
 - b. 70%
 - c. 80%
 - d. 90%

56. This beer is often called "Liquid Bread"

- a. Helles Bock
- b. Doppelbock
- c. Oktoberfest
- d. Marzen
- 57. This beer is similar to a Tripel, but it is cleaner, lighter, and drier. Duvel is the classic example. Its perceived bitterness is moderate. Color is gold. ABV is high to very high.
 - a. Belgian Blonde
 - b. Belgian Golden Strong
 - c. Belgian Pale
 - d. Saison
- 58. Typical draft system operating temperature is:
 - **a. 38** °F
 - **b. 36** °F
 - **c. 34** °F
 - **d. 32** °F
- 59. For a proper pour, a beer should have
 - a. Approximately a half an inch of foam head. Weizens and Belgian ales can have 1.5 inches of head.
 - b. Approximately 3 inch of foam head. Weizens and Belgian ales can have 4--6 inches of head.
 - c. Approximately I inch of foam head. Weizens and Belgian ales can have 2--4 inches of head.
 - d. Very little head. Weizens and Belgian ales can have I inch of head.
- 60. What is the first thing you should do after clearing a used glass off the bar:
 - a. Wash the glass with petroleum based soap and brush
 - b. Refill with more beer for the customer
 - c. Empty glass into open drain
 - d. Rinse the glass in cold water

CBS PRACTICE TEST

Answer key

Pre-test

- 1. B
- 2. C
- 3. A
- 4. C
- 5. B

CBS Exam	21. A	42. A
1. B	22. A	43. C
2. D	23. C	44.A
3. C	24. D	45. B
4. D	25. B	46. D
5. C	26. A	47. B
6. B	27. D	48. A
7. C	28. A	49. B
8. B	29. B	50. C
9. D	30. C	51. A
10. A	31. B	52. D
II. C	32. C	53. B
12. B	33. B	54. D
13. A	34. D	55. D
14. B	35. B	56. B
15. A	36. A	57. B
16. C	37. A	58. A
17. D	38. C	59. C
18. D	39. A	60. C
19. B	40 . D	
20. C	41. B	