ALCOHOLIC & NON-ALCOHOLIC BEVERAGE PROCESSING -Level-II

Based on October 2019, Version 2

Occupational standards

Module Title: - Preparing and Make Additives and Finings

LG Code: ND ANB2 LO (1-4) LG (43-46)

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LG #43	LO #1- Prepare Additives and finings

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Confirming availability of additives and fining materials
- Measuring additives and fining materials
- Checking additives and fining materials handling, mixing and blending equipment
- Confirming availability of Services
- Setting the process

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Confirm availability of additives and fining materials
- Measure additives and fining materials
- Check additives and fining materials handling, mixing and blending equipment
- Confirming availability of Services
- Set the process

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.

5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Confirming availability of additives and fining materials

1.1 . Food additive

Food additives are intentionally added to food and must be safe for a lifetime of consumption based on current toxicological evaluation. The definition of food additive does not include contaminants. Thus pesticide residues, metallic contamination, Mycotoxins etc are excluded. Food additives are used for the purpose of maintaining or improving the keeping quality, texture, consistency, appearance and other technological requirements.

Food additives do not include use of vitamins, minerals, herbs, yeast, hops, starter cultures, malt extract etc. Food additives are classified on the basis of their functional use and are grouped as:

1. Colors - adds or restores colour to foods
2. Preservatives - preservative anti-microbial preservative, anti-mycotic agent, bacteriophage control agent, chemosterilant, disinfection agent
3. Stabilizers binder - firming agent, water binding agent,
4. Foam stabilizer- maintains the homogeneous dispersion of two or more immiscible substances in a food
5. Acidity Regulators - alters or controls the acidity or alkalinity of a food

   acid, alkali, base, buffer, buffering agent, pH adjusting agent

6. Antioxidants - retards or prevents the oxidative deterioration of a food

   Antioxidant, antioxidant synergist

   Anticaking agents

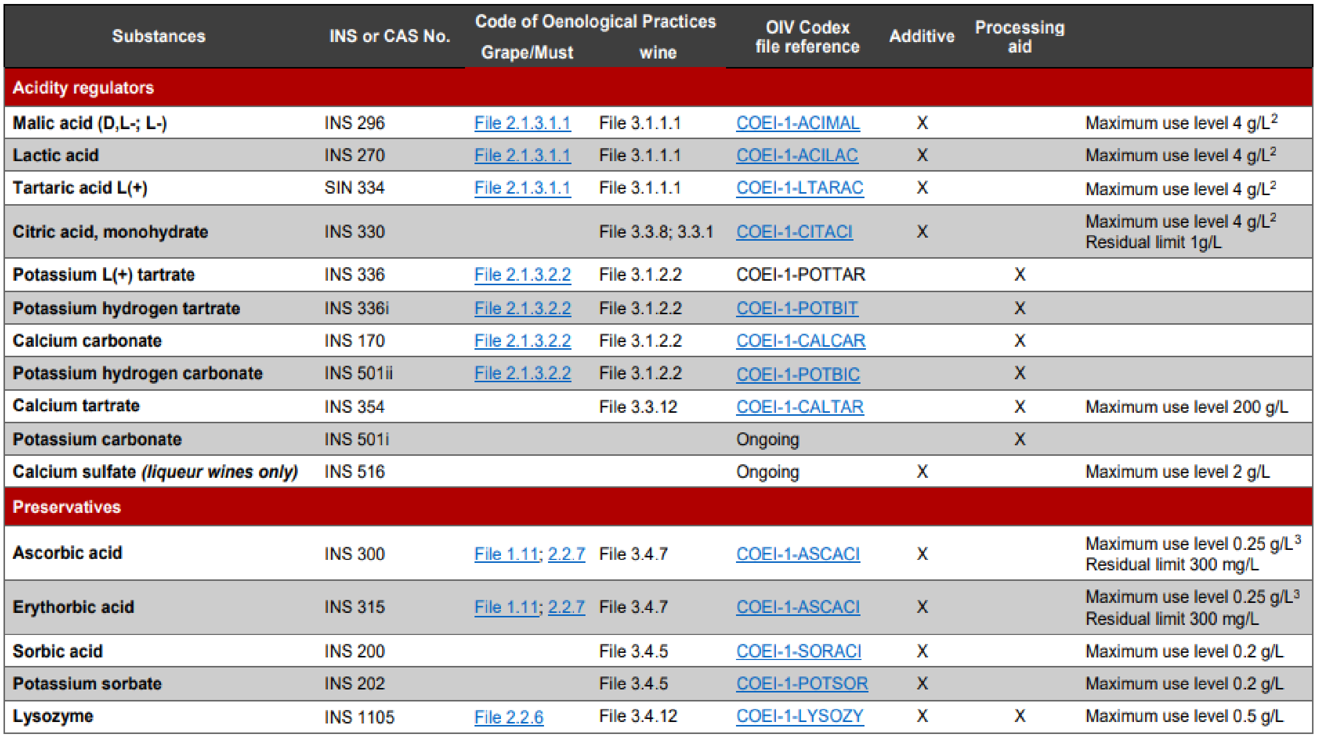
7. An anti-caking agent - is an additive placed in powdered or granulated materials, such as table salt, to prevent the formation of lumps and for easing packaging, transport, and consumption. Anticaking agents function either by adsorbing excess moisture, or by coating particles and making them water repellent

Figure.1 Eggs

8. **Artificial sweeteners** - the main ingredient is saccharin. Saccharin will artificially sweeten your wine, but it will not permanently mix with the wine. If given enough time, such as when aging, the saccharin will drop to the bottom. When commercial products, such as Tab used saccharin as a sweetener, they also added a binder to keep it suspended. Us home winemakers do not have this luxury available to us.
9. Sulphide dioxide (SO2) is used for its antiseptic and antioxidant properties in the treatment of must (dosage usually 100–200 ppm). For red wines, small quantities are added to fully eliminate spoilage bacteria and unwanted yeast. In white wine, the functions of SO2 are similar and in addition, SO2 prevents the development of a brownish colouring.

1.2 processing aid mean any substance which is not consumed as a food by itself, but is intentionally used in the processing of raw materials, foods or their ingredients, to fulfill a certain technological purpose during treatment or processing; and may result in the unintentional but technically unavoidable presence in the final product of residues of the substance or its derivatives provided they do not present any health risk and do not have any technological effect on the final product.

Table 1. Shows type name of additives, process aids, preservatives, specification and mount g/L[2]



Substances	INS or CAS No.	Code of Oenological Practices Grape/Must	wine	OIV Codex file reference	Additive	Processing aid	
Acidity regulators							
Malic acid (D,L-; L-)	INS 296	File 2.1.3.1.1	File 3.1.1.1	COEI-1-ACIMAL	X		Maximum use level 4 g/L^2
Lactic acid	INS 270	File 2.1.3.1.1	File 3.1.1.1	COEI-1-ACILAC	X		Maximum use level 4 g/L^2
Tartaric acid L(+)	SIN 334	File 2.1.3.1.1	File 3.1.1.1	COEI-1-LTARAC	X		Maximum use level 4 g/L^2
Citric acid, monohydrate	INS 330		File 3.3.8; 3.3.1	COEI-1-CITACI	X		Maximum use level 4 g/L^2 Residual limit 1g/L
Potassium L(+) tartrate	INS 336	File 2.1.3.2.2	File 3.1.2.2	COEI-1-POTTAR		X	
Potassium hydrogen tartrate	INS 336i	File 2.1.3.2.2	File 3.1.2.2	COEI-1-POTBIT		X	
Calcium carbonate	INS 170	File 2.1.3.2.2	File 3.1.2.2	COEI-1-CALCAR		X	
Potassium hydrogen carbonate	INS 501ii	File 2.1.3.2.2	File 3.1.2.2	COEI-1-POTBIC		X	
Calcium tartrate	INS 354		File 3.3.12	COEI-1-CALTAR		X	Maximum use level 200 g/L
Potassium carbonate	INS 501i			Ongoing		X	
Calcium sulfate *(liqueur wines only)*	INS 516			Ongoing	X		Maximum use level 2 g/L
Preservatives							
Ascorbic acid	INS 300	File 1.11; 2.2.7	File 3.4.7	COEI-1-ASCACI	X		Maximum use level 0.25 g/L^3 Residual limit 300 mg/L
Erythorbic acid	INS 315	File 1.11; 2.2.7	File 3.4.7	COEI-1-ASCACI	X		Maximum use level 0.25 g/L^3 Residual limit 300 mg/L
Sorbic acid	INS 200		File 3.4.5	COEI-1-SORACI	X		Maximum use level 0.2 g/L
Potassium sorbate	INS 202		File 3.4.5	COEI-1-POTSOR	X		Maximum use level 0.2 g/L
Lysozyme	INS 1105	File 2.2.6	File 3.4.12	COEI-1-LYSOZY	X	X	Maximum use level 0.5 g/L

Figure.2 Types of additives

1.2 Finings

Fining materials are used for the specific purpose of removing something from wine. A wine might be fined to remove unwanted color, haze, bitterness, excessive astringency, off-flavors, unpleasant odors, etc. Usually, the fining agent itself is eliminated before the wine is bottled.

For lengthy period many different materials have been used as wine fining agents. Each fining material has different characteristics. Sometimes **two or more** fining materials are needed to solve a single wine defect. At other times, the winemaker might be lucky and discover that a single fining agent can eliminate multiple wine problems. For example, a dark, murky, blush wine might be fined with bentonite. This single bentonite application might

- Remove excessive protein and make the wine hot stable, and it might also
- Improve the clarity of the young wine and
- Remove a small amount of the excess color.

1.2.1 Using fining materials

Fining is a process which agglomerates particles causing them to gain weight and fall out of suspension. The objectives of fining are to: precipitate out suspended materials, reduce color or undesirable smells, and stabilize the wine against future cloudiness. Use carefully — excessive fining strips the wine of color, aroma, and taste — use lab tests. Fining agents are positive or negative charged materials which agglomerate unwanted particles in the wine accelerating settling**.**

Some examples of fining agents:

1. Agglomerated bentonite - aluminum silicate clay, negative charge (-): 2g/G

a. Effective on protein particles (+) found in white wines (not needed in red wines as the negatively charged tannins provide the necessary agglomeration)

b. With well-settled must, adding bentonite at time of fermentation effective

2. Activated carbon: 0.2 g/G for color, up to 1 g/G for off odors (do fining trials)

a. Reduces color and bad odors through absorption (not by charged particles)

b. Tends to leave an off-flavor

3. Gelatin (+): 1/8-1/2 g/G

a. Reduces tannin in red or white wines

b. Follow by kiesselsol (-) to ensure protein stability caused by excess remaining gelatin

c. If over-fined, wine tends to become cloudy

4. Egg whites (+): 1 to 3 egg whites/60 G barrel

- Best used during barrel aging to reduce tannin levels
- Softens astringency, mellows wine
- No after-effects

5. PVPP (Poly-Vinyl-Poly-Pyrrolidone) (+): 1/4- 1 g/G

- Used in place of gelatin (leaves no aftertaste)
- Reduces tannin level, remove browned oxidized polyphenols, and lessen future oxidation
- Use with a small amount of bentonite to help settle
- Often used with active carbon to reduce undesirable odors

6. Sparkolloid (-): 1 tea spoon (tsp)/G (gallon)

- Does not tend to strip wines of flavor or aroma
- Fluffy lees cause wine loss blending - Blending is effective if sufficient different wines are available. It is used to overcome 14 deficiencies or defects, balance the wine, and enhance complexity. **Acidity, pH, alcohol, tannin, varietal aroma, fruitiness, oak flavor, volatile acidity, residual sugar, bitterness, and off-flavor c**an sometimes be corrected. Remember the axiom: A bad wine blended with a good wine will result in a bad wine.

Sometimes novice winemakers attempt to clear dull, cloudy wines by filtration, but these attempts can be frustrating and expensive. Polysaccharide (gums), yeast cells and some types of bacteria clog filter media very quickly, and the unfortunate winemaker spends much time and expense changing filter pads. Using a fining material to clean up the wine before **filtration** is often a better approach

Some of the most commonly-used and permitted fining agents for wine are:

- Gelatin, Isinglass, Egg white (egg albumen), Casein, Skim milk, Bentonite and Carbon, Polyvinyl poly pyrrolidone (PVPP)

Best way to apply fining agents

- Lower addition rates are preferable rather than higher as it is possible to **remove positive flavour** characteristics.

- Sufficient fining agent is added when the prime purpose of fining is to achieve stability and/or to remove undesirable sensory characters.
- It is essential that identical components used in the cellar for the finished wine is replicated in the laboratory trials.
- **A control**, where no addition is made, should always be set up so that the sensory effect of the addition can be assessed.

The addition of protein based fining agents to white wines also affect protein stability. It is advisable to carry out a heat stability test after the fining operation is complete. It is also advised that fining agents be assessed for the presence of any taints or off-flavours prior to use screening tests for commonly used winemaking chemicals and processing aids.

Some fining agents, such as **bentonite, gelatine and isinglass** do have their own unique aroma.

1.2. 1.1 Gelatine

Gelatine is often added to white juice, and particularly pressings, to aid clarification and to reduce the level of phenolic compounds associated with bitterness, astringency and browning. It is added to red wine to reduce the level of phenolic compounds associated with excessive bitterness and astringency and might also remove some colour. Gelatine interacts mainly with larger polyphenolic compounds and sometimes it is added in conjunction with tannin to provide better clarification.

Of the proteinaceous fining agents, gelatine is the most aggressive and can easily result in over fining and colour removal. As gelatine preferentially binds with larger molecules it has a more dramatic effect on colour and tannin reduction in older wines as they contain a greater percentage of large polyphenols. Gelatine is occasionally used to help remove the harshness and colour of press juice prior to fermentation.

Side effects of gelatin ; the fact that gelatine is a wine soluble and heat un-stable protein, residual protein might remain in the wine if an excessive amount is used, possibly increasing the risk of the wine throwing a protein haze. Available; **powder and liquid forms**

1.2.1.2 Isinglass

Isinglass is a preparation of the protein collagen and is primarily used for clarifying white wines. It gives a brilliantly clear wine and has a less dramatic effect on the astringency and body of the wine compared to gelatine. Monomers and smaller polyphenolic compounds react easily with isinglass, which can aid in the removal of harsh taste sensations.

Isinglass is available in two forms; as **sheet or flocculated isinglass**. The flocculated form is easiest to work with because it does not have to be rinsed to remove fishy odours.

Isinglass is principally used in white wine fining to bring out or unmask fruit character without large changes in phenolic levels. It is less active towards condensed tannins than either gelatine or casein. Since condensed phenolics are principally responsible for astringency, isinglass has a less dramatic effect on the reduction of both wine astringency and body than most other protein fining agents. Also, isinglass has the added benefit of not requiring extensive counter-fining as compared with other proteinaceous fining agents.

Excess isinglass can impart a **fishy odour** to the wine and thus should always be preceded with an assessment of a laboratory fining trial. The **lees** produced, when using isinglass, tend to be light and fluffy, thus care needs to be taken not to disturb the lees on racking or filtering. In the same way as gelatine, excessive use of isinglass can result in residual protein remaining in the wine, which might increase the chance of a protein **haze forming**.

1.2.1.3 Egg white (egg albumen)

A solution of egg whites can be used to remove phenolic compounds associated with harsh astringency in red wines, as the protein binds with the larger polymeric material in the wine. The fining leads to a softening and improved suppleness in the wine. It is often carried out when the wine is in barrel or prior to bottling. The weight of an egg white in an average medium size egg is approximately 30 g, of which approximately 12 g is protein.

Addition in the cellar; the temperature of the wine should be about 10°C. Combine the required number of egg whites in a suitable size beaker, add 10 times the weight of distilled water adjusted to pH 7 and stir gently. Note that **potassium chloride** is not an allowed additive and thus cannot be used in the preparation in the cellar. Add this mixture slowly and with thorough but gentle mixing to the wine. Allow about a week for settling, then rack or earth filter. A small amount of foam might appear on the top of the wine which can be skimmed off or gently stirred into the wine.

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Figure 3. Egg albumin protein

1.2.1.4 Casein

Casein is the principal protein in milk. It is used mainly for fining white wine and Sherries to reduce the level of phenolic compounds associated with bitterness and browning. It is softer than gelatine or isinglass but has limited clarifying action. Several types of casein fining agents are available including casein, potassium caseinate, mixtures of potassium caseinate with bentonite/silica and skim milk. The most commonly used casein fining agent is potassium caseinate.

Casein can be used as a substitute for carbon in de-colourising wines. Although it is not as effective in colour removal as carbon, casein avoids the oxidative degradation often associated with carbon.

1.2.1.5 Skim milk

The addition of skim milk (low fat) removes similar phenolic compounds to those removed by casein/ potassium caseinate but is less specific.

- Preparation of stock solution for laboratory fining trials skim milk can be added as a solution prepared from a **powder or by diluting with water**.

Addition in the cellar

The temperature of the wine should be about 10°C. Accurately measure out the required volume of milk. Add the milk slowly, and with thorough but gentle mixing, to the wine. Allow a few days for settling then rack or earth filter.

1.2.1.6 Bentonite

Bentonite is a type of very fine clay made of aluminium-silicate. It is distinct from other clays in that it is formed from volcanic ash. Bentonite is principally used to remove proteins from white wine and juice, as it is a negatively charged clay colloid and reacts with positively charged proteins, precipitating them from the wine. Use of bentonite in red wines should be limited because of its ability to reduce colour by adsorption of anthocyanins.

Because the positive charge on proteins is stronger at lower pH values, the effectiveness of bentonite is greater in wines with lower pH values. If it is intended to adjust the pH and titratable acidity of the wine, then this should be carried out prior to bentonite fining, since stability might be different under the new pH conditions.

1.2.1.7 Carbon

Carbon can be used to remove off-flavours and odours from wine, to decrease browning or pinking in white wines and to remove colour from red wines. There are two forms of carbon: 'decolourising' carbon, normally marked KBB and 'deodourising', normally marked AAA. Carbon works well in combination with PVPP in both tasks. The compounds to be removed are physically adsorbed to the large surface area of the carbon particles. The adsorption rate on the carbon surface is typically very fast. Carbon is regarded as a severe and relatively non-specific fining agent and therefore should be used with care. Special care should be taken to avoid exposure to carbon: use eye protection in combination with breathing protection.

1.2.1.9 Polyvinylpolypyrrolidone (PVPP)

PVPP is a synthetic polymer used to reduce the level of phenolic compounds associated with browning and astringency in white wine. It can also be used to remove pink colour and pinking precursor compounds in white wines. PVPP is practically insoluble in wine and absorbs the low molecular weight phenolics, especially anthocyanins and catechins. PVPP is a gentle fining agent which preserves wine aroma, unlike some other fining agents. When used for colour reduction in white wines, combining with carbon is more effective in many cases, as it helps with clarification of the carbon particles. PVPP is not commonly used in red wines, however, it can reduce bitterness and brighten the colour. In many cases PVPP can also reduce certain off-flavours and bitterness.

- When PVPP is used to remove brown colour and pink colour, selection of the appropriate fining rate can be aided by the results of spectrophotometer readings, as well as by visual examination.
- <u>Addition in the cellar</u> accurately weigh out the required amount of PVPP and make a slurry with minimal volume of distilled water. Add the slurry slowly with mixing to the wine, allow a few days for settling, then earth or pad filter.

Self-check 1	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (6 point)

A. quality

Test II: Short Answer Questions

Information Sheet 2- Measuring additives and fining materials

1.1 Bench trial is a small-scale trial meant to simulate the addition of an additive or fining agent to a larger volume of wine. The idea is that by trying an addition or fining out on a small scale, you can try a range of 10 ppm: 30 ppm: 50 ppm per liter, dosages, or even different products, without having to treat all of your wine. This allows you to accurately determine the exact process and dosage that will have the optimal impact on your wine, allowing you to move forward and perform this process on your whole batch. Ideally, we'd be doing a bench trial ahead of the addition of any product that has a dosage range rather than a fixed dosage that is appropriate. Knowing the amount of additives and fining helps us to prevent the danger of stripping away much of a wine‟s character when performing a fining, including bentonite. Nice to know exactly how much bentonite will take care of our hazy wine so that we don't have to risk stripping out more flavor, aroma and color than necessary. Bench trials should be performed immediately ahead of a fining or addition procedure. For example, might schedule a bench trial for egg white fining a week ahead of the actual fining, but plan on doing a TA addition trial just 2-3 days ahead of when you plan on making the addition to the whole batch of wine. The bench trial process can be broken down into 6 basic steps:

1. Determining your sample volume
2. Determining your range of dosages for the trial
3. Scaling the dosages down to your sample size
4. Creating a model solution
5. Dosing the samples and
6. Evaluating the results.

Figure 4. Bench test

Bench test procedures

1) Determine your sample volume. The correct volume depends on how much wine you have to work with, how small the dosages of the product you're trying are and how exact you can be with a pipet and scale.

So, select a larger sample size if you have plenty of wine to work with, if the additive or fining agent needs a very small dosage or if you feel that you may not be too accurate with measuring out the test dosages. Remember that the smaller the sample and/or dosage are, the more significant any small error on your part becomes. If you are trying to measure out 10 mL of liquid and are off by 1 mL that is a 10% error – pretty significant. However, if you are measuring out 100mL of liquid and are off by 1 mL, a 1% error is not such a concern. Recommended sample sizes anywhere from 50 mL up through 500 mL.

2) Determine your range of dosages. Most additives and fining agents have a recommended range of dosages for treating wines. For instance, unique, pre-soaked bentonite product Albumex can be added in a range between 1 and 3 g/L of wine.
    - First step is deciding how many samples are going to run.
    - Typically run 4 or 5 samples.

- Remember to always keep one untreated sample off to the side as a control. Also, it is a good idea to try to keep the step between the dosages uniform. If we were running a trial with Albumex, 5 samples and a control would be a good idea. The dosages for the samples would be 1 g/L, 1.5 g/L, 2 g/L, 2.5 g/L and 3 g/L.

While it may take some getting used to, it's the best and easiest way to do this.

3) Scale down the dosages to sample size: As we mentioned in the previous step, the dosages that you choose will likely be in terms of grams/liter, or perhaps in oz / gallon, though metric units are recommended. Running the trial on samples as big as 1 liter (or 1 gallon). It is necessary a little math to scale down the dosage to match your sample size. During sample taking it is better to take large samples to minimize errors.

.The basic idea here is that you ask yourself the following question: "If I want to achieve a dosage of 1 g/L, how much product do I weigh out for my 50mL sample?" Since 50mL is 5% of 1L, you also need 5% of 1g, which is 0.05g. The easiest way to set up the math is as follows:

(Dosage)x(Conversion Factor)x(Sample Size)=(Amt of Product for Sample). For example; **(1g/L)x(1L/1000mL)x(50mL) = 0.05g.**

4) Create a model solution:

5) Dose your samples: Now that you have made up your model solution it is time to add the doses to the samples.

This is probably the easiest part of doing the bench trial.

Simply add enough mLs of the model solution to each sample in order to achieve the dosage rate that you are looking for.

In our example with Albumex, this would mean adding 1mL to the first sample, **1.5mL** to the second, then **2mL, 2.5** and finally **3mL** to the last sample.

The easiest way to do this is with a pipette.

A good technique for this is to fill a pipette to a given level, then seal the end with your finger tip.

6) Taste your samples: Now for the fun bit. After allowing enough time for the product you're testing to work, you want to come back and taste the samples to see which dosage (if any of them) you liked the best. It is a good idea to do this tasting with one or two other people there as well – many palates are better than just one. Ideally you

would be able to leave your samples for as long as it normally takes the product to work. With many additives, you would want to flush out the sample vial with Argon gas prior to closing them up. If you do not have the equipment necessary to do this, then you really only want to allow the sample to sit for about 24hr or it will begin to oxidize while you're waiting for the product to work. It is acceptable to taste the samples after 24hr, but recognize that you will not be getting a fully clear picture of products benefits or negatives. Allow enough time for this addition to work completely, and then taste the wine again to evaluate whether or not you think a further addition is necessary.

Table 2. Typical rates of additions of fining agents in white and red wine

Type of product	Typical doses used (mg/L)	Characteristics
White wine		
Gelatine	15 – 120	Good clarity. Effective in reducing bitter after-taste.
Isinglass	10 – 100	Good clarity. Intensifies yellow colour. Light flakes, bulky, settles slowly.
Casein	50 – 250	Good clarification. Treats and prevents oxidation. No over fining.
Bentonite	200 – 1000	Average clarification. Treats and prevents protein instability and reduces the likelihood of copper casse. Facilitates settling. Avoids over fining.
Carbon	50 – 2000	Removes off-odours. Effective in colour reduction (browning and pinking).
PVPP	100 – 800	Effective in colour reduction (browning and pinking). Reduces bitterness. At high rates can result in colour and flavour stripping.
Red wine		

Gelatine	30 – 240	Very good fining agent for tannic wines. Affects only the most aggressive tannins. May make wine softer or thinner.
Egg white (egg albumen)	30 – 150	Very good fining agent for tannic wines with some age. Tends not to remove protective colloids.
Casein	50 – 250	Good clarification. Treats and prevents oxidation. No over fining.
Bentonite	200 – 500	Clarification of young wines. Eliminates colloidal colouring matter. Facilitates sedimentation of protein fining agents.
Carbon	50 – 2000	Removes off-odours. Effective in colour reduction (browning and pinking).
PVPP	100 – 450	Reduces bitterness. Brightens colour. At high rates can result in colour and flavour stripping.

Table 3. Dose levels of some common fining materials.

Fining material	Purpose	Dose range	Typical dose
AAA carbon	remove odors (H2S) strip wine for blending	1/4 to 4 g/gal 2 to 8 g/gal	1 g/gal 4 g/gal
KB carbon	remove un	1/8 to 1 g/gal	2 g/gal
Bentonite	remove protein general clarification	2 to 4 g/gal 2 g/gal 2 to 2 g/gal	2g/gal 1 g/gal
Casein	remove browning remove bitter taste remove excess oak	1/8 to 1/4 g/gal 1/4 to 1 g/gal 1/8 to 1 g/gal	1/4 g/gal 2 g/gal 2 g/gal
Gelatin	white wine clarification remove bitter taste tannin reduction	1/16 to 1/4 g/gal 1/8 to 2 g/gal 1/4 to 2 g/gal	1/8 g/gal 1/4 g/gal 2 g/gal

Egg whites	red wine clarification eggs tannin reduction	1 to 4 per barrel 1 to 6 eggs per barrel	-- --
PVPP	remove browning remove excess color remove oxidized taste remove bitter taste	1/4 to 1 g/gal 1/4 to 2 g/gal 1/4 to 1 g/gal 1/4 to 1 g/gal	2 g/gal 3/4 g/gal 2 g/gal 2 g/gal
Sparkolloid	white wine clarification topping over bentonite	1/4 to 1 g/gal 1/8 to 1 g/gal	2 g/gal 2 g/gal

Self-check 2	**Written test**

Name…………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (point)

Test II: Short Answer Questions (points each)

Information Sheet 3- Checking additives and fining materials handling, mixing and

blending equipment

1.1 Mixers, blenders and agitators in the wine industry

Manufacturers a range of mechanical mixers, blenders and agitators for the wine industry, typical applications include;

- For the rehydration of yeast in preparation for fermenting.
- For the addition of yeast nutrients during fermentation.
- For accelerating the flavour take up from oak chips and similar.
- For assisting in maintaining uniform small CO2 bubble size when fermenting.
- For the mixing and subsequent addition of fining agents like bentonite, gelatine and others for clarifying and stabilising wine or juice.
- For the addition of sulphur dioxide in different forms to protect the juice or wine against oxidation.
- To enhance cold stabilisation reducing the duration and energy costs, some wineries have reported cold stabilisation achieved 3 times faster than without agitation.
- For the mixing of different wines and/or juices to achieve a homogenous blend.
- To eliminate temperature stratification within wine silos.
- To increase the turbidity to promote more effective filtration and centrifugation.

For the mixing of yeast lees (battonage) after fermentation to increase contact of yeast lees in tanks. Wineries usually use pumps to transfer juice or wine between different tanks, they often use this pumping action as a mixing process. This can lead to negative consequences. It can create excessive **aeration** with resulting risk of oxidation. When pumping from one tank to another the design of the pumping system is focused on product transfer not mixing. When pumping a fluid into a tank the flow generated often produces a “shadow” in areas within the tank where is little, or no flow, which results in longer mixing times with often poor results. Pumps use more electricity and labour than mixers and take a longer period to produce a result. In addition, pumps can create trip hazards with **hoses** on the winery floor. Mixers consist of an electric motor, often coupled to a gearbox, and an output shaft with one or more impellers, in the case of side entry agitators a mechanical seal is utilised to seal the tank and the point of entry. The geared motor system drives the shaft and impeller which in turn causes the movement of the liquid within the tank. The volume of the tank, the contents and the purpose of the mixer will determine the power of the drive, the speed, the size and the type of impeller. In storage, cold stabilisation and fermentation applications the design and speed of the impeller is important to ensure that the wine or juice is circulated gently within the tank without creating undesirable turbulence. In solids suspension applications, such as making bentonite slurries, creating a superficial velocity within the tank is necessary to suspend the solids and keep them in suspension Mixers can be permanently installed on a tank or can be portable for use on multiple similar size tanks. Permanently installed mixers are usually used for large tanks or specific applications. The tank volume, product and process will determine the specific mixer installed on the tank. To ensure the most effective mixing in the shortest possible time the position and angle of installing the mixer is important. Portable mixers are useful where infrequent mixing in a variety of similar size tanks, tubs, drums and barrels is required. They are usually light weight and can be temporarily clamped to containers or mounted on frames which straddle tanks, tubs and even IBC vessels. In the case of IBC's and closed top barrels, blades which collapse to fit through the relatively small entry bungs are used to achieve the correct blade diameter for the given vessel size. By using a mixer correctly designed for the application and the tank it is to be used in the quality of the mixing/agitation/blending and subsequent downstream processes will be improved and can lead to higher product quality and savings on energy, time and manual labour.

Figure 5. Side Entry Agitator

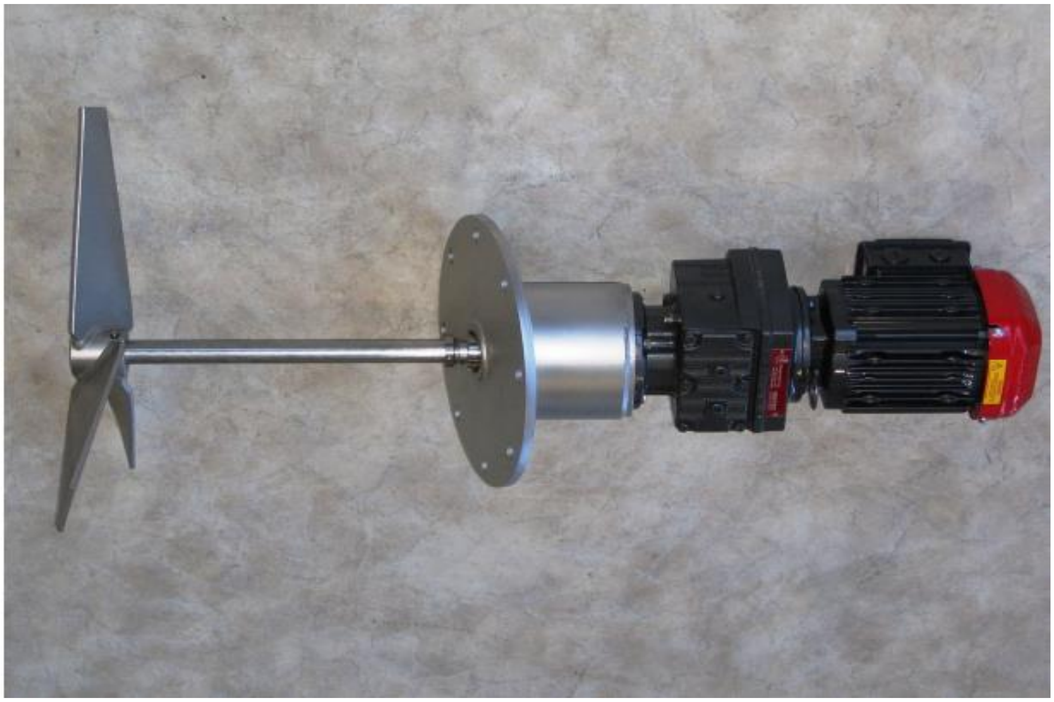

Figure 6. Typical side entry mixer for wine silos

Figure 7. Mobile tank and mixer for making up additives in winery, complete with transfer pump.

Importance of dispersion

All fining materials must be evenly dispersed throughout the volume of the wine. Many fining agents are dry powders, and these materials must be mixed with a small amount of water (or wine) before being added to the wine. Most fining materials should be added slowly and thoroughly stirred into the wine. A long handled spoon is satisfactory for mixing a fining agent into a few gallons of wine. A motor-driven, propeller type mixer is more appropriate for larger containers such as barrels or small tanks. Many small wineries do not have mixing tanks, so they often add fining materials when the wine is **being racked** from one tank into another. The circulation produced by the pump provides adequate mixing.

Self-Check – 3	Written test

Name…………………………………………… ID……………………….. Date…….

Name…………………………………………… ID………………………..Date……

Directions: Answer the questions listed below.

Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers

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Information Sheet 4 - Confirming availability of Services

1. 1 Introduction

Compressed air is a form of stored energy that is used to operate machinery, equipment, or processes. Compressed air is used in most manufacturing and some service industries, often where it is impractical or hazardous, to use electrical energy directly to supply power to tools and equipment**.**

Care has to be taken wherever compressed air comes into contact with food because compressed air is not clean by nature. On the contrary, solids and particles in various concentrations are present almost everywhere in the form of dust. Water, in the form of natural humidity, is released in large quantities when the compressed air cools down. And thus compressed air quality in accordance with the requirements of the application provides the best possible safety for food, consumers and food producers.

The compressed air is used for transporting and mixing, as well as for food production in general. It comes into direct contact with the food. Because these foods are dry, even stricter requirements apply with regard to air humidity. The following compressed air quality classifications in accordance with ISO 8573-1:2010 apply in this case: – Solid particles: Class 1 – Water: Class 2 – Oil: Class 1

Note: In special cases, it is advisable to use a sterile filter, if possible indirect proximity to the consuming device.

Figure 8. Adsorption dryer for targeted, decentralized compressed air drying

Compressed air comes into direct contact with non-dry food (e.g. drinks, meat, vegetables) the compressed air is used for transporting and mixing, as well as for food production in general. It comes into direct contact with the food. The following compressed air quality classification in accordance with ISO 8573-1:2010 applies: – Solid particles: Class 1 – Water: Class 4 – Oil: Class1

TIP

In packaging machines

The compressed air comes into direct contact with the materials in which the food will be packaged. This makes the packaging material part of the food zone.

Figure 9. Service unit combination for compliance with class 1:4:1

Compressed air is used mainly in the bottling facility, but may also be used elsewhere in the winery (e.g. pressing). In the model winery energy use for compressed air systems is estimated at 7% of total electricity use for a winery that has a bottling plant. Energy savings from system improvements can range from 20% to 50% or more of electricity consumption for compressed air systems. Compressed air is probably the most expensive form of energy used in an industrial plant because of its poor efficiency. Typically, efficiency for compressed air systems from start to end-use is around 10%. Because of this inefficiency, if compressed air is used, it should be of minimum quantity for the shortest possible time, constantly **monitored and weighed against alternatives.**

Maintenance of Compressed Air Systems. Inadequate maintenance can lower compression efficiency and increase air leakage or pressure variability, as well as lead to increased operating temperatures, poor moisture control, and excessive contamination.

Improved maintenance will reduce these problems and save energy. Proper maintenance includes the following

- Regulators sometimes contribute to the biggest savings in compressed air systems.

By properly sizing regulators, compressed air will be saved that is otherwise wasted as excess air.

Also, it is advisable to specify pressure regulators that close when failing.

- Keep the compressor and intercooling surfaces clean and foul-free. Blocked filters increase the pressure drop.

By inspecting and periodically cleaning filters, the pressure drop may be kept low.

Keep motors properly lubricated and cleaned.

Poor motor cooling can increase motor temperature and winding resistance, shortening motor life, in addition to increasing energy consumption

- Inspect fans and water pumps for peak performance.
- Inspect drain traps periodically to ensure they are not stuck in either the open or closed position and are clean or electronic drains, do not waste air. Inspecting and maintaining drains typically has a payback of less than
- Maintain the coolers on the compressor to ensure that the dryer gets the lowest possible inlet temperature.
- If using compressors with belts check belts for wear and adjust them. A good rule of thumb is to adjust them every 400 hours of operation.
- Replace air lubricant separators according to specifications or sooner.
- Check water-cooling systems for water quality (pH and total dissolved solids), flow, and temperature. Clean and replace filters and heat exchangers per manufacturer's specifications
- Minimize leaks (see also Leaks section, below
- Specify pressure regulators that close when failing.
- Check applications requiring compressed air for excessive pressure, duration or volume

Monitoring

Proper monitoring (and maintenance) can save a lot of energy and money in compressed air systems.

Proper monitoring includes the following:

- Pressure gauges on each receiver or main branch line and differential gauges across dryers, filters, etc.
- Temperature gauges across the compressor and its cooling system to detect fouling and blockages.
- Flow meters to measure the quantity of air used.
- Dew point temperature gauges to monitor the effectiveness of air dryers.
- kWh meters and hours run meters on the compressor drive.
- Compressed air distribution systems should be checked when equipment has been reconfigured to be sure no air is flowing to unused equipment or obsolete parts of the compressed air distribution system.
- Check for flow restrictions of any type in a system, such as an obstruction or roughness. These require higher operating pressures than are needed. Pressure rise resulting from resistance to flow increases the drive energy on the compressor by 1% of connected power for every 2 psi of differential
- Check for compressed air use outside production hours.
- Turn off unnecessary compressed air.
- Equipment that is no longer using compressed air should have the air turned off completely.

Pumping

Pumping systems account for nearly 20% of the world's electrical energy demand. Pumping systems account for about 25% of the electricity used in manufacturing. In wineries, pumping energy needs may account for between 10 and 25% of electricity consumption. Pump efficiencies may vary between **15% and 90%,** demonstrating potential for efficiency improvement. In a winery, pumps are not only used to pump product, but pumps are also found in **refrigeration systems and water systems**. Hence, there are different pumps used within a winery, e.g. centrifugal, progressive cavity, lobe, flexible impeller, diaphragm, peristaltic and reciprocating piston pumps.

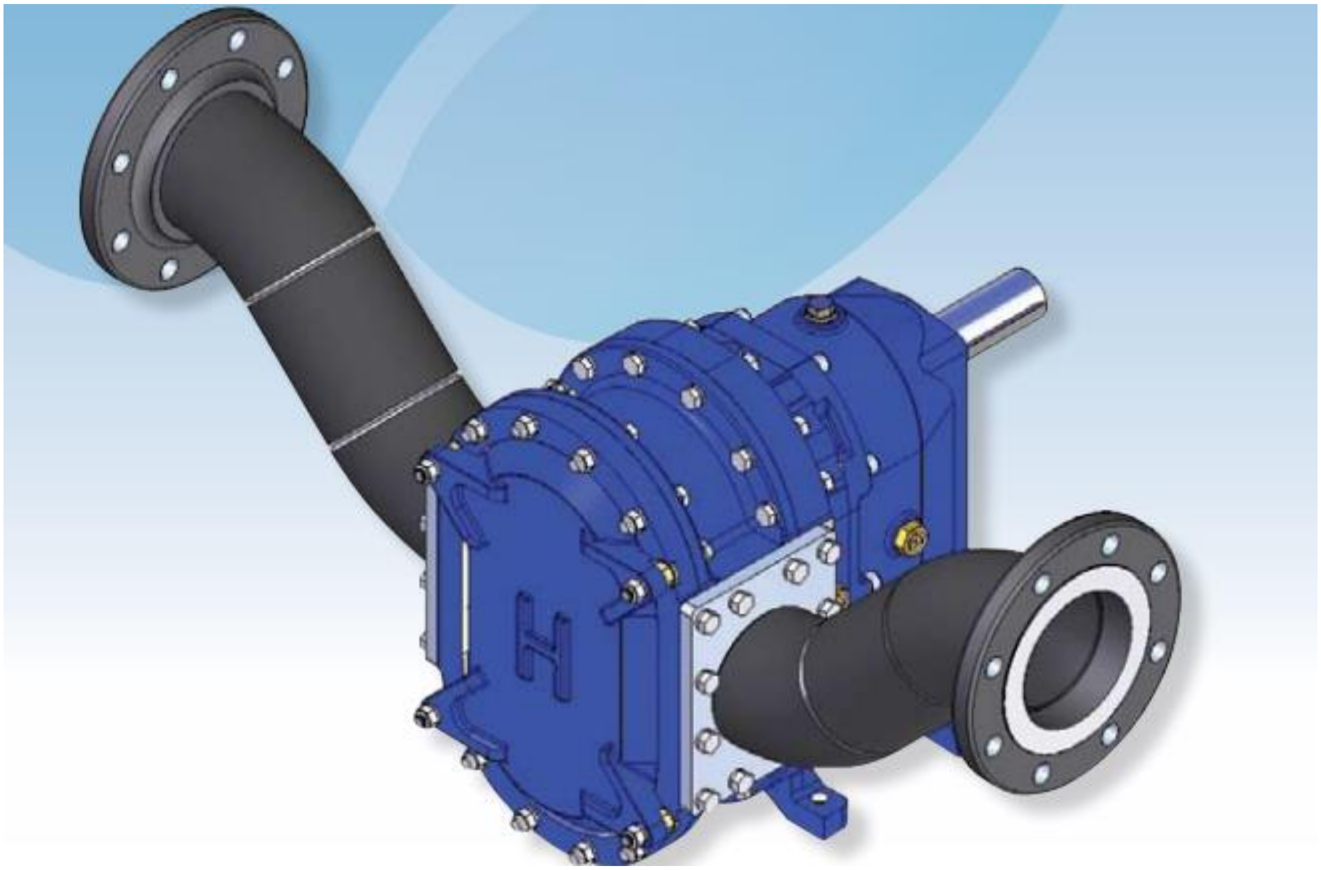

Figure 10. Lobe pump

For product handling, the choice of pump is particularly important. For example, lobe pumps are suitable for 24 pumping fluids with suspended solids (**e.g. must and lees),** while **centrifugal pumps are mostly used** for moving wine between tanks or for pumping water. It is important to note that initial costs are only a fraction of the life cycle costs of a pump system.

Pumping systems consist of a pump, a driver, pipe installation and controls (such as adjustable speed drives or throttles)

For example, higher efficiency motors also increase the efficiency of the associated pump by 2 to 5%.

Pumping systems are addressed; for optimal savings and performance, it is recommended that the systems approach incorporating pumps, compressors, motors and fans be used.

There are two main ways to increase pump efficiency, aside from reducing use.

These are:

1) Reducing the friction in dynamic pump systems (not applicable to static or "lifting" systems) and

2) Adjusting the system so that it draws closer to the best efficiency point (BEP) on the pump curve. Correct sizing of pipes, surface coatings or polishings and adjustable speed drives, for example, may reduce the friction loss, increasing energy efficiency. Correctly sizing the pump and choosing the most efficient pump for the applicable system will push the system closer to the best efficiency point on the pump curve.

Maintenance and Monitoring

Inadequate maintenance at times lowers pump system efficiency, causes pumps to wear out more quickly and increases costs. Better maintenance will reduce these problems and save energy. Monitoring in conjunction with maintenance can be used to detect problems and determine solutions to create a more efficient system.

Monitoring can determine clearances that need be adjusted, indicate blockage, impeller damage, inadequate suction, operation outside preferences, clogged or gas-filled pumps or pipes, or worn out pumps.

Monitoring should include wear monitoring, vibration analyses for main pumps, pressure and flow monitoring, current or power monitoring, and distribution system inspection for scaling or contaminant build-up.

Proper maintenance includes the following

- Replacement of worn impellers, especially in caustic or semi-solid applications.
- Bearing inspection and repair.
- Bearing lubrication replacement, once annually or semiannually.
- Inspection and replacement of packing seals.

Allowable leakage from packing seals is usually between two and sixty drops per minute.

- Inspection and replacement of mechanical seals.
- Allowable leakage is typically one to four drops per minute.
- Wear ring and impeller replacement. Pump efficiency degrades from 1 to 6 points for impellers less than the maximum diameter and with increased wear ring clearances

Pump/motor alignment check

Typical energy savings for monitoring and maintenance are estimated to be between 2 and 7% of pumping electricity.

Reduce Pumping Need. Holding tanks can be used to equalize the flow over the production cycle, enhancing energy efficiency and potentially reducing the need to add pump capacity. In addition, bypass loops and other unnecessary flows should be eliminated.

Each of these steps saves 5 to 10% of pump system electricity consumption, on average for the U.S. industry

In smaller, new wineries, a design based on gravity can reduce the need for pumping by locating the tanks in such a way that no pumping is needed.

The presses are located over the fermentation tanks, which are located over the storage facilities (cellar). It is also claimed that such a layout is easier on the grapes.

Hence, a gravity design may be most applicable to small, specialized wineries. The energy savings are estimated at 5-10% of total energy use in wineries. This investment is driven by wine quality and not by energy savings, and the additional investments (compared to a standard design) are strongly dependent on the site of the winery.

Controls

The objective of any control strategy is to shut off unneeded pumps or reduce load until needed. Remote controls enable pumping systems to be started and stopped more quickly and accurately when needed, and reduce the required labor. The wireless control system able to control all pumps simultaneously from one location

Bypass loops may be an indication of an oversized pump

Variable speed drives or on/off regulated systems always save energy compared to throttling valves

Figure. 11 Tanks Hose Hdwe

Water

In some country the only jurisdiction to permit addition of water to change the character of the wine – it can be added with or without sugar to reduce acidity. This is known as **amelioration.** Water is also allowed to flush equipment and facilitate fermentations, and to add materials within specified limits.

States wine "may contain water in proportion not exceeding 30 mL/L where the water is necessary for the incorporation" of any permitted additive or processing aid.

Water can be used to modify the characteristics of the wine, water is only allowed as a processing aid.

Use and addition of gases The EU permits aeration with oxygen, argon or nitrogen; the addition of oxygen and carbon dioxide; and the use of carbon dioxide, argon or nitrogen to prevent oxidation. The USA permits carbon dioxide to “stabilize and preserve”; nitrogen to prevent oxidation and preserve pressure in bottling and filtering; and the use of oxygen and compressed air. South Africa permits addition of carbon dioxide, nitrogen and oxygen with no qualification on reason for use.

Self-Check – 3	Written test

Name……………………………. ID……………………………. Date………………………………….

Time started: ________________________ Time finished: ________________

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (point)

Test II: Short Answer Questions () points each

Information Sheet 5- Setting the process

1.1 setting the process

The additives and fining agents are added at different steps of winery processing based on the test results (bench test result) that helps to increase shelf life, efficiency of the wine juice extraction quality, quality of fermentation and filtration of the liquor. These additives and fining agents are added at different sequence of steps in the carboy, barrel or container.

Most red wines clear without any fining or filtering because **the tannin in red** wine acts as a fining agent. **Red wines are typically** clear and bright after being racked a couple of times and aged for several months. However, red wines can sometimes produce unsightly bottle deposits if they are not lightly fined with a protein agent or filtered with a medium pad.

Crush (break the skins) and de-stem the grapes. For most grape varieties, about 90% of the larger stems should be removed. Test for total acidity following the instructions in your acid testing kit. If the acidity is less than, 6%, add enough tartaric acid to bring it to that level. If you have a pH meter, also test the pH. Test for sugar with your **hydrometer**. Correct any deficiencies by adding enough sugar to bring the reading up to at least 22°Brix or add water to bring the sugar down to a range between 22 and 26°Brix. When these tests and corrections have been completed, the must should be sulfited. The amount needed will depend on the condition of the grapes, with moldy grapes getting the most concentrated dose. Extremely clean grapes may be fermented with little or no SO2. Unless you have found it necessary to add more than 65 parts per million SO2 in step 4, yeast should be added immediately. If using more than 65 parts per million SO2, you must wait six hours before doing so. Add 1 -2 grams of dry wine yeast per gallon evenly across the surface of the crushed grapes (now called “must”). Stir it in thoroughly after eight to twelve hours. The must should be stirred twice a day until fermentation begins. The beginning of fermentation is obvious, as the grape skins are forced to the surface, forming a solid layer, called a cap. Once the cap has formed, mix it back down into the fermenting juice twice a day using your hand or a stainless steel punch-down tool until it is ready to be pressed. Throughout fermentation, the temperature of the must is usually between about 60 and 75°F. For better color extraction from the skins, it is helpful to allow the temperature to rise at least once to the 80-90°F range. The fermentation itself generates some heat, which helps warm the must along with warm fall weather. If it is late in the season you may need a heater. Add an ML culture (optional) to the wine about half to two thirds through fermentation or in the case of direct pitch strains like Enoferm Alpha or Beta, add to the fermentors after pressing. When the wine has reached 0° Brix the grapes should be pressed to separate the wine from the skins. This is usually about 1-2 weeks of fermentation at 70-80°F.

During pressing, collect the wine into a bucket under the press and funnel the wine into secondary fermenters. Attach fermentation locks, and allow the containers to settle until all visible signs of fermentation have ceased (several days to a week or so). Top full when all activity ceases even if you have to add wine from another batch, or buy a similar wine, remember, you get to drink it later. When the wine has begun to clarify in 1-2 weeks, rack the wine off the gross lees into clean, sanitized storage containers (glass, stainless steel, or oak). Top up the containers and let stand for a month.

If ML fermentation is still active do not add sulfite during this time. After one month, rack the wine away from the lees again, add sulfite to 25 or 30 ppm, and keep in topped up containers for four to six months. You must top up barrels, and visible inspect carboys. This is a good time to add oak alternatives such as sticks or chips. Add sulfite every few weeks. If you inoculated for ML, test the wine to be sure it is complete. Rack off the lees again, and retest to see if the ML fermentation has finished. If completed, raise the sulfite to 20-30 ppm and store in a cool place for aging. If ML fermentation has not completed, keep the sulfite level below 20 ppm and warm the storage containers for a month to encourage completion. Usually during the summer (just before you need your storage containers for the next year's crush), carefully rack the wine to a sanitary bottling container, then siphon into bottles and cork them. Keep the bottles neck-up for one week to allow the corks time to expand, then move the cases to their side or upside down for storage. Bottling time is your last opportunity to make sure the wine will be bottle stable, so test and adjust the sulfite to 30 ppm. If this is a sweet wine, add Sorbistat to keep the wine from further fermentation. Most red wines will benefit from at least one year's additional aging

Gelatine

- Preparation of 1% w/v stock solution for laboratory fining: There are two types of gelatine available; powder and liquid forms. One that is commonly used is a commercially available liquid form. The percentage gelatine activity (normally around 30%) should be noted from the manufacturer's instructions. A stock solution of 1% w/v can be prepared by diluting the liquid form accordingly. To make a 1% w/v solution using gelatine powder, add 10 mL of 96% ethanol to 80 mL of distilled water. Add 1 g of gelatine to the solution. Gently stir while warming the solution, but do not allow the temperature to exceed 40°C. When the mixture is homogeneous; make to volume with distilled water in a 100 mL volumetric flask. Mix well but gently. This stock solution should be prepared fresh every few days.
- Conducting and assessing a laboratory trial: 1 mL of the 1% w/v stock solution added to 100 mL of juice/wine represents an addition rate of 100 mg/L. Typical ranges to evaluate white juices and wines are 15 to 120 mg/L, whilst red wines are 30 to 240 mg/L. **Isinglass**

- Preparation of 0.5% w/v stock solution for laboratory fining trials. Dissolve 1 g of citric acid in about 80 mL of distilled water. Add 0.5 g of finely chopped isinglass to this solution. Disperse by gentle stirring for about 12 hours or overnight (do not heat). Make to volume with distilled water in a 100 mL volumetric flask. The preparation is a jelly-like solution. If the preparation is taking a long time to prepare or if the preparation is to be stored, then sulfur dioxide should be added at a concentration of 200 mg/L.
- Conducting and assessing a laboratory trial. One mL of the 0.5% w/v stock solution added to 100 mL of juice/wine represents an addition rate of 50 mg/L.
- Typical ranges to evaluate white wines are 10 to 100 mg/L and if used for light red wines 30 to 150 mg/L.

Egg white (egg albumen)

- Preparation of a 10% w/v stock solution for laboratory fining trials Break eggs and separate the white from the yolk. Weigh egg whites into a large beaker. Add 10 times this weight of distilled water which has been adjusted to pH 7 (using potassium carbonate) and containing 0.5 % potassium chloride. Dissolving can be facilitated by potassium chloride as it maintains the globulins in solution. Stir gently, but avoid foaming, until dissolved. Vigorous stirring will denature the proteins. The egg white solution must be prepared fresh and used on the same day. Egg white is also available in dried and frozen form, however fresh egg whites tend to give the best result.
- Conducting and assessing a laboratory trial 1mL of the 10% w/v stock solution added to 100 mL of juice/wine represents an addition rate of 1000 mg/L.Typical ranges to evaluate red wines are 300 to 600 mg/L.

Casein

- Preparation of 1% w/v stock solution for laboratory fining trials
- Dissolve 1 g of potassium caseinate in 100 mL of distilled water with stirring. Warm the solution, but do not exceed 40°C. Stirring might be required for several hours to completely mix the powder into solution. This solution should be used within a day or two. If using casein, the preparation needs to be made alkaline to make it dissolve: dissolve 1 g of casein into 100 mL of distilled water which has been adjusted to pH 8 by addition of potassium carbonate.
- Conducting and assessing the laboratory trial 1 mL of the 1% w/v stock solution added to 100 mL of wine represents an addition rate of 100 mg/L. Typical ranges to evaluate are 50 to 250 mg/L. The stock

solution of casein flocculates immediately on addition to wine. Therefore, when adding the stock solution to the wine, it should be quickly blown in via a graduated pipette into the middle of the volume of wine and mixed immediately.

Skim milk

The addition of skim milk (low fat) removes similar phenolic compounds to those removed by casein/ potassium caseinate but is less specific.

- Preparation of stock solution for laboratory fining trials Skim milk can be added as a solution prepared from a powder or by diluting with water. Prepare a stock solution from the powder by following the manufacturer's recommendations. Prepare a stock solution from liquid skim milk (low fat) by diluting it 1:1 with distilled water.
- Conducting and assessing a laboratory trial: for powdered preparations, follow the supplier's recommendations. The preparation of the 1:1 liquid skim milk (low fat)/ distilled water is added at rates between 0.4 and 2.0 mL to 100 mL wine. To calculate addition rates, access the

Bentonite

- Preparation of 5 % w/v stock solution for laboratory fining trials: Weigh 5 g bentonite into a dry 50 mL beaker. Measure approximately 85 mL of distilled water into a 250 mL glass beaker. Heat the water to approximately 60°C. While stirring, slowly sprinkle the bentonite into the water to disperse it thoroughly. When all the bentonite is added, allow the suspension to cool. During this period the bentonite will swell; normally the suspension is left to stand overnight. If the bentonite is not well dispersed, the suspension might need to be heated a second time. The suspension is then made to volume with distilled water in a 100 mL volumetric flask. Mix well. It is important to note that the same batch of bentonite should be used in both laboratory trials and the cellar. Additionally, the bentonite suspension should be prepared under conditions as similar as possible to those existing in the cellar; with respect to water, water temperature, composition, and time of rehydration before use.
- Conducting and assessing the laboratory trial: One mL of the 5% w/v stock solution added to 100 mL of wine represents an addition rate of 500 mg/L. Conduct an initial trial covering a wide range of bentonite additions in order to ascertain the appropriate rate of fining to achieve protein stability. This should be done using 100 mL measuring cylinders and adding the bentonite with a graduated pipette. Having established the rate at which stability is achieved in this range of additions, a further trial should be conducted at narrower range. The appropriate rate is determined by the heat stability test (80°C for six

hours). If a haze is seen in the fined heated wine, it is not stable and more bentonite is required. A turbidimeter can be used for more objective comparison of the turbidity in the heated samples. In this case, wines that exhibit a turbidity increase of greater than a given criterion for Nephelometer Turbidity Units (NTU) after heating, as compared with the **unheated control**, can be considered to have failed the heat stability test. Some laboratories use a criterion of 0.5 NTU, but other practitioners in industry have indicated that a more reasonable criterion is 2.0 NTU.

- Addition in the cellar: Prepare a 5 % w/v solution by weighing out the required amount of bentonite and slowly adding, with stirring, to an adequate volume of water which has been heated to about 60°C. The suspension is left to stand overnight and used the next day. Mix well before addition. It is important that the bentonite is thoroughly dispersed in the slurry. If the suspension settles out or forms lumps, break up the lumps, reheat and stir vigorously to re-suspend the bentonite. To reiterate, it is important that the same batch of bentonite is used in both the laboratory trials and in the cellar. Additionally, the bentonite suspension should be prepared under conditions as similar as possible to those existing in the cellar; with respect to water, water temperature, composition, and time of rehydration before use.
- Different bentonite types Sodium bentonite, calcium bentonite or combinations are common. Calcium bentonites often require higher addition rates but are easy to hydrate and prepare and also result in quite compact bentonite lees and thus less wine loss. Extraction of calcium is possible into the wine so care should be taken to avoid calcium instabilities.

Carbon

- Preparation of 10 % w/v stock solution for laboratory fining trials: Add 10 mL of 96 % ethanol to about 80 mL of distilled water. Add 10 g of the appropriate carbon to this solution. Stir to prepare a thoroughly mixed slurry. Make to volume with distilled water in a 100 mL volumetric flask. Mix thoroughly.
- Conducting and assessing a laboratory trial: 1mL of the 10% w/v stock solution added to 100 mL of wine represents an addition rate of 1000 mg/L. Typical ranges to evaluate are 50 to 500 mg/L for odour removal and 100 to 2000 mg/L for color removal. Make sure the carbon slurry is mixed before each sampling. After addition of the carbon slurry, each addition rate (wine plus carbon) should be mixed about every 10 minutes over a 1 hour period. After 1 hour, filter each solution. The appropriate fining rate can be determined by sensory evaluation when carbon is used for odour removal. When carbon is used to remove colour or decrease pinking and browning, selection of the appropriate fining rate can be aided by the results of spectrophotometer readings, as well as by sensory evaluation.

Polyvinylpolypyrrolidone (PVPP)

- Preparation of 10 % w/v stock solution for laboratory fining trials: Add 10 mL of 96 % ethanol to about 80 mL of distilled water. Add 10 g of PVPP. Stir to prepare a thoroughly mixed slurry and make to volume with distilled water in a 100 mL volumetric flask. Mix thoroughly.
- Conducting and assessing a laboratory trial: 1 mL of the 10% w/v stock solution added to 100 mL of wine represents an addition rate of 1000 mg/L. Typical ranges to evaluate are 100 to 800 mg/L for white wines and 100 to 450 mg/L for red wines.
- When used to reduce astringency, the appropriate fining rate is determined by sensory evaluation. When PVPP is used to remove brown colour and pink colour, selection of the appropriate fining rate can be aided by the results of spectrophotometer readings, as well as by visual examination.

Self-Check – 5	Written test

Name…………………………………………… ID…………………………Date……

Directions: Answer the questions listed below.

I. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers.

LG #44	LO #2- Make additives and finings

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Adding additives and fining materials in quantities and sequence
- Operating the process to meet addition requirements
- Monitoring control points
- Identifying work hazards
- Making additives and fining
- Calibrating and monitoring equipment
- Identifying, rectifying and reporting out-of-specification
- Monitoring the Process using performance control chart, production data etc

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Add additives and fining materials in quantities and sequence
- Operate the process to meet addition requirements
- Monitor control points
- Identify work hazards
- Make additives and finings
- Calibrate and monitor equipment
- Identify, rectify and report out-of-specification

- Monitor the Process using performance control chart, production data etc

Learning Instructions:

10. Read the specific objectives of this Learning Guide.
11. Follow the instructions described below.
12. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
13. Accomplish the “Self-checks” which are placed following all information sheets.
14. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Adding additives and fining materials in quantities and sequence

In wine making there are steps to produce alcohol beverages by harvesting, crushing, macerating, pressing, fermentation, clarification, ageing and bottling from different types of wine grapes for different range of alcohol level, color, aroma and taste. These results depend on the type of wine grape variety, processing time, fermenter type (tanker), additives, finings agents. The alcohol production passes different treatments to get quality products by:

- Removing unwanted materials (color pigments ,protein)
- Improving taste
- Improving color
- Reducing the anti-nutritional factors

These additives, processing aids and fining agents are added in the sequence of wine processing steps from harvesting up the bottling to get hazard minimized wine products.

1.2 Adding SO2 (Potassium Metabisulfite)

One of the keys to a successful fermentation is removing any native wild yeast and bacteria from the must prior to adding special winemaking yeast. Wild yeast and bacteria can consume sugar from grape juice just as easily as special yeast can, but generally produce some pretty terrible flavors in the process. In addition, many wild yeasts are less tolerant to high alcohol levels, and may stop **fermentin**g before all of the sugars have been consumed, creating a "**stuck" fermentation**. If this happens, left-over sugar could be used as a food supply for any spoilage organisms present, and the wine will be compromised. Therefore, sulfite is added immediately after crush to "clean the slate" of these unwanted guests.

1. For good condition grapes, free of mold etc., add 50ppm (parts per million") of SO_2 based on the total volume of the must.

2. For grape with defect/ not in good condition, add more sulfite to counteract the presence of the mold and bacteria- up to 100ppm. However, be aware that levels of SO2 above 50 ppm will inhibit an MLF (Malolactic Fermentation) if you choose to do one. The 50ppm dosage rate at the time of the crush is usually fine.

Types of SO2

SO2 in 2 specific forms for addition to wine, Potassium Metabisulfite (most common) and Efferbaktol.

Potassium Metabisulfite is often shortened to “meta” “SO2” “Sulfite”, and comes in a white powder form. It can be dissolved into water and added to the must or finished wine. The second one sulfite is in the form of effervescent self-dissolving granules called Efferbaktol.

SO2 is also available from Campden tablets, which look like aspirin. Campden tablets are made from Sodium Metabisulfite, a less desirable form of SO2. However, they're easily measurable in small doses.

Efferbaktol packets: Sizes:

Available in 2g (AD503A), 5g (AD504A), and 10g (AD505B) packets. 2g adds 528ppm per gallon, 5g adds 1320ppm per gallon, and 10g adds 2640ppm per gallon. To add the right amount of SO2 to the fermenter using Efferbaktol, divide the ppm by your gallons of must to see how many ppm of SO2 will be added:

Let's take 10 gallons of must. The 2g packet offers 528ppm per gallon; divide 528ppm by 10 gallons to get 52.8ppm, close enough to our desired 50 ppm.

To use:

- Tear the bag open and add directly to the must or wine.
- Mix thoroughly.
- Easy and clean.

About Efferbaktol: It takes 2.5 grams of product weight to give 1 gram of SO_2. So, the 2 gram packet of Efferbaktol actually weighs 5 grams. This is useful to remember when dividing dosages between vessels while using a scale.

Once opened, should quickly use the entire contents of the package because it begins to lose its effectiveness when exposed to moisture in the ambient air. SO_2 in Powdered Form: Sizes: Available in 4oz (AD495), or 1lb (AD500) bags 0.33 grams per gallon results in 50ppm. For 10 gallons you would need 3.3 grams of powdered meta-bisulfite. If you do not have a gram scale, ½ teaspoon (level) is about 3.3 grams and adds 50ppm ("total") to 10 gallons.

To use: Dilute the sulfite powder **in water** or juice until the crystals are completely dissolved and thoroughly mix into the must

It's used as a general sanitizer at all stages of the winemaking process. Post-ferment, it also prevents the enzymatic browning of white wines and guards against premature oxidation in both reds and whites. It preserves freshness and color and it stabilizes a wine, thereby extending the shelf life of your labors. If a wine does not contain the required amount of SO2, chances are that it won't gracefully make it past one year in the bottle (depending on the pH)

Testing SO2

It is important to start this section with some information.

Potassium Metabisulfite ("Sulfite", "Meta", "SO2") (AD495) is used in winemaking in the post-crush/pre-inoculate stage for killing **unwanted bacteria and wild** yeast, thereby effectively creating a "clean slate" for the more desirable and SO2-tolerant cultured yeasts to get in and do their job. It's used as a general sanitizer at all stages of the winemaking process. Post-ferment, it also prevents the enzymatic browning of white wines and guards against premature oxidation in both reds and whites. It preserves freshness and colour and it stabilizes a wine, thereby extending the shelf life of your labors. If a wine does not contain the required amount of SO2, chances are that it won't gracefully make it past one year in the bottle (depending on the pH).

There are two forms of sulfite that you need to be aware of: **bound SO2 and free SO2**. When you make your SO2 addition, a portion of it binds with elements in the must or wine (acetaldehyde, yeast, bacteria, sugars, and oxygen) and is referred to as bound.

The unbound is referred to as free. It is this latter and it is only the free SO2 brings all of the benefits that wine both needs and deserves. The goal with SO2 additions is to try to use the least amount needed in order to attain a beneficial saturation level (0.8 ppm molecular SO2 for whites), while trying to avoid adding too much, which would flaw the wine by giving it a sulfite smell and/or taste.

Adjusting to this ideal level of SO_2 that will end up as free after you make your addition actually varies in direct relation to the pH of the must or wine.

In short, the higher the pH the more SO_2 will be needed, and conversely, the lower the pH the less SO_2 will be needed to attain the ideal level.

The Importance of Inert Gas

During aging, if a wine is not protected from both microbial spoilage and oxygen at all times it is likely to spoil. Protecting wine usually involves maintaining proper SO2 levels and keeping containers full. Additionally, purging your headspaces with inert gas to effectively remove the oxygen greatly increases the amount of protection. When it comes to using SO2, the benefits are widely understood and in-depth information describing its usage is readily available in most winemaking literature. It is important be aware that creating an effective blanket of gas to protect wine requires more than just shooting some Argon into the headspace of vessel until it feels right.

The need to control oxygen exposure:

Any space in a carboy, tank or barrel that is not occupied by liquid is filled with gas. The air around us is actually a mixture of gases, roughly 20% of which is oxygen.

A continuous exposure to oxygen is for storing most wines is not good. This is because when wine is exposed to oxygen a series of chemical changes takes place. If oxygen exposure is not controlled and extends over time, then the resulting changes often result in undesirable flaws such as:

- browning
- loss of freshness
- sherry-like aromas and flavors
- and volatile acidity production (“VA” or vinegar)

Since these unwanted reactions happen as a result of oxygen exposure, wines which exhibit these defects are described as oxidized. One of the key points to properly aging/storing wine is learning how to limit a wine’s exposure to oxygen so that it won’t become oxidized. This could easily be achieved by filling the storage vessel with the wine to the rim and therefore eliminating any headspace (as is the case when filling/topping-up barrels), but as we shall see in the next section this may not always be practical.

Expansion & contraction — the need for headspaces:

Unless you are in a situation with a guarantee of temperature stability, as with a glycol-jacketed tank, or a temperature-controlled storage area, tanks and carboys should have a small headspace kept at the top (note that barrels should not have any space in them when filled/ topped). This headspace is needed because it helps to compensate for the expansion and contraction of the liquid due to ambient temperature changes (remember things expand when heated and contract when cooled). Since gas compresses more readily than liquid, no significant additional pressure is exerted on the storage vessel if a little space is maintained at the top. This is why you see a ¼" space below a cork in a finished bottle of wine, and also why it is recommended to leave a 1" gap below the stopper in a sealed carboy. If the headspace is not present, as the temperature rises and the wine expands, the resulting pressure will not be mitigated by the gas' ability to compress and the full force of the liquid will push up against the lid/bung. Depending on how extreme the shift in temperature is and the volume of the wine, this pressure can be enough to either bow the lids of tanks outward and/or push bungs out entirely.

Making headspaces safe:

The answer lies in being able to replace the oxygen-containing air in the headspace with an inert gas, such as Nitrogen, Argon or CO_2. Unlike oxygen, these three gases do not react with wine to create any negative characteristics.

Of the three gasses, **Argon and CO_2** are actually heavier than air and winemakers can use this property to their advantage. When done correctly, purging headspaces (also referred to as flushing or sparging) with either Argon or CO_2 can remove oxygen by lifting it up and carrying it out of the storage vessel, much like the way oil floats on the surface of water. Inert gas will have effectively displaced the oxygen in the vessel and the wine can now be safely held during its aging/ storage period with no ill effects. The trick to successfully achieving this level of protection lies in understanding the techniques needed to effectively create this blanket.

Note: Nitrogen is lighter than air. While it is perfectly safe for use in winemaking from a non-reactivity point of view, unless you are using a sealed tank that will never be opened during the wine's storage, the fact that it will not act as a protective blanket makes it a poor choice for purging headspaces.

The 3 recommended steps for creating a protective blanket of inert gas:

1. Avoid turbulence to maintain purity: The key to creating an effective blanket with CO_2 or Argon lies in understanding a basic physical property of gases: they readily mix with each other when agitated. When purging headspaces with inert gas, the flow rate of the gas as it exits the tubing will determine the make-up/ purity of the final volume of gas that you will end up with. Higher flow rates create a churning effect that actually causes the inert gas to mix with the ambient air (which contains oxygen).
2. The diameter of the tubing will determine how fast you can safely flow your gas: To achieve the highest volume of gas that can be delivered while maintaining the low-turbulence flow rate needed to avoid mixing the gas with the air we are trying to get rid of. Any size tubing can be used to deliver an effective blanket of inert gas; the amount of time it takes will increase as the diameter of the delivery tubing decreases. To

illustrate this, let's take a look at two different scenarios using an analogy of filling a bucket with a garden hose.

- For the first example, the spigot turned on and the water is flowing freely out of the end of the hose. Large volume of water is being delivered, the stream only travels a few feet before it hits the ground. We have a large amount of water being delivered under low turbulence/force. If we were filling a bucket, then we could do so quickly and with little splashing.
- Second scenario, without increasing the flow-rate at the spigot, if we partially cover the open end of this same hose with our thumb, the stream now becomes forceful enough to shoot across the yard. Filling our bucket in this style would generate quite a bit of unwanted splashing/turbulence and in order to avoid this we are forced to turn down the flow-rate. As a result, the time it takes to fill our bucket has just become longer than it was without our thumb over the opening of the hose.

From these two examples speed up the sparging process without compromising the gentle flow needed to create an effective blanket, we should look to expand the diameter of the output tubing. This can be done by simply attaching a small length of a larger diameter tube to the existing gas line that is running from your regulator.

Figure. Hose

3. Laminar is best: Instead of aiming the flow of gas directly at the surface of the wine, the best way to deliver it with the least amount of turbulence is to have it flow parallel to the surface of the wine, or laminar. This way, the inert gas will be less likely to churn-up and mix with the ambient air on delivery, because it will not "bounce" off the surface of the liquid. The gas will behave more like fog rolling over a landscape- creating a nice, thick, pure blanket of protection over the wine.

Note: CO2 is only to be used for a non-pressurized headspace. If you will be using gas to push the wine, such as in filtration, serving from a keg, etc., you will want to use Nitrogen or Argon. The reason for this is that CO2 will go into solution under low pressures and the other gasses will not. In other words, if you use CO2, you could inadvertently carbonate your wine! On the other hand, if that was what you were after, this would be a perfect way to do sparkling wines for the home wine-maker!

Gelatine

Addition in the cellar the temperature of the wine should be about 10°C. The liquid form of gelatine can be added directly to the wine. Accurately measure out the required volume. Add the liquid to the wine slowly and with thorough but gentle mixing. Allow a few days for settling, then rack or earth filter. **White** juices and wines are 15 to 120 mg/L, whilst red wines are 30 to 240 mg/L.

Isinglass

Addition in the cellar. The temperature of the wine should be about 10°C. Prepare a 0.5 % w/v solution by weighing out the required amount of isinglass and dissolving in an adequate volume of water. Mix and ensure the isinglass is well dispersed. Add this solution slowly and with thorough but gentle mixing to the wine. Allow a few days for settling, then rack or earth filter. White wines are 10 to 100 mg/L and if used for light red wines 30 to 150 mg/L

Egg white (egg albumen)

Addition in the cellar the temperature of the wine should be about 10°C. Combine the required number of egg whites in a suitable size beaker, add 10 times the weight of distilled water adjusted to pH 7 and stir gently. Note that potassium chloride is not an allowed additive and thus cannot be used in the preparation in the cellar. Add this mixture slowly and with thorough but gentle mixing to the wine. Allow about a week for settling, then rack or earth filter. A small amount of foam might appear on the top of the wine which can be skimmed off or gently stirred into the wine. The egg white solution must be prepared fresh and used on the same day. Egg white is also available in dried and frozen form, however fresh egg whites tend to give the best result. As a guide, the number of egg whites added to 225 L of wine can vary from 2 to 8.

Casein.

Addition in the cellar the temperature of the wine should be about 10°C. Accurately weigh out the required amount of potassium caseinate or casein and dissolve in a minimal volume of distilled water. Add the solution slowly to the wine and mix in immediately. Rack or earth filter after about a week. Typically for white wine (range 50 to 250 mg/L)

Skim milk

Addition in the cellar the temperature of the wine should be about 10°C. Accurately measure out the required volume of milk. Add the milk slowly, and with thorough but gentle mixing, to the wine. Allow a few days for settling then rack or earth filter. Range between 0.4 and 2.0 mL to 100 mL wine

Bentonite

Addition in the cellar Weigh out the required amount of carbon. It can be added to the wine by direct addition of the powder or as a slurry, with thorough mixing. Allow a few days for settling, then earth or pad filter. Decrease browning or pinking in white wines and to remove colour from red wines and range of addition ange 50 to 500 mg/L for odour removal and 100 to 2000 mg/L for colour removal.

Polyvinylpolypyrrolidone (PVPP)

Addition in the cellar accurately weigh out the required amount of PVPP and make a slurry with minimal volume of distilled water. Add the slurry slowly with mixing to the wine, allow a few days for settling, then earth or pad filter. Ranges to evaluate are 100 to 800 mg/L for white wines and 100 to 450 mg/L for red wines.

Self-check -1	Written test

Name………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Information Sheet 2- Operating the process to meet addition requirements

Dosing System include:

It increases the accuracy of dosing as it is computer controlled. It is a Continuous Process that can operate 24/7. It does not require any labour component other than operation of the control panel. Password protected control panel ensures that addition levels are not changed by unauthorised personnel. All additions and flows are monitored and recorded for tracking and traceability. There is No Stratification within the tank of dosed additives as they are added continuously as the wine is passed to the tank. There is no wastage of wine due to human error or wastage of additives as system accuracy is preserved by the operator panel. Alarm and safety measures programmed into the control panel prevent inaccurate dosing. In case of errors or low volume levels the system pauses, alarms and waits for operator commands. Easier CIP through automation of tank and line cleaning. Wine personnel can be used on other tasks. In-Line analytical instruments are available for direct feedback of some components.

Table 4. Additives and specifications

Additives	Specifications
Ascorbic acid	GMP
Carbon dioxide	GMP
Citric acid	GMP
Malic acid	GMP
Dimethyl dicarbonate	200mg/L
Erythorbic acid	GMP
Grape juice extract	GMP
Gum Arabic	GMP
Lactic acid	GMP
Malic acid	GMP
Meta tartaric acid	GMP
Potassium – sorbate acid	200ml/L
Sodium carboxy methylcellulose	GMP
Sulfur dioxide : <35 mg/L	250 mg/L
>35 mg/L	300mg/L

Fig 12 .Screen shots from Bentonite Dosing System

Self-check - 2	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

Information Sheet 3 - Monitoring control points

1.1 Hazard analysis critical control point (HACCP) is a systematic preventive approach to food safety that identifies physical, allergenic, chemical, and biological hazards in production processes that can cause the finished product to be unsafe, and designs measurements to reduce these risks to a safe level. In this manner, HACCP is referred to as the prevention of hazards rather than finished product inspection.
It is a proactive management system that can be utilized by winemakers and grape growers to help assure product quality control from the vineyard to the glass, through the identification and monitoring of the Critical Control Points during each production step.

Critical Control Point (CCP) is a point, step or procedure at which controls can be applied and a safety hazard can be prevented, eliminated or reduced to acceptable (critical) levels. Furthermore, HACCP requires the maintenance of records and reports generated during the monitoring of the Critical Control Point. And finally, the effectiveness of the CCP monitoring process needs to be verified periodically

HACCP-like plans are developed to fit the wine industry's need to integrate chemical, physical, microbiological, and sensorial analyses into quality and stylistic control programs. Such plans are designed to identify where Critical Control Points (junctures in processing, crucial to quality and stylistic success) occur, and establish monitoring and verification measures to ensure compliance with standard operating procedures. Typical HACCP plans include seven steps:

1. Creating a processing flow diagram from vine to bottle, and beyond.

2. Identifying the critical control points (CCPs) at each step in the process.

3. Establishing critical limits (CLs) for each analysis to be conducted.

4. Developing a monitoring procedure for each CCP.

5. Establishing a plan for corrective action when CCPs are not met. 6. Establishing a record system to document corrective steps taken.

7. Developing a verification plan for all analyses. Wine industry HACCP-like plans begin with establishing a processing flowchart or diagram that starts in the vineyard and ends with movement of wine through the distribution network to the consumer. At each step, CCPs are identified and ranked in terms of their importance, and a corresponding list of analytical control measures is established. Each CCP is examined and evaluated using chemical, physical, microbiological and/or sensorial methods. Results are assessed at specific time intervals to

determine if additional steps or corrective steps are required. HACCP allows growers and winemakers to customize a quality management system tailored entirely to specific needs and to production practices and philosophy. The following examples address typical vineyard and winery production concerns in the context of a HAACP-like program.

Viticultural HACCP-Like Plans

Viticultural HACCP plans can be written in general, or can be created to focus on specific grape growing or winemaking issues. HACCP plans are used to determine CCPs, establish limits for each, develop a monitoring system, plan for corrective action, and record and verify assessments. Examples of viticultural CCPs include the following:

- vine balance
- shoot density
- crop to pruning-weight ratio
- canopy microclimate
- fruit exposure
- training and trellising system
- vineyard uniformity

Variability between berries, clusters, and vines may impact wine quality. If ten berries develop at different rates, each will reach optimum quality potential at a slightly different time. Since the overall quality of the juice is simply the average of all ten berries, asynchronous berry development may result in a reduction in overall quality.

A CCP may be the degree of uniform vegetative growth and fruit development that can be influenced by pruning, the degree of shoot uniformity, irrigation, etc. HACCP planning helps to define acceptable uniformity. It also helps determine sources of variation and can be used to create a management strategy for variation. Although variation between berries is poorly understood, it has a large potential impact on grape and wine quality. Variables include berry size, composition, seed number and size, and berry position. The importance of these issues is seen in vine-to-vine variability in a “uniform” vineyard as a percentage of coefficient of variation:

- Brix 4-5%
- pH 3-4 %
- berry weight 6-20%
- color 13-18%

Principle 1: To Conduct a Hazard Analysis

Hazards divided into three groups: microbiological, chemical, and physical. From a microbiological point of view, no human pathogenic bacteria, fungi, or virus can successfully develop in wine due to its ethanol content. However, some micro-organisms that commonly appear in wine or grapes, such as lactic bacteria or fungi, are able to produce some potentially dangerous compounds, such **as biogenic amines**, ochratoxin A, or ethyl carbamate. These compounds constitute the main health hazards of microbiological origin in the wine industry. The main chemical hazards are the **pesticides** used in the vineyard to protect the plant and grapes from diseases produced by fungi. Migrations emanating from the packaging or containers where the wine is stored or manipulated are also chemical problems. Some **fining** agents that, on occasion, can be potential allergen compounds for specific groups of people are used to fine the wine in order to reduce the initial turbidity.

Additives that can stabilize wine against micro-organism spoilage or against spoilage processes, such as oxidation, in over dosage can also produce health risks e.g. SO_2. The main physical hazards in the winemaking process are remains of machinery particles that can end up in the wine and glass particles from deteriorated bottles in which the final wine is stored.

Principle 2: To Determine the Critical Control Points

After conducting a study of all the possible hazards and their potential detriment to health and the probability of occurrence, we must establish how to control these risks. Critical control points (CCPs) are phases in the food process where it is essential to control some parameter that can prevent or eliminate the potential food safety hazard or reduce it to an acceptable level. Example, grapes row material, the best moment to control it is before processing so as to make it easier to isolate the source.

Principle 3: To Establish Critical Limits

Once it has been established where a hazard is going to be controlled, we must establish a criterion that allows for differentiating between what is acceptable and what is not. That criterion is defined according to a critical limit. Most of the time, critical limits are established according to the legal limits defined by legislation, such as that pertaining to **histamine, ochratoxin A, ethyl carbamate, or legalized additives**.

Principle 4: To Establish a Monitoring System

Once the stage where we have to control a hazard and its critical limit have been established, we must establish the kind of control to use, its frequency, and the qualified responsible person to use it.

These controls are usually analyses that are fast and economical but allow for very quick decision-making.

It is very common to use semi-quantitative methodologies that are not the official methods and are usually expensive and require specific equipment not commonly available from every winery. The official methods are commonly used in HACCP Principle 6.

Principle 5: To Establish Corrective Actions

When a deviation from the established critical limits occurs, a corrective action must be performed in order to restore the control and avoid potentially dangerous wine reaching the consumer. The most drastically corrective action is to eliminate the product. Nevertheless, several other options permit removing the hazard or procuring a secondary product less valuable but with a residual economical value.

The principle also proposes to review the cause of the mistake or the imprecise action that generated the deviation in order to correct the procedure.

Principle 6: To Establish Verification Procedures

Hazard analysis and critical control point (HACCP) verification is defined as those activities, other than monitoring, that establish the validity of the HACCP plan and ensure that the HACCP system is operating according to the plan. Verification is done to determine whether the HACCP plan is being implemented properly, whether practices used are consistent with the HACCP plan, whether the HACCP system is working to control significant hazards, and whether modifications of the HACCP plan are required to reduce the risk of recurrence of deviations.

In winemaking, to verify the success and correct implementation of control measures in most cases based on fast and semi-quantitative analyses, the most common procedure is to perform periodic checks using the official methodology. For that reason, it is very common to perform the verification analyses in accredited laboratories that possess advanced equipment, such as HPLC or GC/MS, and qualified professionals to run them.

Principle 7: To establish documentation concerning all procedures and records that are appropriate to these principles and their applications

A HACCP manual must be written. It describes the methodologies to follow in the HACCP system and how to apply them to this specific industry. It also describes:

- Potential hazards and their effect on human health
- critical control points
- critical limits,
- corrective actions

- control measures
- and verification measures.

The manual also keeps records of all performed operations in order to help produce safe products.

The main purpose of this review is to show wine manufacturers the main hazards in the wine industry and how to manage them according to HACCP theories.

1.2 A **programmable logic controller (PLC**) is a small, modular solid state computer with customized instructions for performing a particular task. PLCs, which are used in industrial control systems (ICS) for a wide variety of industries, have largely replaced mechanical relays, drum sequencers and cam timer PLCs are useful tools for repeatable processes because they have no mechanical parts and they can gather information. Each central processor unit (CPU) continually loops through an input scan, program scan, output scan and housekeeping mode, repetitively performing a single task while monitoring conditions.

The information the controller gathers can be used as feedback to guide needed changes and improvements to processes, some of which can be performed automatically according to the device's coding.

PLCs take up less space, perform more complex tasks and are more customizable than the mechanical technologies they have replaced. They are known for their ability to operate continuously without maintenance and have had a great impact on digitizing a great many industries, particularly manufacturing.

The structure and features of programmable logic controller programmable logic controllers (PLCs) have been used in industry in one form or another for the past twenty over years.

The PLC is designed as a replacement for the hardwired relay and timer logic to be found in traditional control panels, where PLC provides ease and flexibility of control based on programming and executing logic instructions. The internal functions such as timers, counters and shift registers making sophisticated control possible using even the smallest PLC. The structure of a PLC can be divided into four parts. They are input/output modules, central processing unit (CPU), memory and programming terminal.

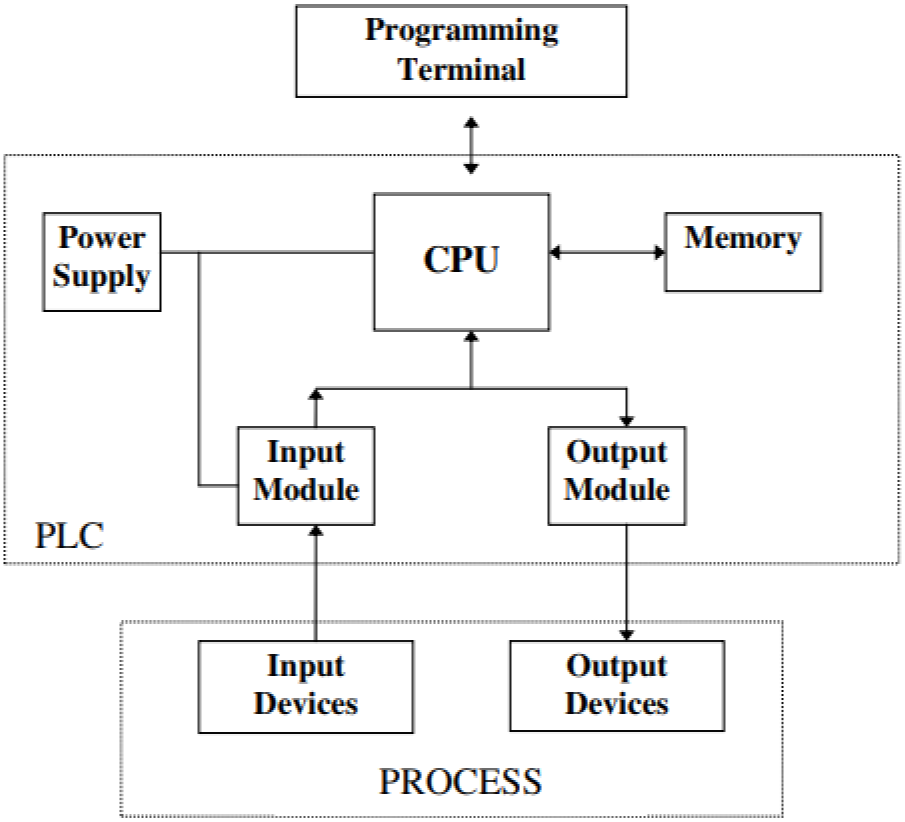

Figure 13. Programmable logic controller (PLC) structure

A programmable controller operates by examining the input signals from a process and carrying out logic instructions (which have been programmed into its memory) on these input signals, producing output signals to drive process equipment or machinery. Standard interfaces built-in to PLC allow them to be directly connected to process actuators and transducers without the need for intermediate circuitry or relays.

PLCs require shorter installation and commissioning times than do hard-wired systems. Although PLCs are similar to 'conventional' computers in term of hardware technology, they have specific features suited for industrial control:

(a) Rugged, noise immune equipment;

(b) Modular plug-in construction, allowing easy replacement or addition of units (e.g. input/output);

(c) Standard input/output connections and signal levels;

(d) Easily understood programming language;

(e) Ease of programming and reprogramming in-plant;

(f) Capable of communicating with other PLCs, computers and intelligent devices;

(g) Competitive in both cost and space occupied with relay and solid-state logic systems; These features make programmable controllers highly desirable in a wide variety of industrial-plant and process-control situations.

Self-Check – 3	Written test

Name…………………………………………… ID……………………….Date……

Directions: Answer the questions listed below.

I. Choose the best answer

1. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers

Information Sheet 4- Identify work hazards

1.1 Introduction

Wine industry workers have a number of specific health risks associated with their occupation. Viticulture workers are at risk of work-related musculoskeletal problems, especially of the wrists and hands, from vine **pruning work,** and can develop allergic diseases, including occupational asthma, from exposure to insect pests growing on vines.

They may also be at risk of illness from exposure to the many classes of pesticides used to keep vine pests in check. Wine production workers also face health risks. The most serious of these—working in confined spaces with low oxygen and high carbon dioxide levels—can cause death. Winemakers and wine tasters may suffer significant **dental erosions and sensitivity** as a result of the acidic nature of the wines they need to taste numerous times a day. This problem can seriously affect their ability to practise their profession. While work-related injuries are more commonly reported than **work-related diseases** in the wine industry, physicians assessing the medical problems of wine industry workers should be aware of the occupational health risks faced by these individuals

Types of hazards

- Confined space
- Hot work
- Hazardous manual tasks
- Plant and machinery
- Hazardous chemicals
- Electrical
- Noise
- Fatigue
- Risks of falls
- Exposure to extremes of temperature and cold
- hit by moving objects
- Traffic management
- Visitor and customer access

Table 4 – Examples of different types of hazards which may exist within wineries

Type of hazard	Potential harm
Manual tasks	Overexertion or repetitive movement can cause muscular strain
Gravity	Falling objects, falls, slips and trips of people can cause fractures, bruises, lacerations, dislocations, concussion, permanent injuries or death
Electricity	Potential ignition source. Exposure to live electrical conductors may result in electrical shock, burns or death from electrocution
Machinery and equipment	Being hit by moving vehicles, or being caught by moving parts of machinery can cause fractures, bruises, lacerations, dislocations, permanent injuries or death
Hazardous chemicals	Chemicals such as anhydrous ammonia (irritant corrosive) can skin, eyes, respiratory tract; chemical burns, carbon dioxide (Asphyxiant) affects respiratory/nervous system, sulphur dioxide affects and causes irritation of the eyes and the respiratory tract.
Extreme temperatures	Heat can cause burns, heat stroke or fatigue. Cold can cause hypothermia
Noise	Exposure to hazardous noise can cause noise induced hearing loss
Radiation	Ultra violet, welding arc flashes, micro waves and lasers can cause burns, cancer or blindness
Biological	Micro-organisms can cause hepatitis
Psychosocial hazards	work related fatigue
Glass/products	Lacerations from handling of broken glass materials/products

Workers in vineyards and wineries can be exposed to a number of hazards, including toxic pesticides and low-oxygen environments.

The wine industry has become more sophisticated over the years and has seen improvements in product quality and competitiveness.

Viticulture workers

Workers in vineyards run the risk of the same accidental injuries faced by all agriculture workers. They are also exposed to the same hazards associated with outdoor work, such as noisy machinery, insects, snakes, inclement weather, solar radiation, and thermal stress. In addition, viticulture workers are at risk of musculoskeletal disorders, asthma caused by mite exposure, and illness caused by pesticide exposure.

Musculoskeletal disorders

While tending vineyards, viticulture workers do a variety of highly repetitive tasks that predispose them to developing work-related musculoskeletal disorders, including back and neck strains as well as a variety of tendinopathies and neuropathies of the upper extremities. Pruning vines can produce significant biomechanical strains because of the repetitive actions, forceful motions, and awkward postures required

Workers generally have to make more than 30 cuts per minute, many hours a day, for many weeks during the growing season.

Spider mites (e.g., Tetranychus mcdanieli) are acarids that commonly infest fruit trees, greenhouse plants, and grape vines. They may occur in high numbers in vineyards, causing damage to the plants and reducing grape production by sucking on the leaves and buds. Spider mites can also cause allergic diseases in workers, including dermatitis and urticaria, conjunctivitis, rhinitis, and asthma. Cross-reactions with other ubiquitous acarids, such as the common house dust mite and the storage mite, have been reported. With workplace exposure, some affected individuals may have exacerbations of their underlying allergic diathesis.

Illness caused by pesticide exposure

A variety of pesticides are used to control pests including organophosphates, carbamates, organochlorines, pyrethroids, fungicides, and herbicides

Each pesticide group has its own specific toxicity profile. The most important routes of occupational exposure are inhalation and dermal absorption. Ingestion is less typical. All workers who handle pesticides or are near areas of pesticide application risk exposure and illness. Most pesticides can cause a variety of dermatoses, including irritant and allergic contact dermatitis

Re-entry into a sprayed field too soon after application may result in unwanted exposure. As a general rule, re-entry should be restricted to 24 to 48 hours after spraying, depending on the inherent toxicity of the pesticide. Manufacturer recommendations should be followed.

Organophosphates: These compounds irreversibly bind and inactivate acetylcholinesterase, thus inhibiting the breakdown of acetylcholine at nerve synapses and muscle neural end-plates, and inducing a hypercholinergic state.

In addition to inhalation, dermal absorption is an important route of occupational exposure for many organophosphates. The severity of signs and symptoms of acute exposure depends on the absorbed dose. Signs and symptoms may include myosis, blurred vision, headache, nausea, dizziness, sweating, salivation, lacrimation, rhinorrhea, bronchorrhea, bronchospasm, chest tightness, cough, wheezing, pulmonary edema, vomiting, abdominal cramps, diarrhea, muscle fasciculation, weakness, tremors, incoordination, anxiety, restlessness, depression, memory loss, confusion, bizarre behavior, loss of consciousness, incontinence, convulsions, respiratory depression, toxic cardiomyopathy, and bradycardia. Death can result from respiratory failure and **sinus arrest**.

After the resolution of the acute symptoms, the intermediate syndrome occurs, typically 24 to 96 hours (1 to 4 days) after exposure. This manifests as respiratory paresis and muscular weakness, particularly of facial and neck muscles as well as those of the proximal limbs. Cranial nerve palsy and decreased deep tendon reflexes can occur.

Carbamates: The toxicity profile of carbamates resembles that of organophosphates. Like organophosphates, carbamates also inhibit acetylcholinesterases. However, this is a reversible process and carbamate exposure generally tends to have less severe and less prolonged effects than organophosphate exposure.

Cancer risk associated with this class of pesticides is believed to be related to co-exposure with dioxin-contaminated herbicides.

Fungicides: The most commonly used fungicides in vineyards consist of the various sulfur preparations. Sulfur can be irritating to the skin, eyes, and respiratory tract.

Fungicides such as benomyl and iprodine have little or no reported systemic toxicity in humans. Benomyl may cause photoallergic dermatitis.

Copper-containing fungicides can be irritating to the skin, the respiratory tract, and especially the eyes. Copper sulfate can be corrosive to mucous membranes and the cornea. With chronic exposure, a mixture of copper sulfate and lime known as “Bordeaux mixture” can cause “vineyard sprayer’s lung,” a granulomatous fibrosing lung disease.

Herbicides: Most herbicides specifically affect plant metabolism and therefore tend to have low toxicity profiles for mammals. Glyphosate can cause photodermatitis.

Paraquat, a nonselective contact herbicide sometimes used in vineyards, can be highly toxic if improperly used.

Paraquat is poorly absorbed by inhalation. Paraquat exposure occurs primarily from ingestion (accidental or purposeful) or dermal absorption though damaged skin. The primary target organ is the lung. Following systemic absorption, paraquat accumulates in pneumocytes causing oxidative damage to the lungs. Death commonly follows from circulatory failure or in a week or two from pulmonary damage and fibrosis. Paraquat can cause skin irritation and contact dermatitis, as well as nail damage and loss.

Wine production workers

Individuals working in the quality-control laboratories of wineries are frequently exposed to small quantities of toxic chemicals. Wine production workers may be exposed to small quantities of chemical additives in the making of wine. They may also be exposed to chemical products used to clean and sterilize winemaking equipment. The substances are often caustic and irritating to the skin, mucous membranes, and respiratory tract. Some of the additives, such as sulfites and metabisulfites can result in allergic reactions, including occupational asthma.

Adequate ventilation, the use of fume hoods, and personal protective equipment can generally reduce the risk from these types of exposures.

Confined space risks

One of the most serious occupational risks faced by wine production workers involves working in a confined space.

Avoidable fatalities have occurred too many times because appropriate safety measures and procedures were ignored.

Confined spaces are defined as enclosed or partially enclosed areas with restrictive means of entry.

In the wine industry these consist mainly of storage and fermentation tanks.

Hypoxic environments frequently occur in these tanks as a result of the biologic activity of fermenting wines.

The hemoglobin saturation and the oxygen content of blood can decline very rapidly at low atmospheric oxygen concentrations.

Entry into these areas without adequate respiratory protection, including supplied air, can result in rapid hypoxemia with decreased exercise capacity and mentation ability.

Loss of consciousness, apnea, and cardiac standstill can occur quickly in an atmosphere of less than 6% oxygen.

In addition to creating a low-oxygen environment, wine fermentation can produce large quantities of carbon dioxide, which can then attain very high concentrations in a confined space.

Dental erosions

Decalcification of human teeth can occur with repeated exposure to acidic solutions such as fruit juices and carbonated soft drinks, or with frequent emesis and regurgitation as seen among alcoholics and bulimics. Demineralization of enamel commences at a pH of less than 5.7.

Wines contain approximately 5 to 8 g/L of tartaric and malic acids, 1 to 3 g/L of lactic acid, and smaller amounts of other acids, including succinate and citrate. The pH of wines ranges from 3.2 to 3.8. Winemakers may do 5 to 50 tastings per day, holding and swirling each wine in the mouth for approximately 15 seconds at a time for adequate degustation. A winemaker will typically taste thousands of wines in his or her career.

The affected individual typically complains of a sore mouth with general discomfort of the teeth, especially when consuming anything cold. Examination reveals extensive and widespread erosion. Without treatment, this problem can seriously hamper the individual's livelihood and dental consultation is advisable. Application of topical fluoride may reduce erosion. Frequent rinsing with an alkaline solution or other solutions can help neutralize the acidity. For obvious reasons any treatment should not interfere with the individual's sense of taste.

Self-check - 4	Written test

Name………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Information Sheet 5- Calibrate and monitor equipment

Calibration of an instrument is the process of determining its accuracy. The process involves obtaining a reading from the instrument and measuring its variation from the reading obtained from a standard instrument. Calibration of an instrument also involves adjusting its precision and accuracy so that its readings come in accordance with the established standard.

Equipment Calibration

Calibration of equipment needs to be carried out on a regular basis. This is because instruments tend to deviate owing to hard operating conditions, mechanical shocks or exposure to extreme temperature or pressure. Frequency of calibration would depend on the tolerance level. When the objective of the measurement is critical calibration would need to be carried out more frequently and with great accuracy.

To assure accuracy in instrument calibration, it is vital to ensure that each component of the measuring instrument is conforming to its specified standard. Regular equipment calibration carried out in a set format helps you obtain valid data and operate in a safe working environment.

Types of Calibration

Instrument calibration can be carried out on different types of instruments across sectors..

Pressure Calibration

This is one of the most frequently performed types of equipment calibration. Under pressure calibration service gas and hydraulic pressure are typically measured across a variety of sectors. Various types of pressure balances and calibrators along with a number of pressure gages are used for carrying out pressure calibration. For the purpose of pressure calibration, it is vital that ISO 17025 UKAS accreditation and national standards be adhered to when performing pressure calibration. Pressure instruments that are frequently calibrated include:

- Analogue Pressure Gauges
- Barometers
- Digital Indicators

- Digital Pressure Gauges
- Test Gauges
- Transmitters

Temperature calibration

Temperature calibration is carried out in all processes where temperature readings play a critical role. Temperature calibration is carried out in a controlled environment. State-of-the-art electrical and mechanical thermometers are available that can help in the process of temperature calibration. Temperature measuring equipments that require calibration on a periodic basis include:

- Chambers/furnaces
- Data acquisition systems
- Dial thermometers
- Infrared meters

Flow calibration

Flow calibration services needs to be carried out on a routine basis for flow meters that check product or feedstock quality and quantity function in a critical process. The four main types of flow meters that frequently require calibration include:

- Laminar flow meters
- Roto meters – gas and air
- Thermal Mass flowmeters
- Turbine Meters

Pipette calibration

Pipette calibration is essential for laboratories that frequently make use of this measuring instrument. Various types of pipettes are being used in the laboratories such as single-channel and multi-channel manual pipettes and electronic pipettes. Pipette calibration needs to follow several aspects of calibration process and protocols. When carrying out pipette calibration accuracy and precision of liquid volume, operator training application besides other factors should be carefully considered.

Electrical calibration

Electrical calibration is required for checking the veracity of electrical instruments across a diverse range of industries. Under electrical calibration elements such as current frequency, resistance and voltage are checked. Ensure that calibration process has been carried out under UKAS accredited standards as it is considered the most credible way. Instruments that are frequently sent for electrical calibration include:

- Clamp Meters
- Counter timers
- Data Loggers
- Electrical meters
- Insulation Testers
- Loop Testers
- Multi-meters
- Oscilloscopes

Mechanical calibration

Mechanical calibration services are invoked for a range of mechanical instruments. Under this process a number of elements such as mass, force, dimension, angle, volume, flatness, torque and vibration are calibrated in a temperature controlled facility. Some of the most frequently tested instruments for mechanical calibration include:

- Micrometers, Verniers, Height Gauges
- Scales/balances
- Weight & mass sets

Process

The exact process of equipment calibration shall vary according to the type of instrument, how critical its role is in the operation and standards that are followed for the calibration purpose. Mentioned below is a typical process that needs to be followed for equipment calibration.

- **Attention given to the instrument design:** When carrying out calibration, special attention should be given to the design of the instrument which is to be calibrated.
- **Follow instructions:** Instructions specified for carrying out equipment calibration should be followed closely. Deviation from instruction or use of wrong calibrator value may result in accuracy.

- **Check tolerance value:** Tolerance value of the instrument should be taken in regard. It may be noted that every calibrator has a particular tolerance level this is due to the normal variations in the instrumentation and quality control process. The tolerance level will vary according to several factors including the industry sector and even the country in which the calibration process is to be carried out.
- **Accuracy ratio:** Maintaining accuracy ratio is also critical in a calibration process. This describes the accuracy of the test standard in comparison to the accuracy of the instrument which is to be calibrated. Ensuring at least 4:1 accuracy ratio is essential. This suggests that the accuracy of the standard should be at least four times greater that the instrument which is to be calculated.
- **Adhering to standards:** Adhering to internationally recognized standards is vital. Hence when calibrating equipment, all standard procedures established under nationally or internationally recognized standards need to be followed.
- **Make uncertainty analysis:** Uncertainty analysis is to be taken at the end of the calibration process. This helps to evaluate any factor that may have affected the results of calibration.

Need of equipment calibration

All measuring instruments, whether they are used in factories, laboratories or at home, need to be calibrated on a periodic basis to ensure they are offering accurate results. However, in factories and laboratories, measurement results are usually of a critical value. Deviation from accuracy can not only affect productivity but also cause threat to the life of workers. Hence, it is imperative that instrument calibration be carried out carefully and at regular intervals.

Figure.14. Bios definer

Figure 15 . Delta cal

Figure 16. ECO-HTO

figure.17 Gas diluters & dividers

Self-Check – 5	Written test

Name…………………………………………… ID………………………….Date……

Directions: Answer the questions listed below.

I. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

Information Sheet 6- Identify, rectify and report out-of-specification

When we are saying out of specification product, a product which is deviated from tolerable qualitative and quantitative level. But any product should fulfill at least minimum level of a standard. Out of specification product can also be known as nonconformance product.

5.1. Monitoring the process and equipment operation to identify out-of-specification results or non-compliance. This may involve monitoring:

- pressing effectiveness
- dosage of additions
- product loss
- dilution
- oxidation
- speed of mixing

- free run quality and flow
- pressings quality and flow
- relevant product characteristics (solids content and press fractions)

5.2. systems for Rectifying and Reporting nonconformance product

Corrective and preventive action (**CAPA**, also called corrective action/preventive action or simply corrective action) consists of improvements to an organization's processes taken to eliminate causes of non conformities or other undesirable situations. It is usually a set of actions that laws or regulations require an organization to take in manufacturing, documentation, procedures, or systems to rectify and eliminate recurring nonperformance. Non-conformance is identified after systematic evaluation and analysis of the root cause of the non-conformance.

5.2.1. Non-conformance may be:

- failure of Machinery
- quality management system
- Misinterpretation of written instructions to carry out a work.

The corrective and preventive action is designed by a team that includes quality assurance personnel and personnel involved in the actual observation point of nonconformance. It must be systematically implemented and observed for its ability to eliminate further recurrence of such non-conformation.

5.2.2. Corrective action and preventive action (CAPA)

It focuses on the systematic investigation of the root causes of identified problems or identified risks in an attempt to prevent their recurrence (for corrective action) or to prevent occurrence (for preventive action).Corrective actions are implemented in response to customer complaints, unacceptable levels of product non-conformance, issues identified during an internal audit, as well as adverse or unstable trends in product and process monitoring such as would be identified by statistical Process Control (SPC).

Preventive actions are implemented in response to the identification of potential sources of non-conformity.

To ensure that corrective and preventive actions are effective, the systematic investigation of the root causes of failure is pivotal.

CAPA (preventive action and corrective action) is part of the overall Quality Management System (QMS).

1.2. Clearly identified sources of data that identify problems to investigate

Root cause analysis that identifies the cause of a discrepancy or deviation, and suggest corrective actions. A common misconception is that the purpose of a preventive action is to avert the occurrence of a similar potential problem. This process is all part of corrective action, because it is a process of determining such similarities that should take place in the event of a discrepancy. Preventive action is any proactive methodology used to determine potential discrepancies before they occur and to ensure that they do not happen (thereby including, for example, preventive maintenance, management review or other common forms of risk avoidance).

Corrective and preventive actions both include stages for investigation, action, review, and further action if required. It can be seen that both fit into the PDCA (Plan-Do-Check-Act) philosophy as determined by the "Deming-Shewhart "cycle.

Investigations to root cause may conclude that no corrective or preventive actions are required, and additionally may suggest simple corrections to a problem with no identified systemic root cause. When multiple investigations end in no corrective action, a new problem statement with expanded scope may be generated, and a more thorough investigation to root cause performed.

Implementation of corrective and preventive actions is the path towards improvement and effectiveness of Quality Management Systems. Corrective actions are nothing but the action/actions based on the problem identification.

The problem or a non-conformance can be identified internally through staff suggestions, management reviews, document reviews or internal audits. External leads to finding the root cause of the problem can include:

Customer complaints/suggestions; customer rejections; non-conformities raised in customer/third-party audits; recommendations by auditors.

A root cause is the identification of the source of the problem where the person(s), system, process, or external factor is identified as the cause of the non-conformity. The root cause analysis can be done via 5 times Whys

Corrective action is the re-work/rectification activity of the non-conforming products as per ISO 9001:2008 (8.5.2).

Preventive action includes the prediction of problems and attempts to avoid such occurrences (fail safe) through self-initiated actions and analysis related to the processes/products.

This can be initiated with the help of an active participation by staff members/workers through improvement teams, improvement meetings, opportunities for improvement during internal audits, management review, customer feedback and deciding own goals quantized in terms of business growth, reducing rejections, utilizing the equipment effectively, etc.

1.3. Immediate notification potentially harmful or unacceptable effects

The authorization holder has a legal obligation to report immediately about adverse effects of the active substance or biocidal product, development of resistance, in adequate efficacy or other new data.

In particular, the authorization holder is obligated to report immediately:

- New data or information on adverse effects of the active substance or biocidal product on humans, especially vulnerable groups, as well as on animals or the environment
- All data indicating the development of resistance to the active substance.
- New data or information that the biocidal product is not sufficiently effective

Self-Check – 6	Written test

Name…………………………………………… ID………………………..Date……

Directions: Answer the questions listed below.

II. Write short answer/s

1 Write the importance of documenting materials.(5 points)

2 What are the things be documented and checked during oil seed storage.(5points)

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

Information Sheet 7- Monitor the Process using performance control chart, production data etc

Definition

Control charts are used to routinely monitor quality. Depending on the number of process characteristics to be monitored, there are two basic types of control charts. The first, referred to as a univariate control chart, is a graphical display (chart) of one quality characteristic. The second, referred to as a multivariate control chart, is a graphical display of a statistic that summarizes or represents more than one quality characteristic.

If a single quality characteristic has been measured or computed from a sample, the control chart shows the value of the quality characteristic versus the sample number or versus time. In general, the chart contains a center line that represents the mean value for the in-control process. Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL), are also shown on the chart. These control limits are chosen so that almost all of the data points will fall within these limits as long as the process remains in-control.

Control charts are a valuable tool for monitoring process performance. However, you have to be able to interpret the control chart for it to be of any value to you. Here is the key to effectively using control charts – the control chart is the way the process communicates with you. Through the control chart, the process will let you know if everything is "under control" or if there is a problem present. Potential problems include large or small shifts, upward or downward trends, points alternating up or down over time and the presence of mixtures.

The only effective way to separate common causes from special causes of variation is through the use of control charts. A control chart monitors a process variable over time – e.g., the time to get to work. The average is calculated after you have sufficient data. The control limits are calculated – an upper control limit (UCL) and a lower control limit (LCL). The UCL is the largest value you would expect from a process with just common causes of variation present. The LCL is the smallest value you would expect with just common cause of variation present. As long as the all the points are within the limits and there are no patterns, only common causes of variation are present. The process is said to be "in control."

The figure below illustrates this.

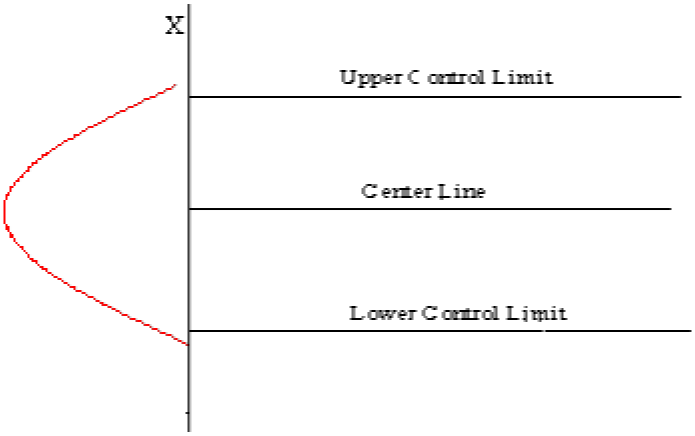

Figure 12. Time or order of production

Monitoring charts

We use monitoring charts, also called control charts, to display and detect this unusual variability. A monitoring chart is a display of one value (variable), against time, or in sequence order. These time-based plots also show some additional information: usually a target value, and one or more limits lines are superimposed on the plot. The plots are most useful when displayed in real-time, or close to real-time. There are various technical ways to express what a monitoring chart does exactly, but a general definition is that a monitoring chart helps you detect outliers and other unusual behaviour.

The key points are:

- it is most often a time-series plot, or some sort of sequence,
- a target value may be shown,
- one or more limit lines are shown,
- They are displayed and updated in real-time, or as close to real-time as possible.

Here is an example that shows these properties.

Tank temperature(degC)

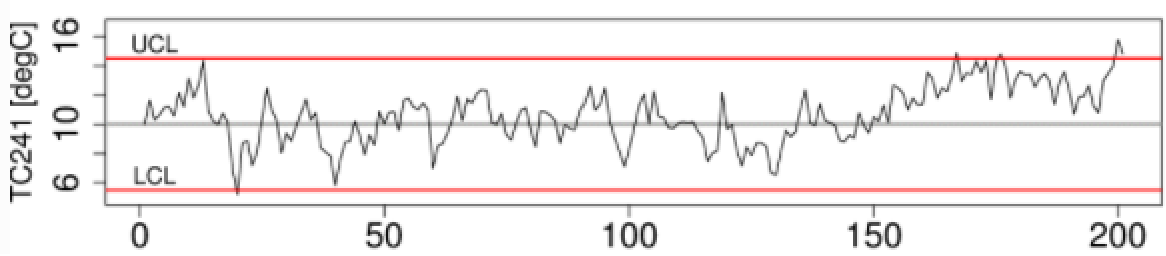

Figure 18. Time sequence order

General approach

Monitoring charts are developed in 2 phases. You will see the terminology of:

Phase 1: building and testing the chart from historical data that you have collected. This phase is performed off-line, it is very iterative (involving operation), and you will spend most of your time here. The primary purpose of this phase is to

- find portions of the data that are from stable operation
- use these stable portions to calculate suitable control chart limits
- ensure that your chart works as expected based on historical data

Phase 2: We use the monitoring chart on new, fresh data from the process. This phase is implemented with **computer hardware and software for real-time** display of the charts.

Monitoring parameters

Any variable can be monitored. However, the purpose of process monitoring is so that you can **react early** to **bad**, or unusual operation. This implies we should monitor variables as soon as they become available, preferably in real-time. They are more suitable than variables that take a long time to acquire (e.g. laboratory measurements). We shouldn't have to wait to the end of the production line to find our process was out of statistical control.

Raw material data from your supplier should also be monitored as soon as it is available, e.g. when received by your company, or even earlier - before the supplier ships it to you.

These intermediate variables measured from the process are

- available much more frequently and without delay
- are more precise
- are usually more meaningful to the operating staff than final quality variables from the lab, and

- contain the “fingerprint” of the fault, helping the engineers with diagnosis and process adjustment.

Note that we don’t have to monitor variables that are measured only from on-line sensors. The variable could be a calculation made from the on-line measurements. For example, an energy balance could be calculated from various thermocouples on the process and the degree of mismatch in the energy balance could be critical to quality. For example, the mismatch could indicate an unexpected source of heat into or out of the process - so monitor that mismatch, rather than the raw temperature data.

In-control vs out-of-control

All that “in control” means is that there are no **special causes** in the data, i.e. the process is stable. A special cause, or an assignable cause is an event that occurs to move the process, or destabilize it. Process monitoring charts aim to detect such events. The opposite of “special cause” operation is common cause operation.

Figure 19. Data control room

About ppm

PPM is an abbreviation for Parts Per

Million. ν It is equivalent to milligrams/Liter (mg/L) ν

There is 1/1000 of a gram in a milligram ν

There is 1000 grams of water in a liter ν

So 1,000 x 1,000 = 1,000,000

Effective Level of Molecular SO2 ν

S. cerevisiae is inhibited at 0.8 PPM Molecular SO2 .

Bacteria, wild yeast and Brett.

inhibited at 0.4 PPM Molecular SO2 ν

Bisulfite has a weak effect on ML bacteria but is eclipsed by the effect of molecular SO2 .

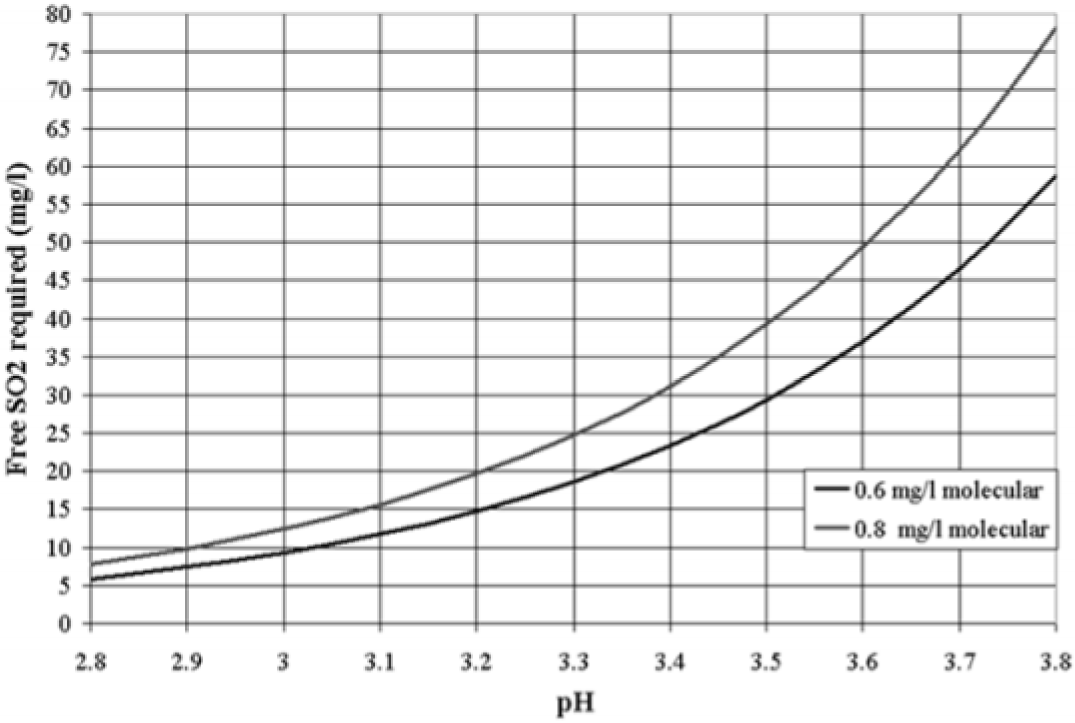

Figure 20. Sulfur Dioxide & Wine Additives

Self-Check – 8	Written test

Name…………………………………………… ID………………………Date……

Directions: Answer the questions listed below.

III. Write short answer/s

3 Write the importance of documenting materials.(5 points)

4 What are the things be documented and checked during oil seed storage.(5points)

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

LG #45	LO #3-Complete additives and finings

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Completing the process
- Dismantling equipment and preparing for cleaning
- Storing unused materials
- Collecting, treating and disposing or recycling waste
- Conducting Work

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Complete the process
- Dismantle equipment and preparing for cleaning
- Store unused materials
- Collect, treating and disposing or recycling waste
- Conduct Work

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Completing the process

Completing the process may require single or multiple energy sources to be shut down, that is,

- electrical,
- air,
- hydraulic,
- Chemical sometimes in a certain order.

Ensure the plant operator is aware work is being conducted. On many occasion workers are typically injured when plant operators are unaware the plant is being worked on. After cleaning, all equipment should be rinsed with clean potable water. If the equipment is not to be used immediately it should be allowed to drain dry.

1.1. General lockout/ tag out procedure

1.1.1. Purpose

This procedure establishes the minimum requirements for lockout of energy sources that could cause injury to personnel. All employees shall comply with the procedure.

1.1.2. Responsibility

The responsibility for seeing that this procedure is followed is binding upon all employees. All employees shall be instructed in the safety significance of the lockout procedure by (designated individual). Each new or transferred affected employee shall be instructed by (designated individuals) in the purpose and use of the lockout procedure.

1.1.3. Preparation for Lockout

Employees authorized to perform lockout shall be certain as to which switch, valve, or other energy isolating devices apply to the equipment being locked out. More than one energy source (electrical, mechanical, or others) may be involved. Any questionable identification of sources shall be cleared by the employees with their supervisors. Before lockout commences, job authorization should be obtained.

1.1.4. Sequence of Lockout Procedure

- Notify all affected employees that a lockout is required and the reason therefore.
- If the equipment is operating,
- Shut it down by the normal stopping procedure (such as: depress stop button, open toggle switch).
- Operate the switch, valve, or other energy isolating devices so that the energy source(s) (electrical, mechanical, hydraulic, and other) is disconnected or isolated from the equipment.
- Lockout energy isolating devices with an assigned individual lock. Stored energy, such as that in capacitors, springs, elevated machine members, rotating fly wheels, hydraulic systems, and air, gas, steam or water pressure, must also be dissipated or restrained by methods such as grounding, repositioning, blocking, and bleeding down.
- After ensuring that no personnel are exposed and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate.
- Return operating controls to neutral position after the test.
- The equipment is now locked out.

1.2.5. Restoring Equipment to Service

When the job is complete and equipment is ready for testing or normal service, check the equipment area to see that no one is exposed. When equipment is clear, remove all locks. The energy isolating devices may be operated to restore energy to equipment

Self-check -1	Written test

Name…………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Information Sheet 2- Dismantling equipment and preparing for cleaning

1.1 Definition dismantling and cleaning

1.1.1 Dismantling: Dis locating equipment components or parts of equipment in each sequential order

1.1.2 Cleaning: Removing and separating off-specification material, organic and non-organic debris, metals, and pesticide residues, among other contaminants, from the raw material prior to further processing

a. Reasons for Cleaning

- To reduce the risks from food hazards -food poisoning and foreign body contamination
- To comply with local and international legislation
- To meet specific customer requirements,
- To meet the requirements of global food safety standards
- To maintain positive audit and inspection outcomes
- To allow maximum plant productivity
- To present a hygienic visual image
- To promote safe working conditions for staff, contractors and visitors
- To maintain product shelf-life
- To avoid pest infestation

The main purpose of cleaning is to remove undesirable foreign material and it should be designed to obtain:

- Complete removal of separated contaminants and avoidance of recontamination
- Maximum separation efficiency consistent with minimum wastage of desirable material

- Minimum quantity and concentrations of residues the foreign material found on fruits and vegetables can be grouped under the following headings:

b. Cleaning Methods

Wine makers should prefer cleaning methods appropriately that could be compatible for the specific equipment's. Cleaning methods include the following categories:

- Automatic cleaning (cleaning in place, CIP)
- Manual cleaning (outdoor cleaning, COP)

Manual cleaning using cloths, mops, brushes, pads, etc. It is normally used in small areas, equipment that is non-water proof or requires dismantling or areas which are difficult to clean by other methods. It is a labor intensive method and may limit the use of certain chemicals for safety reasons. To ensure Cleaning is effective the method must be clearly defined and staff trained to an appropriate level.

c. Cleaning procedures

Cleaning is a complex process. To ensure it is conducted correctly a defined and systematic approach is required that takes into account a number of factors previously covered. This approach takes the form of a Procedure and this is usually a legal requirement in addition to a fundamental requirement of global food standards.

A collection of these cleaning procedures forms a Cleaning Plan or Program which is plant specific.

A typical **cleaning procedure** includes the following:

- Cleaning method
- Standards
- Frequency
- Chemicals used
- Equipment used
- Time and temperature specifications

The correct sequence of a general cleaning procedure for surfaces in a food plant is:

1. Gross Clean/Preparation: preparing solutions to required concentration and temperature
2. Pre-rinse: to remove surface debris in contact with on equipment and to avoid solution loss
3. Detergent application: applying detergent at appropriate contact time and pressure
4. Post-rinsing: to remove chemical residue

5. Disinfection: to remove microbial contamination
6. Terminal rinsing: to remove any chemical residue

d. Steps of dismantling and cleaning of medium scale wooden basket press

1. Untighten screw on the head of a press

Figure 21.Dislocate components of an equipment

Figure 22 .Break down press cake

Figure 23. Remove break down press cake and collect in to container

Figure 24 .Clean all compartment of an equipment to remove sticked cake on a surface using presurised ,clean and fresh water

Figure 25 . After wet cleaning dry all equipment parts

Figure 26. Relocate all equipment compartment sequentially

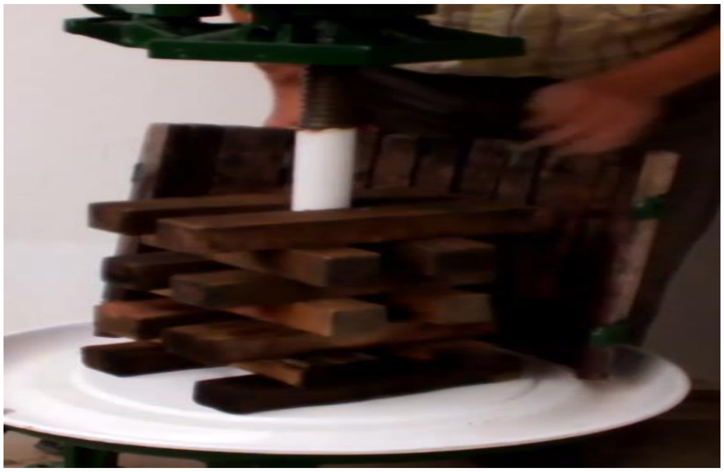

Figure 27. Make it ready for next operation

Self-check -2	Written test

Name…………………………………………… ID………………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Information Sheet 3- Storing unused materials

Un used materials and products should be clearly marked as such and stored separately in restricted areas. They should either be returned to the suppliers or, where appropriate, reprocessed or destroyed. Whatever action is taken should be approved and recorded by authorised personnel.

The reprocessing of rejected products should be exceptional. It is only permitted if the quality of the final product is not affected, if the specifications are met and if it is done in accordance with a defined and authorised procedure after evaluation of the risks involved. Record should be kept of the reprocessing.

The recovery of all or part of earlier batches which conform to the required quality by incorporation into a batch of the same product at a defined stage of manufacture should be authorised beforehand. This recovery should be carried out in accordance with a defined procedure after evaluation of the risks involved, including any possible effect on shelf life. The recovery should be recorded. 5.64 The need for additional testing of any finished product which has been reprocessed, or into which a recovered product has been incorporated, should be considered by the Quality Control Department. 5.65 Products returned from the market and which have left the control of the manufacturer should be destroyed unless without doubt their quality is satisfactory; they may be considered for re-sale, re-labelling or recovery in a subsequent batch only after they have been critically assessed by the Quality Control Department in accordance with a written procedure. The nature of the product, any special storage conditions it requires, its condition and history, and the time elapsed since it was issued should all be taken into account in this assessment. Where any doubt arises over the quality of the product, it should not be considered suitable for re-issue or re-use, although basic chemical reprocessing to recover active ingredient may be possible. Any action taken should be appropriately recorded.

Self-check -3	Written test

Name…………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (point)

Test II: Short Answer Questions (point each)

Information Sheet 4- Collecting, treating and disposing or recycling waste

Cleaner production 'Cleaner production' offers avenues (which are often low-cost) to reduce the load on wastewater treatment plants – reducing the design parameters, lowering their cost and simplifying their operation.

Within the winery the emphasis in pre-treatment stages is on avoiding and reducing wastes. It is a matter of 'treating the source – not the symptom'. Segregating wastes of different quality is another key to efficient treatment and optimizing reuse and recycling options. This section considers options in wineries to:

Reduce – lowering inputs and reducing loads to treatment plants

Reuse – re-using inputs for similar purposes

Segregate – isolating wastes of differing quality to reduce loads, for easier treatment and to optimize reuse and recycling Key message Apply cleaner

Figure 21.Treat the source, not the symptom – and segregate wastes of different quality

Reduce

This section presents options to reduce the use of:

- Water
- Salts and chemicals

• Organics and solids

Water

Improving water use efficiency (reducing water use) may lead to higher concentrations in effluent, if total loads remain the same, but it can mean smaller treatment systems are required. Examples include:

- Dry sweep and shovel instead of always wet cleaning
- Squeegee instead of hosing
- High pressure hosing and cleaning
- Automatic shut-off nozzles
- Maintenance – fix leaks
- pigging for transfers (can also result in faster turnovers)

Salts and chemicals Salts and many chemicals cannot be cheaply removed in treatment. Keeping them out of effluents to begin with, by reducing their use or early segregation, can be very effective. Examples include:

- using high pressure or hot water instead of cleaning agents for some cleaning tasks, although noting any safety or additional energy issues with the use of hot water;
- installing 'easy-clean' equipment, or only cleaning as necessary, to reduce the use of cleaning agents;
- using alternative cleaning chemicals; and
- recycling caustic cleaning agents to reduce the amount purchased and treated

Pigging

Pigging is the practice of pushing an inert substance down a pipeline. It comes from 'Pipeline Inspection Gauges' which are moved along inside pipes. In wineries, pigging refers to injecting inert gas or inserting a 'pig' for cleaning or to separate different wine or juice transfers rather than draining and cleaning a pipe before transferring the next batch. It can save time as well as cleaning and flushing liquids. It has been estimated that a winery of 25,000L tank size, and averaging five wine push throughs of 500 metres in a 3" line, would typically lose around 4% of wine using 'visual cut-off' to control transfers (Deans, 2006; Deans & Oemcke, 2007). Pigging can save most of that loss. Organics and solids The level of organics is often a major determinant of the treatment system chosen. Reducing organics can make a big contribution to easing the load on treatment plants – and result in more efficient use of valuable grape inputs as well as a simpler treatment system. Examples include: • dry sweeping and shovelling before wet cleaning; • controlling spillages with bunding or drains; • installing sieves and grates over drainage channels; and • in-line filtration to remove solids at the point of generation.

Figure 22. Winery Wastewater Management & Recycling

Reuse

This section considers options to reuse:

- water
- salts and chemicals

Water

Water is used in many parts of the winery for a variety of purposes, many of which do not require high quality water. Used water may be suitable for reuse for the same, or other, purposes. Examples include:

- Bottle cleaning water is usually still of relatively good quality and may, with some treatment, be reused for the same purpose, for tank washing or for truck washing.
- Cellar cleaning water may contain organics but is still quite suitable for reuse to clean floors.
- Water used to test for barrel leaks may be reused for the same purpose.
- Push-through transfer water is highly variable in quality, but may be reused for the same purpose.
- Water from liquid-ring vacuum pumps is generally fairly good quality and can be recirculated through the pumps. • Relatively low-quality water can be used for hardstand and truck washing.

Salts and chemicals

Chemicals which are difficult to treat, have special treatment needs or are costly to remediate are prime targets for reuse. Examples include:

- Caustic cleaning agents (e.g. potassium hydroxide and sodium hydroxide can be re-circulated if the pH is monitored and the agent is replaced when necessary).
- Recovery of used diatomaceous earth for use as body-feed on pre-coat filtration (with savings of up to 85% feasible

Segregation

This section considers options to segregate:

- water
- salts and chemicals
- Solids Water Segregating effluents and diverting or managing high loads or volumes will reduce the size and complexity of treatment that is needed – and is often a key to reuse and reduction. Examples include:
- Isolate sewage and treat separately or dispose of to a sewer to avoid treating all wastewater for pathogens.
- Isolate stormwater from road surfaces and grounds to avoid surges and disruptions to treatment processes, and to retain options for recycling the water or disposing of treated wastewater as tradewaste.
- Isolate roof run-off and use it for cleaning (e.g. trucks and floors) or processing.

Storm water varies in quality between sites and during rainfall. It can be high in contaminants (e.g. if coming off well-used sealed roads) or of quite good quality (e.g. if coming off paved areas around a winery). A first-flush may carry high sediment loads (and need to be diverted for treatment), but subsequent flows may be very clean and useful for cooking, cleaning or to shandy with treated wastewater for irrigation.

Environmental regulators will class wastes by their worst component – hence it can be very cost-effective to keep wastes that require high levels of treatment out of general wastewater streams

Salts and chemicals

Salts and chemicals that are difficult to treat and not suitable for reuse may be segregated and treated on-site, or disposed of separately as trade waste, more cheaply than if they are allowed to 'contaminate' entire effluent streams. Examples include:

- High salinity streams, such as the final 'blow down' from caustic recycling or regenerant from ion exchange that may be sent for evaporation, to be shandied with better quality water or directed to trade waste.
- Tartrate may be recovered and applied in compost or sent off-site for treatment.

Solids

Solids in wastewater increase organic loads and the risk of blockages. Segregating solids will reduce treatment costs and may open up opportunities for recycling the materials. Examples include:

- Marc can be composted and used in vineyards.
- Lees can be resettled during decanting and (along with rinse water) can be converted to compost for use in vineyards – and can be processed (e.g. a Rotary Drum Vacuum or lees press) to recover wine or else sent for distillation.
- Bentonite clay can be incorporated into compost and there may be recycling options for diatomaceous earth (DE) sludges, but DE suppliers and local environmental authorities should be consulted for suitable local solutions. Isolating wastes according to their characteristics will optimise their reuse, and reduce treatment loads and costs. This may involve on-site treatment – treating at the source – and/or zoning the winery and the collection of run-off and wastes.

Marc and lees Grape marc and lees are big contributors of organic carbon and potassium to winery wastewater. The more time they spend in wastewater, the more of each is dissolved out. Therefore, the sooner they are segregated from waste streams the less load there will be for the treatment plant to deal with.

Commercial solids recovery Commercial solids recovery services are available in several wine centres, where marc, filter cake and lees are recovered and processed to extract alcohol, oils and tartrates. Spent marc may also be converted to stock feeds.

Trade-offs

It may be necessary to make trade-offs between different cleaner production options – and each will need to be assessed in light of treatment and end-use considerations. As an example, a cleaner production option may significantly reduce water use in the winery; but result in higher salinity water coming from the treatment plant which restricts its end-use options. In that case, a decision must be made about which was more important overall – improved water use efficiency in the winery or more options to recycle the salinised water. Similarly, using recycled water from a treatment plant may not be the preferred option from a viticultural perspective, but when viewed from a whole of winery perspective, a local agriculture perspective or in regard to 'water security', it may prove the best option.

Zoning Wineries can be zoned (e.g. into receival, cellar, barrel hall and tank farm zones), for the collection of wastewaters (e.g. using bunding or different drains). Holding tanks can capture poor-quality waste streams, enabling their re-use or in situ treatment before being released into the broader wastewater treatment system.

Figure 23. Solid waste takeoff

Treatment technologies

This section considers treatment technologies available for wastes of different quality or volume. The treatments may be used in different combinations (and sequences) but are generally grouped as primary, secondary and tertiary treatments.

Primary treatment – surge storage, screen and settle – chemical pre-treatment

Secondary treatment – facultative ponds – anaerobic treatment – aerobic treatment

Tertiary treatment – artificial (constructed) wetlands – filtration – reverse osmosis – disinfection Evaporation ponds may be used as a form of treatment as well as being a disposal option.

Self-check -4	Written test

Name…………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

Information Sheet 5- Conducting Work

Rules for Using Lockout Procedure

All equipment shall be locked out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device bearing a lock

Winery plant must be maintained and repaired according to the manufacturer's specifications or, in the absence of such specifications, in accordance with a competent person's recommendations. Plant should be isolated before maintenance or cleaning commences. Where plant is isolated and plant shutdown will result, any total or partial shutdown should not allow a hazardous situation to be created. Isolated or disengaged plant should: not hinder or interfere with the operation of any other plant have guards in place where a risk of injury is identified, and not obstruct access.

A process should be put in place to enable effective communication and consultation with affected workers and other persons conducting a business or undertaking to prevent any risk to health and safety arising from restarting the operation of the plant which has been shut down due to inspection, maintenance or cleaning.

An energy isolation procedure should be developed to ensure that potential energy sources, that is, electrically charged capacitors, hydraulic and pneumatic pressure and water pressure are in a zero mechanical state prior to any maintenance or cleaning work being carried on plant items such on grape presses.

Self-check -5	Written test

Name………………………………………… ID……………………… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answer (2 point)

Test II: Short Answer Questions (point each)

LG #46	**LO #4-Record information**

Instruction sheet :

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Recording workplace information
- Signing all records
- Communicating information records
- Keeping workplace information records

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Record workplace information
- Signing all records
- Communicate information records
- Keep workplace information records

Learning Instructions:

10. Read the specific objectives of this Learning Guide.
11. Follow the instructions described below.
12. Read the information written in the "Information Sheets". Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
13. Accomplish the "Self-checks" which are placed following all information sheets.
14. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-

checks).

15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Recording workplace information

Records Laboratory work is very detail oriented, as this chapter has shown. You can never check and recheck data, computations, conversions, formulas, or notations too many times. This attention to detail generates a tremendous amount of data that substantiates the accuracy and precision of all laboratory methods, reagents, standards, controls, equipment, and instruments. Every detail that leads up to obtaining a test result is documented. Raw data encompasses analysis results and their computations and verification of accuracy, procedures, methods, actions, and observations. Raw data include the following:

- Notebooks
- Instrument printouts
- Analytical record sheets
- PM logbooks
- Proficiency testing
- Solution preparation logs

Computer records have been a subject of controversy over the years. Many high-quality computerized instruments store their raw data files. It is a simple process to download and copy the data, making the information readily accessible and eliminating storage problems. Unfortunately, these records can be altered, making computer-generated data questionable from a legal standpoint. Analyses results are transferred to other forms in order to communicate those results to the appropriate requestor. To eliminate transcription errors

Self-Check – 1	Written test

Name…………………………………………… ID………………………..Date……

Directions: Answer the questions listed below.

IV. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers

Information Sheet 2- Signing all records

All activities being recorded sign.

An all activities being recorded sign has effective messages to address security policy and protection concerns. An all activities being recorded sign is a helpful tool to help protect the health and safety of personnel, and is not a replacement for required protective measures for lessening or removing hazards. All activities which are undertaken starting from preparation of storage area to storing the raw materials should be recorded and signed by the concerned personnel. Workplace information is recorded clearly and accurately in the format and at the time required by the organization. Records provide the industry manager with data, information and knowledge.

All the record you put Accurately locate the appropriate recording mechanism for the information you need to record Where records do not currently exist, set them up, or work with the appropriate people to get them set up. Make entries into records that are accurate, complete and, in the case of written records, legible

- Record information within required timescales
- Store updated records accurately in the correct location
- Follow procedures when records are transferred to another location
- Maintain security and confidentiality of information recorded, in accordance with requirements
- Take the appropriate action to resolve or report any errors or omissions that are discovered in the records, or any problems with maintaining, storing or retrieving records

The systems for record keeping and storage used within the organization;

- The records which you are required to update and where they are located
- The correct format in which records must be completed
- When records should be completed
- The limits of your responsibility for handling and using records
- our responsibility under relevant legislation

- What the records are used for and the importance of accurate record keeping
- Procedures for transferring records
- Records that are confidential or commercially sensitive and how to deal with these

Types of records

Paper-based records are one of the most common ways of dealing with information. Examples of paper-based records include: reports, magazines, journals and newspapers, project files, Contracts, minutes of meetings business letters email messages and memos, faxes, Forms, diaries and other note-taking method. File and store information when you process information, you may be required to catalogue items in the filing system after you have collected, updated or modified them. You'll need to know:

- What information to keep
- the legal requirements of keeping the information
- your organization's filing procedures
- The security issues surrounding the information. Collection of information in laboratory sample examination

Self-Check – 2	Written test

Name…………………………………………… ID………………………..Date……

Directions: Answer the questions listed below.

V. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers

Information Sheet 3- Communicating information records

1.1 Communicating information records

If work is being taken over by the next shift or another crew, a handover should occur. This involves discussing the stages, testing sample have been taken (e.g. turbidity, PH, alcoholic test, acidity, TDS, microbiological test etc.) the work is at and changing over locks and personal danger tags. The only worker who should remove personal danger locks and tags is the person who put them in place. A procedure should be available which first considers all options to allow the person who placed the lock and tag to personally remove them, consider emergencies and/or if the worker is unable to remove the lock. If the worker cannot remove the lock and tag, the employer should ensure: a senior person is accountable for the lock and tag the situation is assessed to be safe before removing the lock and tag ensure the removal is validated and signed off by two or more people. To do any activity ,technician should communicated with concerned body via necessary communication channels ,which may be upward and down ward or horizontally these may leads to avoid unnecessary production down time and other related messes. And after all you have to get a confirmation to go ahead maintenance activity, unless never do maintenance activity by yourself

Self-Check – 3	Written test

Name…………………………………………… ID………………………Date……

Directions: Answer the questions listed below.

VI. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers.

Information Sheet 4- Keeping workplace information records

Keeping track of information Storing information in a centralised area allows everyone to access information easily, whether it is paper-based or in electronic form. However, systems must be in place to control the movement of information so everyone knows where a file is at any moment.

In some organisations, file security is extremely important. These include:

- Organizations that keep sensitive information about their customers such as insurance companies
- Legal firms and government department's
- Organizations developing new products where information revealed to competitors may disadvantage the organization
- Files that are confidential, or have restricted access, are generally kept separate from the main filing system.
- Sometimes they are tagged to indicate their security rating (for example, general, personal, restricted, confidential, secret and top secret).
- Electronic files are more difficult to store separately
- Especially with a networked computer system
- So other measures are used such as password protection.

Methods used to keep confidential or restricted files secure include:

- keeping hard-copy files locked,
- Storing confidential computer files on a CD or other storage device rather than on the hard drive (the CD can then be stored in a locked cupboard), Using encryption, a method in which the computer file is coded and requires a decoding key to open and translate the file.

If you require access to confidential or restricted files, you will need help to make sure you completely understand the policies and procedures for accessing such files.

It is particularly important that the movement of these files is accurately recorded to ensure they are not accidentally released into the wrong hands or lost. It is equally important to look after the organisation's files while you are using them. When files are out of the filing system, they should be kept in a safe place and treated with care. Don't leave documents lying unprotected on your desk, especially overnight. Place them in a folder, a desk drawer or a file. Be careful not to damage or remove material from a file. If something must be removed from a file temporarily (for example, to photocopy it) it should be recorded by using a marker, such as an out card, and returned to exactly the same place in the file.

Maintaining information and filing systems

- Keeping records up to date.
- All information within the system should be current and easy to access.
- Updating records is a day-to-day task for any organisation.
- The specific procedures for doing this may vary from place to place.
- Keeping records up to date might include modifying particular records by changing information or adding information to them. For example, updating: **additives and finings** sample taking procedures Sample test procedures Standards and specifications (set points). Sample test reports stock records to make sure they match the actual number of stock items sales records to make sure they match the number of sales made customer and supplier details to make sure the details are correct account details to make sure the amounts owed by customers, and to suppliers, are correct technical information to ensure it is current Daily, weekly or monthly sales targets, to reflect current goals regular specials lists or offers. Some records need to be updated when policies, procedures, legislation or regulations are changed. Part of your job may be to replace old information in the organisation's files with updated information. You need to do this correctly, so your organisation can easily access up-to-date information and carry out procedures in a lawful way. Inaccurate records can be worse than having no records at all.
    - ✓ Imagine what would happen if: Coding /lot was wrong
    - ✓ Testing procedure document was wrongly written
    - ✓ Name of sample tested raw materials was recorded incorrectly on the database
    - ✓ a customer's address or telephone number was recorded incorrectly on the database
    - ✓ a wrong 'received' date was stamped on an invoice sent to your organization
    - ✓ an invoice sent to one of your customers was recorded differently in the company records from the amount appearing on the invoice
    - ✓ A file number was recorded incorrectly on the file index.
    - ✓ Inaccurate records cause problems and confusion.
    - ✓ If somebody looks at a record and the information is inaccurate or missing, at best they may need to spend time sorting out what the correct information is. At worst, it may affect the organisation's reputation; for example, customers may be upset

- ✓ Or accounts may not be paid on time. When updating a file, always double check: file codes the index to the filing system, dates ,Supplier name ,ype sample testing, raw material name, names, titles and addresses of supplier, Telephone, Fax , email and website addresses

Self-Check – 4	Written test

Name…………………………………………… ID…………………………Date……

Directions: Answer the questions listed below.

VII. Write short answer/s

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answers

AKNOWLEDGEMENT

We wish to extend thanks and appreciation to the many representatives of TVET College/ Institutes Trainers and respective experts of Regional TVET bureau, Bishofitu management institute Librarian, UNESCO and Federal Technical and Vocational Education and Training Agency (FTVET) who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

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This Teaching, Training and Learning Materials (TTLM) was developed on September, 2020 Bishoftu management institute

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