

Grade 8 Natural Science Worksheet

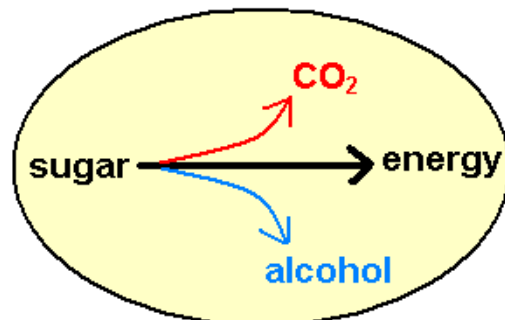
Commercial uses of CO₂

Thousands of years ago, humans discovered that when certain foods such as fruit and grains were left uncooked in warm conditions, they began to bubble and produce a strange tasting liquid. The process they had discovered is fermentation.

Fermentation is caused by microscopic organisms called yeast. Yeast is a type of unicellular fungus. It reproduces very quickly when conditions are warm. Like all living cells, yeast needs food in the form of sugar.

The sugar is broken down in the yeast cells to produce energy. Two waste products are formed: carbon dioxide and alcohol. The baking and brewing industries exploit or use the natural fermentation process.

Fermentation in yeast cells.



1. How is yeast used in baking to produce bread? [5]
2. How do the brewing and wine making industries use fermentation? [5]
3. You will work in groups to research some aspects of beer and wine-making. Think of how you can present your research in a creative way to the class. You could make a poster or do a demonstration. There must also be a written record of your presentation.

Group A:

In South Africa, home-brewed beer or *umqombothi* is a drink traditionally made by women for a community to celebrate special occasions. Your group will find out how *umqombothi* is made.

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Group B:

South Africa has a world-class wine-making industry. Your group will find out how wine is made and what the different types of wine are.

[20]

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Rubric to assess presentation

Criteria	Level 4 [4]	Level 3 [3]	Level 2 [2]	Level 1 [1]
Group involvement in presentation	Outstanding, full co-operation and participation.	Good, fair co-operation and participation.	Fair, limited co-operation and participation.	Poor, little co-operation and participation.
Quality of research and factual content of presentation	Excellent research with comprehensive understanding of the facts.	Good research with reasonable understanding of the facts.	Fair research with satisfactory understanding of the facts.	Poor research with limited understanding of the facts.
Quality of written work	Outstandingly presented with logical attention to detail.	Well presented with some attention to detail.	Satisfactorily presented with limited attention to detail.	Poorly presented with little attention to detail.
Quality of presentation	Creative, dynamic and interesting presentation which held class attention. x 2	Competent and interesting presentation which generally held class attention. x 2	Fair presentation which largely held class attention. x 2	Poor presentation which did not always hold class attention. x 2

[30 marks]

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Suggested Solutions

Question number	Possible marks	Solution
1	5	In baking, yeast is added to the flour with a small amount of sugar. The yeast uses the sugar and ferments. The carbon dioxide bubbles in the dough. When the bread is baked, the bubbles remain in the dough, making it light and airy. The alcohol is destroyed by the high temperature used to bake the bread.
2	5	In the brewing and wine making process, the sugar in fruit such as barley (for beer), apples (for cider) or grapes (for wine) is broken down by the yeast. The alcohol is kept in the drink. Sometimes carbon dioxide bubbles are allowed to escape, such as in still wines, but sometimes the carbon dioxide is trapped in the drink to make a bubbly beer or sparkling wine.
3	20	See rubric in Appendix of Assessment Tools.

Appendix of Assessment Tools

Some resource material for the teacher to use when marking the presentations.

Group A

Sorghum, pearl millet and the marula fruits are traditionally used in SA to brew beer. Traditional brewing is done in special clay pots and the beer is strained through reed sieves. In traditional brewing, the fermentation process is started and then continues without further interference. Fermentation usually takes about 2 to 4 days. The taste of the brew varies greatly depending on the amount of sugar in the starting material and the micro-organisms used to ferment this material, as well as the ambient conditions. There are many variables involved, so the product varies greatly. The shelf life of traditional beer is only a couple of days, as the brew is not pasteurised and contaminating bacteria spoil the beer causing it to develop a vinegary smell and taste. Traditionally, the women are the brewers in most rural areas. A woman who brews consistent good beer is considered a skilled woman! In some parts of South America and the Middle East, human saliva is used to turn starch grains into sugar. The maize (or whatever grain that is to be used) is chewed and spat into a container. Then natural yeasts ferment the sugar.

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Group B

The basic winemaking process:

In wine making, fresh ripe grapes are pressed to extract the juice which is called *must*. The outside of the grape has a waxy coating which has millions of naturally occurring yeast cells on it. Traditional wine makers allowed these natural yeasts to ferment the juice. But today, winemakers usually add their own special strains of yeast to the must and allow it to ferment. Different types of grape have different amounts of fructose (fruit sugar) in them. The yeast ferments the must, using the fructose as its source of energy. Alcohol and carbon dioxide are produced as the yeast undergoes anaerobic cellular respiration. Other flavours are added to the fermented juice by the tannins in the grapes, the fruity acids and the flavourings in the skins. If the winemaker wants a fruitier, sweeter wine, he will stop fermentation before all the fructose has been fermented. A drier, less sweet wine will be allowed to ferment for longer. The must is strained and cooled to stop fermentation. The wine is either matured in vats, or bottled.

Different types of wine:

Sometimes, a winemaker will stop fermentation quite early to retain the natural sweetness of the wine, but then there will be little alcohol present in the wine. In this case, the winemaker may add some extra alcohol to the wine. These wines are called *fortified wines*. Examples of fortified wines are sherry, port, muscadel, jerepigo, hanepoot, - all called dessert wines, as well as wine spirits such as brandy.

Red wines are made from red/black grapes. Different types of red wines get their names from the *cultivars* or strain of grape used to make the wine. Examples of red wines are Pinotage, Zinfandel, Merlot, Cabernet Sauvignon, Cinsaut, Shiraz, Tinta Berocca. Each cultivar produces its own flavour due to the characteristics of the grape.

White wines are made from white/green grapes. Examples of white wine cultivars are Riesling, Chenin Blanc, St Emillion, Colombard, Muscadel/Hanepoot, Sauvignon Blanc, Buketraube.

Rosé wines are made from white grapes to which the skins of red grapes have been added for a short while.

Sparkling/perlé wines are made by either trapping the natural carbon dioxide from a second smaller fermentation process – *methode' champenoise* (traditional French champagne) or from adding carbon dioxide to the wine as it is bottled.

Cultivars grown in different areas may have subtle differences in their flavours. Therefore, the *origin* or location of the vineyard is important in selling the wine.

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