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**AS GCE APPLIED SCIENCE**

**G623/01/INSERT** Cells and Molecules

**PLAN FOR AN INVESTIGATION**

**INSERT**



**INFORMATION FOR CANDIDATES**

- The abstract on pages 2 and 3 of this insert is to give you some background information that you might find helpful in planning for the task that follows. Not all the information included will be directly relevant and you are expected to select the information that is relevant to the task.
- This document consists of 4 pages. Any blank pages are indicated.

## 'Extreme Winemaking'

Icewine (or eiswein) is usually served as a dessert wine. It is produced from grapes that have been frozen while still on the vine. As the frozen grapes are pressed, the natural water portion of the juice remains within the grape skins in the form of ice crystals. A more concentrated grape juice is pressed from the frozen grapes, which, when fermented, results in a very sweet wine containing fructose, acids and phenolic compounds that give the wine its flavour and aroma. With icewines, the freezing happens before the fermentation, not afterwards. Unlike the grapes from which other dessert wines are made, such as Sauternes, or Trockenbeerenauslese, icewine grapes should not be affected by *Botrytis cinerea* or noble rot.



The discovery of icewine in 1794 in Franconia, Germany, was accidental. In that year a freak cold spell froze vineyards prior to harvest and, to avert ruin, winemakers tried to press juice from the frozen grapes.

It was not until the middle of the last century in the Rheingau, Germany, that wine growers made conscious efforts to produce icewine on a consistent basis and in commercially viable quantities. They quickly discovered that it was impossible to produce icewine every year. For the production of icewine, the vineyards need to freeze for several days to ensure the grapes remain frozen during picking and pressing. If the grapes thaw at any point during the harvest, the sugary juice is diluted and the wine is ruined. The freezing conditions needed to produce this wine in Germany do not occur regularly; usually every three or four years on average.

Canada's Niagara Peninsula in Ontario is an ideal location for the production of icewine. Niagara's winters are much harsher than those of Germany, but not sufficient to damage the fruit and kill the vines. It enjoys very hot summers and cold, but not glacial, winters, which a good icewine demands. These climatic conditions occur consistently year after year and produce grapes with higher sugar levels than in Germany.

Icewine is produced from ripe grapes left on the vine well past the regular harvest and into the winter. When subzero temperatures start freezing the grapes, most of the water turns solid, leaving the sweet, fructose-laden and flavourful centre concentrated with aromas. For this phenomenon to occur, the temperature must be  $-8^{\circ}\text{C}$  for at least 24 hours. Officially, icewine grapes can only be harvested when frozen solid. Ontario's Vintners Quality Alliance says it has to be  $-8^{\circ}\text{C}$  or below, while the world's official wine body, the International Office of Vine and Wine (OIV), stipulates  $-7^{\circ}\text{C}$  or below. Both are adamant that grapes have to be frozen naturally, out of doors and on the vine. Placing the fruits in a freezer – 'cryoextraction' – is considered cheating.

The low temperature is essential for maximum sweetness. The colder the grapes become, the higher the sugar content of the juice squeezed out of them will be. Sugar content is another detail that has to be just right. By regulation, icewine grapes must have a minimum sugar content of 35° Brix – that is 35 grams of sugar in every 100 grams of grape juice. A table-wine grape, by contrast, might rate at only 20° Brix. At  $-8^{\circ}\text{C}$ , the grapes will usually be sweet enough. Below  $-13^{\circ}\text{C}$ , it is difficult to extract any juice.

The fermentation process is slow due to the extremely high sugar levels. It takes months to complete the fermentation (compared to days or weeks for regular wines). The fruit requires specially cultivated yeasts and must be monitored constantly to ensure acceptable quality.

Typical grapes used for icewine production are Riesling, considered to be the most noble variety by German winemakers, Vidal, highly popular in British Columbia and Ontario, Canada, and, interestingly, the red grape Cabernet Franc. Many vintners, especially from the New World, are experimenting with making icewine from other varieties. They use white grape varieties such as Seyval Blanc, Chardonnay, Kerner, Gewürztraminer, Chenin Blanc, Pinot Blanc, and Ehrenfelser and red grape varieties such as Merlot and Pinot Noir.

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