

**ADVANCED SUBSIDIARY GCE**

**APPLIED SCIENCE**

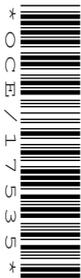
Cells and Molecules

**G623/INSERT**

**PLAN FOR AN INVESTIGATION**

**INSERT**

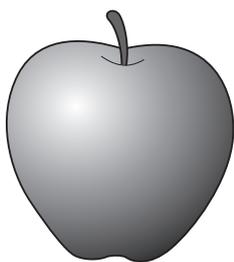
For issue on or after: **FRIDAY 12 MARCH 2010**



**INFORMATION FOR CANDIDATES**

- The abstracts on page 2 of this insert are to give you some background 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 2 pages. Any blank pages are indicated.

## 'More juice from apples'

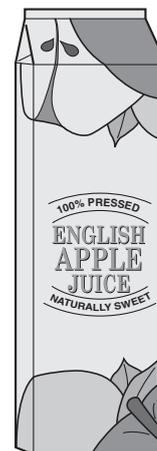


Enzymatic juice extraction from apples was introduced 30 years ago and today some 5 million tons of apples are processed into juice annually throughout the world.

After they have been crushed, apples are usually left for 20-30 minutes so that enzyme inhibitors in the pulp are oxidised. The pulp is then heated before pectinases are added.

Enzyme treatment takes anything from 15 minutes to two hours, depending on the exact nature of the enzyme, the dosage rate, the reaction temperature and the variety of apple used. During incubation, the pectinases degrade soluble pectin in the pulp, making juice flow more freely.

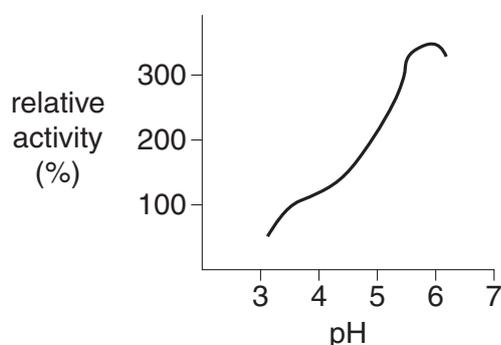
Next the apples are pressed. Yields of juice may be increased by up to 20% by enzyme treatment, depending upon the age and variety of apple used and whether pre-oxidation is employed. Pectinase treatment is effective with mature apples and those from cold storage. Significant increases in yield are not usually achieved from fresh, early season fruit.



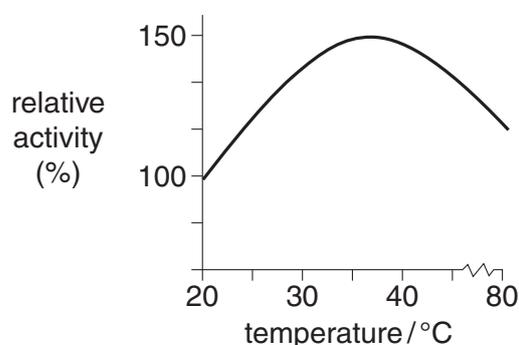
### Pectinase (a mixture of enzymes)

Commercial preparations of pectinase are usually a mixture of enzymes. The main enzyme in the pectinase preparation is polygalacturonase. The graphs below show the activity of a commercial preparation of pectinase.

polygalacturonase activity at 20 °C



polygalacturonase activity at pH 3.5



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