OCR
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AS GCE APPLIED SCIENCE

G623/01/INSERT Cells and Molecules

PLAN FOR AN INVESTIGATION

INSERT

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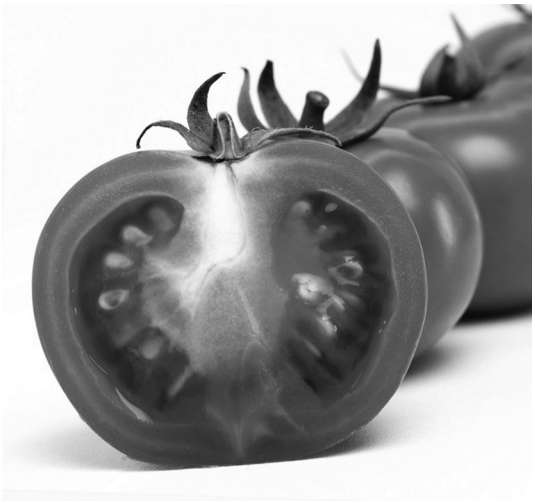
INFORMATION FOR CANDIDATES

- The abstract on page 2 of this insert is 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.

‘On the Sauce’



Lycopene is a carotenoid which gives tomatoes and other red fruits their characteristic red colour. It is a powerful antioxidant that has been shown to neutralise free radicals, especially those derived from oxygen. A large body of evidence from clinical and experimental studies supports a role for lycopene in reducing the risk of prostate cancer, breast cancer, atherosclerosis and associated coronary heart disease.

Research has shown that lycopene can be absorbed more efficiently by the body after tomatoes have been processed into juice, sauce, paste or ketchup. In fresh fruit, lycopene is enclosed in the fruit tissue. Therefore, only a portion of the lycopene in the fresh fruit is absorbed. Processing fruit makes the lycopene more bioavailable. The chemical form of lycopene is altered by temperature changes involved in the processing to make it more easily absorbed by cells. Also, since lycopene is fat-soluble, absorption into tissues is improved when oil is added to the diet.

Lycopene is in high demand by the pharmaceuticals industry, as well as by the food and cosmetics industries. Natural lycopene is produced today mainly by extraction and concentration from whole tomato fruits that are grown specifically for the purpose. The commercially available product is very expensive and current production from whole tomato fruits is small compared to projections of future demand. This has prompted research into alternative sources of lycopene and new technologies for its recovery.

Millions of tons of tomatoes are processed yearly to produce juices, sauces, purees, pastes and canned tomatoes. This results in large amounts of tomato peel, pulp and seeds as industrial waste (called tomato pomance). Tomato pomance is currently disposed of or used as animal feed. Research has shown that the tomato peel contains up to five times more lycopene than tomato pulp. The high moisture levels and its susceptibility to microbial spoilage make the storage and processing of the peel fraction problematic. Difficulties arise when attempting to recover lycopene from the tomato peel. This is due to the location of the pigment in the peel, where it is found as clusters of crystals in the chloroplast membranes. Its extraction by conventional food grade organic solvents such as hexane, ethanol and ethyl ethanoate is low.

Plant cell walls are comprised of complex carbohydrates called pectins, cellulose and hemicelluloses. Cell wall degrading enzymes such as pectinase, cellulase and hemicellulase have been used to enhance the release of a variety of natural plant compounds. Research into low cost enzymatic pre-treatment of tomato peel and optimum pre-treatment times is ongoing to enhance recovery yields of lycopene and avoid the use of organic solvents, thus being more environmentally friendly.