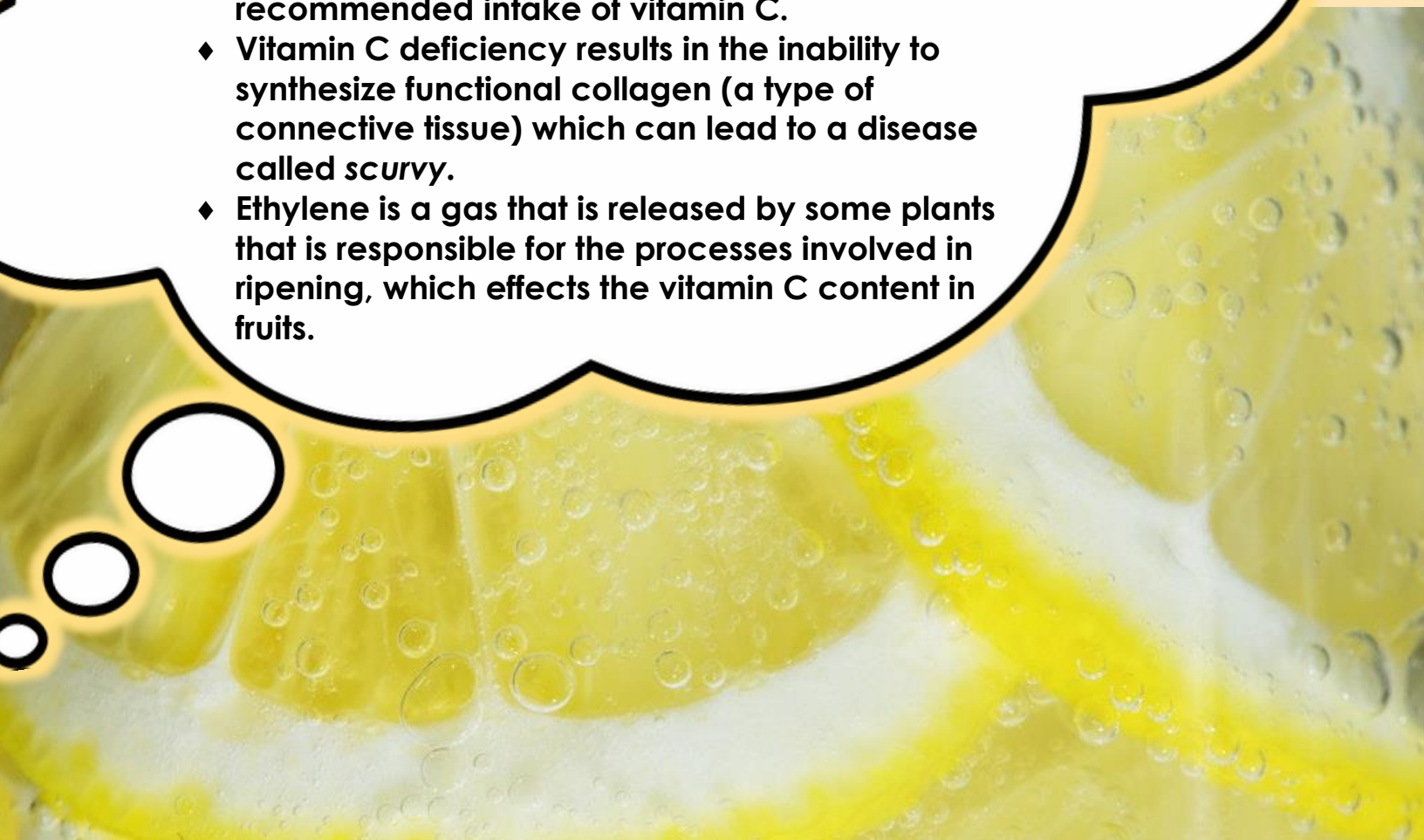
EFFECT OF RIPENING STAGE ON VITAMIN C CONTENT IN FRUITS

FUN FACTS

- The only mammals that can't synthesize vitamin C on their own are primates (including humans), guinea pigs, and fruit bats.
- 100 g of chili peppers contains 404% of your daily recommended intake of vitamin C.
- Vitamin C deficiency results in the inability to synthesize functional collagen (a type of connective tissue) which can lead to a disease called *scurvy*.
- Ethylene is a gas that is released by some plants that is responsible for the processes involved in ripening, which effects the vitamin C content in fruits.



Introduction:

Vitamins are organic compounds which are essential for the human body but are only required in small quantities. Since our bodies are either unable to synthesize them, or synthesize them in insufficient amounts, most of the vitamins we obtain are from our diet. Vitamins can be water-soluble or lipid-soluble depending on where they dissolve in the body and whether they are stored or excreted. Their functions vary from maintaining healthy skin, teeth, and hair, to regulating calcium uptake and protein metabolism.

One of the most important water-soluble vitamins is ascorbic acid, commonly known as vitamin C. Ascorbic acid can act as a powerful antioxidant that inhibits the harmful effect of free radicals, thereby lowering the risk of infections and certain forms of cancer. Ascorbic acid is also an essential cofactor for neurotransmitter synthesis (*e.g.* norepinephrine). Additionally, vitamin C plays a role in collagen synthesis. Collagen is the primary structural protein found in various connective tissues, and vitamin C is an essential cofactor for the enzymes involved in collagen production.

Our daily vitamin C requirement of 75-90 mg can be obtained from both synthetic and/or natural sources. Vitamin C tablets are often consumed as a daily supplement. On the other hand, natural sources of vitamin C can be obtained from various fruits, and vegetables. Food-derived sources such as acerola cherries, mustard spinach, and guavas are some of the richest vitamin C-containing sources.

As you may have already noticed, most of the food that you purchase at the supermarket contain nutrition labels that include quantitative information regarding number of calories, amount of different types of fats, sugars, proteins and vitamins found in the food that you buy. Have you ever wondered how the values in the nutritional tables, such as the one shown below, are determined by the food companies?

Nutrition Table for Apple Juice →

Nutrition Facts
Valeur nutritive
Per 250 mL / par 250 mL

Amount Teneur	% Daily Value % valeur quotidienne
Calories / Calories 120	
Fat / Lipides 0 g	**0** %
Saturated / saturés 0 g + Trans / trans 0 g	**0** %
Cholesterol / Cholestérol 0 mg	
Sodium / Sodium 10 mg	**1** %
Potassium / Potassium 240 mg	**7** %
Carbohydrate / Glucides 29 g	**10** %
Fibre / Fibres 1 g	**4** %
Sugars / Sucres 25 g	
Protein / Protéines 0.3 g	
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	150 %
Calcium / Calcium	2 %
Iron / Fer	2 %

Instructions

- You will be provided with 2 grapefruit samples; one of the grapefruit samples will be in the unripe stage, while the second sample will be in the fully ripe stage.
- The fully ripe sample was stored in an enclosed container with other fruits for 5 days, while the unripe sample was stored in the refrigerator for 2 days prior to conducting the experiment.
- In groups of 2-4 students, design a titration experiment and quantitatively determine the vitamin C content in two different samples of grapefruit.
- Record two trials per each individual grapefruit sample.
- Once you have collected all your experimental data, proceed with the provided questions.

Questions:

1) Describe your experimental design using a flow chart that visually displays the exact procedure of your experiment. Ensure that all relevant materials and equipment are included, and that your procedure is specific enough for someone to be able replicate your experiment. Make sure to include a legend.

2) **Write out the balanced equations that describe any reaction(s) which occur in your designed experiment. Explain the significance of each of the equations.**

3) **Based on the data you have collected from your experiment; how much ascorbic acid is found in each of the grapefruit sample? Show all your steps and express your answers in units of mg of ascorbic acid per 100 g of grapefruit.**

4) **Based on your results obtained from the experiment, during which part of the ripening stage is it ideal to consume grapefruit? Overall, what factors do you think contribute to the ascorbic acid content in fruit, and how should you store the grapefruit to ensure that the maximum vitamin C content is maintained in the fruit?**

My doctor must be a very visual person,
Whenever I have a cold he holds out my medication and says "vitamins, see".