

Acid Erosion

A dentist has contacted this lab to determine which of three drinks is the least acidic, and hence which is the least likely to cause tooth enamel erosion.



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Dear scientist,

I have recently read two different newspaper reports advising on the effect of acidic drinks on patient's teeth resulting in the erosion of tooth enamel (*White wine rots your teeth...and brushing makes it worse, Daily Mail, 21st October 2009*; *Fruit drinks 'can be as acidic as vinegar and rot away teeth enamel, dentists say, Daily Mail, 20th May 2012*).

In order to correctly advise my patients on the best liquids to drink, I would like to be provided with some data on the acid content in some common everyday drinks.

Drinks popular with my patients include orange juice, lemonade and white wine.

Please provide me with a full report outlining your analysis method, data and conclusions, including an evaluation of the accuracy of your data.

I am also somewhat confused. Is the type of the acid present in the different drinks likely to be important? Any information you can provide to help with my confusion would be much appreciated.

Many thanks

H/G A Malgam

Dr H. G. A. Malgam



Learn Chemistry

Problem Based Practical Activities

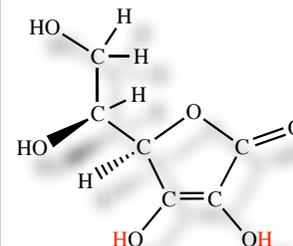
Problem 6: Acid erosion

Developed by Dr Catherine Smith, RSC School Teacher Fellow at the University of Leicester 2011-2012
This resource was produced as part of the national HESTEM Programme

Background

The 4 main acids found in these drinks are **citric acid**, **malic acid**, **ascorbic acid (Vitamin C)** and **tartaric acid**.

Copy each acid into your lab book. Colour in red any hydrogens that can form H^+ ions and work out or find out all the other missing information.



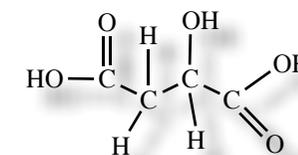
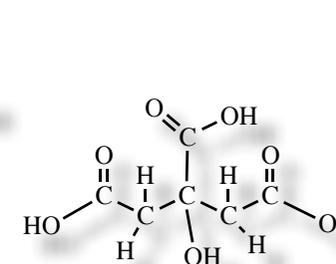
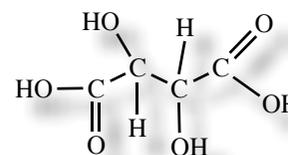
Name: Ascorbic acid (Vitamin C)

Formula: $C_6H_8O_6$

Number of H^+ ions released: 2

Found in: orange juice

(Ascorbic acid does not contain 'normal' acid groups like the acids below)



Research

This is an opportunity to practice / pass **Assessment Task 2**

Application of Chemistry: The acidity of various drinks

Impact on Society: Effect of acid erosion on dental health

Either *in class* or *at home*, you will be given time to *research this topic*.

You should *make notes* etc. to help you.

In class - and **working on your own** - you will be asked to produce a **short report (50 to 100 words approx)** on what you have found out. You may be allowed access to your notes

Investigation

This is an opportunity to practice / pass **Assessment Task 1**

You can investigate the **acidity of various drinks** using the **Titration** method met during Topic 4.

To pass this assessment, you will prepare a **scientific report** to show that you can:

- plan an experiment
- make and record observations / measurements accurately
- present your results in an appropriate format
- draw valid conclusions
- evaluate experimental procedures

Checkpoint



Whilst you are carrying out your experiment you will be observed to make sure that you are following procedures safely, and that you are making measurements correctly.

Your **plan** must include:

- an **aim** - a clear statement of what you are trying to do in this experiment
- the **dependent** and **independent variables**
- the relevant variables to be kept **constant**
- what you will be **measuring / observing**
- a **list of the equipment / materials** you will be using
- a **labelled diagram** of the experimental arrangement
- a **description** of how you will carry out your experiment (including safety where appropriate)

Checkpoint



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- you should carry out your experiment safely and **record your observations / measurements** in an appropriate way.

Due to time limitations, you will only be expected to determine the acidity of **lemonade**. Results for *orange juice* and *white wine* are provided.

orange juice : average titre = **33.75** cm³ of 0.1M NaOH

Checkpoint

white wine : average titre = **22.95** cm³ of 0.1M NaOH



Present your findings / results in an appropriate way. You should:

- record the information / data in a clear and systematic way, with **well organised tables** of raw data
- process / analyse the results and **present your findings** in an appropriate format. This may be a table, line graph, chart, key, diagram, flow chart or summary. Graphs must be plotted on graph paper.
- use appropriate **SI units** and **standard abbreviations**.

State your conclusion(s) - which should include:

- reference back to your aim
- are the results as you expected?

Evaluate your experimental procedures - Your evaluation should include **at least one** of the following, **with justification**.

- effectiveness of procedure
- control of variables
- limitations of equipment
- possible sources of uncertainty
- possible improvements

Scientific Report

Checkpoint

