

-Why do plants hate algebra so much?



THE LAB REPORT



Turns out Broccoli is cooler than toothpaste...?

No one enjoys their parent's constant nagging when it comes to eating your vegetables - especially cruciferous vegetables such as broccoli, sprouts and cabbage. They're green, often lacking in desirable flavour and taste; but they may actually be more effective than the overwhelmingly minty fresh toothbrushing sessions that you are also forced to do the second you crawl out of bed, (disclaimer, I am not a dentist, please don't stop brushing your teeth every day...)

In a recent study by Ben-Gurion University, researchers have discovered a molecule produced from eating these cruciferous vegetables, this is known as 3,3'-Diindolylmethane (DIM), and it has been shown to kill 90% of *Streptococcus mutans* biofilms in lab tests in lab tests. This is a component of the plaque that appears on your teeth, and it eventually produces acid and provides protection for bacteria, ultimately leading to tooth decay. However, these studies have been not conducted on humans yet, but researchers hope that DIM could someday be added to toothpaste or mouthwash, to prevent decay naturally. Also, DIM is also being studied for its anti-inflammatory and anticancer properties. This propels DIM into being one of nature's most versatile molecules.

-Isabelle Donoghue and Poppy Williams



BIOLOGY



How do hand warmers work?

During the bleak and biting cold of the UK's winter, some of you may be wondering "hmm... how do hand warmers work?" Looking at your cold red hands while you travel from class to class trying not to slip. And if you weren't... well you're going to find out!

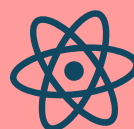
Many of you may have likely heard of the terms exothermic and endothermic reactions. An exothermic reaction is a chemical process that releases energy, as usually in the form of heat, into its surroundings, causing the temperature of the surroundings to increase. Endothermic reactions are also a chemical process, but they take in energy from the surroundings, causing the temperature of the surroundings to decrease.

Hand warmers are an example of exothermic reactions, as they release heat. They achieve this by containing iron powder, water, salt and activated charcoal. When you open the outer package, air enters, and the iron reacts with oxygen very rapidly. As the iron rusts, it produces iron oxide and releases energy, heating up your poor, cold hands.

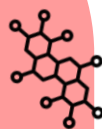
So next time you're walking from the train station in the morning, or between the school sites with your hand warmers, you can explain to your friends the science behind them!

Stay smart and warm this winter, thanks to hand warmers!

-Sara Sehgal and Nkemdirim Uliem



CHEMISTRY



Does dark energy really exist?

The theory of how the universe began starts with the Big Bang, when the universe suddenly expanded from a hot dense point at incredible speed. Eventually atoms and molecules formed, and these gathered into stars and galaxies.

By the late 1990s scientists found that there was enough matter to slow the expansion but not enough to stop it. They also measured the current rate of expansion and needed to see how it had changed over time.

Then in 1998 two independent groups of researchers announced they had measured the expansion of the universe more precisely and found that it was getting faster. This acceleration shows that some unknown force is working against gravity to make the universe expand more quickly, this force we still do not understand is called dark energy.

The Hubble Space Telescope helped detect supernovae in distant galaxies. These supernovae were dimmer than expected which meant that their host galaxies were farther away than they should be. This only made sense if the universe was expanding at an accelerating rate.

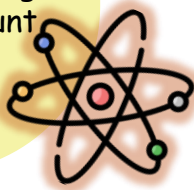
Scientists now think that after the Big Bang the universe slowed down for a time because of gravity but then as it grew larger the effect of gravity weakened and dark energy began to dominate causing the expansion to speed up.

By observing supernovae that exploded billions of years ago and measuring how fast their galaxies are moving away scientists can estimate the amount of dark energy needed to explain the acceleration

-Obinna Uliem



PHYSICS



Zero: The most powerful nothing

Zero is often treated like it does nothing yet it quietly runs mathematics. It anchors the number line and marks the point where positives and negatives change direction. Without zero there is no clear starting point and no way to describe balance. Place value completely depends on it. Without zero the difference between ten and one hundred would fall apart and large numbers would lose all meaning.

In algebra zero is the moment of truth. When an equation equals zero it means everything is balanced and the problem is solved. In graphs zero shows intercepts, turning points and key features that exam questions love to ask about. In physics, zero helps define reference points like zero displacement or zero potential energy which means it shows up everywhere even when it pretends not to.

Zero also has a personality problem. You can add it or subtract it and nothing changes. Multiply by it and everything vanishes instantly. Divide by it and maths refuses to cooperate. This is not a glitch, it is a rule. Historically this caused chaos. Many ancient civilisations avoided zero because the idea of counting nothing felt illegal. When Indian mathematicians accepted zero as a real number it unlocked algebra advanced calculation and eventually calculus.

Zero proves that maths is not just numbers but ideas. Something that represents nothing can still be essential. It is confusing, annoying, powerful, and impossible to ignore which honestly makes it very human.

-Varshini Ganesh, Aminah Hossain & Injila Bilal

Did you know?

The roman numeral system had no zero, which is one reason why Roman maths never became very advanced!

LXVII



FUN FACT

Earth's rotation is changing speed. It's actually slowing down!

MATHEMATICS

Post-16 Careers Advice:



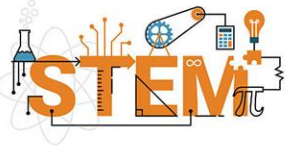
CAREERS

When considering a career, it can be helpful to investigate many different careers before deciding to pursue one. For instance, when studying science, it may be beneficial to investigate careers such as a laboratory technician, or an environmental consultant and then examine differences between careers in terms of daily life experiences. Job investigations may include information available on the internet or by networking with individuals who are carrying out a certain career. This not only provides information regarding specific skills needed, but it may give individuals experience through placements, volunteer opportunities, or part-time employment, such as working in retail, or in an office or community events.



Success in your professional life is not just based on grades and qualifications but can involve skills that are transferable to other jobs. Teamwork can be demonstrated in group work or sporting teams, and presentation skills in presentations, customer service work, or speaking in public. Dealing with problems in your workplace or having to manage on your own can help with problem-solving skills. It is also important to remain flexible, since many people end up in unexpected jobs later on in their lives.

-Kinus Krishnamoorthy & Juanita Jabson



Unsure what career you want to pursue in the future? This article should help you with job investigations and attaining skills to help in future jobs.

Revision tips

Revision works best when you use a range of techniques to keep your learning active and interactive. Some helpful revision methods include flashcards to test key facts; mind maps to make links between ideas; writing summaries in your own words of key information; past papers to practise exam style questions. Teaching someone else or talking out loud about a topic also helps you identify gaps in your knowledge and solidifies memory.



Another key element of revision is looking after your time and energy. The concentration and stress levels can be lowered by studying in shorter and more focused sessions. Regular breaks, sufficient sleep, and adequate fluid intake are all ways that enable your brain to work much more efficiently. Mix different revision techniques with looking after your wellbeing: this way, you will revise more effectively and feel more confident in your learning.

-Kinus Krishnamoorthy & Juanita Jabson



Today's joke
-Because it gives them square roots!

Thanks for reading!
If you have any questions or articles for
future issues, please email us at
TheLabReport@ccgrammarschool.co.uk

That's all from us , see you in our next issue !

-Isabelle Donoghue, Poppy Williams, Juanita Jabson,
Varshini Ganesh, Aminah Hossain, Nkemdirim Uliem,
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Edited by Joseph Hobley