

THE LAB REPORT



Today's Joke

Do you know what you call an acid with a bad attitude?

01/10/26

PHYSICS

By Aminah Hossain and Varshini Ganesh

The Physics of Rock 'n' Roll



When you think of physics, you probably picture quiet labs and complex equations, not a roaring stadium. Yet, rock 'n' roll is actually just applied physics pushed to its absolute limits.

It all begins with a powerful magnetic field connection. Solid-body electric guitars do not rely on a hollow wooden body to naturally resonate and project sound waves. Instead, they use pickups (permanent magnets wrapped in thousands of turns of ultra-thin wire positioned directly beneath the guitar strings.)

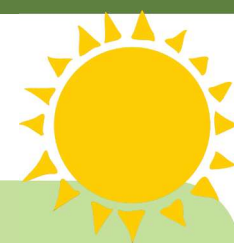
Interestingly, the wire wrapped around these magnets is made of copper, which is a non-magnetic metal. It does not stick to the magnets, but it is chosen because it is an exceptional electrical conductor. The permanent magnets project an invisible magnetic field straight through this copper coil and upward toward the strings. For this connection to work, the strings must be made from highly ferromagnetic metals, primarily steel and nickel.

Because steel and nickel are magnetic, the pickup's field temporarily magnetizes the strings. When a guitarist plucks a string, its physical oscillation disrupts the invisible magnetic lines of force, causing them to shift and ripple. According to Faraday's law of electromagnetic induction, a changing magnetic field passing through a conductor will force an electrical current to move. Even though the copper coil isn't magnetic itself, the rippling magnetic field from the steel string induces a tiny electrical current to flow through it. The pickup instantly translates mechanical energy into a precise electrical signal.

Because it lacks an acoustic soundboard, an electric guitar is nearly silent when not connected to an amplifier. To create stadium-shaking volume, that induced electrical signal travels down a cable as an analog wave. The amplifier uses a massive power source to boost this weak voltage, using the original signal as a blueprint to shape a much larger current. This powerful electrical output is sent to the speakers, forcing the speaker cones to rapidly oscillate back and forth. This mechanical pumping action pushes surrounding air molecules, transforming electrical energy into powerful longitudinal sound waves that travel straight to your eardrums.



Fuelling the future with photons



Scientists have taken a major step toward a future where sunlight doesn't just power homes, it actually creates fuel.

Researchers are working with special materials called carbon nitrides, which can absorb sunlight and trigger chemical reactions that make clean energy sources like hydrogen fuel or turn carbon dioxide into useful chemicals. Pretty futuristic stuff. However, there is one slight issue with using energy from the sun, this being that most of the sun's energy usually gets wasted before anything useful happens.

The breakthrough came when scientists added tiny metal ions into microscopic pores inside the material. These ions help keep energy flowing long enough to do real chemical work instead of disappearing.

What's even better? The team used computer simulations to test dozens of metals virtually before trying them in the lab, speeding up discovery dramatically.

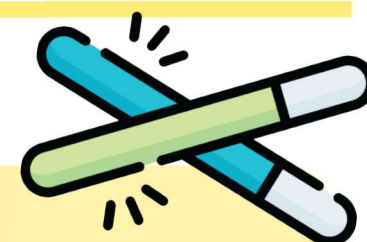
So in conclusion, we now have a much smarter way to design materials that could one day let us store sunshine as fuel, helping power cars, industry, and cities with cleaner energy.



CHEMISTRY

By Sara Sehgal and Joseph Hobley

How do glow sticks work?!

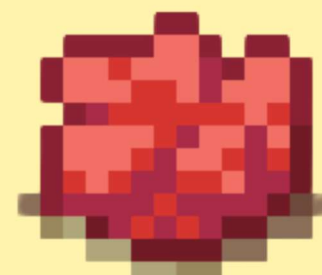
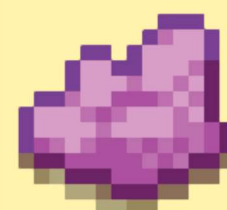


Have you ever wondered how glow sticks can produce such a beautiful light without being activated by fire or electricity. The answer is chemiluminescence, producing light from a chemical reaction. But what chemical reaction occurs in a glow stick?

Well, when you bend a glow stick tiny glass tubes break allowing chemicals to mix. As a result, they react and they release energy. The energy is transferred to fluorescent dye which causes the electrons in it to become excited causing them to move to a higher energy sub shell. When electrons return to their original lower energy level the excess energy is released in the form of visible light.

Like most chemical reactions the reacting chemicals are used up. This means after a while there aren't enough reactant particles left to react and produce excited electrons in the dye. Eventually fewer photons of light are released, and the glow eventually fades.

So that's the life cycle of a glow stick



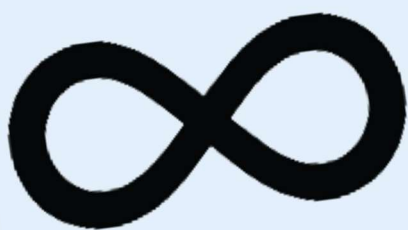
Are some infinities bigger than others?

It might seem like infinity is just endless, but Georg Cantor found out that some infinite sets can actually be bigger than others. Think of the set of all natural numbers (counting- 1, 2, 3 etc.). Now think of the set of all positive even numbers (2, 4, 6, etc.). For each counting number, you can assign it to a corresponding even number by multiplying it by two. This shows that the set of natural numbers and positive even numbers are the same size, despite even numbers being a part of the natural numbers (known by some mathematicians as aleph-nought)!

The same holds true for the rational numbers (any number that can be written as a fraction of two integers). Cantor showed that they can be listed by arranging fractions in an infinitely big grid with numerators increasing to the right and denominators increasing downwards and numbering them along diagonal paths. This means that, surprisingly the rational numbers are also the same size as the natural numbers.

Finally, Cantor proved that the real numbers, despite being infinite, are actually a bigger infinity than the natural numbers. He did this by assuming there was a list containing every single real number between 0 and 1 (for example, 0.24395485, 0.13203203 and so on). He listed them vertically and took the first digit of the first number and changed it, then took the second digit of the second number and changed it too, continuing this process infinitely. The resultant number would have to be different from the first number in its first digit, the second number in its second digit, and so on forever. Therefore, it could not appear anywhere on our list, providing a contradiction, since our list is supposed to contain every real number between 0 and 1!

One interesting fact I was informed of by Professor Moore at Oxford University is that when changing each digit, we shouldn't change any of our digits to a 9 or 0. This is because something like 0.49999... is equal to 0.5, meaning it is possible to accidentally produce a number that is already on the list, potentially making our argument not work.



Today's Joke

A mean o' acid!

Revision tips!

By Sara Sehgal

Make a revision timetable:

Whatever you're training for or revising for, consistency is key. Try making a realistic timetable to organise your time. Break larger topics down into smaller topics. Keep on top of this timetable and update it weekly if needed.

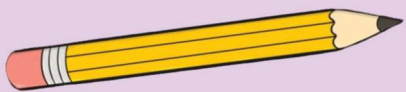
Make mistakes:

Getting questions wrong is a part of learning. Go back and review the questions you got wrong to see why you made that mistake and revisit the topic again if needed and re attempt the questions you got wrong.

Don't just rewrite notes:

Use flashcards, mind maps, YouTube videos or whatever resources you have available. You can blurt what you remember on paper and add what you missed in a different colour. Make sure you understand the topic and then attempt questions to make sure you can apply your knowledge. Practice exam questions are key. Try and try again until you get whatever you're trying right.

Anything is possible with the right mindset!



CAREERS

By Ehsan Fahim and Kinus Krishnamoorthy

Astronomer!

Science is already captivating enough on our planet; however astronomers extend this study to the limits of the universe by observing stars, planets, and galaxies. They do this by using special equipment such as telescopes and gravitational wave detectors, allowing astronomers to detect light and radio waves while also collecting images from several million light years away!

Careers in astronomy are becoming increasingly important to answer the universe's biggest questions. An astronomer would use their findings to support or create new theories to help explain phenomena, requiring persistence and logical reasoning.

Salary and working conditions:

Starting ~ £31,000. Experienced can earn up to and over £65,000

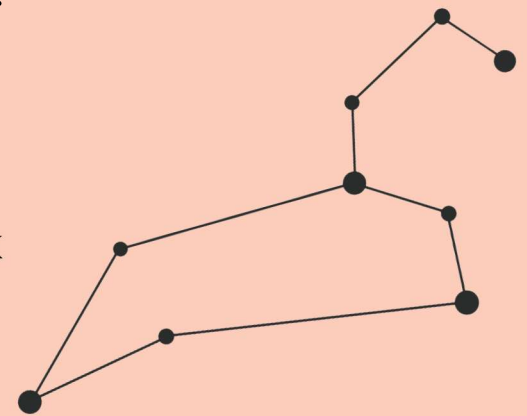
Working hours can be irregular, from about 39 to 41 hours a week

You could have to work on holidays, weekends and evenings.

Entry Requirements:

Generally, you would need 5 GCSEs at grades 9 to 4 (A* to C), or equivalent, including English, Maths and Sciences. 2 or 3 A-levels or equivalent level qualifications, including Maths and Physics

To work as an astronomer, a degree and postgraduate study are needed in a relevant topic such as; astrophysics, maths, physics, astronomy etc



Thanks for reading!

**If you have any questions or articles for future submissions please email us at
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