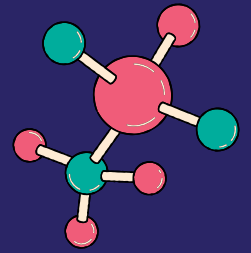
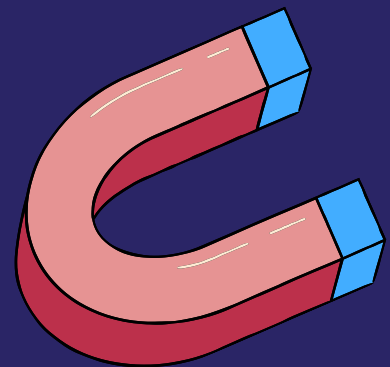
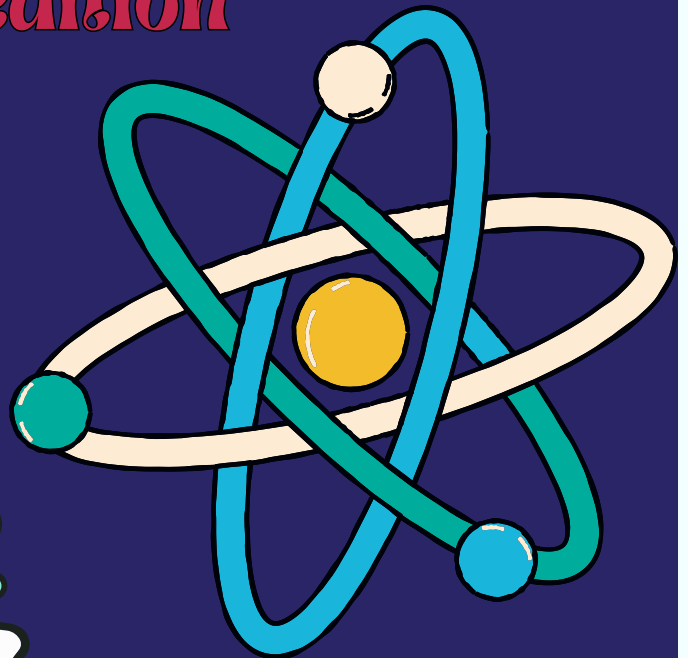
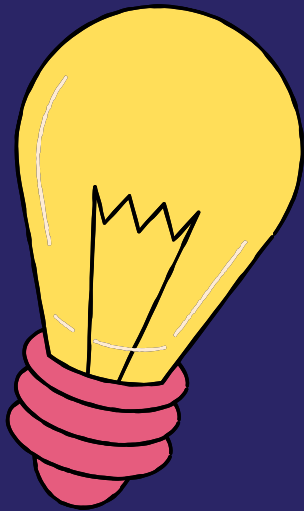


MOD EXPLORERS




third edition



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Should humans Inhabit Mars



The question of human settlement on Mars divides opinion sharply, not because of technology, but because of values. Supporters argue that expanding beyond Earth is a necessary step for human survival. Earth faces climate stress, resource depletion, and the risk of large-scale disasters. From this perspective, Mars represents a backup, a way to ensure that human civilization does not remain tied to a single, vulnerable planet. Settlement is framed as responsibility, not ambition. Learning to live on Mars could also accelerate innovations in energy, agriculture, and sustainability that benefit life on Earth.

Opponents, however, argue that this reasoning avoids a deeper ethical issue. Mars is not an empty testing ground. Even if it appears lifeless, humans do not fully understand its environment. Introducing Earth organisms could permanently alter or erase potential native life, even at a microbial level. Critics argue that humanity has a poor record of entering new environments without causing harm, and there is little reason to believe another planet would be treated differently.

There is also concern about motivation. If Mars becomes a destination only for the wealthy or technologically powerful, settlement risks reinforcing inequality rather than solving global problems. Instead of addressing crises on Earth, resources may be redirected toward an elite future off-world.

Ultimately, the debate is not about whether humans can live on Mars, but whether they should. The decision forces humanity to choose between expansion as progress and restraint as responsibility, a choice that may define how we approach every frontier that follows.

By RAYAANSH KHURANA

YOU ARE A LAB

You do not need a laboratory, expensive equipment, or formal permission to do science. What you need is a question and the willingness to test it carefully. Science begins the moment you decide to observe something systematically rather than accept it as given.

Start small.

Choose a question that fits into your daily life. How does temperature change across different rooms in your house? Does tap water from different sources have the same acidity? How does light intensity affect plant growth on a windowsill?

These are not trivial curiosities. They are the same kinds of questions scientists ask, scaled to what you can control. Design your experiment before you begin. Decide what you will change, what you will measure, and what you will keep constant. Write this down. This step matters because it forces clarity. Guesswork becomes method the moment it is structured.

Use simple tools. A thermometer, a notebook, a phone camera, kitchen ingredients. Precision does not come from advanced instruments alone. It comes from consistency. Measure at the same time each day. Record results honestly, even when they do not match expectations.

Mistakes are not failures. If results are unclear, ask why. Was the sample size too small? Did conditions change without you noticing?

Learning to identify error is part of learning how knowledge is built.

When you finish, reflect briefly. What did the data suggest? What would you change next time? Science is not about proving yourself right. It is about learning how the world behaves when you pay attention.

Doing experiments at home turns science from something you read into something you practice. That shift matters more than any result.

NAVYA CHABRA





If Fruits Were Designed Like Machines: A Pomegranate's Engineering

As Albert Einstein famously said, "Look deep into nature, and then you will understand everything better." This is precisely what we witness in the pomegranate, which is more than just a fruit; it is a work of natural engineering. Hundreds of seeds, which are called arils, are safely contained within its tough outer rind. This acts almost as a protective shell for the pomegranate. Each seed has a juicy coating that protects it from degeneration and dehydration. The modular design resembles modern protective packaging, so even if one portion is broken, the others remain intact. The design also highlights how nature successfully distributes pressure, a concept found in food storage containers, shockproof fabrics, and even helmets.

Mini Engineering Experiment:

Aim:

To see how natural packaging protects delicate structures.

Materials:

- Pomegranate
- Tomato or grape
- Table or floor

Method:

1. Drop a grape or tomato from a small height and observe the damage.
2. Drop a pomegranate from the same height.
3. Compare the results.

Observation:

The fruit with a thick rind absorbs impact far better

Nature designs protective layers that distribute force, a concept mirrored in many human-made products.

Biomimicry, or taking inspiration from nature, is a common practice among engineers. Scientists at Stanford University and the US Department of Energy have developed lithium-ion batteries inspired by the packing of pomegranate seeds.

Vanshika Baid



SANAYA JAIN

The World Around Us

Time Perception: How Our Brain Tricks Reality

Is it just me, or has anybody else noticed how quickly time seems to pass when you're on vacation with friends? But everything appears to move a billion times slower when you're locked in a boring class. While a clock can measure time, the reality is that time perception is much more complex.

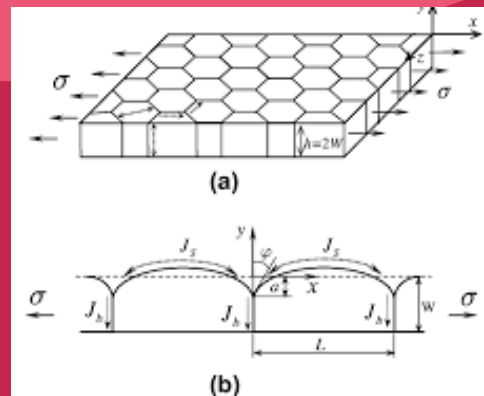
Historically, numerous societies, notably the ancient Greeks, have viewed time in both chronological and philosophical aspects, generating centuries of discussion regarding its meaning.

As contemporary psychology advanced in the late nineteenth century, researchers began researching time perception objectively, noting that it includes complicated neural processes rather than a basic measurement. Time perception is greatly influenced by the brain's capacity to process and assess events, and thus new experiences frequently seem longer than old ones. One of the best illustrations of this is Micheal Siffre's work. In the 1960s and 1970s, Siffre spent a long period of time living in a cave. He didn't have iPhones, artificial light flashes, or even timepieces that could force him into a sleep cycle. As a result, he discovered that his sleep patterns began to shift to a 36-hour clock, which ultimately resulted in hallucinations. All of this demonstrates that we do have some internal influence over how we perceive time rather than just external control. The quantum world demonstrates how time and reality itself may be flexible and unexpected, just as our brains can extend or compress time based on attention and emotion.

All of this raises an intriguing question: Can we ever truly remain in the present if the brain perceives and creates our sense of time?

Science suggests that time feels like a path we move along, yet in daily life, we are always modifying, interpreting, and reacting to it.

By Vanshika Baid



When Metal Became as Thin as a Thought

For decades, scientists believed metals could never exist in a form thinner than a few atoms, bound forever by the rules of physics that kept them solid, dense, and stubbornly three-dimensional. Then, quietly, in a laboratory filled with patience and precision, that belief cracked. Researchers succeeded in creating metals just one atom thick—two dimensional metals that behave unlike anything seen before. The discovery did not arrive with fireworks; it emerged slowly, after years of failed attempts, refined techniques, and relentless curiosity. Yet its impact is enormous. These ultra-thin metals could redefine electronics, making devices faster, smaller, and dramatically more energy-efficient. They may unlock new quantum technologies and sensors sensitive enough to detect changes we once thought invisible. What makes this discovery powerful is not just its technological promise, but its human story—a reminder that science advances because people dare to challenge certainty. In proving that metal can be as thin as an idea, scientists have shown that the future is shaped by those who refuse to stop asking "what if?"

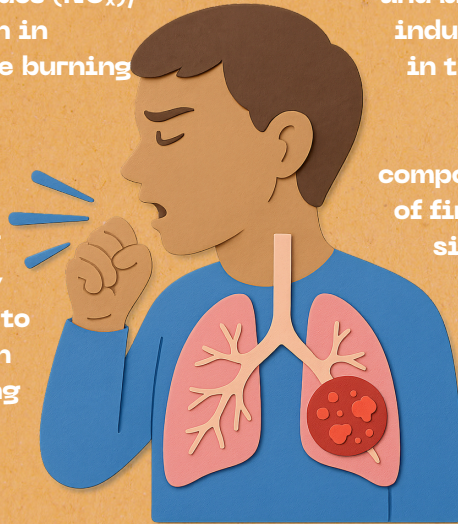
By Eshanya Nahar

Air Quality In Delhi

Global warming precipitated by the heightened levels of the greenhouse effect has been identified as an area of prime concern for the global environment. In the case of the megacity of Delhi, it has been observed to strongly interact with air pollution.

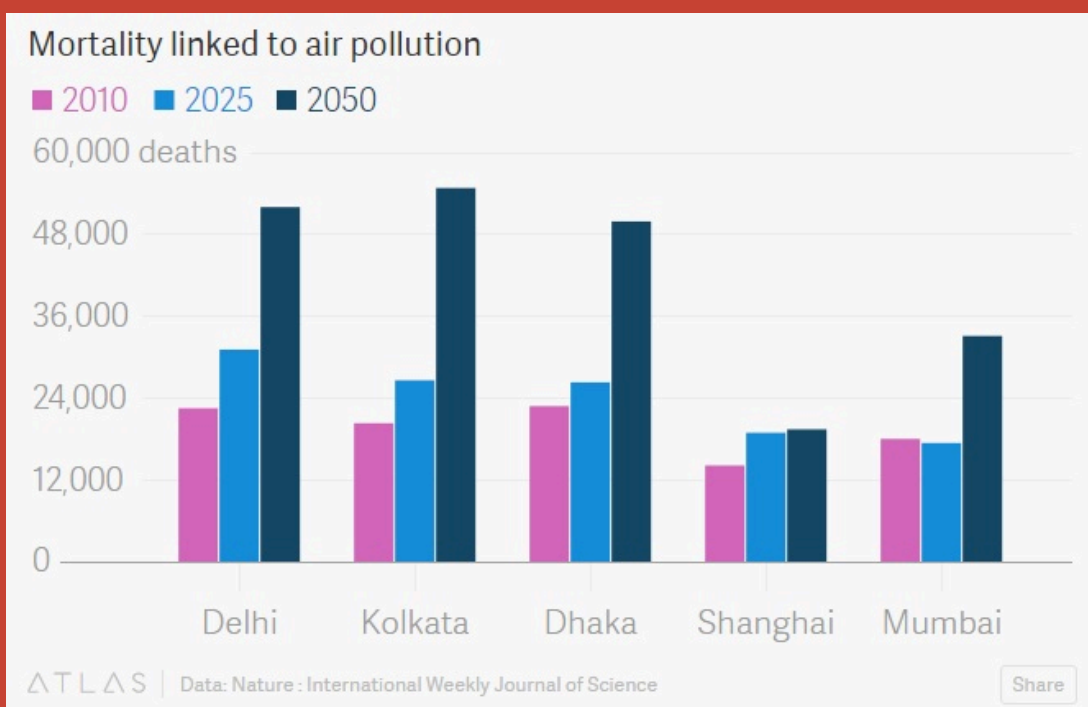
Delhi is one of the largest sources of greenhouse gas emissions (GHGs) and short-lived climate pollutants (SLCP). Important sources are emissions from transportation in the form of carbon dioxide (CO₂), nitrogen oxides (NO_x), and black carbon; coal-based thermal power stations; combustion in industries; emissions during construction in activities; and farm residue burning in the Indo-Gangetic Plains during certain seasons.

One of the characteristic components of the pollution in the city of Delhi is the concentration of finer particulates of size PM₁₀. The finer particles of size PM_{2.5} have the ability to penetrate deep inside the respiratory tracts and also affect the radiation balance by absorbing and scattering solar radiation. The black carbon particles possess a warming effect due to the capability to absorb solar radiation and causing warming in the local climate of the region.



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Meteorological factors further accelerate warming caused by air pollution. In winter, temperature inversion inhibits air motion in the vertical direction and holds pollutants closer to the ground. Thus, a thick smog is formed, and further changes arise in the energy balance at the ground surface because solar radiation is reduced, further leading to variations in climate in the urban area.



what can we do as students?

Reduce unnecessary vehicle use by avoiding single-person car drop-offs and choosing shared transport

Prevent avoidable emissions by ensuring vehicles are not kept idling outside schools

Avoid activities that directly add pollutants, such as burning waste or bursting firecrackers

Minimise energy demand by switching off lights, fans, and air-conditioning when not required, reducing pollution from power generation

Limit indoor air pollution by avoiding aerosols, smoke, and excessive chemical sprays

Make informed daily choices, understanding that repeated small emissions from millions of people add up to serious air-quality damage



2025 Nobel Prizes in Science

Where Curiosity changed the World



Michel H. Devoret, John Clarke
John M. Martinis

“for the discovery of macroscopic quantum mechanical tunnelling and energy quantisation in an electric circuit”

The phrase “for the discovery of macroscopic quantum mechanical tunnelling and energy quantisation in an electric circuit” refers to a breakthrough in showing that quantum effects are not limited to tiny particles like electrons or atoms, but can also occur in large, human-made systems such as electrical circuits.

In classical physics, electric current flows smoothly and continuously. However, this discovery showed that under special conditions—especially in superconducting circuits: current and energy behave according to quantum rules. Energy in the circuit becomes quantised, meaning it can only exist in specific, discrete levels rather than any value. Even more strikingly, the entire circuit can exhibit quantum tunnelling, where it transitions between energy states without crossing the classical energy barrier, something that should be impossible in classical physics.

This was the first clear demonstration of macroscopic quantum behaviour, proving that quantum mechanics applies to systems visible on a human scale. The discovery laid the foundation for modern technologies such as superconducting qubits, which are essential for quantum computing and advanced quantum sensors.

Are we gods if we create life?

For most of history, biology was something we observed. We named organisms, traced their structures, tried to understand the rules that governed them. Life was complex, powerful, and ultimately beyond design. That boundary is beginning to blur. Today, biology is no longer only about reading life's code. It is about rewriting it.

Advances in synthetic biology have made it possible to design cells that behave in ways nature never intended. Scientists can construct genetic circuits, modify metabolic pathways, and build organisms that produce fuel, medicines, or materials on demand. These systems grow, respond to their environment, and reproduce. Yet they are not entirely natural. They are assembled with intention.

This shift changes a fundamental relationship. When DNA becomes editable, it starts to resemble software. Genes can be inserted, removed, or rearranged with increasing precision. Cells become hardware, platforms that can be programmed to perform tasks. The language of engineering enters biology, bringing with it efficiency, optimization, and control.

But life does not behave like code alone. Biological systems are deeply interconnected.

A change made for one purpose can ripple outward in unexpected ways. Cells evolve. They adapt. They interact with ecosystems in ways that are difficult to predict. Designing life is not the same as designing a machine that can be switched off when it fails.

This raises a question that science alone cannot answer. When we create a synthetic organism, what exactly have we made? Is it a tool, owned and controlled like any other technology? Or is it a form of life that carries its own moral weight? The answer matters, especially as these organisms move beyond laboratories and into the world.

Ownership complicates the picture further. Many synthetic organisms are patented. Their genetic sequences are treated as intellectual property. This means that life forms designed to clean pollution, produce food, or generate medicine may be controlled by corporations rather than shared as public goods. Biology, once shaped by evolution, risks becoming shaped primarily by markets.

There is also the question of boundaries. If we can design microbes, can we design more complex life? At what point does intervention become enhancement rather than repair? These questions are no longer speculative. They are approaching relevance faster than ethical frameworks are developing to address them. Supporters argue that synthetic biology offers solutions to problems we cannot solve otherwise. Climate change, antibiotic resistance, and resource scarcity all demand new tools. Critics warn that moving too quickly risks ecological harm and social inequality. Both are right to some degree. Progress and risk are intertwined.

What is clear is that biology is no longer passive. Humans are becoming participants in the creation of life's future, not just its observers. That role carries responsibility. Designing life requires more than technical skill. It requires restraint, humility, and a willingness to accept limits.

-Ojas Panda



Nature's Blueprints: How engineers steal ideas from life

Nature has been testing hypotheses for the last 3.8 billion years selecting and deselecting based on the success or failure of the designed solution. Before human intervention by design as engineers, nature had optimized design through the process of evolution. Today, scientists are catching up with the help of a field of research known as biomimicry, with "nature as the ultimate engineer."

For example, a small gecko, its feet allowing it to stick to walls and ceilings without any adhesive, has had its design imitated to produce strong super-adhesives. The skin of a shark, resistant to bacteria, has led to designs in hospitals that could diminish bacterial growth. In Africa, hot termite hills remain cool even during scorching weather, and architects have designed buildings with natural air-conditioning systems that consume low energy. Even today, airplane designs have designs derived from the wings of birds, whose designs enhance flying flights.

But what makes nature design better than humanity? It's time. Nature does not hurry. Every design made by nature gets tested over ages, and it gets purified by the process of survival. Nature does not produce designs like humanity does, which are sustainable, efficient, and wastage-free.

picture a city that takes cues only from nature. Buildings function like termite hills, roads heal like human skin, and transport networks move like ant trails. They are organised, harmonious, and functioning in perfect sync. Resources are harvested like nature-from the sun, wind, and water.

Kiarra Bajaj



The Earth Status Report



There are days when the planet feels tired in a way that is difficult to measure. Not tired like a machine that has worn down, but like a body carrying an illness it has not yet learned to name. The signs are everywhere, scattered and uneven, often treated as separate problems. A heatwave. A flood. A species quietly gone. But bodies do not fail in fragments. They fail as systems.

Planetary health is the idea that human wellbeing is inseparable from the health of Earth's natural systems. Climate, biodiversity, oceans, soil, microbes, and human bodies are not parallel stories. They are chapters of the same one. To read them in isolation is to misunderstand what is happening.

Temperature is the most visible vital sign. Over the past century, the planet has warmed steadily, not through dramatic spikes but through persistence. A low fever at first, easy to ignore. Even small increases in average temperature alter entire systems. Ice melts earlier. Oceans expand. Weather patterns lose their predictability.

Ice caps act as regulators, reflecting sunlight and controlling sea levels. As they shrink, darker ocean water absorbs more heat. Warming accelerates. The system reinforces its own imbalance. This is not a sudden failure, but a feedback loop tightening over time. Forests play a similar role. They absorb carbon, release moisture, and influence rainfall far beyond their borders.

When forests disappear, the effects are not local. Rainfall patterns shift. Soil dries. Agriculture becomes unstable. The planet's capacity to regulate itself weakens gradually, often unnoticed until recovery becomes difficult. These environmental changes do not remain outside us. Human health is woven into planetary health. As habitats shrink and temperatures rise, animals are forced into closer contact with human populations.

Viruses that once circulated quietly in wildlife find new pathways. Zoonotic diseases are not accidents. They are signals of ecological stress crossing into human bodies. Pollution follows the same pattern. Air thick with particulates enters lungs and bloodstreams. Long term exposure increases risks of asthma, heart disease, and cognitive decline. Environmental harm is not distant. It is intimate. Even food reflects planetary strain. Soil depleted of biodiversity produces crops that look abundant but contain fewer nutrients. Hunger can exist alongside full stomachs. The damage is subtle, but real. What makes planetary illness difficult to confront is its unevenness. Some communities feel the effects immediately. Others are insulated for now.

This creates the illusion that the problem is distant. But systems do not respect borders. Stress accumulates until thresholds are crossed. The causes are not mysterious. Fossil fuel dependence. Deforestation. Industrial agriculture. Overconsumption paired with inequality. These persist not because they are unknown, but because they are embedded in modern life. Treatment cannot be cosmetic. A healthier planet requires reducing pressure, restoring diversity, and allowing natural systems room to function again. Strong ecosystems act like immune systems. When they are intact, they protect us quietly. When they fail, their absence becomes impossible to ignore. Planetary health is not about saving nature for its own sake. It is about recognizing that the condition of the world is already written into our bodies.

-Ojas Panda



WHY THIS MATTERS?

Climate change is no longer a distant threat discussed in future timelines or theoretical models—it is unfolding around us, right now. Record-breaking heatwaves are pushing cities beyond human comfort and safety limits, floods are displacing millions and destroying infrastructure, and prolonged droughts are threatening food security across continents. These events are not isolated accidents; they are connected outcomes of a rapidly warming planet.

What makes this crisis urgent is its ripple effect. Extreme weather disrupts ecosystems, economies, and public health systems simultaneously. Crops fail, water sources become unsafe, energy demand spikes, and vulnerable communities suffer first and hardest. The scientific consensus is clear: without immediate and sustained action, these impacts will intensify within our lifetimes.



Understanding the science behind climate change empowers us to respond—not with fear, but with innovation, responsibility, and informed choices. The decisions we make today will shape the stability of our planet, the resilience of future generations, and the boundary between survival and sustainability.

Things keep going on even if you don't pay attention

Modern life depends on systems that operate continuously, quietly, and largely out of sight. Most people interact with their results, not their mechanisms. Clean water appears at the tap. Electricity flows on demand. Messages travel across continents in seconds. These outcomes feel ordinary precisely because the systems behind them are designed not to draw attention.

Take wastewater treatment.

Every day, enormous volumes of used water are filtered, settled, biologically treated, and chemically disinfected before being released back into the environment. This process removes pathogens and pollutants that would otherwise spread disease.

When it functions correctly, it is invisible. When it fails, the consequences are immediate and severe.

Electrical grids operate under similar constraints.

Supply must match demand at every moment. Power plants, renewable sources, transformers, and control centers constantly adjust to changes in usage.

A sudden spike in demand or a damaged transmission line can cascade through the network if not managed carefully. Stability is the result of continuous monitoring and rapid response.

The internet, often thought of as abstract, relies on physical infrastructure. Data moves through fiber optic cables, servers, and routing centers that decide the fastest path for information. These decisions happen in milliseconds, repeated millions of times each second.

What these systems share is complexity and interdependence.

They are not single machines but networks of processes that rely on balance. Their success lies in prevention rather than reaction.

Understanding invisible systems changes how we think about failure. Breakdowns are rarely isolated events.

They are usually the result of accumulated stress, overlooked maintenance, or disrupted feedback. Paying attention to how systems work before they fail is one of the most effective forms of preparedness modern society has.

Ocean Acidification

The world's oceans absorb nearly one third of the carbon dioxide released into the atmosphere. While this slows the rate of global warming, it also leads to a serious chemical process known as ocean acidification. When carbon dioxide dissolves in seawater, it reacts to form carbonic acid, which lowers the ocean's pH. Since the Industrial Revolution, the average surface ocean pH has decreased by about 0.1 units, representing an increase of roughly 30 percent in acidity.

This change in ocean chemistry directly affects marine organisms that depend on calcium carbonate to build shells and skeletons. Corals, oysters, mussels, and certain plankton species find it increasingly difficult to grow and survive in more acidic conditions. As coral reefs weaken, they lose their ability to support marine biodiversity, protect coastlines from erosion, and sustain fishing communities. The consequences extend through the entire marine food web.

Plankton form the base of this system, so their decline affects fish populations, seabirds, and marine mammals. Reduced fish stocks threaten global food security and the livelihoods of millions of people who rely on the oceans.

Ocean acidification is particularly dangerous because it is invisible and long lasting. Unlike plastic pollution or oil spills, it cannot be easily reversed. Even with immediate reductions in emissions, oceans would take centuries to recover fully. This makes reducing carbon dioxide emissions the only effective long term solution.

Beyond ecological damage, ocean acidification has clear economic and social consequences. Coastal communities that depend on fisheries and aquaculture are already experiencing losses as shellfish hatcheries report lower survival rates and slower growth.

Regions with cold waters, such as the Arctic and parts of the Pacific, are especially vulnerable because they absorb carbon dioxide more rapidly. As fish populations shift or decline, food prices rise and traditional fishing practices become harder to sustain, increasing economic inequality and pressure on marine resources.

Scientific monitoring provides strong evidence that ocean acidification is accelerating. Long term measurements from ocean buoys, research vessels, and satellite data show a consistent decline in pH across major ocean basins.



RIDDLES

Here are 5 fun and interesting riddles for you to solve! Have fun!

- Which nutrient is the body's main source of energy?
- Which vitamin is produced in the skin when exposed to sunlight?
- Which mineral is essential for the formation of haemoglobin?
- Which nutrient helps in the growth and repair of body tissues?
- What type of fat is considered healthiest for the heart?

Answers

Carbohydrates, Vitamin D, Iron, Protein, Unsaturated fats

The Curious Case Of A Laser Beam

In a physics lab, a laser beam was accidentally misaligned, causing an experiment to fail.

Four students were present:

- Aarav: "The laser was already misaligned before we started."
- Bianca: "I never touched the laser setup."
- Chris: "Bianca adjusted the mirror."
- Dev: "Chris is lying."

Rules:

Only one person is telling the truth.

✗ The other three are lying.

Question:

Who is telling the truth, and who caused the laser misalignment?

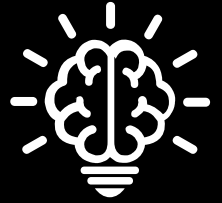


Answer: Dev is telling the truth. Chris caused the misalignment.
Why (brief):
Only one statement can be true. If Dev is telling the truth, then Chris is lying, and the other statements also become false. This satisfies the condition that only one person is truthful.

SCIENCE QUIZ

Which gas contributes the most to human-caused global warming?

- A) Oxygen
- B) Carbon dioxide
- C) Nitrogen
- D) Helium



What term describes long-term changes in Earth's average weather patterns?

- A) Weather variability
- B) Global warming
- C) Climate change
- D) Atmospheric pressure

Which renewable energy source uses sunlight to produce electricity?

- A) Wind
- B) Hydroelectric
- C) Solar
- D) Geothermal




Which sector is the largest global contributor to greenhouse gas emissions?


- A) Agriculture
- B) Transportation
- C) Industry
- D) Energy production

SCIENCE FACTS

- Octopus arms contain more neurons than the rest of the octopus's brain, allowing each arm to process information and make decisions independently.
- Sperm whales have the largest brain of any animal, but intelligence depends more on neural structure and connectivity than size alone.
- Bats create detailed 3D maps of their surroundings using echolocation, processing echoes in milliseconds faster than human visual reaction time.
- Many birds navigate using Earth's magnetic field, detecting it through specialised proteins in their eyes linked to quantum-level processes.



THE LANGUAGE OF DNA – BASICS OF GENETICS AND HEREDITY



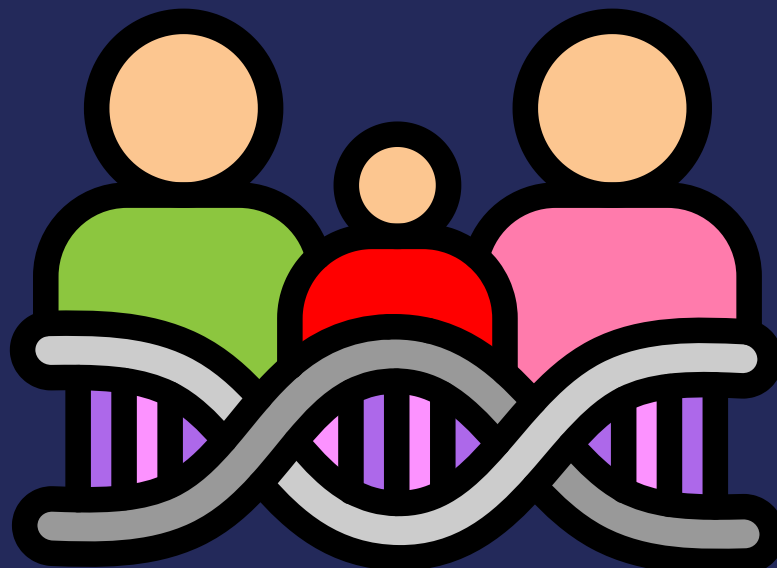
DNA, deoxyribonucleic acid, is the building block molecule that contains instructions for all forms of life. From the pigmentation of your eyes to why you might get a particular illness, DNA stores the genetic makeup that dictates what we are and how we do things. Basic genetics and inheritance not only assists us in realizing how individuals come about but how entire species of living things form over generations as well. Let's enter the interesting world of DNA, the molecules of life.

In essence, DNA is a double-helix molecule composed of four chemical bases: Thymine (T), Guanine (G), Cytosine (C), and Adenine (A). These bases come in pairs in a certain manner: G always with C, and A always with T. These base pairs make up the "rungs" of the DNA ladder, with the "sides" made of sugar and phosphate molecules. The unique arrangement of these base pairs makes up the genetic code, a collection of instructions to assemble proteins. These proteins are required for almost all cellular functions within the body, from metabolism to immunity. The instructions encoded by DNA instruct our cells to make the proteins essential for life itself.

DNA is like a cookbook with each recipe being a gene, a particular piece of DNA that has the instructions to manufacture a specific protein. A gene is really a "sentence" in the language of genetics, directing the manufacture of proteins responsible for a vast array of critical functions. These are the building and repair of tissues, controlling chemical reactions, transporting molecules through cell membranes, and protecting the body from infection. In humans, there are about 20,000 to 25,000 genes distributed over 23 pairs of chromosomes, each gene playing a role in our individual physical characteristics and biological processes.

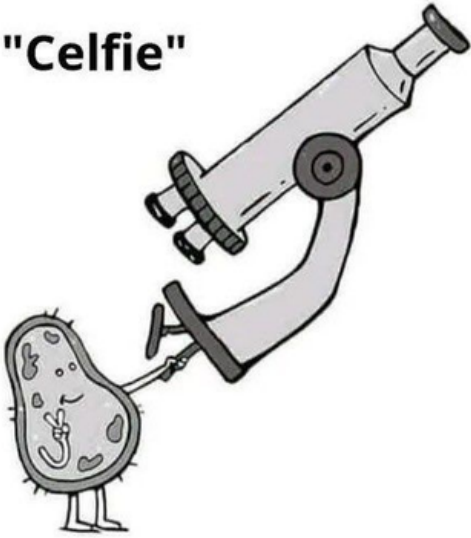
DNA is not alone; rather, it is packaged into structures known as chromosomes. These compactly coiled DNA molecules reside inside the nucleus of every cell. Humans possess a total of 46 chromosomes, which are divided into 23 pairs. One chromosome from each parent makes up each pair. These chromosomes do not only harbor our genetic material but also assign biological sex. XX chromosomes give rise to a female, while XY chromosomes give rise to a male. Beyond this, chromosomes also carry genes that govern everything from our height and eye color to our susceptibility to certain diseases, influencing much of our biology.

Heredity is the process by which genetic traits are passed down from parents to offspring. Traits are determined by alleles, which are variations of the same gene. An individual inherits two alleles for each gene, one from each parent. How alleles are expressed is based on whether they are recessive or dominant. Dominant alleles are expressed if only one is inherited, but recessive alleles are expressed only if the two copies of the gene are identical. For instance, the brown eye gene is dominant to the blue eye gene, so an individual with one blue eye gene and one brown eye gene will have brown eyes. This explains why children inherit features from both their parents and why some features are more prevalent than others.



SCIENCE MEMES

"Celfie"



HOW TO PRAY
BEFORE PHYSICS EXAM



Literally no one:

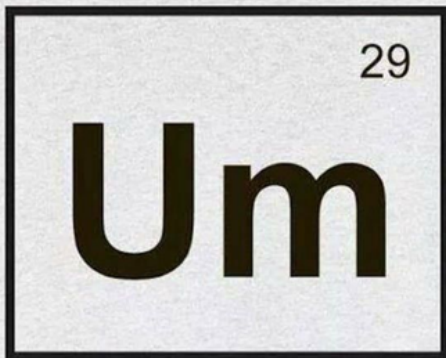
Physics books:

Assume that a penguin is a circular cylinder

NEWTON'S 1ST LAW



A BODY AT REST
WANTS TO STAY AT REST.



The element of
CONFUSION

What you see



What the bacteria
sees



VIDEOS TO WATCH





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