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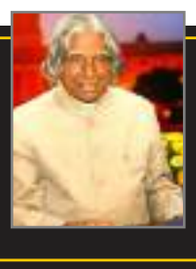
TODAY'S EDITION



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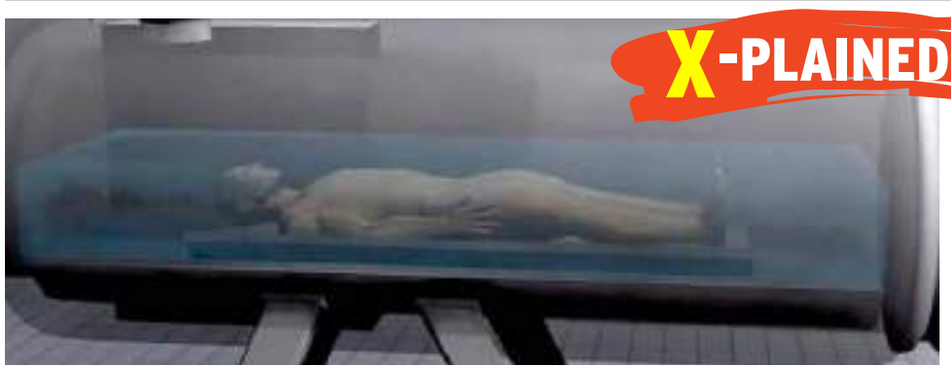
AQUAMATION

Desmond Tutu, the South African archbishop, who passed away recently, was cremated through aquamation. Tutu had always wanted a simple funeral ceremony, and expressed his wish for a cheap coffin and an eco-friendly cremation...

X-PLAINED



WHAT **Aquamation**, or alkaline hydrolysis, is a process in which the body of the deceased is immersed for a few hours in a mixture of water and a strong alkali in a pressurised metal cylinder and heated to around 150 degree centigrade.

WHY **this process:** It is a new eco-alternative to burial and cremation. With shortage in availability of land for burials and cremation producing around 150 kilograms of carbon dioxide per body, and as much as 200 micrograms of toxic mercury, aquamation is being touted as the greenest method for disposing of your mortal remains. According to John Humphries, the chief executive of Aquamation Industries in Gold Coast, Queensland, Australia, who developed the technology, aquamation uses only 10 per cent of the energy of a conventional cremation and releases no toxic emissions. It simply speeds up the natural way that flesh decomposes in soil and water.

HOW **is it done:** The corpse is placed into a steel container and potassium is added, followed by water heated to 150 degree centigrade. The flesh and organs are completely decomposed in four hours, leaving bones as the only solid remains. This is similar to what's left after cremation, where the "ashes" are in fact bones hardened in the furnace and then crushed.

IS IT NEW?

- Aquamation has been used to destroy cattle infected with mad cow disease. It has also been used in the US for the disposal of bodies donated to science, a process referred to as **resomation**
- The process was developed and patented in 1888 by Amos Herbert Hanson, a farmer who was trying to develop an ingenious way to make fertiliser from animal carcasses
- The first commercial system was installed at Albany Medical College in 1993. Thereafter, the process continued to be in use by hospitals and universities with donated body programmes
- It was only in 2011 that the process was used in the funeral industry, at two funeral homes in Ohio and Florida (Source: ANI/Wikipedia)

WORDS OF THE DAY

- Aquamation
- Resomation

Want to learn new words?

WATCH THIS SPACE!

Teenager Bharath Subramaniyam becomes India's 73rd chess Grandmaster

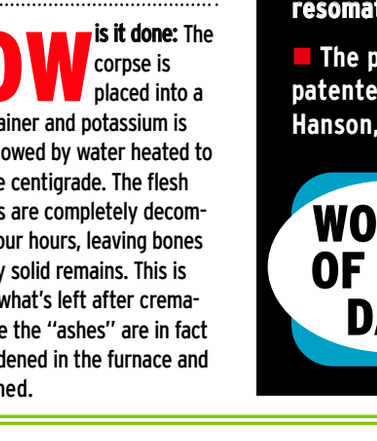
Fourteen-year-old Bharath Subramaniyam, on Sunday, became India's 73rd chess Grandmaster (GM), after completing his third and final GM norm at Vergani Cup Open in Italy. Subramaniyam scored 6.5 points from nine rounds along with four others to finish seventh overall in the event. He secured his third GM norm and also touched the requisite 2,500 (Elo) mark.

Notably, to become a GM, a player has to secure three GM norms and cross the live rating of 2,500 Elo points

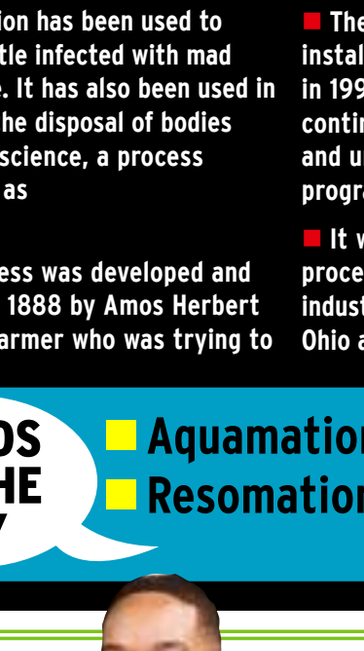
China's Chang'e 5 lunar probe finds first on-site evidence of water on moon's surface

China's Chang'e 5 lunar lander has found the first-ever on-site evidence of water on the surface of the moon, lending new evidence to the dryness of the satellite. The study revealed that the lunar soil at the landing site contains less than 120 parts-per-million (ppm) water or 120 grams water per ton, and a light, vesicular rock carries 180 ppm, which are much drier than that on the Earth. The presence of water had been confirmed by remote observation but the lander has now detected signs of water in rocks and soil.

- A device on-board the lunar lander measured the spectral reflectance of the regolith and the rock and detected water on the spot for the first time.
- The water content can be estimated since the water molecule or hydroxyl absorbs at a frequency of about three micrometres, the state-run Xinhua news agency reported, citing researchers from the Chinese Academy of Sciences (CAS)



SPACE



Will Smith wins his first Golden Globe, takes accolade for 'Best Actor'

American actor, rapper, and film producer Will Smith won a Golden Globe on Monday for his role of Richard Williams in the 2021 movie 'King Richard'. This is the first time that Will Smith has won a Golden Globe. The actor has been nominated for the accolade six times in his career.

- Singer Billie Eilish won the best singer award for the title track of the latest James Bond movie 'No Time To Die'
- Australian actor Kodi Smit-McPhee won a Golden Globe in the category of 'best supporting actor - motion picture'.
- Steven Spielberg's remake of 'West Side Story' was named best musical or comedy film

James Webb Space Telescope fully deployed in space: NASA

The James Webb Space Telescope completed its two-week-long deployment phase on Saturday, unfolding the final mirror panel as it readies to study every phase of cosmic history...

- The most-powerful space telescope ever- built and the successor to Hubble, Webb blasted off in an Ariane 5 rocket from French Guiana on December 25, and is heading to its orbital point, a 1.5 million kilometres from Earth
- Though Webb will reach its space destination, known as the second Lagrange point, in a matter of weeks, it still has around another five and a half months of setup to go
- Next steps include aligning the telescope's optics, and calibrating its scientific instruments

Change your car's colour with an app: BMW unveils colour-changing car

German carmaker BMW has unveiled the world's first "colour-changing" car at the Consumer Electronics Show (CES) in Las Vegas. The concept car, called the BMW iX Flow, uses electronic ink technology normally found in e-readers to transform the car's exterior into a variety of patterns in grey and white. "This is really energy-efficient colour change using the technology E Ink," said BMW research engineer Stella Clarke. "So we took this material – it's kind of a thick paper, and our challenge was to get this on a 3D object like our cars," he added.

1. When stimulated by electrical signals controlled by a phone app, the material brings different pigments to the surface, causing the car to take on a different shade or design, such as racing stripes
2. In the future, the changes would also be controlled by a button on the car's dashboard or perhaps even by hand gestures, Clarke said
3. No energy is needed to maintain the colour the driver selects, according to BMW
4. Though the vehicle displayed at CES could only alternate between grey and white, the technology will be expanded to cover a spectrum of colour, according to BMW

Good communication is the bridge between confusion and clarity.

-Nat Turner

EVOLUTION OF COMMUNICATION

EXAMS Run — SUBJECT: HISTORY, CLASS X, CBSE

Communication has been the essence of existence of human beings. From the stone age to modern era, communication has played a vital role in the development and advancement of civilization through different stages of understanding. With the advancements of modern technology, communication methods have been changing. The life we all are leading today would have been difficult to imagine without communication. From pigeons to the mountain bluebird, we along with our communication methods have evolved at a significant pace. Let us try to understand the timeline of the evolution of communication.

Communication can be broadly classified into verbal and non-verbal communication. Humans have been using different methods to communicate from the beginning.

CAVE PAINTINGS

Cave paintings are the oldest methods of communication. They were used to mark territories. Major events were also recorded through these paintings. They are usually found on the walls and ceilings of caves. Symbolic as well as religious functions were shown in these paintings. Chauvet Cave in France has the oldest cave painting. That painting was made around 30,000 B.C. South Sulawesi, Indonesia, and Coliboaia Cave in Romania has the earliest cave paintings.

SMOKE SIGNALS

Even though used very limitedly, this was an effective way of communication, which is still used in different situations.

CARRIER PIGEONS

Pigeons are known well for their directions. They were known to find their way home, even after travelling long distances. People used to attach small letters to their necks, training them to fly to the receiver. Pigeons were also used by ancient Romans to tell owners how their entries had been placed. They carried essential messages and helped in the evolution of communication.

RADIO

Radios are a source of news as well as entertainment for people. Wireless signals were studied and tested in detail. The scientists practiced using wireless power to share content. Radios are even installed in mobile phones, car systems. They were once a very important medium of communication.

NEWSPAPER

Newspapers are still a wide form of communication used. Every other house has a newspaper delivery every day. These papers deliver written news and also other important national events taking place. Two types of newspapers are national and international. The first printing press system was introduced in 1440 by German Johannes Gutenberg. The newspaper started to get more attention and changed communication forever.

TELEGRAPH

The first electrical communication system to send text messages was called Telegraph. Sending letters required energy and patience to wait for a reply. Telegraphs were introduced to send text messages more quickly than written messages. It helped in sending information across states and nations.

TELEVISION

Even today, televisions are a great source of entertainment. They are a mode of indirect communication to the larger audience. Many people in history put in tremendous efforts to introduce televisions. The early televisions displayed black and white pictures after the World War II. But with tech advancement, colours were added to the screen. Today, there are several features in televisions that provide us more entertainment and information.

INTERNET

The year 1969 marked the beginning of a new age. This year was the launch of the ARPANET (Advanced Research Projects Agency Network); what we commonly know now as the Internet. Then in 1994, came the emergence of the World Wide Web; in 1997, the coming of instant messaging or internet chat, and in 1999, blogging.

SOCIAL MEDIA

People share their life events on social media. Social media platforms help people share pictures, videos, and almost everything on the internet. It is the latest mode of communication in the digital world. Smart phones have made this more convenient. Social media apps can be downloaded on smart phones. Users of social media in this generation are obsessed with these platforms. Social media has revolutionized the way we communicate. We can see what other people are doing through their social media profiles. It is now easy to check on your friends who live far.

TELEPHONE

The telephone was introduced by Alexander Graham Bell in 1876. Within years of its invention, telephones became an essential part of every household and office. The devices transmitted human audio into signals. These signals were then transmitted through wires. Landline telephone service began in 1900s. People could talk on calls for hours through long distances. It was the most reliable form of the communication system. Mobile phones were introduced in 1973 and the mode of communication was changed entirely.

SYMBOLS

It all started with Rock Carvings (Petroglyphs), which were introduced as early as 10,000 BC. These rock paintings drew pictures to convey stories. The carvings on the rock surface were also known as Rock Art. Later on, graphic symbols were used to present ideas or concepts. Chinese created characters for communication as well. Alphabets were created at the last. Evolution of communication was easier after the alphabet.

POSTAL SYSTEM

With the need for communication growing, people started using courier services. Letters were delivered from one person to another through postal services. These systems were very organized in India, China, Persia, and Rome. A Frenchman De Valyer started a postal system in 1653. The use of mailboxes and delivery of letters was done through the system.

The older methods of communication were cave paintings, smoke signals, symbols, carrier pigeons, and telegraph. The latest and modern ways are more convenient and efficient, example- television, phones, internet, e-mails, social media, and text messaging. Communication technology has made progress over thousands of years. This evolution will continue with the changing world. Communication has broadened the capabilities of science through expanding the amount of information in circulation. Numerous things, such as advancing technologies and mediums, have allowed more people to not only understand science but to engage in it as well. Advancements in the field of communication are inevitable as more ways are being discovered to provide reliable service using the least amount of effort.

Y SANDHYARANI, Social Department, Chitturi High School, Vijayawada

SHARPEN YOUR SKILLS IN PHYSICS

EXAMS Run — MOCK PAPER SUBJECT: CHEMISTRY, CLASS XII, CBSE

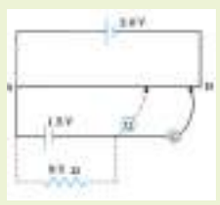
QUESTIONS SET BY KOSURU MARUTHI, PHYSICS FACULTY, WESTBERRY HIGH SCHOOL, BHIMAVARAM, AP

Q1. Coulomb's law for electrostatic force between two point charges and Newton's law for gravitational force between two stationary point masses, both have inverse-square dependence on the distance between the charges/masses.

(a) Compare the strength of these forces by determining the ratio of their magnitudes **(i)** for an electron and a proton and **(ii)** for two protons.
(b) Estimate the accelerations of electron and proton due to the electrical force of their mutual attraction when they are 1 Å (= 10^{-10} m) apart? (mp = 1.67×10^{-27} kg, me = 9.11 × 10-31 kg)

Q2. Two charged conducting spheres of radii a and b are connected to each other by a wire. What is the ratio of electric fields at the surfaces of the two spheres? Use the result obtained to explain why charge density on the sharp and pointed ends of a conductor is higher than on its flatter portions.

Q3. Figure shows a 2.0 V potentiometer used for the determination of internal resistance of a 1.5 V cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of 9.5 Ω is used in the external circuit of the cell, the balance point shifts to 64.8 cm length of the potentiometer wire. Determine the internal resistance of the cell.



Q4. For a circular coil of radius R and N turns carrying current I, the magnitude of the magnetic field at a point on its axis at a distance x from its centre is given by,

$$B = \frac{\mu_0 I R^2 N}{2\left(x^2 + R^2\right)^{3/2}}$$

(a) Show that this reduces to the familiar result for field at the centre of the coil.
(b) Consider two parallel co-axial circular coils of equal radius R, and number of turns N, carrying equal currents in the same direction, and separated by a distance R. Show that the field on the axis around the mid-point between the coils is uniform over a distance that is small as compared to R, and is given by,

$$B = 0.72\frac{\mu_0 N I}{R}$$

approximately.
[Such an arrangement to produce a nearly uniform magnetic field over a small region is known as Helmholtz coils.]

Q5. A 1.0 m long metallic rod is rotated with an angular frequency of 400 rad s^–1 about an axis normal to the rod passing through its one end. The other end of the rod is in contact with a circular metallic ring. A constant and uniform magnetic field of 0.5 T parallel to the axis exists everywhere. Calculate the emf developed between the centre and the ring.

Q6. An LC circuit contains a 20 mH inductor and a 50 μF capacitor with an initial charge of 10 mC. The resistance of the circuit is negligible. Let the instant the circuit is closed be t = 0.
(a) What is the total energy stored initially? Is it conserved during LC oscillations?
(b) What is the natural frequency of the circuit?
(c) At what time is the energy stored (i) completely electrical (i.e., stored in the capacitor) (ii) completely magnetic (i.e., stored in the inductor)?
(d) At what times is the total energy shared equally between the inductor and the capacitor?
(e) If a resistor is inserted in the circuit, how much energy is eventually dissipated as heat?

Q7. Answer the following questions:
(a) The angle subtended at the eye by an object is equal to the angle subtended at the eye by the virtual image produced by a magnifying glass. In what sense then does a magnifying glass provide angular magnification?
(b) In viewing through a magnifying glass, one usually positions one's eyes very close to the lens. Does angular magnification change if the eye is moved back?
(c) Magnifying power of a simple microscope is inversely proportional to the focal length of the lens. What then stops us from using a convex lens of smaller and smaller focal length and achieving greater and greater magnifying power?
(d) Why must both the objective and the eyepiece of a compound microscope have short focal lengths?
(e) When viewing through a compound microscope, our eyes should be positioned not on the eyepiece but a short distance away from it for best viewing. Why? How much should be that short distance between the eye and eyepiece?

Q8. In double-slit experiment using light of wavelength 600 nm, the angular width of a fringe formed on a distant screen is 0.1°. What is the spacing between the two slits?

Q9. In an accelerator experiment on high-energy collisions of electrons with positrons, a certain event is interpreted as annihilation of an electron-positron pair of total energy 10.2 BeV into two γ-rays of equal energy. What is the wavelength associated with each γ-ray? (1BeV = 109 eV)

Q10. The number of silicon atoms per m^3 is 5 × 1028. This is doped simultaneously with 5 × 1022 atoms per m^3 of Arsenic and 5 × 1020 per m3 atoms of Indium. Calculate the number of electrons and holes. Given that ni = 1.5 × 1016 m^{-3}. Is the material n-type or p-type?