Prelim Bits 29-12-2023 | UPSC Daily Current Affairs

Molecular Jackhammers

Scientists have discovered a new method to fight cancer using aminocyanine molecules.

- **Aminocyanine molecules -** These aminocyanine molecules are termed molecular jackhammers.
- These molecules show a remarkable capability to break apart cancer cell membranes when stimulated by near infrared light.
- The use of near infrared light holds significant importance, as it facilitates deeper penetration into the body.
- In comparison to their predecessors, these molecular jackhammers demonstrate over a million times faster mechanical motion.
- These molecules are commonly used as synthetic dyes in bio imaging.
- **Bio imaging -** It is a term that refers to a procedure in which there is no involvement of tools that can invade the skin or physically enter the body, and it allows scientists to view biological functions in real time.
- The purpose of bio imaging is to cause as minimal disruption to live processes as possible.

In experiments conducted on cultured cancer cells, the molecular jackhammer method exhibited a staggering 99 per cent success rate in destroying cells.

- **Test -** Moving from lab settings to living organisms, the approach was tested on mice with melanoma tumors, resulting in half of the animals becoming cancer-free.
- **Working -** Aminocyanine molecules possess a unique structure and chemical properties that synchronize with the right stimulus, near infrared light.
- As these molecules move, the electrons within them form plasmons, collective vibrating entities that induce movement throughout the entire molecule.
- The plasmons, resembling molecular arms, connect with cancer cell membranes and, through vibrational movements, dismantle them.

Plasmons are collective oscillations of the electrons, which are present at the bulk and surface of conducting materials and in the neighborhood of conducting particles.

References

1. WION – Scientists find new method to destroy 99% of cancer cells
2. NDTV – Vibrating Molecules Wipe Out 99% of Cancer Cells

3. Science Alert – Scientists Destroy 99% of Cancer Cells

Sardine Run

Thousands of sardine fish surface near Goa beach, experts call it 'rare' event, known as Sardine Run.

- Shoals of the marine species are fluttering in shallow waters along the coast at Keri-Terekhol, on the Goa-Maharashtra border.

  Shoals are a large group of fish that feed and swim together.

- Sardine Run happens due to sudden changes in the temperature of sea surface water.
- A drop or rise in sea surface temperature can induce migration of sardines in higher numbers and sometimes they are trapped in shallow waters.
- When the deeper water rises, it brings nutrient-rich water on top, triggering high food production and Sardines feed on this fresh food called 'phytoplankton'.

Sardines

- They belong to the herring family of fishes.
- The name sardine can also refer to the common herring and to other small herrings or herring like fishes when canned in oil.
- The European sardine, known as pilchard in Britain, occurs in the Mediterranean Sea and off the Atlantic coasts of Spain, Portugal, France, and Britain.
- Sardines are small, silvery, elongated fishes with a single short dorsal fin, no lateral line, and no scales on the head.

  Unfavorable climatic conditions following El Nino had badly affected the spawning and growth pattern of oil sardine.

References

1. The Indian Express – 1000s of sardine fish surface near Goa beach
2. NDTV – Sardine Run
3. Britannica – Sardine

Buy Now Pay Later (BNPL)

Checkout portals of many e-commerce websites, mobile applications and even banks now offer an option of paying later.

- BNPL is a short-term credit facility extended by banks directly or retailers (through their tie-ups with banks and NBFCs), that allow consumers to defer payment on their purchases for 15 to 365 days.

- Depending on the service provider, the interest-free period may vary from 15-30 days, beyond which the customer can repay in a single shot or in EMIs spread over 1-12 months.

  EMI stands for equated monthly instalment, which relates to payments made regularly to repay an outstanding loan within a certain period.

- Unlike the paperwork for traditional loans, customers can enroll for this credit facility almost instantly using their mobile phones, by finishing basic e-KYC procedures.
- In most cases, the e-KYC procedure does not involve a video authentication.
- Hence, the RBI has mandated that the loans disbursed shall be term loans, for a maximum tenure of 12 months, capped at ₹60,000 a year, unless the customer upgrades to full KYC.

  OLA's Postpaid, or Amazon's Pay Later, or HDFC Bank's Flexi Pay, are all examples of a now in vogue short-term financing facility called Buy Now Pay Later (BNPL).

- BNPL also helps lenders explore new borrowers who would not ordinarily come to them for a loan.
- Besides the digital only enrolment, BNPL also varies from a regular credit card purchase or a regular personal loan, on the low-ticket size and comparatively lower interest rate charged.
- BNPL loans do not entail any processing fee or other on-boarding charges.
- However, BNPL providers do levy additional charges such as late payment fee and pre-closure charges.

References

1. The Hindu Business Line – All about Buy Now Pay Later
2. The New Indian Express – Buy now pay later model
3. CNBC – Buy now, pay later boom

Kilonova Explosions

Kilonova explosions from neutron star collisions could explain how Earth got gold.

- When some type of massive stars die, the nuclear fusion process that fuels them stops.
- This forms an ultra-dense and neutron rich star.

  A neutron star is the remnant of a collapsed supergiant star that was between 10 and 25 times the mass of our Sun.

- When such stars collide with each other, these free neutrons are released into space and taken up by atoms to form very heavy elements beyond the scope of the periodic

table.

- The collision of these ultra-dense, dead stars causes ripples in the very fabric of space-time, called gravitational waves.

In physics, space-time is any mathematical model that fuses the three dimensions of space and the one dimension of time into a single four-dimensional continuum.

- The collision also causes high-energy gamma-ray bursts and a flash of light (Kilonova) which can be detected across large distances in space.

Gold and other metals heavier than iron are formed in space when two neutron stars collide.

Neutron Capture Process	Rapid Neutron Capture Process (R-Process)
• Neutron capture, type of nuclear reaction in which a target nucleus absorbs a neutron (uncharged particle), then emits a discrete quantity of electromagnetic energy (gamma-ray photon). • The target nucleus and the product nucleus are isotopes, or forms of the same element. • The heavier isotope that results may be radioactive, so that neutron capture, which occurs with almost any nucleus, is a common way of producing radioactive isotopes. • Neutron capture is also named neutron-gamma because of the prompt emission of only electromagnetic radiation.	• The r-process, is a set of nuclear reactions that is responsible for the creation of approximately half of the atomic nuclei heavier than iron, the heavy elements, with the other half produced by the p-process and s-process. • **P-process -** It is initiated by the passage of the supernova shock wave and acts via photodisintegration reactions like a spallation process which produces neighboring (proton-rich) isotopes from pre-existing heavy nuclei. • **S-process -** In the s-process, a seed nucleus undergoes neutron capture to form an isotope with one higher atomic mass.

Among the natural elements, boron, cadmium, and gadolinium are the best absorbers of slow neutrons by the capture process.

Gold	Uranium
• Gold (Au), a dense lustrous yellow precious metal of Group 11 (Ib), Period 6, of the periodic table of the elements. • Gold has several qualities that have made it exceptionally valuable throughout history.	• Uranium (U), of the actinoid series of the periodic table, and is an important nuclear fuel. • Some important uranium minerals are pitchblende, uraninite, carnotite, autunite, and torbernite.

References

1. The Indian Express – Kilonova explosions explain how Earth got gold
2. WION – Scientists study kilonova explosion
3. Space – Gold mine of kilonova explosions

Zombie Deer Disease

Experts have termed the zombie deer disease a slow-moving disaster and have urged governments to prepare for the possibility of it spreading to humans.

- The deadly and infectious *chronic wasting disease (CWD)*, also known as zombie deer disease, affects cervids, which are deer, elk, caribou, reindeer, and moose.
- The neurological symptoms of the disease, which include weight loss, lack of coordination, lethargic behavior, listlessness, and drooling.
- It is brought on by a protein called a prion that is flawed and builds up in the brain and other tissues, leading to emaciation, behavioral and physiological abnormalities, and finally death.

The US Geological Survey claims that CWD was first detected in Colorado in 1967 and has since spread to several other states and nations.

- **Transmission -** The condition may take more than a year to incubate, and symptoms may take time to appear.
- Animals can contract it directly from one another or indirectly by coming into contact with infected particles that linger in the environment, such as soil, plants, or excrement.
- They can also become infected if prions carrying the infection contaminate an animal's feed or pasture.
- **Treatment -** There is currently no vaccination or cure for the zombie deer disease.
- **In humans -** There has never been a reported case of zombie deer disease in a human.

Mad Cow Disease

- It is also know by the name Bovine Spongiform Encephalopathy (BSE).
- BSE is a progressive neurological disorder of cattle that results from infection by an unusual transmissible agent called a prion.
- The normal prion protein changes into a pathogenic (harmful) form that then damages the central nervous system of cattle.
- The disease is incurable.
- It is related to a disease in humans called variant Creutzfeldt-Jakob disease (vCJD).

References

1. Business Standard – What is 'zombie deer disease'?
2. Times of India – What is the ‘zombie deer disease’?

3. Aljazeera – What is the 'zombie deer disease'?

Other Important News

Financial Intelligence Unit (FIU)

• A Financial Intelligence Unit (FIU)- India is a national body that collects and analyzes information about suspicious financial activity.
• The FIU-IND is an independent body in ***New Delhi*** that reports directly to the ***Economic Intelligence Council (EIC)***, which is headed by the Finance Minister.
• The FIU-IND cooperates with other law enforcement agencies both ***domestically and internationally***.

Pegasus spyware

• Pegasus is a spyware developed by an Israeli firm, NSO Group, to ***infiltrate smartphones*** — Android and iOS and turn them into surveillance devices.
• It is used as a tool to track criminals and terrorists for ***targeted spying*** and not mass surveillance.
• A spyware is any malicious software designed to enter your computer device, gather your data, and forward it to a ***third-party without your consent.***
• NSO Group has affirmed that it sells the software ***only to governments.***

Black Sea

• The Black Sea also known as the ***Euxine Sea*** is a large ***inland sea*** located at the southeastern tip of Europe.
• The Black Sea is a marginal sea of the ***Atlantic Ocean***, located between Eastern Europe and Western Asia.
• The Black Sea is bordered by Ukraine, Russia, Georgia, Turkey, Bulgaria, and Romania.
• It is the ***world's largest meromictic basin***, meaning that the upper and lower layers of water exchange very little.

Shanghai Archaeology Forum

• The Shanghai Archaeology Forum (SAF) is a ***global initiative*** that promotes the protection, investigation, and use of the world's archaeological resources and heritage.
• It was established in ***2013*** and is a ***biennial forum*** that provides a platform for academic exchanges between archaeologists worldwide.
• **Shanghai Archaeology Forum Discovery Award** is a ***biennial award*** that recognizes individuals and organizations that have made significant contributions to human history.

Director General of CISF

• The centre recently appointed Nina Singh, the ***1st woman IPS*** officer as the Director General of Central Industrial Security Force (CISF).
• CISF is a federal police organization in India that is part of the ***Central Armed Police Forces (CAPF).***
• CISF is responsible for providing security and protection to various industrial establishments, government infrastructure projects, and other important installations in India.
• It is the ***largest industrial security force*** in the world.

Maternity benefits for women soldiers

• Defence Ministry recently has extended the rules for maternity, child care and child adoption leaves for women soldiers, sailors and air warriors in the tri-services.
• It will entitle women soldiers, sailors and air warriors to the same maternity, childcare and child adoption leaves as ***female officers*** in the three services.

Golden Quadrilateral Corridor

• The Golden Quadrilateral (GQ) is a highway network that connects ***India's 4 largest cities - Delhi(north), Mumbai(west), Kolkata(east), and Chennai (south)***.
• It is ***India's longest highway project*** and the ***5th longest in the world*** that also passes through 13 states.
• It is managed by the ***National Highways Authority of India (NHAI)*** under the Ministry of Road, Transport and Highways.
• It is intended to establish faster transport networks between major cities and ports.

Promotion for disables in Group A

• The Union government recently issued an order for Persons with Disabilities to be considered for reservation in promotions up to the lowest rung of Group A posts in the Central government.
• The reservation is in retrospective effect from June 30, 2016.

Iron Ore Exports to China

• China has emerged the highest buyer of iron ore from India for April-November period (8 months), a 400% year-on-year rise.
• Data shows that nearly 95% of India’s iron ore shipments have gone to China while small stocks went to *Indonesia, Malaysia and South Korea.*

Cumulative Roof Top Solar (RTS)

• Cumulative Roof Top Solar (RTS) in India has crossed 10 GW and ***Gujarat*** has emerged as the leader in the segment with a contribution of 30% to the total capacity.
• Gujarat’s share was 3.2 GW, followed by Maharashtra at 1.9 GW and Rajasthan at 1.1 GW capacity.
• According to Union Ministry of New and Renewable Energy (MNRE) the *Compound annual growth rate (CAGR)* of RTS installations during Mar, 2019 to Nov, 2023 is about 46%.

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