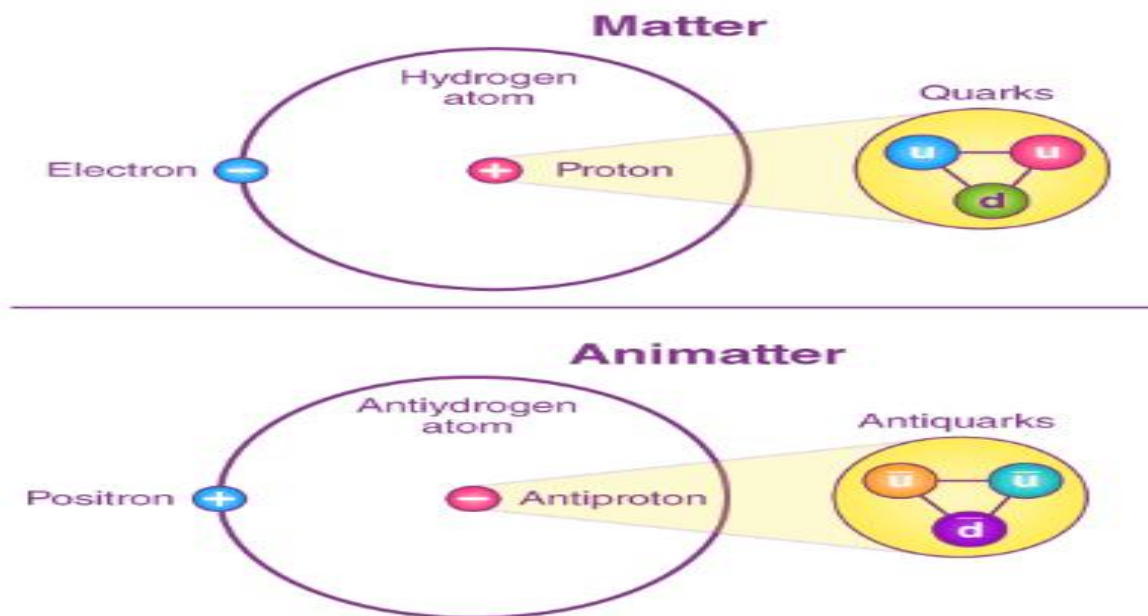


UPSC CURRENT AFFAIRS NOTES 30-09-2023

ANTI-MATTER

A long-standing dispute in physics has just been settled: how would antimatter, the counterpart of matter, behave under the influence of gravity?

Einstein's general theory of relativity implied that antimatter would fall just like matter does, but some physicists have long been suggesting that it should rise upward.



Experiments at CERN have now demonstrated that antimatter falls, validating yet another aspect of the general theory.

Antimatter is the counterpart of matter, with properties reversed, such as positively charged positrons instead of negatively charged electrons.

The general theory of relativity, proposed by Albert Einstein in 1915, treats all matter as identical, suggesting that both matter and antimatter should respond to gravitational forces in the same way.

The Experiment at CERN

CERN, the European Organization for Nuclear Research, conducted experiments to investigate how gravity affects antimatter.

The ALPHA collaboration at CERN has an Antimatter Factory where antihydrogen atoms are created and studied.

Antihydrogen atoms consist of a positron orbiting an antiproton nucleus, and they are confined to prevent contact with regular matter, as their annihilation would occur upon contact.

The Gravity Test

In the experiment, researchers switched off the magnetic field to allow antimatter annihilation.

An apparatus called ALPHA-g, commissioned in 2021, measured the vertical positions at which the annihilation occurred.

Groups of about 100 antihydrogen atoms were slowly released and compared to the results with "regular" matter under the same conditions

Experimental Results

Computer simulations predicted that 20% of matter atoms would exit through the top of the trap, and the remaining 80% would exit through the bottom due to gravity.

The experiment's results demonstrated that antimatter atoms exited through the top and bottom in the same proportion as predicted for matter atoms, indicating that antimatter falls under gravity, just like matter does.

Introduction to Antimatter

What is Antimatter?

Antimatter consists of particles that are the counterparts of normal matter particles, but with opposite electrical charge.

When matter and antimatter collide, they annihilate each other in a burst of energy.

Historical Overview and Discovery

The concept of antimatter was first introduced in the early 20th century by theoretical physicist Paul Dirac.

The first antiparticle, the positron (the antimatter counterpart of the electron), was discovered in 1932 by Carl D. Anderson.

Properties of Antimatter

Antiparticles: Antimatter has antiparticles for each type of matter particle. For example, the antiparticle of a proton is an antiproton, and the antiparticle of an electron is a positron.

Annihilation: When a particle encounters its corresponding antiparticle, they annihilate each other, releasing energy in the form of gamma rays.

Charge and Mass: Antiparticles have the same mass as their corresponding matter particles but carry opposite electrical charges.

Production of Antimatter

Particle Accelerators: Most antimatter is produced in particle accelerators, where high-energy collisions generate antiparticles.

Natural Sources: Cosmic rays and certain types of radioactive decay produce antimatter in small quantities.

Artificial Production: Researchers are continually developing more efficient methods for producing antimatter, as it is challenging and energy-intensive.

Antimatter in the Universe

Cosmic Rays: High-energy cosmic rays striking the Earth's atmosphere can produce antimatter particles.

Antimatter Galaxies: Some galaxies are believed to be composed primarily of antimatter, which could have profound implications for our understanding of the cosmos.

Cosmic Antimatter Distribution: Studying the distribution of cosmic antimatter can provide insights into the composition and history of the universe.

Applications of Antimatter

Medical Imaging and Cancer Treatment: Positron Emission Tomography (PET) relies on positron annihilation for medical imaging. Antimatter could also be used for precise cancer treatment.

Propulsion Systems: Antimatter propulsion systems have been proposed for future spacecraft, offering higher energy densities than conventional fuels.

Energy Generation: In theory, antimatter could be harnessed for power generation, but this is currently highly speculative.

Challenges and Limitations

Storage and Containment: Antimatter is notoriously difficult to store and contain due to its annihilative nature.

Production Costs: Producing antimatter is extremely energy-intensive, making it currently prohibitively expensive.

Ethical and Safety Concerns: The controlled use and transportation of antimatter would require robust safety protocols and international cooperation.

Theoretical Implications

Antimatter and the Big Bang: The abundance of matter over antimatter in the universe is a key question in cosmology related to the Big Bang.

Matter-Antimatter Asymmetry: The reason for the observed excess of matter over antimatter is still not fully understood.

Dark Matter and Antimatter: There are speculations about the possible connections between dark matter and antimatter.

Einstein's General Theory of Relativity

The Equivalence Principle

General Relativity starts with the Equivalence Principle, which posits that locally, in a freely falling elevator, there is no way to distinguish between gravity and acceleration.

This principle challenges the classical concept of gravity as a force and introduces the idea of curved spacetime. Curved Spacetime

Einstein's theory proposes that massive objects warp the fabric of spacetime, causing other objects to move on curved paths.

The presence of mass-energy creates gravity by bending the geometry of the universe itself.

Einstein's Field Equations

General Relativity is mathematically described by Einstein's field equations, which connect the curvature of spacetime (Ricci tensor) with the distribution of matter and energy (the energy-momentum tensor).

Predictions of General Relativity

General Relativity predicts phenomena like gravitational time dilation, the bending of light by gravity (gravitational lensing), and the existence of black holes.

India's NavIC will now be supported by 'Made in India' chipsets

NavIC, or the Navigation with Indian Constellation, is a magnificent gem in the crown of India's technological process. With celestial grace and precision, NavIC illuminates our skies and will soon guide travelers and explorers with unwavering accuracy. It comprises a constellation of seven satellites orbiting high above, weaving a celestial tapestry of signals that empower navigation, positioning and timing across the vast Indian subcontinent and beyond. NavIC system primarily uses IRNSS (Indian Regional Navigation Satellite System) signals for navigation and positioning. These signals are transmitted by a constellation of satellites in

geostationary and geosynchronous orbits. NavIC is like GPS in its functioning and operational principles. The only difference being GPS is owned and operated by United States government while NavIC is owned and operated by India. NavIC covers all of Indian subcontinent and offers a positional accuracy of 5 mtrs compared to 15-20 mtrs of GPS.



NavIC is India's beacon of self-reliance, shining brightly in the world of satellite navigation, and now the indigenously built NavIC enabled chipsets will make it a truly 'Made in India' marvel.

or the first time the chipsets or microchips which are capable of receiving and processing the signals of the indigenous navigational system NavIC will be designed and manufactured in India by an Indian company.

NavIC is a satellite based navigational system, developed by Indian Space Research Organization (ISRO), which enables users to determine their precise geographic location and track their movements anywhere in India and 1500 kms beyond India's territorial boundary.

Not all smartphones and navigational gadgets (or navigators) are compatible with NavIC. To use and decode NavIC signals, a navigating gadget should have a NavIC compatible chipset or microchip incorporated inside it. The receivers of NavIC signals such as NavIC compatible smartphones and other navigators, typically incorporate these chipsets or microchips which are designed to decode and process the signals coming from the seven Indian satellites. Currently, they have been using chipsets made by foreign companies such as Qualcomm Technologies of USA and Mediatek Inc. of Taiwan.

India is keen to increase share of manufacturing in GDP from 17% to 25%: Union Minister Hardeep S Puri

PLI scheme has revolutionised manufacturing in 14 strategic sectors: Shri Hardeep Singh Puri. There has been an increase of 76% in FDI in manufacturing sector due to PLI schemes.

“Global supply chains are realigning. India is emerging as an alternative supply source given its raw materials, low labour costs, growing manufacturing knowhow, and entrepreneurial ability”, said Shri Hardeep Singh Puri, Minister of Petroleum & Natural Gas and Housing & Urban Affairs at an event today. He was addressing the 118th Annual Convention of PHD Chamber of Commerce and Industry (PHDCCI).

Speaking about India’s manufacturing aspirations, Shri Hardeep Singh Puri said that the manufacturing sector currently comprises 17% of the nation’s GDP and over 27.3 million workers. He said that the Prime Minister’s clarion call for ‘Make in India, Make for the World’ at the World Economic Forum this year was a signal that India is ready and keen to increase the share of manufacturing to 25% by 2025.

The minister said that Economic reforms and policies such as GST, IBC, asset monetization, labour law reforms, PLI, National Infrastructure Pipeline, and Gati Shakti mission for multimodal connectivity, have fixed many structural deficits.

Referring to the strong industrial base of India, the Union Minister highlighted that India is second-largest producer of steel; second-largest producer of cement; and second-largest producer of coal. Talking about the infrastructure, the country has second-largest construction of built environment; fourth-largest railway network; and second-largest road network. Noting about the automobile industry the Minister said that India is largest producer of two-wheelers and fourth-largest producer of four-wheelers.

Shri Hardeep Singh Puri said that Performance-linked Incentives (PLI) scheme has revolutionised manufacturing in 14 strategic sectors. He said that there has been an increase of 76% in FDI in manufacturing sector due to PLI schemes. Over the next five years, the PLI schemes are expected to create 60 lakh additional jobs.

Speaking about the transformational impact of PLI, the Minister said that there was a 20% value addition in mobiles manufacturing within a period of 3 years, and a 139% increase in exports of smartphones.

During the event, the Minister also spoke about the transition witnessed by energy sector in recent years. He said that India is simultaneously pursuing both traditional fuel exploration and energy transition.

The minister said that India aims to increase its net geographic area under exploration from 8% (0.25 million sq. kms.) to 15% (0.5 million sq. kms.) by 2025.

India is a global exporter of petroleum products, and boasts the fourth-largest refining capacity globally, he added.

Referring to the significant milestones achieved in biofuel revolution, he noted that the ethanol blending that has increased from 1.53% in 2013-14 to 11% in 2023.

He said that India has also launched the National Green Hydrogen Mission with an allocation of Rs. 19,744 crores to develop a green hydrogen ecosystem.

Talking about India's journey towards green energy transition, he said that India is supporting electric vehicles through PLI, and alternative fuel stations will be established at 22,000 retail outlets by May 2024.

22nd Law Commission submits report`

"Age of Consent under the Protection of Children from Sexual Offences Act, 2012" The Law Commission received a reference from the Hon'ble High Court of Karnataka (Dharwad Bench), vide letter dated 9th November, 2022, asking the



Commission to rethink on the age criteria for consent, taking into consideration the rising number of cases relating to minor girls above the age of 16 years falling in love, eloping and having sexual intercourse with the boy, thereby attracting the

provisions of the Protection of Children from Sexual Offences Act, 2012 ("POCSO Act") and/or the Indian Penal Code, 1860. The Commission is also in receipt of a reference from the Hon'ble High Court of Madhya Pradesh (Gwalior Bench), vide letter dated 19th April, 2023, wherein the Court has drawn the Commission's attention on how the enforcement of the POCSO Act, in its present form, causes gross injustice in cases of statutory rape where de facto consent is present. The Court further requested the Commission to suggest amendment to the POCSO Act, vesting discretionary power in the Special Judge to not impose the statutory minimum sentence in cases where de facto consent is apparent on part of the girl child or where such a relationship has culminated in marriage, with or without children.

After a careful review of existing child protection laws, various judgements and considering the maladies of child abuse, child trafficking and child prostitution that plague our society, the Commission is of the measured view that it is not advisable to tinker with the existing age of consent under the POCSO Act. However, having cautiously considered all the views and suggestions furnished in this regard, the Commission considers it necessary that certain amendments need to be brought in the POCSO Act to remedy the situation in cases wherein there is tacit approval in fact though not consent in law on part of the child aged between 16 to 18 years. This is so because in our considered opinion, such cases do not merit to be dealt with the same severity as the cases that were ideally imagined to fall under the POCSO Act. The Commission, therefore, deems it fit to introduce guided judicial discretion in the matter of sentencing in such cases. This will ensure that the law is balanced, thus safeguarding the best interests of the child. Accordingly, Report No. 283 titled "**Age of Consent under the Protection of Children from Sexual Offences Act, 2012**" was submitted to the Ministry of Law & Justice, Department of Legal Affairs,

Sale of Electoral Bonds at Authorised Branches of State Bank of India (SBI)

The Government of India has notified the Electoral Bond Scheme 2018 vide Gazette Notification No. 20 dated 2nd January 2018 (as amended vide Gazette Notification dated 7th November, 2022). As per provisions of the Scheme, Electoral Bonds may be purchased by a person (as defined in item No. 2 (d) of Gazette Notification), who is a citizen of India or incorporated or established in India. A person being an individual can buy Electoral Bonds, either singly or jointly with other individuals. Only the Political Parties registered under Section 29A of the Representation of the People Act, 1951 (43 of 1951) and which secured not less than one per cent of the votes polled in the last General Election to the House of the People or the Legislative Assembly of the State, shall be eligible to receive the Electoral Bonds. The Electoral Bonds shall be

encashed by an eligible Political Party only through a Bank account with the Authorised Bank.

The State Bank of India (SBI), in the XXVIII Phase of sale, has been authorised to issue and encash Electoral Bonds through its 29 Authorised Branches (as per list enclosed) w.e.f. 04.10.2023 to 13.10.2023.

The Electoral Bonds shall be valid for fifteen calendar days from the date of issue and no payment shall be made to any payee Political Party if the Electoral Bond is deposited after expiry of the validity period. The Electoral Bond deposited by an eligible Political Party in its account shall be credited on the same day.

Combined Index of Eight Core Industries increases by 12.1 per cent (provisional) in August 2023 over August 2022

Production of all Eight Core Industries (Cement, Coal, Crude Oil, Electricity, Fertilizers, Natural Gas, Refinery Products and Steel) record positive growth in August 2023

INDEX OF EIGHT CORE INDUSTRIES (BASE: 2011-12=100) FOR AUGUST, 2023

The combined Index of Eight Core Industries (ICI) increased by 12.1 per cent (provisional) in August 2023 as compared to the Index of August 2022. The production of all Eight Core Industries (namely, Cement, Coal, Crude Oil, Electricity, Fertilizers, Natural Gas, Refinery Products and Steel) recorded positive growth in August 2023 over the corresponding month of last year. Details of annual and monthly indices and growth rates are provided at Annex I & II respectively.

The ICI measures combined and individual performance of production of eight core industries viz. Cement, Coal, Crude Oil, Electricity, Fertilizers, Natural Gas, Refinery Products and Steel. The Eight Core Industries comprise 40.27 percent of the weight of items included in the Index of Industrial Production (IIP).

The final growth rate of Index of Eight Core Industries for May 2023 is revised to 5.2 per cent. The cumulative growth rate of ICI during April to August, 2023-24 is 7.7 per cent (provisional) as compared to the corresponding period of last year.

4. The summary of the Index of Eight Core Industries is given below:

Cement - Cement production (weight: 5.37 per cent) increased by 18.9 per cent in August, 2023 over August, 2022. Its cumulative index increased by 12.7 per

cent during April to August, 2023-24 over corresponding period of the previous year.

Coal - Coal production (weight: 10.33 per cent) increased by 17.9 per cent in August, 2023 over August, 2022. Its cumulative index increased by 11.5 per cent during April to August, 2023-24 over corresponding period of the previous year.

Crude Oil - Crude Oil production (weight: 8.98 per cent) increased by 2.1 per cent in August, 2023 over August, 2022. Its cumulative index declined by 0.4 per cent during April to August, 2023-24 over corresponding period of the previous year.

Electricity - Electricity generation (weight: 19.85 per cent) increased by 14.9 per cent in August, 2023 over August, 2022. Its cumulative index increased by 5.3 per cent during April to August, 2023-24 over corresponding period of the previous year.

Fertilizers - Fertilizer production (weight: 2.63 per cent) increased by 1.8 per cent in August, 2023 over August, 2022. Its cumulative index increased by 7.5 per cent during April to August, 2023-24 over corresponding period of the previous year.

Natural Gas - Natural Gas production (weight: 6.88 per cent) increased by 10.0 per cent in August, 2023 over August, 2022. Its cumulative index increased by 3.9 per cent during April to August, 2023-24 over corresponding period of the previous year.

Petroleum Refinery Products - Petroleum Refinery production (weight: 28.04 per cent) increased by 9.5 per cent in August, 2023 over August, 2022. Its cumulative index increased by 3.7 per cent during April to August, 2023-24 over corresponding period of the previous year.

Steel - Steel production (weight: 17.92 per cent) increased by 10.9 per cent in August, 2023 over August, 2022. Its cumulative index increased by 14.8 per cent during April to August, 2023-24 over corresponding period of the previous year.

Ministry of Ayush to organize more than 358 events for the “Ek Tareekh, Ek Ghanta, Ek Saath” event

Ministry of Ayush is all geared up to make “Ek Tareekh Ek Ghanta Ek Saath” event under Swachhata Hi Seva Campaign to be held on 1st October 2023 a huge success. Ministry of Ayush has firmed up more than 358 events to be observed across India as part of this campaign. Along with special one hour cleanliness drive, the ministry also plans to raise awareness about mental health, wellness



and importance of sanitation in overall health and well-being. More than 8000 functional Ayush Health and Wellness Centers will be engaged to propagate this message.

Ministry of Ayush's research councils, more than 100 national institutes, subordinate organizations along with National Commission of Indian System of Medicine (NCISM) and National Commission for Homoeopathy (NCH) through their network of more than 750 colleges will also participate in this campaign.

The Ministry has also requested various states/UTs to observe the shramdaan activity at all Ayush Health and Wellness Centers operational through National Ayush Mission (NAM).

Ministry has appointed a nodal officer of Joint secretary level to oversee the preparation of the entire campaign and activities to be held on 1st October 2023 across India. The theme for SHS 2023 is "Garbage Free India". Ministry of Ayush is actively perusing special campaign for disposal of pending matters (SCDPM) 3.0 and Swachhata Hi Seva Campaign from 15th Sept to 2nd Oct '23.

Apart from planning of this event, Ministry of Ayush is actively participating in Ayushman Bhav Campaign by organizing weekly Ayush Health Mela's across India through its Ayush Health and Wellness Centers under National Ayush Mission. This campaign is ongoing in all around 8000 functional Ayush Health and Wellness Centers.