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## Trio wins the Physics Nobel prize for building device that demonstrates 'quantum tunnelling'

The Nobel Prize for Physics this year will be awarded to three scientists — John Clarke, Michel Devoret and John Martinis, the Royal Swedish Academy of Sciences said on Tuesday. The three worked together and devised experiments to tease greater insight into the workings of the quantum world. Much like early insight into quantum mechanics paved the way for transistors and silicon chips in the 1950s, the three scientists devised an electrical circuit with two superconductors, components that can conduct a current without any electrical resistance. They separated these with a thin layer of material — called a Josephson junction — that did not conduct any current at all. In this experiment, they showed that they could control and investigate a phenomenon in which all the charged particles in the superconductor behave in unison, as if they are a single 'particle' that fills the entire circuit. Following this, they were able to demonstrate that such a particle could be made to be have simulating the flow of electricity even without voltage, a prerequisite for the flow of current. One of the behaviours that particles are capable of here is "tunnelling", literally, the ability of particles to pass through physical walls. Such strange behaviour cannot be observed at the macroscopic level but these scientists showed that it was possible to organise a multitude of single particles and coerce them to exhibit "tunnelling" properties. "It is wonderful to be able to celebrate the way that century-old quantum mechanics continually offers new surprises. It is also enormously useful, as quantum mechanics is the foundation of all digital technology," said Olle Eriksson, Chair of the Nobel Committee for Physics.

### Nobel Prize in Physics



John Clarke

Michel H. Devoret

John M. Martinis

"for the discovery of macroscopic quantum mechanical tunnelling and energy quantisation"



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# STATE

## PRELIMS CORNER :

1.The term "Summit of Financial Markets and the World Economy" seen in the news refers to :

- (a) OECD
- (b) G20
- (c) World bank
- (d) World Economic Forum

2.Chagos Islands and Diego Garcia have recently seen in the news a dispute between :

- (a) China and Philippines
- (b) China and Japan
- (c) UK and Maldives
- (d) UK and Mauritius

3.Which one of the following issues is the 'World Economic Situation and Prospects report' periodically ?

- (a) World bank
- (b) International Monetary Fund
- (c) United Nations
- (d) World Economic Forum

4.Zaporizhzhia nuclear power plant, which was recently in the news, is located in ?

- (a) Afghanistan
- (b) Belarus
- (c) Russia
- (d) Ukraine

## Study finds trenches and fences are main causes of elephant injuries, deaths

- Trenches, solar fences, and electric fences are the major causes of elephant injuries and deaths in conflict zones across Karnataka and Kerala, as found by a Centre for Wildlife Studies (CWS) report published in Scientific Reports.
- Trenches caused 32.8% of recorded elephant injuries in Karnataka, while solar and electric fences in Kerala accounted for 63.8% of injuries and deaths.
- These barriers, designed to deter elephants from farms or for maintenance, often cause unintended harm and fatal accidents due to poor design.
- The CWS study used rainfall, elevation, and land cover data to predict elephant movement. Rainfall was the most important predictor (28%), with forest cover and fruit crops also influential.
- Environmental factors and landholdings shape migration patterns, often resulting in repeated crop damage and emotional distress for local communities.
- The report urges improvements in barrier design and calls for broader community participation to address human-elephant conflict in these landscapes.
- Man-animal conflict remains a pressing socio-ecological issue, especially in regions where expanding human activity encroaches on wildlife habitats, demanding comprehensive and community-inclusive strategies for effective mitigation.





## Sri Lanka is a natural barrier protecting south-eastern coast from ocean fury: study

- Sri Lanka acts as a natural land barrier located to the south of India, shielding the southeastern Indian coast from the destructive impacts of long-period swell waves generated in the Southern Ocean.
- Regions north of Sri Lanka, such as Tamil Nadu and Andhra Pradesh, remain largely unaffected by these powerful ocean swells, while regions south and southwest of Sri Lanka still face flooding and erosion from these waves.
- Scientific research using real-time data and modelling revealed that more than 96% of such swell events observed on the west coast did not significantly impact the eastern coast due to Sri Lanka's landmass.
- If Sri Lanka's landmass was hypothetically removed in simulations, the model showed that the southeastern Indian coast would face increased exposure to swell waves, confirming Sri Lanka's protective role.
- The findings have significant implications for coastal management, early warning systems, and climate change preparedness, highlighting the importance of natural geographical barriers like Sri Lanka in mitigating oceanic risks to mainland India.
- Alteration of coastal morphology affects sediment cycles, water quality, and increases vulnerability to flooding and storms.
- Coastal erosion thus poses complex challenges requiring multi-dimensional strategies that integrate environmental conservation, economic safeguarding, community resilience, and cultural preservation.

## Starmer leads 100-member U.K. delegation on India visit

- The UK-India Free Trade Agreement (FTA) has bipartisan support in the UK and is seen as central to the future of India-UK relations, highlighted during UK Prime Minister Keir Starmer's upcoming visit to India.
- India-UK ties are considered dependable amid global uncertainty, with both countries viewed as stable, reliable partners for one another.
- The "living bridge" of Indian diaspora and business ties is emphasized, with over 650,000 Indian-origin people and 850 Indian companies in the UK.
- The Vision 2035 document sets out key collaboration areas: economic cooperation (trade, SME support, tariff elimination), education (student and skills exchanges, vocational recognition), research and innovation, defence (industrial cooperation and co-development), and investment.
- Bilateral trade for 2024 (goods and services) is projected to surpass £50 billion, with strong growth in services, education (over 100,000 Indian students in the UK), cultural exchanges, and improved connectivity (flights, visa, and consular services).
- Initiatives like science and innovation councils, updated film co-production frameworks, and people benefits (youth mobility, student scholarships, business launches) reinforce broader, long-term partnership goals.
- The agenda includes reviewing progress on the trade agreement, attending tech and business events in Mumbai, and discussing major collaborative opportunities in sectors like higher education, technology, and manufacturing.



## ‘No State has fully complied with key drug quality norms’

- No Indian state has fully complied with key drug quality norms, specifically the Corrective and Preventive Action (CAPA) guidelines, which are crucial for pharmaceutical manufacturing under the revised Schedule M regulations.
- While 18 state drug control authorities use the Online National Drugs Licensing System (ONDLS) for processing drug-related licences, full compliance with CAPA remains lacking.
- CAPA guidelines are essential for safety, high standards, and quality management in regulated pharmaceutical manufacturing, especially after recent deaths linked to spurious drugs in Madhya Pradesh and Rajasthan.
- ONDLS is a digital, transparent, and accountable system aimed at streamlining drug licensing, with 5,308 MSMEs licensed and 3,838 compliant with revised Schedule M GMP so far.
- Compliance with CAPA ensures that drug violations are registered and corrective action is taken, but voluntary uptake, not enforcement, is currently driving progress.
- Non-compliance can lead to unsafe, substandard, or adulterated medicines reaching the market, resulting in adverse health consequences such as toxicity, infections, allergies, organ damage, treatment failures, and even death—as seen in recent tragedies with toxic cough syrups.
- Non-compliance damages the reputation of pharmaceutical companies and the Indian industry, resulting in loss of market share, bans, rejections, or recalls in international markets, reduced exports, and foreign exchange losses.
- Loss of consumer and investor trust leads to decreased business, investment, and long-term viability—including declines in employment and revenue.

## Top court asks States, U.T.s to frame road safety rules within six months



- The Supreme Court has directed all States and Union Territories to frame comprehensive road safety rules within six months, covering pedestrian protection, helmet compliance, lane discipline, and control of vehicle modifications like dazzling LED headlights and unauthorized strobe lights.
- Rules must be framed under Sections 138(1A) and 210-D of the Motor Vehicles Act, 1988, with a mandate for standards in design, construction, and maintenance of roads.
- The Court emphasized the urgent need for safer pedestrian crossings and improved road safety, citing that over 35,000 pedestrians and 54,000 two-wheeler riders/passengers died in road accidents in 2023 alone, often due to lane indiscipline and non-wearing of helmets.
- The directive was issued in response to a public interest litigation highlighting India’s alarming road fatality statistics and the “utter callous and casual attitude” of authorities toward safety.
- The Court also asked authorities to strictly enforce helmet laws for both riders and pillion passengers, regularly monitor compliance, and submit reports.
- Support sustainable development: Road safety aligns with global objectives such as the UN Sustainable Development Goals by fostering safer transit, healthier communities, and reduced environmental impact..
- Reduce economic burden: Fewer accidents mean lower health costs, damage claims, and traffic delays, which supports economic growth and saves resources for families and governments.
- Ensure pedestrian and vulnerable user protection: Specific guidelines help safeguard children, cyclists, and elderly pedestrians by defining safe crossing zones, mandatory stops, and vehicle conduct.

## EXPLAINED

# Why Indian capital needs to invest domestically?

As the global economy now moves to an extended period of uncertainty, due to tariffs and fluctuations in world trade, India's private business houses have to work closely with the government and align with public interest to maintain the economy's growth momentum. Historically, Indian capital played a crucial role in nation-building when external options were limited, using savings and profits for local growth and infrastructure, especially in early industrialization phases.



- The risks of overdependence on external demand and supply shocks, which can cause volatility in employment, wages, and economic activity, further exacerbated by recent global disruptions.
- Public capital expenditure has surged, but private investment has lagged; the need is for both sectors to collaborate, especially in strategic areas such as technology, urban infrastructure, housing, transportation, and national security.
- To maintain growth momentum and reduce risk, Indian capital must align with public priorities, invest in innovation and emerging sectors, and take a lead in funding development during uncertain global cycles.
- **Job Creation and Poverty Reduction:** Domestic investments, especially in infrastructure and industry, generate significant employment opportunities within the country. Higher local employment increases household incomes and lifts people out of poverty, leading to broad-based prosperity.
- **Stimulating Demand and Enhancing Productivity:** Investment in facilities, services, and technology raises domestic demand for goods and services, which boosts the output of other local businesses and creates a virtuous cycle of economic activity.
- **Capital Formation and Infrastructure Growth:** Domestic funds directed towards building roads, power, transport, and digital infrastructure provide the backbone for further industrialization and innovation, improving economic efficiency.
- **Innovation and Competitiveness:** Domestic investors tend to better understand local needs and can target innovation in sectors directly relevant for the country. Higher domestic R&D spending increases productivity, competitiveness, and adaptability to changing global markets.
- **Economic Resilience and Stability:** Relying on domestic sources for capital shields the economy from global shocks, foreign exchange volatility, and cyclical downturns in world trade. It ensures that growth is not overly dependent on uncertain external flows.
- **Attracting Additional Investment:** Successful domestic investment signals political and economic stability, increasing the country's attractiveness for both local and foreign capital inflows, which further accelerates development.
- **Supporting Government Initiatives:** When domestic capital aligns with public infrastructure projects, employment schemes, and technological upgrades, the synergy amplifies countrywide growth momentum.

## Policy Considerations

- Governments should foster a conducive environment for local investors through policy stability, infrastructure support, access to finance, and streamlined regulations.
- Encouraging domestic investment in diverse regions and emerging sectors expands the benefits throughout society and enhances the sustainability of economic progress.

## Private credit cash pivots from 'risky' West to emerging markets

- Private credit investment is shifting from developed Western markets to emerging markets due to the search for higher yields as returns have diminished in the U.S. and Europe, and competition has driven down margins.
- Asset managers and funds, such as PIMCO, have committed billions of dollars to emerging market deals and expect significant growth, especially in infrastructure, sovereign, and corporate projects that banks find too risky or are barred from financing.
- Emerging markets offer higher risk profiles and returns, with private credit priced above 300 basis points higher than in developed markets, attracting investors looking for high-yield and low correlation opportunities.
- Borrowers in emerging markets use private credit for large energy, infrastructure, and commodity projects, including oil refineries, wind farms, and fuel prepayment deals, due to limited banking access and greater flexibility compared to sovereign debt or local banks.
- The shift boosts economic development in emerging regions but brings higher risk exposure for investors and raises concerns about effects on sovereign debt markets and financing stability.
- Private credit in emerging markets enables bespoke financing, unique repayment terms, and asset-backed lending, with investors having greater influence over project structure and governance than in developed markets.



## Waiting for other countries to unveil digital currency: RBI

- The Reserve Bank of India (RBI) is waiting for other countries to launch digital currencies before proceeding with a nation-wide rollout of Central Bank Digital Currency (CBDC) for retail, stressing the need for simultaneous adoption for effectiveness, especially for cross-border payments.
- RBI Deputy Governor Rabi Sankar stated that cross-border payments are the most appropriate use-case for a CBDC, but did not rule out a future retail launch.
- At the Global Fintech Fest, the National Payments Corporation of India (NPCI) unveiled biometric authentication for UPI payments, allowing customers to opt for biometric verification instead of entering a PIN, increasing security and ease of use, especially for seniors and first-time users.
- Biometric authentication uses cryptographic checks, ensuring reliable and independent transaction verification, and is expected to drive safer, seamless digital payments.
- Financial Inclusion: CBDCs can reach unbanked and underbanked populations by giving everyone with a smartphone or digital ID access to digital payment tools, promoting economic participation and reducing inequality.
- Government Payments and Welfare: Governments can directly distribute subsidies, social benefits, pension payments, or disaster relief funds to citizens' digital wallets, minimizing fraud, administrative leakages, and delays.
- Improved Interbank Settlement: On the wholesale level, CBDCs streamline settlements between banks, lowering risks and improving the resilience and efficiency of the financial system.



# INTERNATIONAL

## Israel marks October 7 anniversary as talks held to end the war in Gaza



- Israel marked the second anniversary of the October 7 Hamas attack with indirect talks between Hamas and Israeli negotiators to end the war in Gaza, set against the backdrop of a US-proposed peace plan and growing optimism from President Donald Trump.
- The October 7, 2023, attack by Hamas was the deadliest in Israel's history, with over 1,219 people, mostly civilians, killed and 251 people taken hostage, sparking a massive Israeli retaliatory offensive in Gaza.
- A Hamas official described the attack as a 'historic response' to Israel's actions, with ongoing negotiations in Egypt to overcome obstacles to a ceasefire and potential hostage release.
- There are continued accusations of genocide against Israel by the UN and human rights groups, with Israel rejecting these claims and counter-accusations against Hamas for war crimes.
- Trump's new 20-point peace plan, including gradual Israeli withdrawal and hostage releases, received positive initial responses, fueling hopes for diplomatic progress, while memorial vigils in Israel highlight the lasting impact of the attack on families and communities.
- Washington's broader plan was to integrate Israel deeper into the regional economy as well as the global order with two major initiatives, both involving India — the I2U2 grouping (India, Israel, the U.S. and the United Arab Emirates), and the India-Middle East-Europe Economic Corridor (IMEEC).

## Donetsk in Ukraine seen as Russia's gateway, not the war's ultimate prize

- Donetsk, once an economic and population hub in eastern Ukraine, has become symbolic of Ukraine's survival struggle, as Russia controls most of the Donbas region and has annexed other southern regions.
- Over a decade of fighting has led Ukraine to lose around 70% of Donetsk, with cities and industries devastated, much of the population displaced, and the region serving as a key battleground.
- While Russia's focus remains on consolidating control in Donetsk and using it as a strategic launchpad, military experts argue it is not the ultimate prize but a "gateway" to other objectives and leverage at the negotiating table.
- The region features immense fortifications, making further advances difficult and costly for both sides, while politics often dictate continued fighting even when the military value is limited.
- Ukraine resists ceding more territory, and control of Donetsk is about more than land—it is about national morale, leverage, and defining the course of the broader war as Russia seeks concessions from Kyiv and the West.
- Russia has claimed to capture nearly 5,000 square kilometers of Ukrainian territory this year, asserting complete strategic initiative on the battlefield, especially in the Donbas and southern regions.
- Fighting remains intense along a 1,250 km front, with Russia advancing in several directions and Ukrainian forces launching strikes deep inside Russian territory using drones.



# Prelims Corner: Explanations

## Q1. Ans b

The G20 is an international forum comprised of 19 countries and the European Union and African Union, representing the world's major developed and emerging economies. Together, the G20 members represent 85% of the global GDP, 75% of international trade and two-thirds of the world's population. It focuses on major global economic issues such as international financial stability, climate change mitigation, and sustainable development. The G20 Summit is formally known as the "Summit on Financial Markets and the World Economy".



## Q2. Ans d

Chagos Island and Diego Garcia are disputed islands between United Kingdom and Mauritius which are located in the Indian ocean. The Chagos Islands are a strategically significant group of islands in the Indian Ocean, and Diego Garcia is the largest island within the archipelago, home to a major U.S. naval and air base. The UK formally handed sovereignty of the Chagos Islands to Mauritius in May 2025, but will lease Diego Garcia from Mauritius to maintain the crucial military base for the next 99 years.



## Q3. Ans c

The World Economic Situation and Prospects is a report produced by the United Nations Department of Economic and Social Affairs (UN DESA), in partnership with the United Nations Conference on Trade and Development (UNCTAD) and the five United Nations regional commissions:

- Economic Commission for Africa (UNECA)
- Economic Commission for Europe (UNECE)
- Economic Commission for Latin America and the Caribbean (UNECLAC)
- Economic and Social Commission for Asia and the Pacific (UNESCAP)
- Economic and Social Commission for Western Asia (UNESCWA)

The Prospectus deals with 4 Sustainable Development Goals: SDG8, SDG10, SDG12, SDG13.

## Q4. Ans d

The Zaporizhzhia nuclear power plant was built between 1984 and 1995. It is located in the city of Enerhodar, on the banks of the Dnieper river, just 200 kilometres from the conflicted Donbas region where Russian-backed separatists and Ukrainian forces have been fighting. It is Europe's largest nuclear power plant and the ninth largest in the world. It has six reactors, each generating 950MW, and a total output of 5,700MW, enough to power four million households.



## Case Study:



Residents of the Dutch Caribbean island of Bonaire spoke at the Hague courtroom on Tuesday and accused Netherlands of not doing enough to protect them from the effects of climate change. The case, backed by Greenpeace, follows a series of international landmark rulings that found governments have broad obligations to protect their citizens from increasing temperatures and rising sea levels. Bonaire, along with two other islands, St. Eustatius and Saba, became special Dutch municipalities in 2010. The island's 20,000 residents are Dutch citizens. The Netherlands "presents itself internationally as a champion of ambitious climate policy. The problem is that the state is not putting its words into action," lawyer Michael Bacon, who represents the plaintiffs, said in court. The case is being heard at The District Court of The Hague, where the landmark Urgenda proceedings began more than a decade ago, and in 2019, the Dutch Supreme Court ruled in favor of climate activists and ordered the government to cut greenhouse gas emissions. Legal experts on climate change cases say the Dutch case is one of the first to test the obligations set in a landmark 2024 European climate ruling and this year's World Court opinion on a national level.

