

Rupees vs Dollar

- A number of countries, including India, are now considering the use of other currencies to avoid the U.S. dollar and its hegemonic role in settling international transactions
- In recent times, India has been taking an active interest in having the rupee used for trade and the settlement of payments with other countries, which include Russia, now facing sanctions.
- The advantages India is currently seeking in these arrangements include avoidance of transactions in the highly priced dollar which has an exchange value of ₹80, impacting the Indian economy with inflation, capital flight.
- There are quite a few problems that may prevail in implementing the desired rupee payments and avoiding dollar transactions.
- Apart from issues that concern an agreed exchange rate between the rupee and the ruble (R-R), two volatile currencies, there is also the question of the willingness of private parties (companies, banks) to accept the rupee for trade and settlements.
- The fear continues even after the recent Congressional approval of those purchases as a special case in the backdrop of Chinese aggression.
- Moreover, the deals between India and Russia, especially on oil, can be considered by the West as 'indirect back door support' as India is importing Russian crude at a 30% discount, processing at refineries in Gujarat which include Reliance, and then exporting those to the West.
- Crucial aspects of the bilateral trade and payments agreement arrangement included: participation by state-trading units alone; fixed exchange rates as agreed upon by trade partners, and the offer of credit by countries that had a trade surplus to countries with a trade deficit.

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Human health and animal health

- India has a livestock population of 1.6 billion that in turn translates into a scenario where approximately 280 million farmers rely on the livestock and related industries for livelihood.
- From the perspective of trade, the dairy industry in the country is valued at \$160 billion, while the meat industry is valued at \$50 billion.
- In addition, livestock and related activities have significant overlap with wildlife and humans.

- Statistics indicate that globally, we have witnessed around 9,580 instances of disease outbreaks from 2000 to 2010, of which 60% of diseases were zoonotic in nature
- A major loophole in the context of pandemic preparedness can be attributed to the fact that it has largely been human-centric, leaving a large unaddressed gap for diseases of pandemic potential in animals.
- The Department of Animal Husbandry in Government of India has been working towards increased investment in preparedness to protect health and building economic resilience so that India could become a world leader in animal pandemic preparedness.
- To this end, the Department of Animal Husbandry and Dairying (DAHD) has set up a dedicated 'One Health Unit' in collaboration with the Gates Foundation.
- One of the primary focus areas of the unit has been on coming up with an "animal pandemic preparedness" model by creating a mechanism for storage and seamless exchange of data and information on livestock health this will be implemented through the National Digital Livestock Mission (NDLM)
- To incentivize the growth of the animal health industry in India, companies can now avail incentives for setting up or expansion of animal

vaccines and related infrastructure under the Animal Husbandry Infrastructure Fund.

- **Alpha Fold - X-ray crystallography, Nuclear magnetic resonance (NMR), Cryo-electron microscopy (Cryo-EM)**

What is Alpha Fold?

- AlphaFold is an AI-based protein structure prediction tool.
- It is based on a computer system called deep neural network. Inspired by the human brain, neural networks use a large amount of input data and provides the desired output exactly like how a human brain would.
- The real work is done by the black box between the input and the output layers, called the hidden networks.
- Alpha Fold is fed with protein sequences as input.
- When protein sequences enter through one end, the predicted three-dimensional structures come out through the other.
- It uses processes based on "training, learning, retraining and relearning."
- The first step uses the available structures of 1,70,000 proteins in the Protein Data Bank (PDB) to train the computer model.
- Then, it uses the results of that training to learn the structural predictions of proteins.

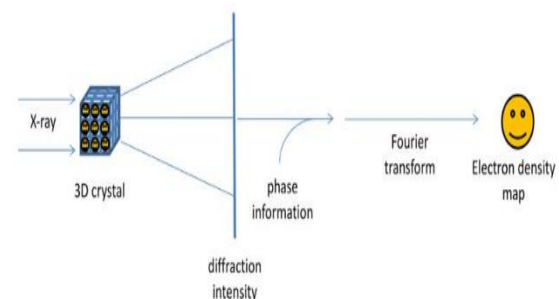
What are the implications of this development?

- Proteins are the business ends of biology, meaning proteins carry out all the functions inside a living cell.
- Therefore, knowing protein structure and function is essential to understanding human diseases.
- Scientists predict protein structures using x-ray crystallography, nuclear magnetic resonance spectroscopy, or cryogenic electron microscopy.
- These techniques are not just time-consuming, they often take years and are based mainly on trial-and-error method.

X-ray crystallography

- X-ray crystallography uses X-ray to determine the position and arrangement of atoms in a crystal.
- The most classical method of X-ray crystallography is single crystal X-ray diffraction, in which crystal atoms cause the incident X-ray beam to produce scattered beams.
- When the scattered beams land on the detector, these beams produce a speckle diffraction pattern.
- As the crystal is gradually rotated, the angle and intensity of these diffracted beams can be measured, and then a three-dimensional image of the electron density within the crystal is generated.
- Based on this electron density, the average position of atoms in the

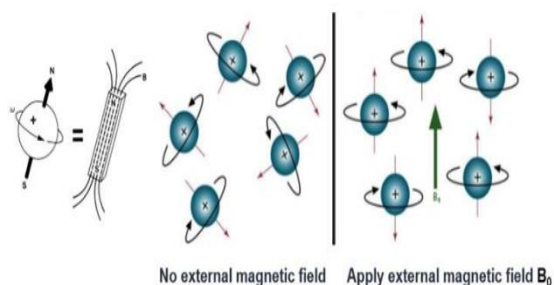
crystal, chemical bonds, crystal barriers, and various information can be determined



Nuclear magnetic resonance (NMR)

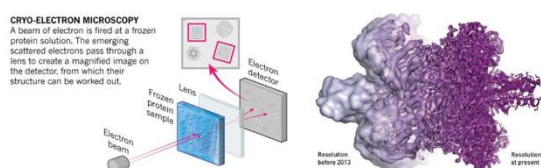
- The second method is nuclear magnetic resonance (NMR). Nuclei are charged, fast spinning particles, which are similar to outer electrons.
- The ratios of different atomic nuclei are different and therefore have different resonance frequencies. The movement of the nucleus is not isolated--it interacts with the surrounding atoms both intra- and inter-molecularly.
- Therefore, through nuclear magnetic resonance spectroscopy, structural information of a given molecule can be obtained.
- Taking protein as an example, its secondary structure, such as α -helix, β -sheet, turn, circular, and curl, reflect the different arrangement of the main chain atoms of protein molecules three-dimensionally.
- The spacing of the atomic nuclei in different secondary domains, the interaction between nuclei, and the dynamic characteristics of polypeptide segments all directly

reflect the three-dimensional structure of proteins.



Cryo-electron microscopy (Cryo-EM)

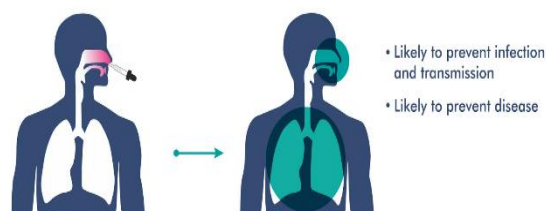
- The third approach is the cryo-electron microscopy (Cryo-EM) technique, which includes three different methods: single particle analysis, electron tomography and electron crystallography.
- The essential mechanism of Cryo-EM is electron scattering. The basic principle is described as follows. Samples are prepared through cryopreservation prior to analysis.
- The coherent electrons are used as a light source to measure the sample.
- After the electron beam passes through the sample and the nearby ice layer, the lens system converts the scattered signal into a magnified image recorded on the detector. And signal processing is performed to obtain the three-dimensional structure of the sample.



Intranasal vaccine

- An intranasal vaccine stimulates a broad immune response neutralizing IgG, mucosal IgA, and T cell responses.
- Immune responses at the site of infection (in the nasal mucosa) essential for blocking both infection and transmission of COVID-19.

Intranasal SARS-CoV-2 Vaccines



- The nasal route has excellent potential for vaccination due to the organized immune systems of the nasal mucosa.
- Non-invasive, Needle-free.
- Ease of administration – does not require trained health care workers.
- Elimination of needle-associated risks (injuries and infections).
- High compliance (Ideally suits for children and adults).
- Scalable manufacturing able to meet global demand.

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PMI

- Purchasing Managers' Index or PMI is an economic indicator, which is derived after monthly surveys of different companies.

- The index shows trends in both the manufacturing and services sector.
 - The index helps in determining whether the market conditions, as seen by purchasing managers, is expanding, contracting or staying the same.
 - It is used to provide information regarding the current and future business conditions.
 - PMI is one of the closely watched indicators of business activity and helps in predicting the economic health of a country.
 - There are two types of PMI Manufacturing PMI and Services PMI.
 - A combined index is also made using both manufacturing PMI and services PMI.
- (20%), suppliers' delivery times (15%) and stock of items purchased (10%).
 - The surveys are conducted on a monthly basis.
 - A PMI number greater than 50 indicates expansion in business activity. A number less than 50 shows contraction.
 - The rate of expansion is also judged by the difference from the mid-point (50) and also by previous month's data.

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How is the manufacturing PMI derived?

- The PMI is derived by sending fact-based questions to a large number of companies in the concerned sector. For manufacturing PMI, the questionnaire is sent to manufacturing companies.
- The questions are factual in nature and the survey is not meant for opinions, intentions, or expectations.
- The questions are related to 5 key variables. The variables with their weights in the index are new orders (30%), output (25%), employment