

### WHAT IS MAGNETIC RESONANCE IMAGING (MRI)?

#### What is MRI?



MRI is a **non-invasive diagnostic procedure** that is used to **obtain images of soft tissues** (that hasn't become harder through calcification) within the body. It is widely used to image the **brain, the cardiovascular system, the spinal cord and joints, various muscles, the liver, arteries**, etc. Its use is particularly important in the observation and treatment of certain **cancers** (like prostate) and to **track neurological conditions** including Alzheimer's, dementia, epilepsy, and stroke.

#### When was it Developed?

In the early 1970s, techniques for MRI were developed. Later, it was refined by **Lauterbur and Mansfield**. Their work led to the **Nobel Prize in Medicine in 2003**.

#### How does MRI Work?

MRI machines **use the magnetic properties of hydrogen atoms in the body to create images**. The machine includes a superconducting magnet creating a stable magnetic field, aligning hydrogen atom spins. A **radiofrequency pulse** is emitted, exciting excess atoms. When the pulse stops, these atoms emit energy, detected and converted into signals by a receiver. These signals are processed by a computer to generate detailed **2D or 3D images of the scanned body part**.

#### What are the Pros of MRI?

An MRI scan can practically **image the body from all useful directions**. Once the magnetic fields are taken away, the atoms in the scanned part don't remain affected. This means, **MRI scans do not pose any threats to the body**.

#### What are the Cons of MRI?

MRI machines are **expensive** and diagnostic facilities **pass this cost on to its patients**- each scan often costs Rs 10,000 or more. As MRI technique use strong magnetic fields, **individuals with metallic implants** (including pacemakers) may not be able to undergo MRI scans. Also, a **scan's effects on pregnant women** aren't well-studied.

## WHAT IS CAPITAL GAINS TAX (CGT)?



- The term **capital gains** can be defined as **profits accumulated from the sale of any capital asset.**
  - Land, buildings, house property, vehicles, patents, trademarks, leasehold rights, machinery, and jewellery are a few examples of capital assets.
  - This includes having rights in or in relation to an Indian company.
  - It also includes the rights of management, control, or any other legal right.
- Depending on the duration, capital gains can either be **short-term or long-term**. Since profits are categorised as an ‘income’, they are **liable for taxation**, which is **known as CGT**.
- Such taxes are **levied when an asset is transferred between owners**. This tax applies to both individuals and businesses. Taxpaying individuals can use tax-efficient financial strategies to reduce the burden of their CGT.

There are **two types of CGT**: Short-term CGT and Long-term CGT

- **Short-term CGT:**
  - Any asset that is held for less than 36 months is termed as a short-term asset.
  - In the case of immovable properties, the duration is 24 months.
  - The profits generated through the sale of such an asset would be treated as short-term capital gain and would be taxed accordingly.
- **Long-term CGT:**
  - Any asset that is held for over 36 months is termed as a long-term asset.
  - Assets like preference shares, equities, UTI units, securities, equity-based Mutual Funds and zero-coupon bonds are also considered as long-term capital asset if they are held for over a year.
  - The profits generated through the sale of such an asset would be treated as long-term capital gain and would attract tax accordingly.

## WHAT IS A NON-BANKING FINANCIAL COMPANY (NBFC)?



**Non-Banking Financial Company (NBFC)** is a company registered under the **Companies Act, 1956**, engaged in the business of loans and advances, the acquisition of shares/stocks/bonds/debentures/securities issued by the Government or local authority or other marketable securities of a like nature, leasing, hire-purchase, insurance business, chit business.

- It **does not include** any institution whose principal business is that of agriculture activity, industrial activity, the purchase or sale of any goods (other than securities) or providing any services and sale/purchase/construction of immovable property.
- A **non-banking institution** which is a company and has the principal business of receiving deposits under any scheme or arrangement in one lump sum or in installments by way of contributions, or in any other manner, is also a NBFC (Residuary non-banking company).
- Generally, these institutions are **not allowed to take traditional demand deposits** from the public. They can **only accept time deposits** and they do not provide savings or current account facilities.
  - They cannot accept deposits for a period less than 12 months and more than 60 months.
  - They cannot offer interest rates higher than the ceiling rate prescribed by RBI from time to time. The present ceiling is 12.5 per cent per annum.
- They also **provide** a wide range of **monetary advice like chit-reserves and advances**.
- They lend and make investments, and hence their **activities are akin to that of banks**; however, there are a **few differences** as given below:
  - They do not have a banking license;
  - They cannot accept demand deposits;
  - They do not form part of the payment and settlement system and cannot issue cheques drawn on itself;

- Deposit insurance facility of Deposit Insurance and Credit Guarantee Corporation is not available to depositors of NBFCs, unlike in the case of banks.
  - Unlike banks, NBFCs are not subjected to stringent and substantial regulations.
  - **Regulation:**
    - The functions of the NBFCs are **managed by both the Ministry of Corporate Affairs and the RBI.**
    - The **RBI** has the authority to **issue licenses to NBFCs, regulate their operations**, and ensure that they adhere to the established norms and regulations.
  - **NBFCs are categorized**
    - in terms of the types of liabilities into **Deposit and Non-Deposit accepting** NBFCs,
    - non-deposit taking NBFCs by their size into systemically important and other non-deposit holding companies (NBFC-NDSI and NBFC-ND) and by the kind of activity, they conduct.
  - **What are systemically important NBFCs?**
    - NBFCs whose **asset size is ₹ 500 crore or more** as per the last audited balance sheet are considered systemically important NBFCs.
    - The rationale for such classification is that the activities of such NBFCs will have a bearing on the financial stability of the overall economy.
  - **Examples** of NBFCs include investment banks, mortgage lenders, money market funds, insurance companies, equipment leasing companies, infrastructure finance companies, hedge funds, private equity funds, and P2P lenders.
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## PARTICIPATORY NOTES (P- NOTES)



**Participatory Notes** are often referred to as **PNs or P-Notes**. These are financial instruments used by investors and hedge funds to invest in the Indian securities, and **no registration** is required with the **Security Exchange Board of India (SEBI)**.

- Investments flowing in through PNs are considered as **offshore derivative investments**.

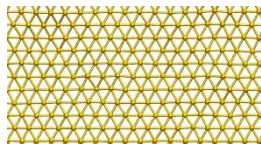
- These are issued by registered **foreign Portfolio Investors** (FPIs) to overseas investors who wish to be part of the Indian stock market without registering themselves directly.
- While the FIIs have to report all such investments each quarter to SEBI, they need not disclose the identity of the actual investors.

## What is Foreign Portfolio Investment?

- It refers to the purchase and holding of a wide array of **foreign financial assets** by investors seeking to invest in a country outside their own.
- Foreign portfolio investors have access to a range of investment instruments such as **stocks, bonds, mutual funds, derivatives, fixed deposits**, etc.
- FPI generally intends to invest money into the foreign country's stock market to generate a quick return.
- In India, foreign portfolio investment is **regulated** by the **Securities and Exchange Board of India (SEBI)**.

## WHAT IS GOLDENE?

For the first time, researchers have created a free-standing sheet of gold that is only one atom thick and named it as Goldene.



**Goldene** is the first free-standing **2D metal** and is only one **atom thick**.

- **How it is created?**
  - Researchers first sandwiched an atomic monolayer of silicon **between layers of titanium carbide**.
  - When they deposited gold on top of this sandwich structure, the gold atoms diffused into the material and replaced the silicon atoms, forming a trapped monolayer of gold atoms.
  - Subsequently, scientists etched away the titanium carbide layers to create a free-standing, one atom thick layer of gold.

- This was done with the help of an age-old Japanese technique used to forge katanas and high-quality knives, using a chemical popularly known as **Murakami's reagent**.
  - These sheets of goldene are roughly 100 nanometres thick (a nanometre is a billionth of a metre), approximately 400 times thinner than the thinnest commercially available gold leaf.
  - **Applications:**
    - It can be used in **electronics industry**.
    - It could also be used in carbon dioxide conversion, hydrogen-generating catalysis, selective production of value-added chemicals, hydrogen production, water purification, etc.
  - **Significance:** It holds promise as a great catalyst because it's much more economically viable than thicker, three-dimensional gold.
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## ARTIFICIAL GENERAL INTELLIGENCE (AGI)

### What is Artificial General Intelligence (AGI)?

- **About**
  - AGI refers to a machine or a software that can perform any intellectual task that a human can do.
  - This includes reasoning, common sense, abstract thinking, background knowledge, transfer learning, ability to differentiate between cause and effect, etc.
  - In simple words, AGI aims to emulate human cognitive abilities such that it allows it to do unfamiliar tasks, learn from new experiences, and apply its knowledge in new ways.

### How is AGI different from AI we already use?

- **Scope and capabilities**
  - The main difference between AGI and the more common form of AI, also known as narrow AI, lies in their scope and capabilities.

- Narrow AI is designed to perform specific tasks such as image recognition, translation, or even playing games like chess—at which it can outdo humans, but it remains limited to its set parameters.
- On the other hand, AGI envisions a broader, more generalised form of intelligence, not confined to any particular task (like humans).
- **AGI at the summit of all developments in artificial intelligence**
  - Humans learn through their experiences — in school, home, or elsewhere; by talking to people or observing things; by reading books, etc.
  - The human brain then uses the information it has gathered to make decisions (often subconscious) that solve any given problem, or come up with a new one.
  - With AGI, researchers aim to build a software or computer that can do all this — everything that a human computer does.
  - Hence, experts put AGI at the summit of all developments in artificial intelligence.

## Skepticism regarding AGI

- **Impact on environment**
  - The humongous amount of computational power required to develop AGI systems raises concerns about its impact on the environment, both due to the energy consumption and generation of e-waste.
- **Division in society**
  - AGI could also lead to a significant loss of employment, and widespread socio-economic disparity, where power would be concentrated in the hands of those who control the AGI.
- **New security vulnerabilities**
  - It could introduce new security vulnerabilities, the kind we have not even thought about yet.
  - Its development could outrun the ability of governments and international bodies to come up with suitable regulations.
- **Impact on human capabilities and skills**

- If humans were to become dependent on AGI, it might even lead to the loss of basic human skills and capabilities.
  - **AGI can outpace human being**
    - Its abilities can outpace human beings', making its actions difficult to understand and predict.
    - This might even lead to a situation where it becomes too independent, so much so that humans simply lose control.
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## INCOIS ADVISES COASTAL STATES TO BE ON ALERT

### Why in the News?

The Indian National Centre for Ocean Information Services (INCOIS) has cautioned coastal states to remain alert to the sea being rough with high waves and inundation of low-lying areas.

### About INCOIS:

- Indian National Centre for Ocean Information Services (INCOIS) is an autonomous organization, established in 1999, under the Ministry of Earth Sciences.
- It is a unit of the Earth System Science Organization (ESSO).
- **Objective:** To provide ocean data, information and advisory services to society, industry, the government and the scientific community.
- **Activities of INCOIS Include:**
  - Provides round-the-clock monitoring and warning services for the coastal population on tsunamis, storm surges, high waves, etc.
  - Provides daily advisories to fisher folk to help them easily locate areas of abundant fish in the ocean while saving on both fuel and time used to search for the same.
  - Short term (3-7 days) Ocean State Forecasts (waves, currents, sea surface temperature, etc.) are issued daily.



- Deploys and maintains a suite of Ocean Observing Systems in the Indian Ocean to collect data on various oceanic parameters to understand the processes in the ocean and to predict their changes.

## What is the Difference Between Swell Waves and Tsunamis?

- Unlike swell waves, a tsunami is a series of enormous waves created by an underwater disturbance usually associated with earthquakes occurring below or near the ocean.
- **Tsunamis are around 10 times faster than swell waves.**
- Although both swell waves and tsunamis slow down near the coast, the latter hit land at 30–50 km/h.

## Coastal States to be on Alert for swell waves:

- The INCOIS has forecasted that high sea waves, also known as swell waves, might hit the coastal areas of Goa, Maharashtra, West Bengal, Odisha, Tamil Nadu, Kerala, Lakshadweep, Karnataka, Gujarat, and Andaman & Nicobar Islands.
- INCOIS cautioned fishermen and coastal population and urged for total suspension of operational/recreational activities at beach/nearshore regions.
- In March, swell waves led to flooding in several areas of Kerala — the worst affected were Alappuzha, Kollam, and Thiruvananthapuram districts.
- Such flooding events are called **Kallakkadal** in Kerala.