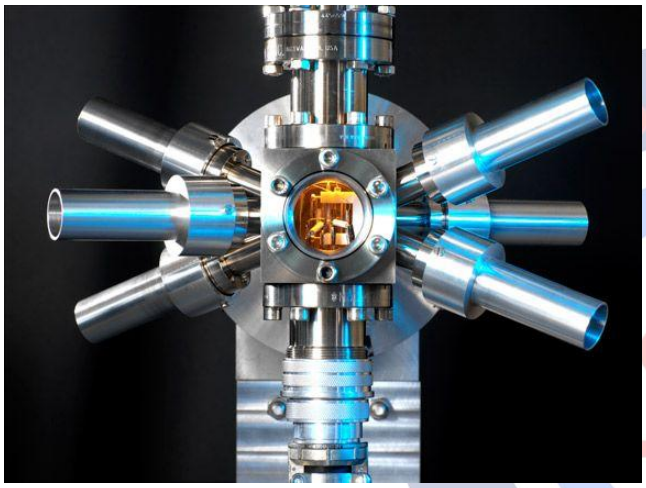
Balalatha's
CSB IAS ACADEMY
The Road Map to Mussoorie...

PRELIMS EDGE 2025 **10-07-2025**

TERMS IN NEWS

Atomic Clock



- It is a device that measures time using the **vibrations of atoms.**
- It specifically uses the oscillations of the electrons in atoms to keep time.
- It is the **most accurate time-keeping device available, with a margin of error of just a few billionths of a second per day.**
- It is **far more precise than conventional clocks** because atomic oscillations have a much higher frequency and are much more stable.

Working

- Atomic clocks work by using a type of atom called a **"cesium atom".**
- Cesium atoms are very stable and have a very specific frequency at which their electrons vibrate. This frequency is used as the basis for the atomic clock's timekeeping.
- To measure time using cesium atoms, an atomic clock uses a device called a **"microwave cavity".** The microwave cavity is a chamber that is filled with cesium vapor.
- A microwave signal is then sent into the cavity, which causes the cesium atoms to vibrate. As the cesium atoms vibrate, they emit radiation at a very specific frequency.
- This frequency is then detected by a detector, which compares it to a standard frequency.
- The difference between the two frequencies is used to adjust the clock's timekeeping.

Applications

- **GPS systems:** GPS systems use atomic clocks to measure the time it takes for a signal to travel from a satellite to a receiver on Earth. This allows GPS systems to calculate the receiver's location with great accuracy.
- **Telecommunications networks:** Telecommunications networks use atomic clocks to synchronize the timing of signals that are sent over long distances.
- **Scientific research:** Atomic clocks are used in many scientific experiments that

require precise timing, such as studies of the behavior of atoms and molecules.

Magnetometer

- A magnetometer is a **passive instrument that measures changes in the Earth's magnetic field.**
- The most promising methods for magnetic field measurement are based on detecting polarization rotation of a probe light passing through alkali atoms in a very weak magnetic field.
- Magnetometers based on this method, referred to as Optically pumped atomic magnetometers (OPAMs) and Spin Exchange Relaxation Free (SERF) magnetometers.
- Typically have high sensitivity but demand sophisticated magnetic shielding and have a lower dynamic range.
- Magnetometers are useful devices with applications in areas ranging from fundamental physics to medical imaging and navigation.

Raman-Driven Spin Noise Spectroscopy

- It **uses laser light to listen to the tiny quantum jitters of Rubidium atoms.**
- These jittery movements, called spin noise, are random fluctuations in the spin of atoms—fundamental quantum properties like tiny bar magnets.
- When exposed to a magnetic field, the pattern of this spin noise shifts in predictable ways. By shining lasers and analyzing the noise, researchers can accurately measure the magnetic field without touching or disturbing the atoms.
- RDSNS enhances the dynamic range considerably without significant loss of sensitivity.
- This method could transform the way we measure magnetic fields—making the process faster, portable and precise even in noisy, real-world environments.
- This method exhibits potential for field-deployable applications of magnetic field measurement with broadband capability and fast time response, extending across various scientific, industrial and exploratory fields

CAT bonds

- Catastrophe bonds or CAT bonds are **financial instruments that pay high returns to investors in exchange for bearing the risk of significant disasters.**
- These bonds are typically issued by insurers, or governments to obtain additional coverage for catastrophic events like hurricanes, earthquakes, or floods.
- Catastrophe bonds allow investors to receive **periodic interest payments, but if a predefined catastrophic event occurs, the bond's principal is used to cover the issuer's losses.**
- Payout conditions are based on triggers defined in the bond contract, which can be parametric (e.g. wind speed, seismic

activity) or indemnity (e.g. actual loss figures reported by insurers).

Ekalavya Model Residential Schools

- It is a flagship intervention of the **Ministry of Tribal Affairs,** Government of India, to provide quality **residential education to Scheduled Tribes students from Class 6th to 12th in remote areas** to enable them to access the best opportunities in education and to bring them at par with the general population.
- The programme has been in operation since 1998 and was revamped during the year 2018-19 to expand the geographical outreach and enhance the quality of facilities.
- **EMRSs will be set up in every block with more than 50% ST population and at least 20,000 tribal persons**.
- Accordingly, the Ministry has set the target to set up 728 EMRSs across the country by the year 2026.
- The National Education Society for Tribal Students (NESTS), an autonomous organization, has been set up under the Ministry of Tribal Affairs to establish and manage EMRS across the country.

Features

- EMRSs are co-educational residential schools from Class VI to XII.
- Eklavya schools will be on par with Navodaya Vidyalayas and will have special facilities for preserving local art and culture besides providing training in sports and skill development.
- The school infrastructure will include classroom, administrative block, hostels for boys and girls, playground, accommodation for teaching and non-teaching staff, Labs etc. facilities catering to the need of academic education as well as extracurricular activities.
- **CBSE** curriculum is followed in these schools, and education is completely free.
- Each school has a capacity of 480 students with an equal number of seats for boys and girls.
- **Non-ST students can be admitted in these schools on seats up to 10% of the total seats**.
- Reservation of 20% of seats under sports quota for deserving ST students who have excelled in the field of sports.

SPECIES IN NEWS

Clouded Leopard

- It is a wild cat inhabiting dense forests of the Himalayas through mainland Southeast Asia into South China.
- They are one of the most ancient cat species. However, they are **neither a true**

great cat nor a true small cat, because they cannot roar or purr.

- **Distribution:** Himalayan foothills from India, South-East Asia and South China.
- **Habitat**: Grassland, shrubs, subtropical and dense tropical forest.

Physical characteristics:

- Many distinguishing features set clouded leopards apart from other cat species, such as their **visually striking coat pattern** with **cloud-like large spots.**
- Clouded leopards possess the **largest canines** in proportion to skull size among all cat species.
- It has **exceptional arboreal abilities**, including climbing and navigating treetops.
- **Threats:** Mainly Wildfires, habitat fragmentation, illegal poaching, deforestation and climate change.

Conservation status:

- **IUCN Status:** Vulnerable
- **CITES:** Appendix I
- **Wildlife Protection Act, 1972:** Protected under Schedule I

Misc facts:

- State animal of **Meghalaya**.
- **Clouded leopard National Park:** Tripura

PRACTICE QUESTIONS

Q1: It is a wild cat species inhabiting dense forests of the Himalayas through mainland Southeast Asia into South China. They are one of the most ancient cat species. However, they are neither a true great cat nor a true small cat, because they cannot roar or purr. They have exceptional arboreal abilities, including climbing and navigating treetops.

Identify the species from the given description

A. Cougar
B. Jaguar
C. Clouded Leopard
D. Lynx

Q2 : Consider the following statements regarding Ekalavya Model Residential Schools

1. It is a flagship intervention of the Ministry of Tribal Affairs, Government of India, to provide quality residential education to Scheduled Tribes students from Class 6th to 12th in remote areas
2. EMRSs will be set up in every block with more than 50% ST population and at least 20,000 tribal persons.
3. Non-ST students can also be admitted in these schools.

How many of the above statements are incorrect?

A. Only One
B. Only Two
C. All of the Above
D. None of the Above

Q3 : These are financial instruments that pay high returns to investors in exchange for bearing the risk of significant disasters. These bonds are typically issued by insurers, or governments to obtain additional coverage for catastrophic events like hurricanes, earthquakes, or floods. They allow investors to receive periodic interest payments, but if a predefined catastrophic event occurs, the bond's principal is used to cover the issuer's losses.

Which among the following is the correct term that suits the above description

A. CAT Bonds
B. Green Bonds
C. Bull Bonds
D. Blue Bonds

Q4 : Consider the following statements regarding Magnetometer

1. A magnetometer is a passive instrument that measures changes in the Earth's magnetic field.

2. Magnetometers based on this method, referred to as Optically pumped atomic magnetometers (OPAMs) and Spin Exchange Relaxation Free (SERF) magnetometers.

How many of the above statements are incorrect?

A. Only Statement One
B. Only Statement Two
C. Both the Statements
D. None of the Above

Q5 : The term microwave cavity, often seen in the news is related to which of the following?

A. Atomic Clocks
B. Dark Matter
C. Gravitational Lensing
D. Rare Earth Magnets

Answers

1. C
2. D
3. A
4. D
5. A