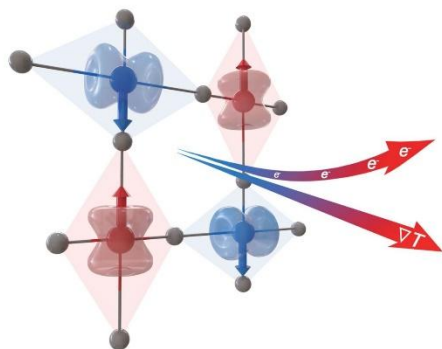


**PRELIMS EDGE 2025****27-07-2025****TERMS IN NEWS****Altermagnets**

- Altermagnets are a newly discovered class of magnetic materials that enjoy the best properties of both ferromagnets and antiferromagnets.
- They do not show any net magnetism externally, but deep inside, their electrons behave in ways that can be incredibly useful—especially for futuristic technologies like spintronics (manipulating the spin of electrons instead of their charge).

**Properties**

- Altermagnets defy conventional norms by embodying a dual nature—resembling antiferromagnets with zero net magnetization and ferromagnets with non-relativistic spin splitting.
- This unique behavior emerges from the intricate interplay of atoms within the crystal structure.

- Additionally, altermagnets exhibit a unique spin polarization. The term “**spin polarization**” means that a preponderance of electron spins tends to align in a particular direction.
- The spin polarization is noteworthy in altermagnets because it occurs in the physical arrangement of atoms (real space) and in the momentum space, where the distribution of electron spins in the material is considered.
- The researchers believe that altermagnets could have a pivotal role in spin caloritronics, a field of research that explores the interplay between spin and heat flow, which are not achievable with ferromagnets or antiferromagnets.
- This field has potential applications in developing new technologies for information processing and storage.

**Altramagnetism in Chromium Antimonide**

- Among the known altermagnets, chromium antimonide (CrSb) is truly remarkable.
- It is metallic, with the magnetic order sustaining up to more than two times that of room temperature and the largest altermagnetic spin-splitting, equivalent to more than 30 times that of room temperature.
- CrSb is one of the very few materials known to exhibit direction-dependent

conduction polarity property and, notably, the first Altermagnet to do so.

- These outstanding attributes make CrSb the most promising altermagnetic candidate for practical applications.
- CrSb is made of earth-abundant and non-toxic elements, making it an environmentally friendly option for future electronics. Combined with its altermagnetic properties

### Indian Regional Navigation Satellite System



- It is India's independent regional navigation satellite system also known as NavIC (Navigation with Indian Constellation).
- It is developed in India by the **Indian Space Research Organisation (ISRO)**.
- IRNSS envisages the establishment of a regional navigational satellite system using a combination of geosynchronous orbit (GEO) and geostationary orbit (GSO) spacecraft and state-of-the-art ground systems.
- **Area covered:** IRNSS-NavIC is designed to provide accurate position information service to users in India and the region extending up to **1500 km from its boundary**.

- **IRNSS-NavIC network:** NavIC is designed with a constellation of seven satellites and a network of ground stations operating around the clock.
  - Three satellites are placed in GSO.
  - Four satellites are placed in inclined GEO.
- IRNSS provides two types of services, namely:
  - **Standard Positioning Service (SPS)** – that is provided to all users.
  - **Restricted Service (RS)** – an encrypted service provided only to authorized users.
- The signals of the other global navigation satellite systems (GNSS), including GPS, GLONASS, Galileo, and BeiDou provide interoperability with those of the NavIC SPS signals

### Comet

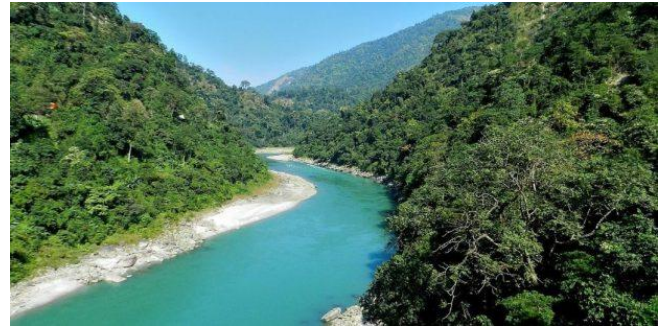


- Comets are large objects made of dust and ice that orbit the Sun.
- Best known for their long, streaming tails, these ancient objects are leftovers from the formation of the solar system 4.6 billion years ago.
- Comets are mostly found way out in the solar system.
- Some exist in a wide disk beyond the orbit of Neptune called the Kuiper Belt.

- We call these short-period comets. They take less than 200 years to orbit the Sun.
- Other comets live in the Oort Cloud, the sphere-shaped, outer edge of the solar system that is about 50 times farther away from the Sun than the Kuiper Belt.
  - These are called long-period comets because they take much longer to orbit the Sun.
- The comet with the longest known orbit takes more than 250,000 years to make just one trip around the Sun.
- A comet is made up of four visible parts: the nucleus, the coma, the ion tail, and the dust tail.
  - The nucleus is a solid body typically a few kilometres in diameter and made up of a mixture of volatile ices (predominantly water ice) and silicate and organic dust particles.
  - The coma is the freely escaping atmosphere around the nucleus that forms when the comet comes close to the Sun and the volatile ices sublimate, carrying with them dust particles that are intimately mixed with the frozen ices in the nucleus.
  - The dust tail forms from those dust particles and is blown back by solar radiation pressure to form a long curving tail that is typically white or yellow in colour.
  - The ion tail forms from the volatile gases in the coma when they are ionized by ultraviolet photons from the Sun and blown away by the solar wind.
  - Ion tails point almost exactly away from the Sun and glow bluish in

colour because of the presence of CO<sup>+</sup> ions

#### Environmental Flow (e-flow)



- Environmental flow refers to the quantity, timing, and quality of water flow required to sustain freshwater ecosystems and the livelihoods that depend on them.

#### Problems in Indian Rivers e-Flow

- In recent decades, extensive interventions in river flow—such as the construction of dams and barrages, pollution, and encroachments—have severely impacted the ecological balance of rivers.
- To address these issues, the concept of “Environmental Flow” has been introduced, emphasizing the need to maintain a minimum water flow to ensure the health of river ecosystems.

#### Significance

- It is critical for maintaining the ecological integrity of rivers and their estuaries.
- E-flow also ensures significant benefits for human welfare, especially in areas where water use is highly competitive and regulated.
- E-Flow studies consider the habitat and flow requirements of key fish species to ensure the survival of aquatic life and balanced river flow.



- This contributes to long-term ecological and economic benefits for society

## SPECIES IN NEWS

### Long-Billed Bush Warbler



- It is a medium-sized bush warbler (songbird) with a relatively long tail and long bill.
- Scientific Name: *Locustella major*

#### Distribution:

- It has a limited distribution in the mountains of Central Asia.
- It's found in parts of China, India, Pakistan, and Tajikistan.
- Habitat: It inhabits grassy slopes dotted with bushes, weeds, and grass; upland terraced cultivation; and edges of alpine meadows and forest clearings, at 2400-3600 m.

#### Features:

- Plumage is generally brownish-olive with fine streaking on the back.
- The underparts are paler, usually whitish or buff.

- Like other bush warblers, typically very skulking and furtive, preferring to run instead of fly when threatened.
- Emerges onto small bushes to sing, producing a dull clicking that would underwhelm a grasshopper.

#### Conservation Status:

- IUCN Red List: Near Threatened

## PRACTICE QUESTIONS

Q1 : Red-wattled lapwing, Indian roller, Long-Billed Bush Warbler etc are terms that represent which of the following species?

- A. Dragonflies
- B. Birds
- C. Beetles
- D. Grasshoppers

Q2: Which of the following terms refers to the quantity, timing, and quality of water flow required to sustain freshwater ecosystems and the livelihoods that depend on them?

- A. Environmental Flow
- B. Minimum Flow
- C. Flow Duration Curve
- D. Channel Flow

Q3: Consider the following statements regarding comets

1. Comets are large objects made of dust and ice that orbit the Sun.
2. Best known for their long, streaming tails, these ancient objects are leftovers from the formation of the solar system 4.6 billion years ago.

How many of the above statements are incorrect?

- A. Only Statement 1

- B. Only Statement 2
- C. All of the Above
- D. None of the Above

Q4: Consider the following statements regarding Indian Regional Navigation Satellite System.

1. It is India's independent regional navigation satellite system also known as NavIC (Navigation with Indian Constellation).
2. IRNSS-NavIC is designed to provide accurate position information service to users in India and the region extending up to 10,000 km from its boundary.

How many of the above statements are incorrect?

- A. Only Statement 1
- B. Only Statement 2
- C. All of the Above
- D. None of the Above

Q5: Consider the following statements regarding Altermagnets

1. Altermagnets are a newly discovered class of magnetic materials that enjoy the best properties of both ferromagnets and antiferromagnets.
2. Altermagnets defy conventional norms by embodying a dual nature, resembling both antiferromagnets with zero net magnetization and ferromagnets with non-relativistic spin splitting.
3. They do not show any net magnetism externally

How many of the above statements are incorrect?

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

#### Answers

1. B
2. A
3. D
4. B