1. Kaziranga National Park

Why in News?

- Kaziranga National Park in Assam, has recently releasing more carbon than it is absorbing.

Highlights:

- It also showed that as the planet warms further, the ability of the Kaziranga National Park (KNP) to absorb carbon would further decrease.
- Earlier, it was found that the Amazon rainforest is now emitting more carbon dioxide than it is able to absorb.
- Researchers found that Kaziranga absorbed the most amount of carbon dioxide during the pre-monsoon season of March, April and May.
- A forests, or trees in a forest, take up carbon dioxide for the process of photosynthesis and release carbon dioxide when they breathe.
- The soil of the region is home to a large population of bacteria that release carbon dioxide as they breathe, which adds to the carbon dioxide being emanated by other organisms, including trees.
- The photosynthetic activity of trees during the monsoon decreases due to increased cloud cover. Hence, the ability of the forest to absorb carbon dioxide also decreases.
- The situation remains the same during the post-monsoon and winter months, making the forest a net carbon emitter.
- The scientists analyzed the isotopes in the transpired water and observed a strong link between the water and carbon cycles of the forest.
- There is a decreasing trend in the rainfall coming from the transpired water in the pre-monsoon months which are responsible for the highest carbon absorption.
- Transpiration is a process that involves loss of water vapour through the stomata of plants.
- Stomatal openings are necessary to admit carbon dioxide to the leaf interior and to allow oxygen to escape during photosynthesis.

2. Operation AAHT

Why in News?

- The Railway Protection Force (RPF) has recently launched a nationwide operation to curb human trafficking.

Highlights:

- As part of "Operation AAHT", special teams will be deployed on all long-distance trains/routes with a focus on rescuing victims, particularly women and children, from the clutches of traffickers.
- The National Crime Records Bureau registers about 2,200 cases of Human Trafficking cases on an average each year.
- The Indian Railways, which transported over 23 million passengers each day (pre-pandemic), is the largest, fastest and most reliable carrier for suspects who trafficked scores of women and children.
- Under Operation AAHT, the infrastructure and intelligence network of the force could be utilised to collect, collate and analyse clues on victims, source, route, destination, popular trains used by suspects, the identity of carriers/agents, kingpins etc and shared with other law-enforcing agencies.
- Under this, the RPF could act as a bridge cutting across States to assist the local police in the mission to curb the menace.
- Also, cyber cells would start patrolling the web/social media to look for digital footprints of Human Trafficking and the focus would be more on trains originating from districts bordering Nepal, Bangladesh and Myanmar.
- Human trafficking, also called trafficking in persons, form of modern-day slavery involving the illegal transport of individuals by force or deception for the purpose of labour, sexual exploitation, or activities in which others benefit financially.
- Human Trafficking, especially of women and children, for sexual exploitation, forced marriage, domestic servitude, organ transplant, drug peddling, etc is an organised crime and the most abominable violation of human rights.

3. Volatile Organic Molecules (VOC)

Why in News?

- Recently, study conducted by Indian Institute of Science Education and Research revealed that India can slash emissions of Volatile Organic Molecules (VOC) by 76% in the next eight years by swapping all two- and three-wheelers with electric vehicles and all diesel-fuelled ones with Compressed Natural Gas (CNG).

Highlights:

- Gases escaping out of a vehicle's exhaust account for 65-80% of an automobile's emissions.
- India is home to 14 out of the top 20 most polluted cities globally. Around 1.67 million deaths were linked to air pollution in 2019. The country lost 1.36% of its gross domestic product the same year.
- Therefore, adopting electric vehicles can help India achieve a cleaner future.
- VOCs are carbon-containing chemicals released by petrol and diesel vehicles. They impact air quality and human health. It can have a natural origin, too.
- Plants emit these chemicals to attract pollinators, defend themselves from pests and predators and adapt to environmental stress.
- Effect of VOCs on Health: VOCs can irritate the eyes, nose and throat, damage body organs and cause cancer.
- Long-term exposure to VOCs is not good because the majority of the VOCs are carcinogenic (cancer-causing).
- It is also linked to medical conditions such as asthma and heart disease.
- Black carbon is linked to health problems such as respiratory and cardiovascular disease, cancer and congenital disabilities. It also contributes to climate change.
- Positive Feedback Loop: VOCs can drive the formation of other dangerous pollutants.
- For instance, they react with sunlight and nitrogen dioxide to form ground-level ozone.
- VOCs also trigger the formation of Particulate Matter (PM2.5), a pollutant that reaches deep into the lungs, affecting their normal functioning.
- They react in the air to produce secondary organic aerosols, minute particles suspended in the air.

4. Nuclear Fusion Energy

Why in News?

- The Scientists in the United Kingdom said they have recently achieved a new milestone in producing nuclear fusion energy, or imitating the way energy is produced in the Sun.

Highlights:

- Energy by nuclear fusion is one of mankind's long standing quests as it promises to be low carbon, safer than how nuclear energy is now produced and, with an efficiency that can technically exceed a 100%.

- One kilogram(kg) of fusion fuel contains about 10 million times as much energy as a kg of coal, oil or gas.

What was the Location of Experiment?

- The JET (Joint European Torus facility) site is the largest operational one of its kind in the world.
- The energy was produced in a machine called a tokamak, a doughnut-shaped apparatus.
- A tokamak is a machine that confines a plasma using magnetic fields in a donut shape that scientists call a torus.
- Deuterium and tritium, which are isotopes of hydrogen, were heated to temperatures 10 times hotter than the centre of the sun to create plasma.
- This was held in place using superconductor electromagnets as it spins around, fuses and releases tremendous energy as heat.
- The record and scientific data from these crucial experiments are a major boost for ITER, the larger and more advanced version of the JET.
- Nuclear fusion is defined as the combining of several small nuclei into one large nucleus with the subsequent release of huge amounts of energy.
- It Is the opposite reaction of fission, where heavy isotopes are split apart.
- Harnessing fusion, the process that powers the Sun, could provide a limitless, clean energy source.
- In the sun, the extreme pressure produced by its immense gravity creates the conditions for fusion to happen.
- Fusion reactions take place in a state of matter called plasma. Plasma is a hot, charged gas made of positive ions and free-moving electrons that has unique properties distinct from solids, liquids and gases.
- At high temperatures, electrons are ripped from atom's nuclei and become a plasma or an ionised state of matter. Plasma is also known as the fourth state of matter.