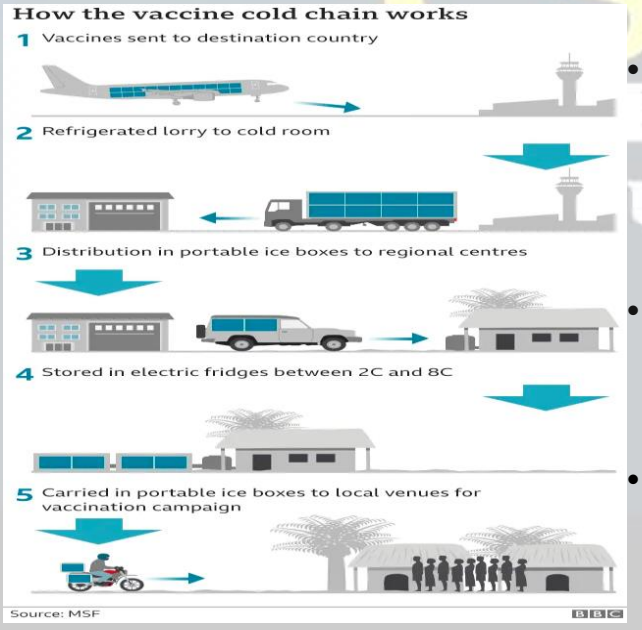
Current Affairs 11th January 2024 by Saurabh Pandey

Warm vaccine

Why in the news??

- A heat-tolerant vaccine developed by the Indian Institute of Science (IISc.) researchers is said to be effective against all current strains of SARS CoV 2 besides having the potential to be quickly adapted for future variants as well.
- The 'warm' vaccine developed by the Bengaluru-based Mynvax laboratories, a company incubated at the Indian Institute of Science Bangalore, is unique among existing vaccines in that it can be stored at 37 degrees Celsius for four weeks and at 100 degrees Celsius for up to 90 minutes



- Nearly all vaccines need to be transported and distributed between 2C and 8C in the so-called cold chain.
- And most of the Covid-19 vaccines under development, according to the World Health Organisation (WHO), will need to be refrigerated at temperatures well below 0, the freezing point of water.
- "warm" or a heat-stable vaccine, they claim, can be stored at 100C for 90 minutes, at 70C for about 16 hours, and at 37C for more than a month and more.
- Only three offering protection against meningitis, human papillomavirus (HPV), and cholera - are licensed and approved by WHO for use at temperatures up to 40C.
- These vaccines can be deployed quickly in hard- to-reach communities, and reduce pressures on healthcare workers.
- The Hindu

Warmest year

- Last year was the planet's hottest on record by a substantial margin and likely the world's warmest in the last

1,00,000 years, the European Union's Copernicus Climate Change Service (C3S) said on January 9. Scientists had widely expected the milestone after climate records were repeatedly broken

- The world has not breached that target which refers to an average global surface temperature of 1.5 degrees over decades but C3S said the fact that temperatures had exceeded the level on nearly half of the days of 2023 set "a dire precedent".
- Despite the proliferation of governments' and companies' climate targets, CO2 emissions remain stubbornly high.
- The world's CO2 emissions from burning coal, oil and gas hit record levels in 2023.
- Last year, the concentration of CO2 in the atmosphere rose to the highest recorded, of 419 parts per million, C3S said.
- It was also the first year in which every day was more than 1C hotter than pre-industrial times.
- Alongside human caused climate change, temperatures were boosted by the El Niño weather phenomenon, which warms the surface waters in the eastern Pacific Ocean and contributes to higher global temperatures, in 2023.
- Each fraction of temperature increase exacerbates extreme and destructive weather disaster.
- The Hindu

Cosmic rays

- Cosmic rays are streams of energetic particles and clusters of particles coming from outer space and the sun.
- They include protons and alpha particles (nuclei of helium atoms). Only low-intensity cosmic rays reach the earth's surface.
- Their energy is mostly lost in the atmosphere itself, as they smash into atoms of the atmospheric gases and produce a shower of other particles.
- Otherwise life wouldn't have been possible on the earth.

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- From the 1930s, studies of cosmic rays led scientists to discover many then unknown subatomic particles

How much energy?

- Data collected by the Telescope Array Project indicated the Amaterasu cosmic ray had an energy of 240 exa electronvolt (EeV).
- The electronvolt (eV) is a unit of energy, like joules, used to measure the energy of subatomic particles.
- The energy of 1 eV is approximately 1.6 × 1019 joules. One joule is the energy required to light a one-watt bulb for one second.
- The light particles in sunlight have an energy of about 1.63.1 eV, for example. When one deuterium nucleus and one tritium nucleus undergo fusion, they release one helium atom, one neutron, and 17.6 million eV of energy.
- The mass energy of a single Higgs boson particle, which is considered 'heavy', is 125.1 billion eV.
- Cosmic rays typically range in energy from about one billion eV to about 100 billion billion eV.
- The Amaterasu cosmic ray had an energy of 240 EeV or 240 billion billion eV. This is extremely high.

What do cosmic ray energies tell us?

- Ultra high energy cosmic rays (UHECRs) are subatomic particles from extragalactic sources with energies greater than 1 EeV.
- Scientists have observed UHECRs more energetic than 100 EeV.
- But typically, cosmic rays with more energy than around 60 EeV don't 'survive' beyond a certain distance in space.

Where did Amaterasu come from?

- An amazing feature of the Amaterasu particle is that if you look along the direction it came, towards its point of origin, there is nothing to be seen – meaning it appears to have come from an empty part of the universe

How can Amaterasu help?

- Cosmic rays can be divided into two types: those originating from beyond our solar system, called galactic cosmic rays (GCR), and high energy particles emitted by the sun, called

solar cosmic rays, that are mainly protons.

- Solar cosmic rays originate primarily in solar flares. In modernity, the particles in these rays have come to be called solar energetic particles.
- By tracking these cosmic rays, scientists have found that the mass ratio of helium to hydrogen nuclei that is, the ratio of the total masses of hydrogen and helium present is about 28:100, meaning there are about 28 grams of alpha particles for every 100 grams of protons in cosmic rays.

The Hindu

Remission policy

The story so far:

- The Supreme Court on January 8 set aside the remission of 11 convicts sentenced to life imprisonment for the gang rape of Bilkis Bano and the murder of her family, during the 2002 communal riots in Gujarat.
- The remission order was passed by the Gujarat government in August 2022.

What are clemency powers?

- Articles 72 and 161 of the Constitution provide powers to the President and Governor respectively to grant pardon, commutation, remission, respite, or reprieve to a convict.
- These are sovereign powers vested in the heads of the Union and State executive to be exercised on the advice of the council of ministers.
- Apart from this, the appropriate State government under Section 432 of the Criminal Procedure Code, 1973 (CrPC) may remit the whole or part of the punishment to which a convict has been sentenced.
- In the case of life imprisonment convicts, this remission can be done only after a period of 14 years in jail as per Section 433A of the CrPC.

Why Fog in north India?

What is fog?

A fog is a collection of small droplets of water produced when evaporated water has cooled down and condensed.

"Fog is nothing but a thick cloud, but very close to the earth's surface. For a thick fog to form, temperatures should be lower, and abundant moisture should be available near the surface."

Fog materializes whenever there is a temperature disparity between the ground and the air.

- **This happens frequently during Indian winters fog is created when the temperature drops at night and in the early morning, aerosols present in the atmosphere condense.**
- **High humidity, combined with an ample presence of water vapor or moisture, encourages foggy conditions.**
- **The process by which it cools plays a pivotal role in the formation of fog. One primary mechanism contributing to fog formation is called infrared cooling.**
- **It typically occurs when the weather is transitioning from summer to winter.**
- **In the summer, the ground absorbs radiation from the sun, becomes warmer, and moistens the air passing over it.**
- **When cooler weather kicks in, this mass of warm, moist air comes in contact with processes that cool it.**
- **The 'collision' prompts the water vapor in the air to condense rapidly, giving rise to fog.**
- **Another type of fog, known as radiation fog, is prevalent and occurs when an unseasonably warm day with high humidity is followed by rapidly dropping temperatures.**
- **The specific type of fog, its duration, and its effects are contingent on various environmental conditions.**

Why is northern India prone to fogging?

- **"The entire Indo Gangetic plains are prone to formation of fog during winter season, as all the conditions low temperatures, low wind speed, moisture availability and plenty of aerosols are present in this region,"**
- **"Moisture incursion into this region can happen once a Western Disturbance a precipational pattern that brings rain to north India during**

winter months moves across northern parts.

- Sometimes, moisture incursion can happen from the Arabian Sea also.

The Hindu

Tornadoes Formation

- Severe weather battered the U.S., spinning off tornadoes and reportedly killing three people in the South as high winds and blizzards buffeted the North causing a power blackout
- Tornado - A violently rotating column of air touching the ground, usually attached to the base of a thunderstorm.
- Tornadoes are nature's most violent storms.
- Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds.
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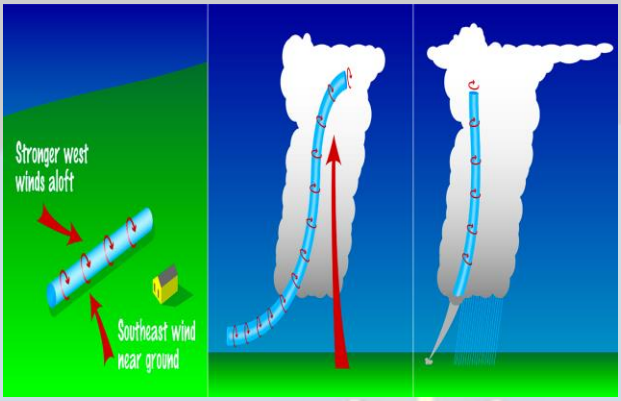
- Winds of a tornado may reach 300 miles per hour.
- A tornado forms from a large thunderstorm.
- Inside thunderclouds, warm, humid air rises, while cool air falls--along with rain or hail.
- These conditions can cause spinning air currents inside the cloud.
- Although the spinning currents start out horizontal, they can turn vertical and drop down cloud-becoming a tornado.

Conditions are ripe for tornadoes when the air becomes very unstable, with winds at different altitudes blowing in different directions or at different speeds a condition called wind shear. The first result is a large thunderstorm.



- Inside the huge thundercloud, warm and humid air is rising, while cool air is falling, along with rain or hail.
- All these conditions can result in rolling, spinning air currents inside the cloud.
- Although this spinning column of air starts horizontal, it can easily go vertical and drop down out of the cloud.
- When it touches the ground, it's a tornado.

The Hindu

AI and the global economy

- False and misleading information supercharged with cutting-edge artificial intelligence that threatens to erode democracy and polarize society is the top immediate risk to the global economy, the World Economic Forum
- In its latest Global Risks Report, the organization also said an array of environmental risks pose the biggest threats in the longer term.
- The report listed misinformation and disinformation as the most severe risk over the next two years, highlighting how rapid advances in technology also are creating new problems or making existing ones worse.
- The authors worry that the boom in generative AI chat-bots like ChatGPT means that creating sophisticated synthetic content that can be used to manipulate groups of people won't be limited any longer to those with specialized skills
- "Societies could become further polarized" as people find it harder to verify facts, she said.
- The rise of AI brings a host of other risks, she said. It can empower "malicious actors" by making it easier to carry out cyberattacks, such as by automating phishing attempts or creating advanced malware.

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CSE

(CIVIL SERVICES EXAMINATION)

FROM BASICS TO UPSC BRILLIANCE