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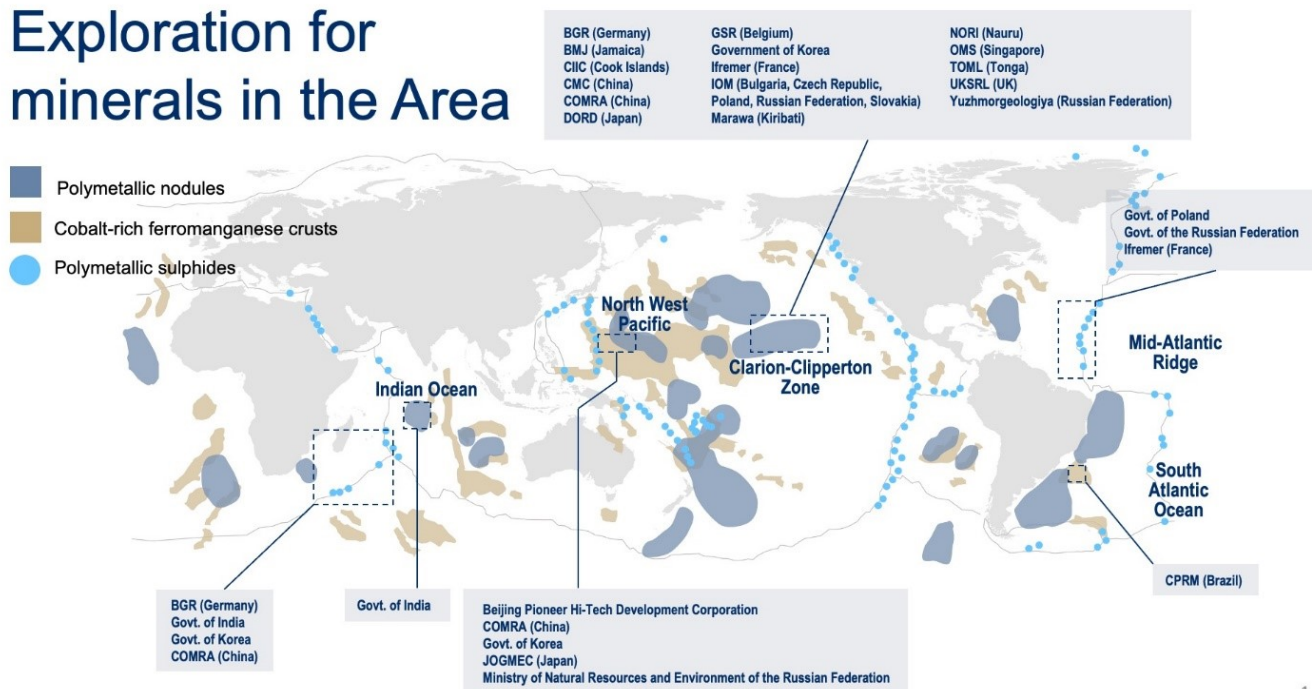
## Prelim Bits 01-07-2023 | UPSC Daily Current Affairs

### Deep Sea mining Vs Mining on Land

#### Deep-sea mining

- It is the process of retrieving mineral deposits from the deep seabed, the ocean below 200m which covers about two-thirds of the total seafloor.
- Deep sea mining will be conducted to extract key battery materials such as cobalt, copper, nickel, and manganese from rocks called "*polymetallic nodules*".
- **Benefits** - Deep-sea mining has metals crucial to making the transition to clean energy.
- **Threat** - Research suggests that deep sea mining could destroy habitats and wipe out species.

### Exploration for minerals in the Area



- The *International Seabed Authority (ISA)* regulates activities in the seabed beyond national jurisdiction.
- Seabed mining doesn't use child labor like much of the land mining does.
- It has a life-cycle carbon footprint that is 90% less than land mining.

#### Deep sea mining in India

- The *International Seabed Authority* has allocated about 75,000 square kilometres in the Central Indian Ocean Basin (CIOB) to conduct exploratory mining.
- Union cabinet introduced '[Deep Ocean Mission](#)' to be implemented by the Ministry of Earth

Sciences.

- India has also committed to the *High Seas treaty* that seeks to protect 30% of the world's ocean by 2030.

## Mining on Land

- Mining is the extraction (removal) of minerals and metals from earth.
- **Examples** - Manganese, tantalum, cassiterite, copper, tin, nickel, bauxite (aluminum ore), iron ore, gold, silver, and diamonds.
- Mining on land can be broadly classified into 2 types - Surface mining and underground mining
- **Surface Mining** - In surface mining, the ground is blasted so that ores near Earth's surface can be removed and carried to refineries to extract the minerals.
- Surface mining can be destructive to the surrounding landscape, leaving huge open pits behind.
- **Underground Mining** - In underground mining, ores are removed from deep within the earth.
- **Mining in India**
  - The Mining industry in India is one of the core industries of the economy governed by **Ministry of Mines**.
  - India has *large reserves* of Iron ore, Bauxite, Chromium, Manganese ore, Baryte, Rare earth and Mineral salts.
  - India is 2nd largest *crude steel producer* in the World.

## International Seabed Authority

- **Establishment** - An autonomous international organization established in 1994 under
  - 1982 United Nations Convention on the Law of the Sea (UNCLOS).
  - 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (1994 Agreement).
- **Headquarters** -Kingston, Jamaica
- **Members** -168 Members which includes 167 Member States and the European Union
- **Exclusive Economic Zones** - ISA holds authority over the ocean floors outside of its 168 member states' Exclusive Economic Zones.
- **Protects marine environment** -ISA has the mandate to ensure the effective protection of the marine environment from harmful effects that may arise from deep-seabed-related activities.
- **United Nations Convention on the Law of the Sea (UNCLOS)** - ISA is the organization through which States Parties to UNCLOS organize and control all mineral-resources-related activities in the area for the benefit of humankind.

## Reference

[The Hindu | Deep-sea mining will be as bad as mining on land](#)

## Algae Bloom in California

*A recent outbreak of algae bloom has sickened and killed an unknown number of sea lions and dolphins in California.*

- The bloom has been traced to the waters off *Central California* and off the northern reaches of *Southern California* where warm water and cooler water coming up from the depths.
- The breadth of the poisoning can cause brain damage, seizures and death in sea lions.
- **Algae bloom** - It occurs when colonies of algae plant-like organisms that live in the sea and freshwater grow out of control while producing toxic or harmful effects on people, fish, shellfish,

marine mammals, and birds.

- It is caused both by natural and man-made.
- The algae is a natural phenomenon that causes the production of a neurotoxin called *domoic acid*.
- The blooms can also proliferate because of human causes such as climate change and an excess of nitrates washed out to sea.
- **Ideal condition for an Algae bloom**
  - Increased nutrients, warmer temperature, abundant light, and stable wind conditions can cause Algae blooms.
  - Increased nutrients and warmer temperature of water.
  - Environmental conditions like abundant light and stable wind can cause Algae blooms.
  - Urban runoff that includes farm fertilizer and human waste.
  - **Upwelling** - Upwelling is a process in which currents bring deep, cold water to the surface of the ocean it happens as a result of winds and the rotation of the Earth.
- **Types**
  - **Cyanobacteria** - Blue-green algae.
  - **Dinoflagellates** - Microalgae or red tide.
  - **Diatoms** - Microalgae or red tide.

#### California Sea lions

- It is a coastal eared seal native to western *North America*.
- It is one of 6 species of sea lions.
- **IUCN Status** - Least Concern.

#### Reference

[The Hindu | Sick sea lions washing ashore in California due to algae bloom](#)

#### Drugs and Clinical Trial (Amendment) Rules, 2023

*An amendment to the New Drugs and Clinical Trial Rules (2023), recently passed by the Government of India.*

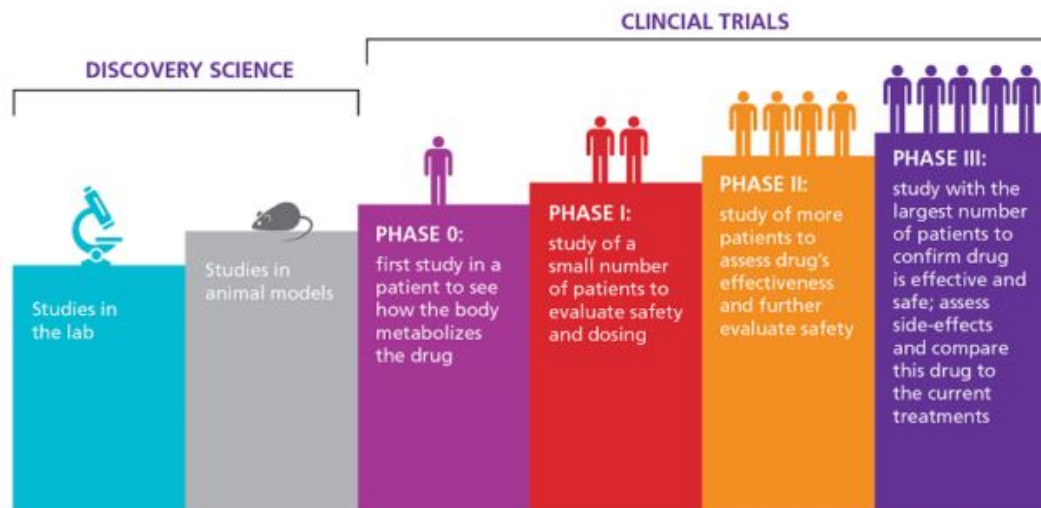
- It is an amendment to the Drugs and Clinical Trials Rules of 2019.
- **Amendment** - To replace the use of animals in research, especially in drug testing.
- Also authorises researchers to instead use non-animal and human-relevant methods.
- **Alternatives** - These methods includes technologies like 3D organoids, [organs-on-chip](#), and advanced computational methods, to test the safety and efficacy of new drugs.
- **Challenges in clinical trials**
  - Developing an organ-on-a-chip system typically requires multidisciplinary knowledge.
  - It concerns that resources are currently imported from the U.S., Europe, and Japan.

#### Drugs and Clinical Trials Rules, 2019

- **Ministry** - Union ministry for health and Family welfare.
- **Aim** - To promote clinical research in India and further the conduct of ethical and quality clinical trials in the country.
- **Clinical Trials** - The rules reduced the time for approving applications to *30 days* for drugs discovered in India or whose research and development has been done in India and are proposed to be manufactured and marketed in India.
- For drugs developed *outside the country*, the approval time has been fixed to *90 days*.
- *Drug Controller General of India (DGCI)* has waived off the clinical trials for the drugs approved

and marketed in the European Union, the UK, Australia, Canada, Japan and the U.S.

- The rules also ensure patient safety and the ethics committee will monitor the trials and decide on amount of compensation in cases of adverse events.
- **Orphan drugs** - For the first time, *orphan drugs* have been defined as intended to treat conditions which affects not more than five lakh persons in India.
- In addition, fee waivers for orphan drug trials is likely to encourage more trials for rare diseases in India.



### Central Drugs Standard Control Organization (CDSCO)

- CDSCO is the national regulatory body for pharmaceuticals and medical devices in India.
- It is divided into zonal offices which do pre-licensing and post-licensing inspections, post-market surveillance, and recalls when needed.
- *Drug Controller General of India (DCGI)* is an organ of the CDSCO which is responsible for approving and licensing of drugs and medical devices.
- The DCGI is advised by the Drug Technical Advisory Board (DTAB) and the Drug Consultative Committee (DCC).

### Reference

[The Hindu | India takes step to remove animals from drug-testing process](#)

### Lithium Titanate Battery

*Lithium titanate battery technology a boon to the energy storage market overcoming the limitations of Li-ion batteries.*

- A lithium-titanate or lithium titanate oxide (LTO) battery is an improved version of Lithium ion batteries (LiB).
- Click here to know more about [Lithium-ion Battery](#).
- **Comparison** - Lithium titanate battery utilises lithium-titanate nanocrystals instead of carbon on the surface of the anode.

- Lithium-titanate nanocrystals allow the anode to gain more surface area than carbon which permits the electrons to enter and exit the anode quickly.
- The ability to donate or accept electrons in the electrolytic solutions of lithium ions with titanium oxides is more likely than the same reaction with graphite.
- This allows for *fast charging capacity* in the case of lithium titanate than in the case of carbon.
- Unlike conventional LiB, it has lower inherent charge.
- Lithium dendrites are less likely to form in the case of titanate.

*Lithium dendrites are extensions of metal that enter into the solid electrolyte and finally cross from one electrode to the other and ultimately short out the battery cell*

- **Advantages of LTO over Li battery**

- It offers fast charging.
- It has long battery life.
- It has low-temperature resistance.
- It is fire-resistant.
- Suitable for solar batteries
- Suitable for applications with dedicated line buses, terminal trailers and other transportation systems.

- **Disadvantages**

- It will induce low specific energy of about 30-110 watt-hours per kilogram.
- High cost of production.

## Reference

[Down to Earth | Lithium titanate battery technology](#)

## VSS Unity

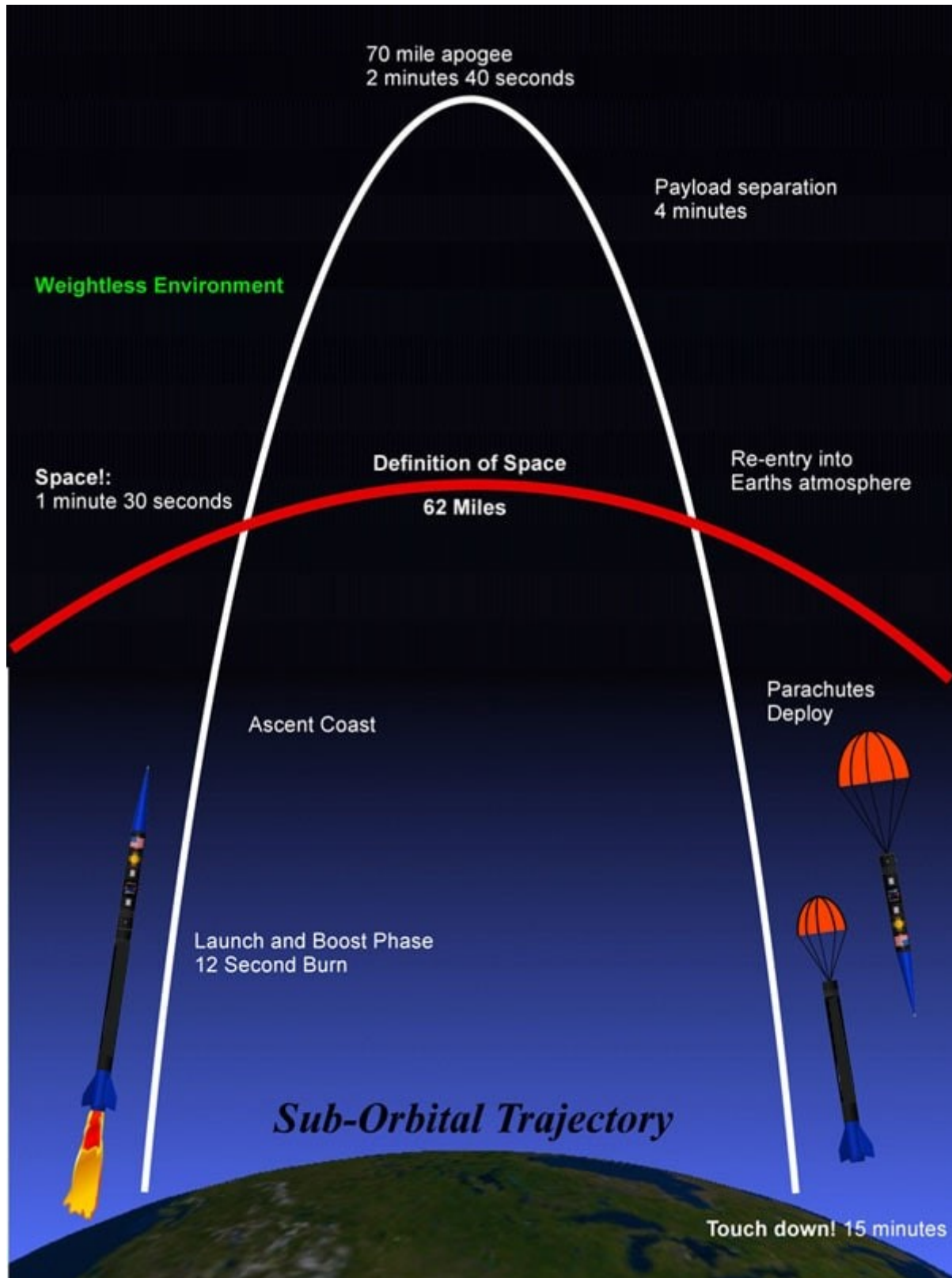
*Recently a 6 person crew on Virgin Galactic's VSS unity spaceship took a suborbital flight and reached the edge of space.*

- Virgin Galactic is a British-American space tourism company, operating in the United States.
- **Founders** - Richard Branson and the Virgin Group.
- Virgin Galactic is launching space tourists and researchers onto suborbital trajectories.
- **VSS unity** - It is a rocket-powered plane which took its first commercial space flight in the '**Galactic 01**' mission.
- 'Galactic 01' took about 90 minutes for the entire trip.
- The space plane reached a peak altitude of more than 52 miles (85 kilometers).

## The Edge of Space

- **Karman line** - The Karman line is the boundary between the Earth's atmosphere and outer space at an altitude of 100km above sea level.
- It is an internationally recognised boundary of space.
- The Karman line is near the transition between the upper mesosphere and lower thermosphere.
- NASA and the US Air Force, considers 50 miles as the border of space.





### Suborbital Trajectory

- When an object travels at a horizontal speed of about 28,000 km/hr or more, it goes into orbit once it is above the atmosphere.
- Satellites need to reach that threshold speed in order to orbit Earth.
- Such a satellite would be accelerating towards the Earth due to gravity, but its horizontal movement is fast enough to offset the downward motion so that it moves along a circular path.
- Any object travelling slower than 28,000 km/hr must eventually return to Earth.

## Reference

[The Hindu | Italian researchers reach the edge of space](#)



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