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Stardust 1.0

- The United States of America's Stardust 1.0 became the first commercial space launch powered by biofuel.
- Stardust 1.0 is a launch vehicle suited for student and budget payloads.
- It has a mass of 250 kg and can carry a maximum payload mass of 8 kg.
- It is manufactured by bluShift, an aerospace company that is developing rockets that are powered by bio-derived fuels.
- These rockets will help to launch small satellites called cubesats into space in a way that is relatively cheaper than using traditional rocket fuel and is less toxic for the environment.

Biofuel

- It is a blend of substances that can be had from any farm across the US.
- But broadly, biofuels are obtained from biomass, which can be converted directly into liquid fuels that can be used as transportation fuels.
- The two most common kinds of biofuels in use are ethanol and biodiesel and they both represent the first generation of biofuel technology.
    1. Ethanol is renewable and made from many kinds of plants.
    2. Biodiesel is produced by combining alcohol with new and used vegetable oils, animal fats or recycled cooking grease.

Green Tax

- To dissuade people from using polluting vehicles, the Union Transport

Ministry has approved a 'green tax' on vehicles of specified vintage.

- Green tax funds are to be kept in a separate account to help States measure pollution and tackle it.
- The policy is scheduled to come into force on April 1, 2022.
- Additional green tax of 10%-25% on the road tax is payable by commercial transport vehicles that are older than eight years at the time of fitness certification renewal, and for personal vehicles after 15 years.
- The policy provides exemptions for tractors, harvesters and tillers used in farms, hybrid, electric, ethanol, LPG and CNG-powered vehicles.
- It provides a lower green tax for public transport vehicles such as buses.

- A higher additional 50% of road tax is proposed for vehicles in highly polluted cities, and differential tax based on fuel and vehicle type.
- Vehicles of government departments and public sector units that are older than 15 years are to be deregistered and scrapped.

Neutrinos and Star Death

- Many stars, towards the end of their lifetimes, form **supernovas** - massive explosions that send their outer layers shooting into the space.
- Most of the energy of the supernova is carried away by **neutrinos** - tiny particles with no charge and which interact weakly with matter.
- Researching the mechanisms of **Type II supernovas**, IIT Guwahati has come up with new insights into the part played by neutrinos in the death of massive stars.
- They claim that a three-flavour model of neutrinos is needed to predict the dynamics of the supernova.
- They have found that the fast oscillations of neutrinos decide the flavour information of the supernova neutrinos.

Supernovas

- All stars burn nuclear fuel in their cores to produce energy.
- The heat generates internal pressure that pushes outwards.
- This pressure prevents the star from collapsing inward due to the action of gravity on its own mass.
- But when a star ages and runs out of fuel to burn, it starts to cool inside.
- This causes a lowering of its internal pressure and therefore the force of gravity wins; the star starts to collapse inwards.
- This builds up shock waves because it happens very suddenly, and the shock wave sends the outer material of the star flying. This is supernova.
- In stars that are **more than eight times** as massive as the Sun, the supernova is accompanied by a collapsing of the inner material of the dying star - this is known as Type II or core collapse supernova.
- The collapsing core may form a black hole or a neutron star, according to its mass.

Neutrinos

- Neutrinos come in three ‘flavours’ or ‘types’, and each flavour is associated with a light elementary particle.
- Electron-neutrino is associated with the electron; the muon-neutrino with the muon and the tau-neutrino with the tau particle.
- As they spew out of the raging supernova, the neutrinos can change from one

flavour to another in a process known as **neutrino oscillations**.

- Due to the high density and energy of the supernova, several interesting features emerge as this is a nonlinear phenomenon.
- This phenomenon may generate neutrino oscillations happening simultaneously over different energies (unlike normal neutrino oscillation), termed collective neutrino oscillation.
- The oscillation result may dramatically change when one allows the evolution with the angular asymmetry, the oscillations can happen at a nanosecond time scale, termed **fast oscillation**.

MITRA Scheme

- The Government has proposed the Mega Investment Textiles Parks (MITRA) scheme, a game changer for the Indian Textiles Industry.



- This will create world class infrastructure with plug and play facilities to enable create global champions in exports.
- It would enable the textile industry to become globally competitive, attract large investments, boost employment generation and exports.
- Along with the Production Linked Incentive (PLI) scheme, MITRA will lead to increased investments and enhanced employment opportunities.

Jal Jeevan Mission Urban

- The Union Budget 2021-22 announced Jal Jeevan Mission (Urban).
- This mission aims to bring safe water to 2.86 crore households through tap

connection with the target year as **2024**.

- There is a need to roll out the urban mission with an aim to ensure sustainable supply of household drinking water in urban India.
- This mission in line with the Centre's rural water supply project (2019).
- Jal Jeevan Mission (Rural) has covered only around 34% of the targeted households in rural India, which was haunted by the 'slippage' problem.
- [**Slippage** means villages or habitations covered with safe drinking water facilities slipping back to 'not-covered' status.]
- An equal emphasis on treatment of faecal sludge is also necessary.
- The current budget allocates Rs 9,994 crore for the toilet++ programme.

Green Hydrogen Energy Mission

- The Union Budget proposed to launch a Hydrogen Energy Mission in 2021-22 for generating hydrogen from **green power sources**.
- Hydrogen can be generated from many sources. But India stresses on the hydrogen sources from renewable sources.
- This mission would decarbonise heavy industries, and also holds the key to clean electric mobility that doesn't depend on rare minerals.
- Hydrogen can act as an energy storage option, which would be essential to meet intermittencies (of renewable energy) in the future.
- Green hydrogen energy is vital for India to meet its Nationally Determined Contributions and ensure regional and national energy security, access and availability.

Source: PIB, The Indian Express, The Hindu, Down To Earth

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