



Decline in Immunisation Coverage

For Prelims: United Nations Children's Fund (UNICEF), Diphtheria, Tetanus, and Pertussis (DPT) Intensified Mission Indradhanush

For Mains: Diphtheria, Tetanus, and Pertussis (DPT), Intensified Mission Indradhanush

Why in News?

Recently, a report by [World Health Organisation \(WHO\)](#) and [United Nations Children's Fund \(UNICEF\)](#) highlighted the impact of [covid-19 pandemic](#) on immunisation programs globally and in India as well.

- DPT vaccine is considered a marker for immunization coverage across countries.

What is Diphtheria, Tetanus, and Pertussis (DPT)?

▪ Diphtheria:

- **Caused by:**
 - Diphtheria is primarily caused by the **bacterium *Corynebacterium diphtheriae***.
- **Symptoms:**
 - Common cold, fever, chills, swollen gland in neck, sore throat, bluish skin etc.
- **Spread:**
 - It is mainly spread by coughs and sneezes, or through close contact with someone infected.
- **Target Population:**
 - Diphtheria particularly affects children **aged 1 to 5 years**.
 - Occurrence of diphtheria cases in under-five children reflects **low coverage** of primary diphtheria vaccination.

▪ Tetanus:

- **Caused by:**
 - Tetanus is acquired through infection of a cut or wound with the spores of the bacterium *Clostridium tetani*, and most cases occur within 14 days of infection. Tetanus cannot be transmitted from person to person.
- **Prevention:**
 - Tetanus can be prevented through immunization with Tetanus-Toxoid-Containing Vaccines (TTCV). However, people who recover from tetanus do not have natural immunity and can be infected again.
- **Symptoms:**
 - Jaw cramping or the inability to open the mouth.
 - muscle spasms often in the back, abdomen and extremities.
 - sudden painful muscle spasms often triggered by sudden noises.
 - Seizures.

▪ Pertussis:

- **Caused by:**
 - Pertussis, also known as **whooping cough**, is a highly contagious respiratory

infection caused by the **bacterium *Bordetella pertussis***. In 2018, there were more than 151 000 cases of pertussis globally.

- The disease is most dangerous in infants, and is a significant cause of disease and death in this age group.
- **Spread:**
 - Pertussis spreads **easily from person to person mainly through droplets** produced by coughing or sneezing.

What are the Key Highlights of the Report?

- Three million children have not received the first dose of the Diphtheria, Tetanus, and Pertussis (DTP) vaccine in 2020.
- The percentage of children worldwide who have received three doses of the DTP vaccine **declined by five percentage points between 2019 and 2021**.
 - With just 8% coverage worldwide it's the **largest sustained decline in childhood vaccination**.
- Around **25 million children globally missed out on or more doses of the DTP vaccine in 2021 alone**, which is two million more than those who left out in 2020 and six million more than in 2019.
- Over **24 million children missed out on their first measles vaccine dose in 2021**, over five million more than in 2019.
- Compared with 2019, 6.7 million more children missed out on the third dose of the polio vaccine and 3.5 million missed the first dose of the [Human papillomavirus \(HPV\) vaccine](#), which protects girls against cervical cancer later in life.
- The **coverage of vaccines dropped in every region whereas East Asia and the Pacific region** recorded the steepest reversal:
 - **Around 18 million of the 25 million children who did not receive a single DTP dose in 2021** belong to low- and middle-income countries, with India, Nigeria, Indonesia, Ethiopia, and the Philippines recording the highest numbers,
 - **Myanmar and Mozambique record the largest increase in the number of children who didn't receive a single vaccine between 2019 and 2021**.

What are the Contributing Factors for the Decline?

- The decline was due to **many factors including an increased number of children** living in conflict and fragile settings where immunization access is often challenging.
- It was also due to **increased misinformation and Covid-19-related issues** such as service and [supply chain disruptions](#), resource diversion to response efforts, and containment measures that limited immunization service access and availability.

What was the India's Performance?

- Annually, India vaccinates more than 30 million pregnant women and 27 million children through its universal immunisation programme.
- India **prevented further backslide by introducing catchup programs** like [Intensified Mission Indradhanush 3.0](#), which helped in **reducing the number of children who had left the first dose from 3 million to 2.7 million in 2021**, as compared to 2019 when 1.4 million children didn't receive the first dose.
- India effectively **avoided a drop in coverage by the early restoration of routine immunisation services**, along with evidence-based catch-up programmes, which enabled it to avoid a drop in routine immunisation coverage.
- India also launched the [Intensified Mission Indradhanush 4.0](#) in February 2022 with the aim to immunize every pregnant woman and child who had missed their vaccination.

What are the related Global Initiatives?

▪ **Global Immunization Agenda 2030 (IA2030):**

- It is a **strategy for all countries and relevant global partners** to achieve set goals on disease prevention through immunisation and vaccine delivery to everyone, everywhere, at any age.
- **WHO** and UNICEF are collaborating with **Gavi**, the Vaccine Alliance, and other partners to implement the **Global Immunization Agenda 2030 (IA2030)**.

▪ **World Immunisation Week:**

- World Immunization Week is **celebrated every year** in the last week of April.
- It aims to **promote the use of vaccines** to protect people of all ages against disease.
- Immunisation describes the process whereby people are protected against illness caused by infection with microorganisms (formally called pathogens). The term vaccine refers to the material used for immunisation.

Way Forward

- There is a **need to intensify efforts for catch-up vaccination** to address backsliding on routine immunization, expand outreach services in underserved areas to reach missed children, and implement campaigns to prevent outbreaks.
- Further there is a **need to implement evidence-based, people-centred strategies** to build trust in vaccines and immunization, counter misinformation and increase vaccine uptake, particularly among vulnerable communities.
- It is also **needed to prioritize health information and disease surveillance systems** strengthening to provide the data and monitoring needed for programmes to have maximum impact.

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. Mission Indradhanush' launched by the Government of India pertains to (2016)

- (a) immunization of children and pregnant women
- (b) construction of smart cities across the country
- (c) India's own search for the Earth-like planets in outer space
- (d) New Educational Policy

Ans: (a)

Exp:

- **Mission Indradhanush is an immunization scheme launched by the Ministry of Health and Family Welfare, GoI on 25th December, 2014.**
- Depicting seven colours of the rainbow, it aimed to cover all those children by 2020 who are either unvaccinated, or are partially vaccinated against seven vaccine preventable diseases which include diphtheria, whooping cough, tetanus, polio, tuberculosis, measles and hepatitis B.
- The mission is technically supported by WHO, UNICEF, Rotary International and other donor partners. Therefore, option (a) is the correct answer.

[Source: IE](#)

Green Grids Initiative

For Prelims: Green Grid Initiative, One Sun One World One Grid, Solar Energy, Solar Panel, Solar Pumps, COP, Renewable Sector, ISA, Climate Change, Clean Energy, Heatwaves

For Mains: India's initiatives to promote renewable energy, Significance of Global Groupings on economy of country, Challenges and opportunities in OSOWOG

Why in News?

India and UK, jointly announced a declaration on “one sun, one world, one grid” — or OSOWOG at the [Conference of Parties \(COP26\)](#), held in Glasgow, UK.

What do we know about OSOWOG?

- **About:**
 - GGI-OSOWOG was **conceived in 2018** to develop **global interconnected solar energy systems**.
 - Under the [International Solar Alliance](#), India announced the launch of the **Green Grids Initiative — One Sun, One World, One Grid (GGI-OSOWOG)** in partnership with the United Kingdom.
- **Objectives:**
 - The vision behind the OSOWOG is **‘The Sun Never Sets’** and is a constant at some geographical location, globally, at any given point of time.
 - The initiative aims to build a framework for **global cooperation on the effective utilisation of renewable resources** and to help ensure that **clean and efficient energy** is a reliable option for all nations to meet their energy requirements by 2030.
 - This project aspires to **harness the sun's energy and build a global interconnected electricity grid** to accelerate the transition to [renewable energy](#).
 - The initiative is expected to connect **more than 80 countries across a large geographical area**, with varying levels of sunlight. A transitional system will enable countries with low levels of sunlight to obtain energy from areas with an excess of it.
- **Stages of Grid Connection:**
 - The interconnection of the **Indian grids with the Middle East, South Asia and Southeast Asian (MESASEA)** grids.
 - MESASEA grids' interconnection with the **African power grid**.
 - Finally, **global interconnectivity**.

What is the Importance of GGI OSOWOG?

- It will bring more **technical, financial and research cooperation** to help facilitate **cross-border renewable energy transfer projects**, which will give OSOWOG its global infrastructure.
- It will also create a depth of **organizational scale, spanning national governments, international financial and technical organisations, legislators, power system operators and knowledge leaders**, to accelerate the construction of the new infrastructure needed for a world powered by **clean energy**.
- It will enable a faster leap towards a **global ecosystem of interconnected renewables** that are shared for mutual benefit and global sustainability.
- It will provide **momentum, and a pool of investment towards low-carbon**, innovative solar projects, and bring together skilled workers for a [solar-powered](#) economic recovery. It can also propel investment and create millions of new green jobs.
- It will lead to **reduced project costs, higher efficiencies and increased asset utilization** for all the participating entities.
- It will result in **economic benefits, positively impact poverty alleviation and support in mitigating water, sanitation, food and other socio-economic challenges**.
- Allow **national renewable energy management centres in India** to grow as regional and global management centres.

What are the Challenges & Opportunities in GGI OSOWOG for India?

▪ Challenges:

- Documentation of GGI **does not comment on improving the efficiency of the existing solar energy infrastructure in the country.**
- The majority of the solar energy infrastructure is located in **desert regions**, which brings dust deposits on panels.
 - A layer of dust **decreases solar power conversion efficiency by 40%.**
- Solar energy technologies such as **batteries and panels** use energy-intensive raw materials and several chemicals and heavy metals that need to be handled and disposed of correctly.
- It does not define strategies to **recycle and repurpose existing infrastructure**, which can be an exciting avenue to view through the [circular economy](#) lens.
- Solar panels **generally have a lifespan of 25 years**, after which they have to be retired since they lose their efficiency.

▪ Opportunities:

- Being a **thermal energy-dependent country**, India faces **severe electricity shortages** in many areas due to [heatwaves](#) (when demand increases) and coal shortages.
 - GGI can **transform the traditional energy system by replacing thermal power plants with solar energy**, making India more resilient against **extreme weather conditions and less dependent on fossil fuels.**
- Solar energy has been **improving the lives of millions of people in rural India**, enabling them to carry out activities and improving their standard of living in an environmentally friendly manner.
 - An example of this is the implementation of **solar-powered agriculture pumps (PM-KUSUM) to extract groundwater**, which are more environmentally friendly than traditional diesel ones.
 - The number of diesel pumps in India is 10 million.
 - It is estimated that the replacement of 1 million diesel pumps with solar-powered pumps can improve agricultural output by Rs 30,000 crore, while also mitigating diesel usage.
 - The implementation of GGI can **enhance the quality of life of rural communities** in many other areas like access to electronic gadgets, clean drinking water, among others.

Way Forward

- Environmental costs of solar power, efficiency issues, energy losses due to conversion and transfer, and the problem of waste management are **barriers that need to be addressed urgently by the implementing bodies.**
- In India, the implementation of GGI comes at an **increased environmental cost** due to waste disposal issues.
 - These obstacles **need to be worked around by developing specific systems to reuse and recycle existing infrastructure.**
- To make the initiative a success in India, there needs to be a **careful consideration of the initiative's costs and the benefits.**
 - Its **modifications** need to be planned in ways that suit the country's requirements and resource capabilities.
- **Institution building** is key to fulfilling the ambitions of a multi-country grid project.
 - In this context, **ISA (International Solar Alliance)** can act as an independent supranational institution to take decisions about how the grid should be run and conflicts settled.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q With reference to solar water pumps, consider the following statements: (2020)

1. Solar power can be used for running surface pumps and not for submersible pumps.

2. Solar power can be used for running centrifugal pumps and not the ones with piston.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (d)

Explanation:

- The main components in a solar pumping system include a photovoltaic (PV) array, an electric motor and a pump.
- There are several different types of solar-powered pumps depending on their functional mechanism. But primarily there are four types of solar water pumps - submersible pumps, surface pumps, direct current (DC) pumps and alternate current (AC) pumps. **Hence, statement 1 is not correct.**
- Solar Power can be used to run both centrifugal as well as piston pumps. **Hence, statement 2 is not correct.**
- **Therefore, option (d) is the correct answer.**

[Source: DTE](#)

India And Belarus

For Prelims: India-Belarus, UNSC, NSG, NAM

For Mains: Indian Belarus Relations and Way Forward

Why in News?

India congratulated Belarus for celebrating its 78 years of Independence on 3rd July 2022.

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How Has Been India-Belarus Relations?

- **Diplomatic Relations:**
 - India's relations with Belarus have been traditionally warm and cordial.
 - India was **one of the first countries to recognize Belarus as an independent country in 1991** after the break-up of the Soviet Union.
- **Supports at Multilateral Fora:**
 - The cooperation between the two countries is visible at many multilateral fora such as [UN Security Council \(UNSC\)](#) and [Nuclear Suppliers Group \(NSG\)](#).
 - Belarus was one of the countries whose support helped in consolidating India's candidature for the non-permanent seat at the UNSC in July 2020.
 - India has also reciprocated Belarus's support at various international fora, such as Belarus's membership in the [Non Aligned Movement \(NAM\)](#) and other international and multilateral groups like [IPU \(Inter-Parliamentary Union\)](#).
- **Comprehensive Partnership:**
 - The two countries enjoy a comprehensive partnership and have established mechanisms for exchanging views on bilateral, regional and multilateral issues through **Foreign Office Consultations (FOC), Intergovernmental Commission (IGC), and Joint Commission on Military Technical Cooperation**.
 - The two countries have signed a number of Agreements/MoUs on various subjects, including trade and economic cooperation, culture, education, media and sports, tourism, science & technology, agriculture, textiles, Avoidance of [Double Taxation](#), Promotion and Protection of Investments, and defence and technical cooperation.
- **Trade and Commerce:**
 - In the economic sector, the annual bilateral trade turnover in 2019 stands at USD 569.6 million.

- India's special gesture in 2015 that granted Belarus the **Market Economy Status and a USD 100 million Line of Credit** has also helped in the growth in the economic sector.
 - Market Economy status is **a status conferred on the country exporting the goods accepted as the benchmark**. Prior to this status, **country is considered as a Non-Market Economy (NME)**.
- India's encouragement to the **Belarusian businessmen to invest in 'Make in India' projects are bearing fruits.**
- **Indian Diaspora:**
 - The Indian Community in Belarus consists of around 112 Indian nationals and 906 Indian students pursuing studies in medicine in State medical universities in Belarus.
 - Indian art and culture, dance, **yoga**, ayurveda, films, etc. remain popular among Belarusian nationals.
 - Many young Belarusians also take keen interest in learning Hindi and dance forms of India.

Way Forward

- Taking into account the gradual shift of the **global geopolitical and geo-economic** center of gravity to Asia, **cooperation with India creates additional opportunities for international trade and investment.**
- Belarus needs several footholds in Asia diversified by geographical subregions. India could become **one of such pillars in South Asia, but Belarusian initiatives should definitely fall into the "matrix" of India's national interests** and sacred meanings.
- There are also certain hidden reserves for cooperation in the field of cybersecurity. Belarus may become **an "entry point" for Indian pharmaceutical companies to the Eurasian market.**
- The potential of military and technical cooperation, including shared developments, has not been fully disclosed. Cinema (Bollywood) could **stimulate the interest of the Indian business community and tourists.**
- An additional increase in the export of tourism and medical services could be ensured by recreational centers to be established in Belarus based on Indian traditional medicine models (Ayurveda + Yoga).
- The drivers of bilateral cooperation could be the interaction of the leading "think tanks" of Belarus and India.
- To increase mutual interest, establishing new innovative growth points and encouraging breakthrough ideas and active expert diplomacy communication is of prime importance. The drivers of bilateral cooperation **could be the interaction of the leading "think tanks" of Belarus and India.**

Measures to Boost Forex Inflows

For Prelims: Forex, CRR, SLR, ECB, RBI

For Mains: Measures to Boost Forex Inflows

Why in News?

Recently, **Reserve Bank of India (RBI)** has undertaken measures **to enhance forex inflows**, amid **Depreciation** of Indian rupee.

Why has the RBI taken Measures to Boost Forex?

- The rupee has depreciated by 4.1 % against the US dollar during the **current financial year (2022-23)** so far amid the **ongoing geopolitical tensions**.
 - Indian Rupee has depreciated 4.1 % to 79.30 **against the US dollar** in the current financial year (FY 2022-23).
- Foreign Portfolio Investors (FPIs) have pulled out **Rs 2.32 lakh crore in six months**.
- India's **forex reserves**, over the last **9 months**, have decreased by **USD 50 billion to USD 593.3 billion**.

What is a Forex Reserve?

- **About:**
 - Foreign exchange reserves **are assets held on reserve by a central bank in foreign currencies**, which can include bonds, treasury bills and other government securities.
 - Most foreign exchange **reserves are held in US dollars**.
- **Components:**
 - Foreign Currency Assets
 - Gold reserves
 - Special Drawing Rights
 - Reserve Tranche Position with the [International Monetary Fund \(IMF\)](#).

What are the Measures?

- **FPI Investment in Debt:**
 - [Foreign Portfolio Investors \(FPIs\)](#) can **invest in government securities and corporate bonds**.
 - It has also sought to boost debt portfolio inflows by widening the basket of securities available to FPIs.
 - FPI is a route for foreign investment in India. It includes [investments in shares of listed Indian Company](#), [Non-Convertible Debentures](#), [units of domestic MF \(Mutual Fund\)](#), [Government Securities](#), [Security Receipts](#), etc.
- **Higher Returns:**
 - The RBI has allowed banks to give higher returns on foreign currency deposits on which **they will not have to maintain any reserves**.
 - Interest rates **should not be higher than those offered by the banks on comparable domestic rupee** term deposits.
- **Relaxation Under ECBs:**
 - Rules governing [External Commercial Borrowing \(ECB\)](#) for corporates have been relaxed, with the automatic route being doubled to USD 1.5 billion and the cap on borrowing costs raised by 1% point.
 - ECBs are loans in India made by **non-resident lenders in foreign currency to Indian borrowers**. Used to facilitate **access to foreign money by Indian corporations** and PSUs (public sector undertakings).
- **Export Taxes:**
 - The Union government **has also increased export taxes on [oil and petroleum products](#) and [import duty on gold](#)**, to control the widening [Current Account Deficit](#).
- **Exemption on FCNR(B) and NRE Deposits:**
 - [Non-Resident Indians \(NRIs\)](#) will get high returns for bringing foreign exchange into India into FCNR(B), and NRE deposits as the cap on rates has been removed for fresh deposits.
 - FCNR(B) are foreign currency non-resident deposits (denominated in foreign currency), while NRE deposits are non-resident external deposits.

What is External Commercial Borrowings?

- **About:**
 - ECBs is a loan availed by an Indian entity from a non-resident lender with a minimum average maturity.
 - Most of these loans are provided by foreign commercial banks buyers' credit, suppliers'

credit, securitized instruments such as Floating Rate Notes and Fixed Rate Bonds etc.

▪ **Advantages:**

- ECBs provide opportunity to borrow large volume of funds.
- The funds are available for relatively long term.
- Interest rate are also lower compared to domestic funds.
- ECBs are in the form of foreign currencies. Hence, they enable the corporate to have foreign currency to meet the import of machineries etc.

[Source: IE](#)

James Webb Space Telescope's First Images

For Prelims: James Webb Telescope, National Aeronautics and Space Administration, Hubble Telescope, European Space Agency

For Mains: James Webb Telescope's new Discovery about Universe

Why in News?

Recently, [National Aeronautics and Space Administration's \(NASA\)](#) released a set of images and science products of five different regions of the sky, taken with the James Webb Space Telescope.

- It includes a **galaxy cluster which appeared 4.6 billion years ago.**
- It is the deepest and finest infrared image of some of the **most distant and oldest galaxies ever discovered.**
- These **characteristics will aid scientists in learning more about each of these ancient galaxies' mass, age, history, and composition.**



What is James Webb Space Telescope?

▪ About:

- The telescope is the **result of an international collaboration** between **NASA**, the **European Space Agency (ESA)** and the **Canadian Space Agency** which was **launched in December 2021**.
- It is currently at a point in space known as the Sun-Earth **L2 Lagrange point**, approximately 1.5 million km beyond Earth's orbit around the Sun.
 - The Lagrange Point 2 is **one of the five points in the orbital plane of the Earth-Sun system**.
 - Named after Italian-French mathematician Joseph-Louis Lagrange, the **points are in any revolving two-body system like Earth and Sun**, marking where the gravitational forces of the two large bodies cancel each other out.
 - Objects placed at these positions are **relatively stable and require minimal external energy or fuel to keep themselves there**, and so many instruments are positioned here.
- It's the largest, most powerful infrared space telescope ever built.
- It's the successor to Hubble Telescope.
- It can **see backwards in time** to just after the Big Bang by looking for galaxies that are so far away that the light has taken many billions of years to get from those galaxies to our telescopes

▪ Objectives:

- It will examine every phase of cosmic history: from the Big Bang to the formation of galaxies, stars, and planets to the evolution of our own Solar System.
- The goals for the **Webb** can be grouped into **four themes**.

- The first is to **look back around 13.5 billion years** to see the first stars and galaxies forming out of the darkness of the early universe.
- Second, to **compare the faintest, earliest galaxies to today's grand spirals** and understand how galaxies assemble over billions of years.
- Third, to see where stars and planetary systems are being born.
- Fourth, to **observe the atmospheres of extrasolar planets (beyond our solar system)**, and perhaps find the building blocks of life elsewhere in the universe.

What is the Difference between Hubble & James Webb Telescope?

- **Wavelength:**
 - The **James Webb Space Telescope** would be observing infrared radiations most primarily covering between 0.6 to 28 microns.
 - **Hubble's** work involved watching the ultraviolet and the visible spectrum of light. It observes the range of 0.8 to 2.5 microns.
- **Orbits:**
 - Webb Telescope would not be orbiting the Earth. It would be orbiting the sun from 1.5 million kilometres away from the Earth.
 - Hubble orbits the Earth at an altitude of 575 kilometres from it.
- **Vision:**
 - As per NASA, Hubble can see the smallest and the newest of all galaxies.
 - Webb would be able to see the Newborn galaxies as well.
 - Webb's near and mid-infrared instruments would be helpful in studying the first formed galaxies and exoplanets.

What are the Other Space Exploration Missions?

- **Pioneer**
 - It was the **first spacecraft to visit the solar system's most photogenic gas giants, Jupiter and Saturn.**
 - Pioneer 10 was the first probe to travel through the solar system's asteroid belt, a field of orbiting rocks between Mars and Jupiter.
- **Voyager**
 - Shortly after the Pioneers made their flybys, the Voyager 1 and Voyager 2 probes followed. They made **many important discoveries about Jupiter and Saturn**, including rings around Jupiter and the presence of volcanism on Jupiter's moon.
 - Voyager 1 is **currently the farthest man-made object from Earth**, at more than a hundred times the distance from the Earth to the sun, and more than twice as far as Pluto.
- **Chandra**
 - Since 1999, the Chandra X-ray Observatory has been **scanning the skies in X-ray light, looking at some of the most distant and bizarre astronomical events.**
 - Because Earth's pesky atmosphere blocks out most X-rays, astronomers couldn't view the universe in this high-energy, short-wavelength light until they sent Chandra up to space.
- **SPHEREx's**
 - The **Spectro-Photometer for the History of the Universe and Ices Explorer (SPHEREx)** is a planned two-year mission **that will survey the sky in optical as well as near-infrared light which, though not visible to the human eye, serves as a powerful tool for answering cosmic questions.**
 - It would be launched in 2024.
 - Astronomers will use the mission to gather data on more than 300 million galaxies, as well as, more than 100 million stars in our own Milky Way.

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. Which of the following is/are cited by the scientists as evidence/evidences for the continued expansion of universe? (2012)

1. Detection of microwaves in space

2. Observation of redshift phenomenon in space
3. Movement of asteroids in space
4. Occurrence of supernova explosions in space

Select the correct answer using the codes given below:

- (a) 1 and 2
(b) 2 only
(c) 1, 3 and 4
(d) None of the above can be cited as evidence

Ans: (a)

Exp:

- Arno Penzias and Robert Wilson in 1963 found mysterious microwaves coming equally from all directions. The radiation called the Cosmic Microwave Background Radiation was the radiation predicted years earlier by Gamow, Herman, and Alpher. This convinced most astronomers that the Big Bang theory was correct and provided an evidential base for continued expansion of the universe. Hence, 1 is correct.
- **Edwin Hubble in 1929 measured the redshifts of a number of distant galaxies.** On plotting redshift against relative distance, the redshift of distant galaxies increased as a linear function of their distance. Astronomers measure the movement of objects relative to us using Doppler shift. Light from distant objects in the universe is redshifted (shift in the frequency of light towards red colour), **which tells us that the objects are all receding away from us. Hence, 2 is correct.**
- Movement of an asteroid in space may provide information regarding the type of material in early universe, but as such no evidence regarding expanding universe is provided. Hence, 3 is not correct.
- The supernova explosion occurs when there is a change in the core, or centre, of a star. It happens in either binary star system or at the end of a single star's lifetime. It helps in studying the distribution of elements throughout the universe. These elements travel on to form new stars, planets and everything else in the universe. However, it does not provide evidence for expanding universe. Hence, 4 is not correct. Therefore, option (a) is the correct answer.

[Source: TH](#)

Kill Switch

Why in News?

The recent 'Uber Files' reveal that the company had deployed kill switches, purportedly to destroy sensitive data that could have been legitimately accessed by police and officials.

What is Kill Switch?

- **About:**
 - A kill switch is a mechanism used to shut down or disable a device or program.
 - In the manufacturing sector, they are deployed to **terminate operations to arrest damage in assembly lines or save a worker's life.**
 - They serve a similar purpose in the digital world but instead of hardware, they are mostly

software-based.

- The purpose of a kill switch is usually to prevent theft of a machine or data or shut down machinery in an emergency.

▪ **Indian context:**

- There was rape in a moving vehicle by the Uber driver, after that case, there was a suspension on uber for two months.
- Further regulatory authorities found many discrepancies around the company like,
 - VAT (value added tax) return violations.
 - Blocking access to data for Indian authorities.
 - No physical presence of operations and Indian operations are being ran from Netherlands headquarters.

Source: IE

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