WBCS (Main) Exam. Paper – IV Practice Set

Answers with Explanation

1. (a) ❖ Only Statement 1 is Correct and statement 2 and 3 are incorrect- Decomposition is the natural process of dead animal or plant tissue being rotted or broken down. The important steps in the process of decomposition are:

➢ Fragmentation > Leaching > Catabolism > Humification > Mineralization

● Fragmentation : It is the initial stage of decomposition. Fragmentation means the breakdown of detritus into smaller pieces by the detritivores. অ্যাচিভার্স

● Leaching : It is the process through which the fragmented particles containing inorganic watersoluble nutrients get dissolved in the water; seep into the soil and get precipitated.

● Catabolism : It is breaking down of complex material broken down into smaller particles and conversion of detritus into simpler inorganic compounds. This process is carried out by various fungal and bacterial enzymes by the process of catabolism.

● Humification : It is the process of formation of a dark-colored layer of amorphous substance on the soil called humus. It cannot be decomposed easily as it is highly resistantto the action of microbes. The layer of humus is very rich in nutrients as it provides high fertility to the soil.

● Mineralization : It is the final step in the process. Mineralization is the process of the degradation of the hummus to release inorganic nutrients. অ্যাচিভার্স

2. (b) ❖ Statement 1 is correct: Ecological niche is a term for the position of a species within an ecosystem, describing both the range of conditions necessary for persistence of the species, and its ecological role in the ecosystem.

➢ Ecological niche subsumes all of the interactions between a species and the biotic and abiotic environment, and thus represents a very basic and fundamental ecological concept.

❖ Statement 2 is incorrect: Niche Diversity and Stability has a Direct Relation. The greater the niche diversity, the more is ecosystem stability because of the larger number of pathways for the flow of energy and less fluctuation of the species population.

❖ Statement 3 is correct: Dominant species occupy an extensive and broader ecological niche in comparison to fewer dominant species.

3. (c) ❖ An ecotone is a zone of junction or a transition area between two biomes (diverse ecosystems). Ecotone is the zone where two communities meet and integrate. For e.g., the mangrove forests represent an ecotone between marine and terrestrial ecosystems. অ্যাচিভার্স

❖ Ecocline is a zone of gradual but continuous change from one ecosystem to another when there is no sharp boundary between the two in terms of species composition. Ecocline occurs across the environmental gradient (gradual change in abiotic factors such as altitude, temperature (thermocline), salinity (halocline), depth, etc.).

❖ Edge effect refers to the changes in population or community structures that occur at the boundary of two habitats (ecotone). Sometimes the number of species and the population density of some of the species in the ecotone is much greater than either community. This is called the edge effect.

❖ Ecological Niche refers to the unique functional role and position of a species in its habitat or ecosystem. The functional characteristics of a species in its habitat is referred to as "niche" in that common habitat. An ecological niche refers to the interrelationship of a species with all the biotic and abiotic factors affecting it. অ্যাচিভার্স

4. (d) On May 23, 2023, the Asian Development Bank (ADB) rolled out its 'India Country Partnership Strategy (CPS) 2023-2027: Catalyze Robust, Climate resilent, and inclusive growth' to assist India in its efforts to achieve sustainable, climate-resilient, and inclusive growth for the next five years.

i. Aim of CPS: To support India to catalyze robust, climate-resilient, and inclusive growth. The CPS is well aligned with India's national development priorities to be achieved by 2047, when India marks 100 years of independence.

5. (c) ❖ Statement 1 is correct: The nutrient cycle is a concept that describes how nutrients move from the physical environment to the living organisms, and subsequently recycled back to the physical environment. Based on the nature of the reservoir, there are two types of cycles namely Gaseous and sedimentary cycle. Gaseous Cycle is where the reservoir is the atmosphere or the hydrosphere, and some of the most important gaseous cycles are namely water, carbon and nitrogen cycles. অ্যাচিভার্স

❖ Statement 2 is not correct: Phosphorus, calcium and magnesium circulate by means of the sedimentary cycle but Nitrogen circulates by means of gaseous cycle. The element involved in the sedimentary cycle normally does not cycle through the atmosphere but follows a basic pattern of flow through erosion, sedimentation, mountain building, volcanic activity and biological transport through the excreta of marine birds. Sedimentary Cycle is where the reservoir is the earth's crust.

❖ Statement 3 is not correct: There is an inexhaustible supply of nitrogen in the atmosphere but the elemental form cannot be used directly by most of the living organisms. Nitrogen needs to be 'fixed', that is, converted to ammonia, nitrites or nitrates, before it can be taken up by plants. Nitrogen fixation on earth is accomplished in three different ways: 1. By microorganisms (bacteria and blue-green algae) 2. By man using industrial processes (fertilizer factories) and 3. To a limited extent by atmospheric phenomenon such as thunder and lighting.

❖ Statement 4 is not correct: A perfect nutrient cycle is one in which nutrients are replaced as fast as they are utilised. Most gaseous cycles are generally considered as perfect cycles. In contrast sedimentary cycles are considered relatively imperfect, as some nutrients are lost from the cycle and get locked into sediments and so become unavailable for immediate cycling. অ্যাচিভার্স

6. (c) ❖ Statement 1 is correct: Ecotone is a zone of junction between two or more diverse ecosystems. It may be very narrow or quite wide. It has the conditions intermediate to the adjacent ecosystems. Hence it is a zone of tension. It is linear as it shows progressive increase in species composition of one in coming community and a simultaneous decrease in species of the other outgoing adjoining community. অ্যাচিভার্স

❖ Statement 2 is incorrect: A well-developed ecotones contain some organisms which are entirely different from that of the adjoining communities.

❖ Statement 3 is correct: Edge effect refers to the changes in population or community structures that occur at the boundary of two habitats (ecotone).

Sometimes the number of species and the population density of some of the species in the ecotone is much greater than either community. This is called edge effect. The organisms which occur primarily or most abundantly in this zone are known as edge species. অ্যাচিভার্স

❖ Statement 4 is incorrect: Mangrove forests represent an ecotone between marine and terrestrial ecosystem. Other examples are grassland (between forest and desert), estuary (between fresh water and salt water) and riverbank or marshland (between dry and wet).

7. (d) ❖ Statement 1 is incorrect: Population is a group of organisms usually of the same species, occupying a defined area during a specific time. Population growth rate is the percentage variation between the number of individuals in a population at two different times. Therefore, the population growth rate can be positive or negative.

❖ Trick to remember: Always remember "HUMANS" cannot breed with any other species hence Human population.

❖ Statement 2 is incorrect: In order to survive, individuals of any one species depend on individuals of different species with which they actively interact in several ways called Communities For e.g.: Animals require plants for food and trees for shelter. Plants require animals for pollination, seed dispersal, and soil microorganism to facilitate nutrient supply. A community is not fixed or rigid; communities may be large or small. অ্যাচিভার্স

❖ Statement 3 is correct: A biome is a large ecological area with similar climatic conditions. A biome can have multiple ecosystems within it. Biomes are determined by the primary vegetation type, the climate of the area, and the geographic location. The plants and animals

in a biome share common traits that are specific to the individual biome those plants and animals inhabit. অ্যাচিভার্স

8. (d) India conducted Asia's first demonstration of performance-based navigation for helicopters. The flight from Juhu (a suburb of Mumbai), Maharashtra to Pune, Maharashtra was made using GAGAN (GPS (Global Positioning System) Aided GEO Augmented Navigation) satellite technology, which allows high-quality air traffic management.

i. The GAGAN technology was jointly developed by the Indian Space Research Organisation (ISRO) and the Airports Authority of India (AAI).

ii. The GAGAN is a state-of-the-art space-based augmentation system that uses a system of ground stations to provide necessary augmentations to the GPS standard positioning service(SPS) navigation signal.

9. (b) ❖ Statement 1 is incorrect: The rate of production of total organic matter during photosynthesis is called the gross primary productivity. Plants use a significant amount of GPP during respiration. অ্যাচিভার্স

❖ Statement 2 is correct: Net primary productivity (NPP) is the sum of gross primary productivity minus respiration losses (R) i.e., NPP = GPP - R. Net primary productivity is the available biomass for the consumption of heterotrophs (herbivores and decomposers). Secondary productivity is defined as the rate of formation of new organic matter by consumers whereas Primary productivity depends on the plant species inhabiting a particular area. It also depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants. Therefore, it varies in different types of ecosystems.

10. (c) ❖ Statement 1 is Incorrect: Flue Gas Desulfurization is a technology to remove Sulphur dioxide from the gases emitted from the fossil fuel-power plants. It can be done with a wet or dry process. Dry Flue gas Desulfurization uses lime as a reactive agent to remove the flue gases from the exhaust gases. Wet Flue gas Desulfurization involves the use of lime slurry which absorbs the pollutants from the flue gases. অ্যাচিভার্স

❖ Statement 2 is Incorrect: Selective catalytic reduction is a technique to remove Nitrogen Dioxide from the flue gases. It uses liquid Ammonia for this process as a reducing agent. Hence, Ammonia is responsible as a reacting agent whereas Nitrogen Dioxide is the pollutant which is removed through this process. It is an expensive process. অ্যাচিভার্স

❖ Statement 3 is Correct: Electrostatic precipitator involves the removal of particles like smoke and dust particles. It makes use of the force that is created using the electrostatic charge that removes the dust and smoke when the gas containing these is passed through the unit.

❖ Statement 4 is Correct: Scrubbers is a technology that removes particulate matter from gases. It removes both the dust and gases when a polluted gas is passed through the dry and wet packaging material.

11. (d) IIT Madras Research Park (IITMRP), not for profit company promoted by the Indian Institute of Technology Madras (IITM), Chennai, Tamil Nadu(TN) and IITM Incubation Cell (IITMIC) have joined hands with Reserve Bank Innovation Hub (RBIH), a wholly-owned subsidiary of the Reserve Bank of India (RBI), to introduce voice-banking solutions to eliminate language barriers across India.

i. The voice-based banking solution aims at conducting basic banking transactions through voicecontrols in Hindi, Tamil, Telugu and English, in the initial stage. অ্যাচিভার্স

ii. IITMRP, IITMIC, and RBIH partnered with State Bank of India (SBI), Axis Bank, Kotak Mahindra Bank, and IDFC First Bank for the 'Vaulter Voice' voice banking hackathon at IIT Madras Research Park.

12. (c) ❖ Statement 1 is incorrect: Presence of organic and inorganic wastes in the water decreases the Dissolved Oxygen (DO) of the water as much of the oxygen is used by the decomposers in the water body to carry out the decomposition of these wastes. Oxygen is required by aquatic species for survival.

Hence, the presence of organic matter is an important indicator of quality of the aquatic ecosystem. অ্যাচিভার্স

❖ Statement 2 is correct: Biological Oxygen Demand refers to the amount of oxygen needed by the bacteria to decompose the organic matter

present in the water. Chemical oxygen demand refers to the oxygen required for the decomposition of both organic and inorganic matter present in the water.

The Greater the Chemical Oxygen Demand less is the amount of Dissolved Oxygen and the availability of the oxygen for respiration is reduced.

❖ Statement 3 is incorrect: A number of factors determine the presence of Dissolved Oxygen in the water body. It includes photosynthesis, respiration by organisms, decomposition of organic wastes, movement of surface water, etc. অ্যাচিভার্স

13. (b) ❖ Statement 1 is incorrect: Sanitary landfills are the improved version of traditional landfills which are lined with the impermeable materials like plastics, clay, etc. in order to reduce the leaching of water and hence of the toxic and contaminants into the soil. The construction of these is very expensive although they prevent the problems of leaching as witnessed in the traditional landfills.

❖ Statement 2 is incorrect: In vermiculture, earthworms are added to the compost and they bring about the breakdown of the wastes. The excreta of the earthworms also enhance the nutrient. অ্যাচিভার্স

14. (b) Acid rains are formed with the reaction of compounds containing Sulphur, nitrogen, and other acids with the moisture in the atmosphere. Other acids include Phosphoric acid, hydrochloric acid, carbonic acids, chlorine, etc. Hence, Sulphur dioxide and the Phosphoric acids contribute directly to the acid rain.

Pollutants like lead, aluminum, methyl mercury, cadmium, etc. are not directly released by acid rain but triggered indirectly.

15. (d) Wool is obtained from the fleece (hair) of sheep or yak. Silk fibres come from cocoons of the silk moth. Wool-yielding animals; for example (sheep, goat and yak) bear hair on their body.

16. (b) Heat flows from a body of higher temperature to a body of lower temperature. Here the temperature of both the objects is same. So, heat will not flow from one object to other or there will not be any change in the temperature of both the two objects. অ্যাচিভার্স

17. (a) These substances taste sour because they contain acids, whereas the substances which are bitter in taste and feel soapy on touch are known as bases. The names of some major acids and related substances are:

Name of acid	Found in
1. Acetic acid	Vinegar
2. Formic acid	Ant's sting
3. Citric acid	Citrus fruits such as oranges, lemons, etc.
4. Lactic acid	Curd
5. Oxalic acid	Spinach
6. Ascorbic acid	Amla, Citrus fruits (Vitamin C)
7. Tartaric acid	Tamarind, grapes, unripe mangoes, etc.

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All the acids mentioned above occur in nature.

Name of base	Found in
1. Calcium hydroxide	: Lime water
2. Ammonium hydroxide	: Window cleaner
3. Sodium hydroxide/Potassium hydroxid	: Soap
4. Magnesium hydroxide	: Milk of magnesia

18. (c) Karbon Card, a B2B (Business to Business) payment solution provider, launched India's first-ever mobile-based expense management card namely 'Card++'. অ্যাচিভার্স

i. Based on the mobile-first approach, it will address the challenges faced by startups and Small and Midsize Business (SMB) by providing reliable and accessible expense solutions, thus, reducing disruptions caused by the use of multiple payment instruments by SMBs.

19. (d) A physical change involves only change in physical state whereas a chemical change results the formation of new substances. Boiling of water, melting of ice and dissolution of salt are physical changes as no new products are formed.

20. (d) The polar regions present an extreme climate. These regions are covered with snow and it is very cold for most part of the year. For six months the sun does not set at the poles while for the other six months the sun does not rise. In winters, the temperature can be as low as –37°C. Animals living there have adapted to these severe conditions.Birds migrate to warmer regions when winter sets in. They come back after the winter is over. অ্যাচিভার্স

21. (b) The Malviya National Institute of Technology (MNIT) in Jaipur, Rajasthan and the National Dam Safety Authority (NDSA), Ministry of Jal Shakti (MoJS) had signed a Memorandum of Understanding (MoU) to establish India's first-

of-its-kind National Centre for Earthquake Safety of Dams which will focus on studying seismic hazards, developing new dams, and enhancing the protection of existing ones.

i. MoJS has recognised the National Centre for Disaster Mitigation and Management (NCDMM) of MNIT to be the National Center for Earthquake Safety of Dams and has approved a Financial Grant of Rs.30 crore for establishing and running the centre for the next 5 years.

ii. The Objective of National Centre for Earthquake Safety of Dams to develop indigenous expertise in addressing technology challenges related to the structural and earthquake safety of dams, thereby making India self-reliant in this field. অ্যাচিভার্স

22. (b) Wind is the movement of air caused by the uneven heating of the Earth by the sun. It does not have much substance–you cannot see it or hold it–but you can feel its force. It can dry your clothes in summer and chill you to the bone in winter. It is strong enough to carry sailing ships across the ocean and rip huge trees from the ground. It is the great equalizer of the atmosphere, transporting heat, moisture, pollutants, and dust great distances around the globe. Landforms, processes, and impacts of wind are called Aeolian landforms, processes, and impacts. Differences in atmospheric pressure generate winds. At the Equator, the sun warms the water and land more than it does the rest of the globe. Warm equatorial air rises higher into the atmosphere and migrates toward the poles. This is a low-pressure system. At the same time, cooler, denser air moves over Earth's surface toward the Equator to replace the heated air. This is a high-pressure system. Winds generally blow from high-pressure areas to low-pressure areas. অ্যাচিভার্স The boundary between these two areas is called a front. The complex relationships between fronts cause different types of wind and weather patterns.Prevailing winds are winds that blow from a single direction over a specific area of the Earth. Areas where prevailing winds meet are called convergence zones. Generally, prevailing winds blow east-west rather than north-south. This happens because Earth's rotation generates what is known as the Coriolis effect. The Coriolis effect makes wind systems twist counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.The Coriolis effect causes some winds to travel along the edges of the high-pressure and low-pressure systems. These are called geostrophic winds. In 1857, Dutch meteorologist Christoph Buys Ballot formulated a law about geostrophic winds: When you stand with your back to the wind in the Northern Hemisphere, low pressure is always to your left. (In the Southern Hemisphere, low-pressure systems will be on your right.) অ্যাচিভার্স

23. (d) In summer, near the equator the land warms up faster and most of the time the temperature of the land is higher than that of water in the oceans. The air over the land gets heated and rises. This causes the winds to flow from the oceans towards the land. These are monsoon winds.In winter, the direction of the wind flow gets reversed; it flows from the land to the ocean. The winds from the oceans carry water and bring rain. It is a part of the water cycle. The monsoon winds carry water and it rains.

24. (b) India's coast is extremely vulnerable to cyclones. With a coastline of 7517 km, the country is exposed to nearly 10 per cent of the world's tropical cyclones. Although cyclones affect the entire coast of India, the eastern coast is significantly more prone to cyclones as compared to the western coast. East coast of India faces the Bay of Bengal while the west coast of India is situated on the shores of Arabian Sea.Bay of Bengal is very active in the months of October to December during the end phase of South west monsoon and whole of North east monsoon period. অ্যাচিভার্স During these periods, the easterlies pick up moisture from BoB and the remnants of typhoons from Malay peninsula enter the waters of BoB and form low pressure troughs. They further intensify in strength due to favourable warm temperatures of sea and increased sea travel. The cyclones then travel in eastern direction due to prevailing easterlies and cross the shores of eastern states of India. The entire east coast from Tamil Nadu to West Bengal is prone to cyclones. Cities like Chennai, Nagapattinam, Rameshwaram, Srikakulam, Gopalpur, Cox Bazaar (Bangladesh) are extremely prone to cyclones. Cyclones do originate in Arabian sea but they mostly tend to move away from west coast of India towards

Oman, Yemen or Somalia. This is due to strong winds from BoB and peninsular India pushing the cyclones/depressions further away.

25. (a) The Employees Provident Fund Organisation (EPFO) has formed 3 committees to frame draft schemes for pension, provident fund and insurance under EPFO, in line with the provisions of the Code on Social Security 2020.

i. The three schemes are:

• Employee's Provident Fund Scheme (EPFS) for provident fund

• Employee's Pension Scheme (EPS) for pension অ্যাচিভার্স

• Employees Deposit Linked Insurance Scheme (EDLIS) for insurance

ii. Chanramauli Chakraborty, Additional Central provident fund Commissioner (ACC) (Headquarters-HQ) Legal, will be the overall co-ordinator for all three committees.

• The committee for framing EPFS 2023 consists of 11 members which will be co-chaired by Sanjay Kumar, ACC (Patna, Bihar) and Pankaj Raman of ACC (HQ).

• The committee for framing EPS 2023 consists of 8 members which will be chaired by Rajiv Bhist, ACC (HQ).

• The committee for framing EDLIS 2023 consists of 5 members which will be chaired by Vaishali Dayal, ACC (Zonal Office, Hyderabad, Telangana). অ্যাচিভার্স

26. (a) In general, higher the temperature the higher is the evaporation, but if humidity is high, evaporation is not higher even if the temperature is high. Thus, equatorial regions with higher temperature, but higher humidity do not have high salinity.

27. (a) Breathing means taking in air rich in oxygen and giving out air rich in carbon dioxide with the help of respiratory organs. The taking in of air rich in oxygen into the body is called inhalation and giving out of air rich in carbon dioxide is known as exhalation. Inhaled air contains 21% oxygen and 0.04% carbon dioxide, while the exhaled air contains 16.4% oxygen and 4.4% carbon dioxide. অ্যাচিভার্স

28. (d) Blood is the fluid which flows in blood vessels. It transports substances like digested food from the small intestine to the other parts of the body. It carries oxygen from the lungs to the cells of the body. It also transports waste for removal from the body.

29. (d) 1. Blood circulation was discovered by an English physician, William Harvey.

2. Blood, blood vessels and heart are all part of the human circulatory system.

3. Blood transports substances like digested food from the small intestine to the other parts of the body. It carries oxygen from the lungs to the cells of the body. অ্যাচিভার্স

4. There are two types of blood vessels present in the body – arteries and veins. Arteries carry oxygen-rich blood from the heart to all parts of the body. Since the blood flow is rapid and at a high pressure, the arteries have thick elastic walls.

5. Veins are the vessels which carry carbon dioxide-rich blood from all parts of the body back to the heart. The veins have thin walls. There are valves present in veins which allow blood to flow only towards the heart.

6. The heart is an organ which beats continuously to act as a pump for the transport of blood, which carries other substances with it. অ্যাচিভার্স

7. The renal is part of the excretory system in humans and not the circulatory system.

30. (b) On World Environment Day 2023 (June 05, 2023), Prime Minister (PM) Narendra Modi launched two schemes named Amrit Dharohar Yojana and MISHTI Yojana (Mangrove Initiative for Shoreline Habitats and Tangible Incomes) under the Ministry of Environment, Forest and Climate Change (MoEFCC), to revive wetlands and mangroves across India.

● As per the statement of PM, the number of wetlands and Ramsar sites in India have increased almost three times in the past nine years. অ্যাচিভার্স

i. Amrit Dharohar Yojana: The scheme was launched to conserve the existing Ramsar sites and achieve sustainable ecosystem development through public participation over the next three years, and make them as the centres of eco-tourism and a source of green jobs for thousands of people.

ii. MISHTI Yojana: The scheme envisages to comprehensively explore the possible area for the development of mangroves covering nearly 540 sq km, spreading across 11 states and two union territories over 5 years, starting from FY24.

31. (c)

32. (a) On June 6, 2023, the World Bank (WB) in its Global Economic Prospects Report-June 2023 lowered India's growth outlook to 6.3% for 2023, a 0.3 percentage point downward revision from 6.6% in January 2023.

i. However, India will remain the fastest-growing economy (in terms of both aggregate and per capita GDP) of the largest EMDEs (Emerging Market and Developing Economies).

ii. India's growth to pick up slightly through FY 2025/26 as inflation moves back toward the midpoint of the tolerance range and reforms pay off. অ্যাচিভার্স

iii. For 2024, WB expects GDP growth rate at 6.4%. While for 2025 forecast, the growth rate is expected at 6.5%.

33. (a) • The device which measures the distance covered by the vehicle is called odometer.

• Speedometer records the speed directly in km/h.

• Accelerometer is an instrument for measuring the acceleration of a moving or vibrating body.

• Altimeter is an instrument for determining altitude attained, especially a barometric or radar device fitted in an aircraft.

34. (c) Galaxeye Space Solutions Pvt Ltd (Galaxeye Space), a space-tech startup incubated by the Indian Institute of Technology (IIT) Madras, (Chennai, Tamil Nadu), is developing the world's first multisensor earth observation satellite namely 'Drishti' incorporating a visible spectrum camera that allows synchronized imaging, capable of capturing multiple images simultaneously. অ্যাচিভার্স

• The startup is going to launch the "Drishti mission", its first satellite, in 2024.

• It will be India's first and the world's highest-resolution multi-sensor imaging satellite.

35. (b) Electric current is defined as the rate of flow of negative charges of the conductor. In other words, the continuous flow of electrons in an electric circuit is called an electric current. The conducting material consists a large number of free electrons which move from one atom to the other at random. Since the charge is measured in coulombs and time in seconds, so the unit of electric current is coulomb/Sec (C/s) or amperes (A). The amperes is the SI unit of the conductor. The I is the symbolic representation of the current. অ্যাচিভার্স

36. (c) According to Newtons second law,The rate of change of linear momentum of a body is directly proportional to the external force applied on the body , and takes place always in the direction of the force applied. So the rate of change of momentum is Force.

37. (c) Jagdish Sudhakar Bakan, wildlife warden and District Forest Officer (DFO) of Ramanathapuram district, Tamil Nadu (TN) has been selected for United Nations Educational, Scientific and Cultural Organization (UNESCO)'s 2023 Michel Batisse Award for Biosphere Reserve Management.

• He is the first Indian to win Michel Batisse Award. অ্যাচিভার্স

i. He is currently the Director of Gulf of Mannar Biosphere Reserve, Tamil Nadu & He has been chosen for the award for his work in the Gulf of Mannar Biosphere Reserve, which is endowed with rich marine biodiversity, including several species of fish, coral, birds, sea turtles, crustaceans.

ii. He will receive the Michel Batisse Award for Biosphere Reserve Management on June 14 2023 in Paris, France.

38. (a) Even infinite no. Of electrons can't be summed up to 1 Coulomb, what you actually mean is -1 Coulomb.

We know that, Charge on 1 electron = -1.6 × 10^-19 Coulomb,

Now, simple application of unitary method, No. of electrons on -1 Coulomb of charge = 1/(1.6×10^-19) = 0.625 × 10^19 = 6.25 × 10^18

So, 6.25 × 10^18 electrons make up a total of -1 Coulomb of charge. অ্যাচিভার্স

39. (d) On 8th June 2023, The World Health Organisation (WHO) and the Global Fund to Fight Acquired Immune Deficiency Syndrome (AIDS), Tuberculosis (TB) and Malaria (the Global Fund) signed a new and revised Strategic Framework for Collaboration.

• The framework aims to build stronger and more resilient health systems and maximise collaboration and have a significant impact in supporting major communicable diseases at the country, regional and global levels.

• The new five-year framework builds upon

the previous agreement established in 2018 and it aligns with the Global Fund's 2023-2028 Strategy and the WHO General Program of Work.

i. New Revised Framework: WHO and the Global Fund will be leveraging their comparative strengths across 35 areas for collaboration divided into 4 categories: অ্যাচিভার্স

- Health Policies and normative guidance
- Advocacy and health governance
- Health products and innovations
- Technical support and capacity building

40. (a) Concave mirrors are used for many purposes. Doctors use concave mirrors for examining eyes, ears, nose and throat. Concave mirrors are also used by dentists to see an enlarged image of the teeth. The reflectors of torches, headlights of cars and scooters are concave in shape. Convex mirror is used as side mirrors in automobiles. Convex mirrors can form images of objects spread over a large area. So, these help the drivers to see the traffic behind them. অ্যাচিভার্স

41. (b) The convex lens forms a erect and magnified image.A convex lens converges (bends inward) the light generally falling on it. Therefore, it is called a converging lens.

The concave lens always forms a virtual, erect, and smaller in size image than the object. The concave lens diverges (bends outward) the light and is called a diverging lens.

Concave Mirror: If a hollow sphere is cut into parts and the outer surface of the cut part is painted.

Then it becomes a mirror with its inner surface as the reflecting surface. This kind of mirror is known as a concave mirror. Light converges at a point when it strikes and reflects back from the reflecting surface of the concave mirror. Hence, it is also known as a converging mirror. When the concave mirror is placed very close to the object, a magnified and virtual image is obtained. But if we increase the distance between the object and the mirror then the size of the image reduces and a real image is formed. So the image formed by the concave mirror can be small or large and it can also be real or virtual. অ্যাচিভার্স

Convex Mirror: If the other cut part of the hollow sphere is painted from inside, then its outer surface becomes the reflecting surface. This kind of mirror is known as convex mirror. A convex mirror is also known as a diverging mirror as this mirror diverges light when they strike on its reflecting surface. Virtual, erect and diminished images are always formed with convex mirrors, irrespective of the distance between the object and the mirror. Apart from other applications, the convex mirror is mostly used as a rear view mirror in vehicles. Spherical mirrors are the mirrors having curved surfaces which are painted on one of the sides. Spherical mirrors in which inward surfaces are painted are known as convex mirrors while the spherical mirrors in which outward surfaces are painted are known as concave mirrors. Concave mirrors are also known as a converging mirror since the rays converge after falling on the concave mirror while the convex mirrors are known as diverging mirrors as the rays diverge after falling on the convex mirror. In this article, we will learn about image formation by concave and convex mirrors.

42. (d) Refraction is the bending of a wave when it enters a medium where its speed is different. We can define it as: Refraction is the change in direction of a wave passing from one medium to another or from a gradual change in the medium. Refraction of light is one of the most usually observed phenomena which includes refraction of light through prism, but other waves like sound waves and water waves also experience refraction. অ্যাচিভার্স

Laws of Refraction of Light:

1. The incident ray, refracted ray, and the normal to the interface of two media at the point of incidence all lie on the same plane.

2. The ratio of sine of angle of incidence to the sine of angle of refraction is a constant. This is also known as Snell's law of refraction.

43. (d) Government of India has constituted a Peace Committee in Manipur under the Chairpersonship of the Governor of Manipur (Incumbent Anusuiya Uikey). অ্যাচিভার্স

i. The members of the committee include the Chief Minister, a few ministers in the state government, MP, MLAs and leaders from political parties, former civil servants, educationists, litterateurs, artists, social workers and representatives of different ethnic groups.

ii. Aim: To facilitate the peace-making process among various ethnic groups of the State, between conflicting groups and strengthen social cohesiveness, mutual understanding and facilitate cordial communication.

Note- On May 3, 2023, Violence broke out in Manipur after a 'Tribal Solidarity March' was organised in the hill districts to protest against the Meitei community's demand for Scheduled Tribes (ST) status. অ্যাচিভার্স

44. (b) A concave lens is a lens that possesses at least one surface that curves inwards. It is a diverging lens, meaning that it spreads out light rays that have been refracted through it. A concave lens is thinner at its centre than at its edges, and is used to correct short-sightedness (myopia). After light rays have passed through the lens, they appear to come from a point called the principal focus.

This is the point onto which the collimated light that moves parallel to the axis of the lens is focused.

The image formed by a concave lens is virtual, meaning that it will appear to be farther away than it actually is, and therefore smaller than the object itself. Curved mirrors often have this effect, which is why many (especially on cars) come with a warning: Objects in mirror are closer than they appear. অ্যাচিভার্স

The image will also be upright, meaning not inverted, as some curved reflective surfaces and lenses have been known to do. The lens formula that is used to work out the position and nature of an image formed by a lens can be expressed as follows: $1/u + 1/v = 1/f$, where u and v are the distances of the object and image from the lens, respectively, and f is the focal length of the lens.

45. (a) ● 22nd March is celebrated as the World Water Day; to attract the attention of everybody towards the importance of conserving water.

● The amount of water recommended by the United Nations for drinking, washing, cooking and maintaining proper hygiene is a minimum of 50 litres per person per day. অ্যাচিভার্স

● Year 2003 was observed as the International Year of Freshwater to make people aware of this dwindling natural resource.

● World Water Day, March 22, 2005 was sponsored by the United Nations and focused attention on this precious and increasingly scarce commodity. World Water Day also marked the beginning of the International Decade for Action on Water for Life, during which the U.N. had seeked to spotlight the need to care for water resources and clean water. অ্যাচিভার্স

● A major goal of the program was to halve the number of people without access to safe drinking water and basic sanitation by 2015.

46. (c) ● Water enters the atmosphere through evaporation and and transpiration. For water cycle, water vapour must be present in the atmosphere.

● Condensation plays a major role in bringing the water back to the earth's surface, while through transpiration, water enters the atmosphere.

● In the atmosphere, water remains in the form of clouds. This water reaches the earth's surface in the form of rain, snow and hail.

● In the last step, water reaches the oceans through the rivers and streams. This is how the water cycle is completed. It is responsible for maintaining a fixed volume of water on earth. অ্যাচিভার্স

47. (a) ❖ Statement 1 is correct: National Air Quality Index is tool Launched in 2014 with outline 'One Number – One Color-One Description' for the common man to judge the air quality within his vicinity. It uses numbers to simplify air quality data of a city by classifying pollution levels into 6 categories. It was important that information on air quality is put up in public domain in simple linguistic terms that is easily understood by a common person. Air Quality Index (AQI) is one such tool for effective dissemination of air quality information to people.

❖ Statement 2 is incorrect: It has been developed by the CPCB Central Pollution control board in consultation with IIT-Kanpur and an expert group comprising medical and air-quality professionals and launched by the Ministry of Environment, Forests & Climate Change. The Central Pollution Control Board (CPCB) of India is a statutory organization under the Ministry of Environment, Forest and Climate Change.

❖ Statement 3 is incorrect: The measurement of air quality is based on eight pollutants, namely: Particulate Matter (PM10), Particulate Matter (PM2.5), Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Carbon Monoxide

(CO), Ozone (O3), Ammonia (NH3), and Lead (Pb). Carbon dioxide is not measured in air quality index this is because air quality index measures the number of pollutants present in the air and Carbon dioxide is not a polluting gas. carbon dioxide is a greenhouse gas that works to trap heat close to Earth.

48. (d) On June 9th, 2023, The World Bank's Board of Executive Directors approved a USD 148 million loan to support West Bengal, India, in improving irrigation practices in rural areas. The loan will help the region harness(utilize) the surface and groundwater resources more effectively for agricultural purposes.

i. West Bengal aims to increase farmers' incomes through production of a range of pulses, fruits, and vegetables which requires water for irrigation. অ্যাচিভার্স

ii. The West Bengal Accelerated Development of Minor Irrigation Project – Phase II will support the state's Department of Water Resources Investigation and Development and water-user associations (WUAs) to plan and operate new irrigation structures such as check dams, small-scale storage structures, creek rehabilitation, tube wells, and pump dug wells.

49. (b) ❖ Statement 1 is correct: Thermal pollution is the rise or fall in the temperature of a natural aquatic environment caused by human influence. This has become an increasing and the most current pollution, owing to the increasing call of globalization everywhere. Thermal pollution is caused by either dumping hot water from factories and power plants or removing trees and vegetation that shade streams, permitting sunlight to raise the temperature of these waters, and releasing cold water which lowers the temperature. Like other forms of water pollution, thermal pollution is widespread, affecting many lakes and vast numbers of streams and rivers in various parts of the world. Major sources of thermal pollution are as following:

1. Power plants create electricity from fossil fuel.
2. Water as a cooling agent in industrial facilities.
3. Deforestation of the shoreline. অ্যাচিভার্স
4. Soil erosion

❖ Statement 2 is incorrect: According to a recent study, by Indian Institute of Tropical Meteorology (IITM), Pune marine heatwaves have been on the rise in waters around India. Marine heatwaves are periods of extremely high temperatures in the ocean. Findings Of the Study are that the western Indian Ocean region experienced the greatest increase in marine heatwaves at a rate of about 1.5 events per decade, followed by northern Bay of Bengal at a rate of 0.5 events per decade. Marine heatwaves in the western Indian Ocean and Bay of Bengal aggravated the drying conditions over the central Indian subcontinent. অ্যাচিভার্স

❖ Statement 3 is correct: Marine heatwaves are periods of extremely high temperatures in the ocean (above the 90th percentile). These events cause habitat destruction due to coral bleaching, seagrass destruction, and loss of kelp forests, affecting the fisheries sector adversely. An underwater survey showed that 85% of the corals in the Gulf of Mannar near the Tamil Nadu coast got bleached after the marine heatwave in May 2020. Warm water contains less oxygen. Elevated temperature typically decreases the level of dissolved oxygen (DO) in water. So there is a decrease in the rate of decomposition of organic matter. Green algae are replaced by less desirable blue green algae. Many animals fail to multiply. অ্যাচিভার্স

50. (c) ❖ Statement 1 is correct: Mercury is a naturally occurring element found in air, water and soil. Mercury can be toxic and have serious health effects on the nervous, digestive and immune systems, and on the lungs, kidneys, skin and eyes and on the fetus. The developing fetus is highly vulnerable to mercury exposure. Mercury is used in thermostats, sensors, relays, switches, medical equipment, lamps, mobile phones and in batteries.

❖ Statement 2 is incorrect: Combating the global trafficking of mercury is discussed in the 2nd round of the fourth meeting of the Conference of the Parties to the Minamata Convention on Mercury (COP-4.2). The declaration was read in Nusa Dua, Bali (Indonesia). Bali Declaration is a non-binding declaration calls upon parties to: অ্যাচিভার্স

1. Develop practical tools and notification and information-sharing systems for monitoring and managing trade in mercury.
2. Exchange experiences and practices relating to combating illegal trade in mercury, including

reducing the use of mercury in artisanal and small-scale gold mining.

3. Share examples of national legislation and data and information related to such trade.

❖ Statement 3 is correct: Minamata Convention on Mercury is a multilateral environmental agreement that addresses specific human activities which are contributing to widespread mercury pollution. It is the world's first legally binding treaty that was adopted in 2013 and entered into force in August, 2017. India has ratified the Convention in 2018. Some 137 parties and countries are working together to control the supply and trade of mercury, reduce use, emissions and release mercury. The treaty also covers areas such as identification of at-risk populations, improving health facilities, and training health workers to better deal with mercury-related illnesses and diseases.

51. (a) ❖ Statement 1 and 2 are correct: Forest fires are broadly categorised into three categories – ground, surface and crown fire. Fires that burn organic material in the soil are called ground fires, and they burn slowly, under vegetation. Surface fires are caused largely by burning of dry leaves, branches and other materials on the ground. Such fires spread swiftly, as in the case of fires in Himachal. Crown fires burn quickly, from one tree top to another and have huge flames with intense heat. Such fires are rare in India.

❖ Statement 3 is correct: Dry pine leaves are highly inflammable and significantly increase the fuel load. In Himachal, of the 196 forest ranges in Himachal Pradesh, 80 are vulnerable to fires. The chir pine forests which make up 15 percent of Himachal's forests, are most prone to fires.

❖ Statement 4 is incorrect: According to Forest Survey of India (FSI), based on the forest inventory records, 54.40% of forests in the country are exposed to occasional fires, 7.49% to moderately frequent fires and 2.405% to high incidence levels, while 35.71% have not yet been exposed to fires of any real significance.

52. (a) ❖ Statement 1 and 2 are correct : Extent of groundwater pollution in India : India, the states of West Bengal, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur, and Chhattisgarh are reported to be most affected by arsenic contamination of groundwater ; Fluoride contamination is widely prevalent in different parts of India, particularly in the state of Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Gujarat, and Rajasthan, where 50-100% of the districts have drinking water sources containing excess level of fluoride ; Across India aquifers from 16 states have reported Uranium contamination in groundwater; High Nitrate concentration in ground water in India has been found in almost all hydrogeological formations.

❖ Statement 3 is incorrect: Bureau of Indian Standards has prescribed limits for contaminants in drinking water. BIS 10500:2012 is the standalone directive that enacts the drinking water standards in India. BIS 10500-2012 specifies the acceptable limit of bacteria and other contamination.

❖ Statement 4 is incorrect: The World Bank's new report–Seeing the Invisible: A Strategic Report on Groundwater Quality describes why, and how, groundwater quality is vital to human health, agriculture, industry and the environment, and explains its importance to the World Bank's work and to decision-makers in countries at all stages of development.

53. (c) ❖ Statement 1,3 and 4 are correct: Sand acts as an aquifer, and as a natural carpet on the bottom of the river. Stripping this layer by sand mining leads to:

→ downstream erosion, causing changes in channel bed and habitat type, as well as the deepening of rivers and estuaries, and the enlargement of river mouths.

→ Rivers are degraded as a result of excessive instream sand and gravel mining. Instream mining lowers the streambed, perhaps causing bank erosion.

→ Sand functions as a link between the running river and the water table in a riverbed. For E.g. Illegal and excessive sand mining in the Papagani catchment area in Karnataka, has resulted in groundwater depletion and environmental degradation in communities along the river's banks in both Andhra Pradesh and Karnataka.

→ It devastates the intertidal zone and raises the risk of saline water infiltration into fresh water. Coastal sand mining devastates fisheries, coral reefs, mangroves, and wetlands, and has resulted in the near-extinction of gharials, a type of crocodile found only in India.

54. (c) In June 2023, the Reserve Bank of India (RBI) Governor, Shaktikanta Das, launched a financial inclusion dashboard named 'Antardrishti'.

• 'Antardrishti' in Hindi means "Insight".

i. Purpose: The dashboard provides the necessary insight to assess and track the development of financial inclusion by recording relevant data. অ্যাচিভার্স

ii. Financial Inclusion aims to provide access to affordable and appropriate financial products and services like savings accounts, credit, insurance, and payment systems.

• RBI had constructed the Financial Inclusion (FI) Index in 2021, to measure the extent of financial inclusion.

• The FI index comprises 3 parameters, 'Access (35% weightage), Usage (45%), and Quality (20%).

55. (d) ❖ Statement 1 is correct: Riparian buffers it is the vegetative area near the stream usually forested which Shields and partially protects a stream from impact of adjacent land use. It plays a key role in increasing water quality.

❖ Statement 2 is correct: Water hyacinth is an aquatic weed. It is an invasive species also called terror of Bengal.

→ Studies reveal that the optimum growth rate of water hyacinth has great effect on waste water purification efficiency in continuous system and nutrient removal was successfully achieved. অ্যাচিভার্স

→ Thus, It can purify water by taking some toxic material and a number of heavy metals from water.

❖ Statement 3 is correct: Oil zappers cleans the oil spills in the water.

❖ Statement 4 is correct: Eucalyptus trees absorb the surplus wastewater rapidly and release pure water vapor into atmosphere. However, they have been found to be responsible for depleting groundwater levels.

56. (d) On June 14 2023, Shaktikanta Das, the 25th governor of the Reserve Bank of India (RBI) has been honoured with the title the "Governor of the Year" at the Central Banking Awards 2023 in London, for his role during Covid-19, the Russia-Ukraine war, and the fight against inflation. অ্যাচিভার্স

i. He is the second RBI governor to be honoured with the award after Raghuram Rajan, who received the title in 2015. অ্যাচিভার্স

ii. Other top 2 notable awards of Central Banking Awards 2023 such as the Central Bank of the Year award and the Currency Manager award were received by The National Bank of Ukraine.

57. (b) ❖ Option (b) is correct: Mycoremediation is a form of bioremediation in which fungi-based remediation methods are used to decontaminate the environment. Fungi have been proven to be a cheap, effective and environmentally sound way for removing a wide array of contaminants from damaged environments or wastewater.

58. (d) On 14th June 2023, The United Nations General Assembly (UNGA) adopted a draft resolution which was introduced by India to establish a memorial wall to honour fallen peacekeepers. অ্যাচিভার্স

• India's Permanent Representative to the UN Ambassador Ruchira Kamboj revealed the draft resolution which was titled as 'Memorial wall for fallen United Nations peacekeepers' at UN General Assembly hall,United Nations Headquarters in New York.

i. It was adopted by consensus and the resolution was co-sponsored by nearly 190 UN Member States out of 193 UN Member states. It will be funded from voluntary contributions.

ii. The wall will be included in the ceremonies on the International Day of United Nations Peacekeepers.

59. (c) ❖ Statement 1 is correct: The National Offshore Wind Energy Policy was notified in October 2015. The main goal is to develop offshore wind energy in the Indian Exclusive Economic Zone (EEZ) which stretches for 7600 kilometres along the Indian coastline. The Ministry of New & Renewable Energy (MNRE) has been authorized as the Nodal Ministry. অ্যাচিভার্স

❖ Statement 2 is incorrect: Wind energy today typically comes in two different "types": onshore wind farms which are large installations of wind turbines located on land, and offshore wind farms which are installations located in bodies of water. Wind energy production from offshore necessitates a significant investment in support infrastructure. Offshore wind farms can be expensive to build and maintain and because of their hard-to-reach locations, they are susceptible to damage from very high-speed

winds during storms or hurricanes which is expensive to repair.

❖ Statement 3 is correct: India's wind energy sector is led by indigenous wind power industry and has shown consistent progress. The expansion of the wind industry has resulted in a strong ecosystem, project operation capabilities and manufacturing base of about 10,000 MW per annum. The country currently has the fourth highest wind installed capacity in the world with total installed capacity of 39.25 GW (as on 31st March 2021). The state of Gujarat has highest Wind Energy potential, followed by Rajasthan, Maharashtra, Tamil Nadu, Madhya Pradesh, Karnataka, Andhra Pradesh. অ্যাচিভার্স

60. (d) ❖ Option (d) is correct: Luminescent Solar Concentrator (LSC): It is a device that uses a thin sheet of material to trap solar radiation over a large area, before directing the energy (through luminescent emission) to cells mounted on the thin edges of the material layer. The thin sheet of material typically consists of a polymer (such as polymethylmethacrylate (PMMA)), doped with luminescent species such as organic dyes, quantum dots or rare earth complexes. The main motivation for implementing LSCs is to replace a large area of expensive solar cells in a standard flat-plate PV panel, with a cheaper alternative. Therefore, there is both a reduction in both the cost of the module (£/W) and the solar power produced (£/kWh). A key advantage of over typical concentrating systems is that LSCs can collect both direct and diffuse solar radiation. Therefore, tracking of the sun is not required. They are excellent candidates for building integrated photovoltaics (BIPV) and for the cloudier northern climates. অ্যাচিভার্স

❖ Ideal LSC: A broad absorption range to utilize the solar spectrum efficiently. 100% emission of light from the absorbing luminescent species. A large shift between the absorption and emission spectra to reduce absorption losses. And provide long term stability.

❖ Challenges for LSC: The development of LSCs aims to create a working structure that performs close to the theoretical maximum efficiency.

61. (b) ❖ Option (b) is correct: Geothermal Energy: Geothermal generation refers to harnessing of the geothermal energy or the vast reservoir of heat stored in the earth's inner core. Below the earth's crust, there is a layer of hot and molten rock called 'magma'. Heat is continually produced there, mostly from the decay of naturally radioactive materials such as uranium and potassium. অ্যাচিভার্স

❖ Geothermal systems can be found in regions with a normal or slightly above normal geothermal gradient and especially in regions around plate margins where the geothermal gradients may be significantly higher than the average value.

❖ Potential Sites:

1. Puga Valley (J&K)
2. Tattapani (Chhattisgarh)
3. Godavari Basin Manikaran (Himachal Pradesh)
4. Bakreshwar (West Bengal)
5. Tuwa (Gujarat)
6. Unai (Maharashtra) অ্যাচিভার্স
7. Jalgaon (Maharashtra)

62. (c) On June 16, 2023, the Department of Legal Affairs in the Ministry of Law & Justice (MoL&J) constituted a 16-member expert committee chaired by the Former Secretary of the Department of Legal Affairs and Padma Shri awardee (2017- Civil Service) T K Viswanathan to recommend reforms in the Arbitration and Conciliation Act, 1996.

• The objective is to alleviate the burden on courts.

i. The panel has been tasked with submitting its report within 30 days.

63. (c) ❖ Statement 1 is incorrect: Solar Photovoltaics (PV) is based on the photovoltaic effect, by which a photon (the basic manufacturing unit of light) impacting a surface made of a special material generates the release of an electron.

❖ Trivia: Photovoltaic cells generate direct current (DC) electricity which is used to convert into Alternating Currents (AC) with help of inverters অ্যাচিভার্স

❖ Statement 2 is incorrect: Concentrating Solar Power (CSP) uses sunlight to heat a fluid depending on the particular fluid, can be water or other fluid, CSP technologies use mirrors to reflect and concentrate sunlight onto a receiver. The energy from the concentrated sunlight heats a high temperature fluid in the receiver. This heat - also known as thermal energy can be

used to spin a turbine or power an engine to generate electricity. অ্যাচিভার্স

❖ Statement 3 is correct: Solar Risk Mitigation Initiative- World Bank has operationalized SRMI with $333 million for 22 African countries. SRMI aims to support countries in developing sustainable solar programs that will attract private investments and so reduce reliance on public finances. It is developed by World Bank-Energy Sector Management Assistance Program (WB-ESMAP) in partnership with, Agence Française de Developpement (AFD), International Renewable Energy Agency (IRENA) and International Solar Alliance (ISA).

64. (a) ❖ Statement 1 is correct: Large amounts of solar energy is stored in the oceans and seas. On an average, the 60 million square kilometers of the tropical seas absorb solar radiation equivalent to the heat content of 245 billion barrels of oil. The process of harnessing this energy is called OTEC (ocean thermal energy conversion). Ocean Thermal Energy Conversion (OTEC) systems uses the temperature differences between the surface of the ocean and the depths of about 1000 m to operate a heat engine, which produces electric power.

❖ Statement 2 is correct: The deeper parts of the ocean are cooler because the heat of sunlight cannot penetrate very deep into the water. Here the efficiency of the system depends on the temperature difference. Greater the temperature difference, the greater the efficiency. The temperature difference in the oceans between the deep and shallow parts is maximum in the tropics, 20 to 25 degrees C. অ্যাচিভার্স

65. (b) Indian Men's Football Team (also known as Blue Tigers) captained by Sunil Chhetri won the Hero Intercontinental Cup 2023 title by defeating Lebanon team captained by Hassan Maatouk (2-0) in the finals at the Kalinga Stadium in Bhubaneswar, Odisha.

Hero Intercontinental Cup 2023, the 3rd edition of the Intercontinental Cup, was held from 9th to 18th June 2023 in Kalinga Stadium in Bhubaneswar, Odisha.

• This marks India's 2nd Intercontinental Cup title. India previously won the inaugural edition in 2018. অ্যাচিভার্স

• This also mark's India's first victory against Lebanon since 1977. India and Lebanon played eight matches against each other from 1977 to 2023. অ্যাচিভার্স

66. (d) The important characteristics of spirogyra are:

1. It is an unbranched, filamentous green algae occurring in the stagnant water so known as pond scum.
2. A mucilaginous covering or sheath is present which makes the surface slimy hence known as pond silk.
3. A double layered cell wall is present in which the outer wall is made of pectin and inner wall of cellulose.
4. A spirally coiled or ribbon shaped chloroplast with number of pyrenoids is present.
5. Reproduction occurs both in vegetative and sexual methods.
6. Vegetative reproduction is by fragmentation.
7. Sexual reproduction takes place by conjugation. অ্যাচিভার্স

67. (c) 1. The average velocity of an object is its total displacement divided by the total time taken. In other words, it is the rate at which an object changes its position from one place to another. Average velocity is a Vector quantity. The SI unit is meters per second.

2. The distance travelled is the path taken by a body to get from an initial point to an end point in a given period of time, at a certain velocity. If the velocity is constant: Distance = time * velocity.

3. The average speed of an object is the total distance traveled by the object divided by the elapsed time to cover that distance. It's a scalar quantity which means it is defined only by magnitude. A related concept, average velocity, is a vector quantity. A vector quantity is defined by magnitude and direction. অ্যাচিভার্স

4. If an object moves relative to a reference frame–for example, if a professor moves to the right relative to a whiteboard, or a passenger moves toward the rear of an airplane–then the object's position changes. This change in position is known as displacement. The word displacement implies that an object has moved, or has been displaced.

Displacement is defined to be the change in position of an object.

68. (d) The United Nations Development Programme (UNDP) partnered with the Deendayal Antyodaya Yojana-National Urban Livelihoods

Mission (DAY-NULM) to empower women to make well-informed career choices in the field of entrepreneurship. অ্যাচিভার্স

i. The partnership will provide support for women looking to start and expand their own enterprises in sectors such as care economy, digital economy, electric mobility, waste management, food packaging and more.

ii. Under the partnership, the 3-year project which is extendable beyond 2025 will cover 8 cities in the initial phase focused on promoting entrepreneurship development and accelerating enterprise growth.

iii. UNDP and DAY-NULM will collaborate on piloting innovative solutions, particularly in the care economy domain by drawing on their extensive sectoral expertise. অ্যাচিভার্স

69. (b) If the displacement of an object is proportional to the square of the time taken then the body is moving with uniformly accelerated motion as it will follow Newton's second equation of motion for a particular initial velocity.

70. (b) Law of conservation of momentum states that For two or more bodies in an isolated system acting upon each other, their total momentum remains constant unless an external force is applied. Therefore, momentum can neither be created nor destroyed. Law of conservation of momentum is an important consequence of Newton's third law of motion. Following are the examples of law of conversation of momentum:

1. Air filled balloons অ্যাচিভার্স
2. System of gun and bullet
3. Motion of rockets

71. (a) Sir Isaac Newton published three laws in the 17th century. In this article, we are going to talk about Newton's 1st law. This law does an introduction of motion of the object and the force acting on it. In other words, it deals with the motion of an object and its relation to force.

Newton's first law states that: a body remains in the state of rest or uniform motion in a straight line unless and until an external force acts on it. Putting Newton's 1st law of motion in simple words, a body will not start moving until and unless an external force acts on it. Once it is set in motion, it will not stop or change its velocity until and unless some force acts upon it once more.

The first law of motion is sometimes also known as the law of inertia. অ্যাচিভার্স

What is an External Force: An external force is defined as the change in the mechanical energy that is either the kinetic energy or the potential energy in an object. These forces are caused by external agents. Examples of external forces are friction, normal force and air resistance.

72. (b) The World Bank (WB) through its lending arm International Bank for Reconstruction and Development (IBRD) has approved an additional USD 150 million loan to support the Resilient Kerala Program to strengthen Kerala's preparedness against natural disasters, climate change impacts, disease outbreaks, and protect lives.

i. This financing along with the earlier investment of USD 125 million, focuses on coastal erosion and water resource management and is expected to protect approximately 5 million (50 lakh) people from the impacts of floods. অ্যাচিভার্স

ii. The loan has a final maturity of 14 years, including a grace period of 6 years.

73. (b) As we know that pressure is inversely proportional to area, so an increase in area means decrease in pressure. School bags are provided with broad straps to increase the surface area in contact with the shoulders and reduce pressure on the shoulders. If thin straps would be used, then surface area in contact with the shoulders would decrease which will lead to increase in pressure on shoulders.

74. (b) According to the Economist Intelligence Unit's (EIU) Global Liveability Index 2023 released on June 21, 2023, Vienna, the capital of Austria, has topped the index as the world's most liveable city.

Vienna has secured the top spot for the second consecutive year excelling in all the categories of the index.

i. Copenhagen (Denmark) ranked second while Melbourne and Sydney of Australia ranked 3rd and 4th in the index. অ্যাচিভার্স

ii. Living conditions remain the worst in Damascus (the capital of Syria) and it ranks 173 as the least liveable city in the world for the second consecutive year due to social unrest, terrorism and conflict.

iii. 5 cities from India have been featured on the EIU's Global liveability index 2023.

• New Delhi (Delhi) 141st rank.
• Mumbai (Maharashtra) 141st rank.
• Chennai (Tamil Nadu) 144th rank.
• Ahmedabad (Gujarat) 147th rank.
• Bengaluru (Karnataka) 148th rank.

iv. EIU's index ranks 173 cities across five categories: stability, healthcare, education, culture and the environment, and infrastructure.

75. (b) Gravitational attraction is caused by the mass of an object. Since Earth is far more massive than the Moon, the gravitational force exerted on the Moon is far greater than that of the Moon on the Earth. An example of the difference: while the Moon causes tides on the Earth, the Earth has the Moon locked so that the same face (minus some wobbling) is always visible from the Earth.

76. (d) Meesho and National Payments Corporation of India (NPCI), two Indian companies have been featured on the "TIME 100 Most Influential Companies of 2023", the TIME Magazine's annual list under the 'pioneer' category

i. The TIME 100 Most Influential Companies List described Meesho as an "Innovative Retailer" and NPCI as "Connecting Commerce".

ii. This list is an expansion of TIME's iconic TIME100 franchise, and will be curated by an expansive network of editors and correspondents of TIME.

77. (a) Indian Railways is set to introduce its first hydrogen train, expected to start operating from Jind district in Haryana by March 2024. The first prototype of the hydrogen train is scheduled to run between the Jind-Sonipat (Haryana) Section of Northern Railway in the fiscal year 2023-2024.

i. India's first hydrogen plant is being established near the railway junction in Jind (Haryana) district, in order to support this initiative.

ii. The hydrogen plant is in its final phase of development and is expected to be completed by December 2023.

78. (c) A force must be applied on a body to accelerate an object. Work must be done in order to apply a force. The body will move with an unvarying speed after the work has been done due to the energy provided by it. The speed and the mass of the body are factors on which the energy transfer that makes up the kinetic energy depends.The kinetic energy of an object is the energy that it possesses due to its motion. Kinetic energy definition is given as: The energy of an object because of its motion or the energy gained by an object from its state of rest to motion. The CGS unit of kinetic energy is erg.

What are the Examples of Kinetic Energy?

1. A semi-truck travelling down the road has more kinetic energy than a car travelling at the same speed because the truck's mass is much more than the car's.

2. A river flowing at a certain speed comprises kinetic energy as water has certain velocity and mass.

3. The kinetic energy of an asteroid falling towards earth is very large.

4. The kinetic energy of the aeroplane is more during the flight due to large mass and speedy velocity.

79. (b) On 21st June 2023, The Indian Institute of Technology, Kanpur (IIT-K), Uttar Pradesh (UP) successfully conducted a test flight/experiment for their cloud seeding project. It was a test of artificial rain through cloud seeding. The experiment was conducted with due approval from DGCA (Directorate General of Civil Aviation).

• Cloud seeding is the process of enhancing the chance of precipitation by using different chemical agents like silver iodide, dry ice, salt, and other elements.

i. In the experiment, a Cessna aircraft of IIT-K was flown from the airstrip of the Flight Laboratory of IIT Kanpur with cloud-seeding attachments and came back to the Flight Lab airstrip, after successfully completing the test ride.

80. (d) The amount of work done depends on the amount of the force applied and the distance object moves along with the angle between force and displacement.

81. (a)

82. (d) Microphone-Sound energy into electrical energy.

Speaker-Electrical energy into sound energy.

Reeds of a harmonium-Mechanical energy into sound energy.

Sails of a ship-Wind energy into mechanical energy.

83. (a) The Solar Ultraviolet Imaging Telescope (SUIT), a space telescope developed by Pune's

InterUniversity Center for Astronomy and Astrophysics (IUCAA), was delivered to the Indian Space Research Organisation (ISRO) for its ADITYA-L1 solar mission.

• SUIT is set to be one of the seven payloads of ADITYA-L1, India's first mission to study the sun. অ্যাচিভার্স

i. The main purpose of the telescope is to study the Sun's ultraviolet (UV) emissions and capture highresolution images of the Sun's atmosphere, known as the corona, in various UV wavelengths.

ii. The SUIT telescope will provide full disk images of the sun in the 2000 to 4000 A (1 angstrom = 10^-10 m) wavelength range which has never been obtained so far. অ্যাচিভার্স

84. (d) A sound is a form of energy, just like electricity, heat or light. Let's examine some sources of sounds like a bell. When you strike a bell, it makes a loud ringing noise. Now, instead of just listening to the bell, put your finger on the bell after you have struck it. Can you feel it vibrating? This is the key to the sound. It is even more evident in guitars and drums. You can see the wires vibrating every time you pluck it. When the bell or the guitar stops vibrating, the sound also stops. The to and fro motion of the body is termed as Vibration. You can see examples of vibrations everywhere. Vibrating objects produce sound. Some vibrations are visible, some aren't. If you pull and then release a stretched rubber band, the band moves to and fro about the central axis and while doing so it also produces a sound. The sound moves through a medium by alternately contracting and expanding parts of the medium it is travelling through. In physics, Sound is a vibration that propagates as an acoustic wave, through a transmission medium such as a gas, liquid or solid. Sound is pictorially represented by a continuous succession of peaks and valleys. The distance between two consecutive peaks or trough is termed as the wavelength of the wave or the period. The number of cycles per unit time is termed as the frequency of the sound. Frequency is measured in cycles per second or Hertz. The faster an object vibrates, i.e. the higher the frequency, then the higher the pitch of the sound. The difference between a man's voice and women must be clearly evident to you. The voice of a man has a lower frequency which contributes to the deepness of the bass in the voice. Women, in contrast, have a voice with higher frequency resulting in a higher shrillness or pitch. অ্যাচিভার্স

What Is Longitudinal Wave?

Longitudinal waves are the waves where the displacement of the medium is in the same direction, or in opposite direction, and direction of the travel of the wave. The distance between the centers of two consecutive regions of compression or the rarefaction is defined by wavelength, λ. When the compression and rarefaction regions are of two waves coincide with each other, it is known as constructive interference and if the regions of compression and rarefaction do not coincide, it is known as destructive interference.

Sound Waves: A sound wave is an example of a longitudinal wave and is produced by the vibrating motion of the particles that travel through a conductive medium. The example of sound waves in a longitudinal direction is tuning fork. In Sound waves, the amplitude of the wave is the difference between the maximum pressure caused by the wave and the pressure of the undisturbed air. The propagation speed of sound depends upon the type, composition of the medium and temperature through which it propagates. অ্যাচিভার্স

85. (b) What is Ultrasound? Sound waves with frequencies higher than the upper audible limit of human hearing are called ultrasound. The limit varies from person to person but is approximately 20,000 Hertz. The physical properties of ultrasound are similar to the normal audible sound. This type of scientific concept is used in many different fields such as navigation, medicine, imaging, cleaning, mixing, communication, testing etc. Even in nature, bats and porpoises use this particular technique for the location of prey and obstacles. In the following section, we shall learn about its applications. অ্যাচিভার্স

Applications:1. Cleaning: In objects with parts that are difficult to reach, for example, spiral tubes and electronic components, the process of ultrasonic cleaning is used. Here, the object is dipped in a solution of suitable cleaning material and ultrasonic waves are passed into it. As a result of this, high-frequency waves

are generated that cause the dirt and grease to detach from the surface. অ্যাচিভার্স

2. Detection of cracks: Ultrasound is used to detect cracks in the metallic components that are used in the construction of high rise structures such as buildings and bridges. They generate and display an ultrasonic waveform that is interpreted by a trained operator, often with the aid of analysis software, to locate and categorize flaws in test pieces. High-frequency sound waves reflect from flaws in predictable ways, producing distinctive echo patterns that can be displayed and recorded by portable instruments. A trained operator identifies specific echo patterns corresponding to the echo response from good parts and from representative flaws. The echo pattern from a test piece may then be compared to the patterns from these calibration standards to determine its condition.

3. Echocardiography: In the process of electrocardiography, the ultrasonic waves are used to form an image of the heart using reflection and detection of these waves from various parts. অ্যাচিভার্স

4. Ultrasonography: ,Medical ultrasound is a diagnostic imaging technique based on it. It is used for the imaging of internal body structures such as muscles, joints and internal organs. Ultrasonic images are known as sonograms. In this process, pulses of ultrasound are sent to the tissue using a probe. The sound echoes off the tissue, where different tissues reflect sound varying in degrees. These echoes are recorded and displayed an image.

5. Lithotripsy: Ultrasonic waves are used to break stones in the kidney. High energy sound waves are passed through the body without injuring it and break the stone into small pieces. These small pieces move through the urinary tract and out of the body more easily than a large stone.

6. SONAR: SONAR, Sound Navigation, and Ranging is a technique in which sound waves are used to navigate, detect and communicate under the surface of the water. অ্যাচিভার্স

7. Echolocation: Echolocation is the process where sound waves and echoes are used to determine objects in space. Echolocation is used by bats to navigate and find their food in the dark. Bats send out sound waves from their mouth and nose, which then hit the objects in their vicinity producing echoes, which are then received by the bats. The nature of the echo helps them determine the size, the shape and the distance of the object. অ্যাচিভার্স

86. (a) Canara Bank became the first Public Sector Bank (PSB) in India to introduce the facility of UPI (Unified Payments Interface) payments to merchants through RuPay Credit Card, in association with NPCI (National Payments Corporation of India).
• This facility is made available at 'Canara ai1' Banking Super App of the Bank.

87. (d) The speed of sound increases with the increase of temperature of the medium. The speed of sound in air increases by 0.61 m/s when the temperature is increased by 10C.

88. (d) Sound or Audible waves are sensitive to human ear and are generated by the vibrating bodies like tuning fork, vocal cords etc. Infrasonic waves are produced by sources of bigger size such as earth quakes, volcanic eruptions, ocean waves etc. Human ear cannot detect Ultrasonic waves. But dog, cat, bat etc can detect these waves. Bat not only detect but also produce ultrasonic waves. অ্যাচিভার্স

89. (b) Due to refraction, sound is heard at longer distances in nights than in day.

90. (d) Rabies is a viral disease that is spread through the animal bite such as the dog. It is caused by the infection of rabies virus. The infection caused from this leads to encephalomyelitis i.e the inflammation of the brain as well as the spinal cord. The transmission of the virus happens through the saliva and affects the CNS or Central nervous system. This virus belongs to the family called Rhabdoviridae. It takes the shape of a bullet. Animals such as dogs, rabbits, cats, fox and etc carry this virus and transmit the disease to human beings. Usually, this disease causes about 24,000–60,000 deaths in worldwide per year.
Control and Prevention of Rabies অ্যাচিভার্স
Prevention is better than cure. Rabies is an infectious disease that can be preventable. Following measures can reduce the infection to nearly high extents. Some of the measures are given below-
• Get rabies vaccination injected to prevent the infection.
• Vaccinating your pet against the disease.

• Maintain distance with the wild animals.

• Wash wounds with soap and water and maintain good hygiene.

• Keep your pets away from the other stray dogs.

• Prevent bats wandering around your campuses and living places. অ্যাডভান্স

91. (b) According to the QS World University Rankings 2024 by Quacquarelli Symonds (QS) released on 27th June 2023, the Indian Institute of Technology Bombay (IIT-B), Mumbai, Maharashtra, is the only Indian Institute featured among the top 150 Universities.

• IIT-B ranked 149th globally, has emerged as the best higher education Institute in India.

i. The global list is topped by the Massachusetts Institute of Technology (MIT), Cambridge, United States of America (USA) for the 12th time (2012 and from 2014 to 2024).

• MIT is followed by the University of Cambridge, Cambridge, the United Kingdom (UK) in 2nd place and the University of Oxford, Oxford, UK in 3rd place.

ii. QS World University Rankings 2024, the 20th edition of the ranking, features 1,500 institutions across 104 locations and is the only ranking of its kind to emphasise employability and sustainability. অ্যাডভান্স

iii. Apart from IIT-B, IIT Delhi (IITD) is the only Indian university among the top 200 in the 2024 ranking.

92. (b) AIDS or Acquired Immune Deficiency Syndrome is a syndrome caused by the HIV virus. In this condition, a person's immune system becomes too weak to fight off any kind of infection or disease.

AIDS is usually the last stage of HIV infection; a stage where the body can no longer defend itself and thus spawns various diseases. AIDS, when untreated, leads to death. অ্যাডভান্স

AIDS is an advanced HIV infection or late-stage HIV. Someone with AIDS may develop a wide range of health conditions like – pneumonia, thrush, fungal infections, TB, toxoplasmosis and cytomegalovirus.There is also an increased risk of developing a medical illness like cancer and brain illnesses. CD4 count refers to the number of T-helper cells in a cubic millilitre of blood. A person may be referred to as "AIDS-affected" when the CD4 count drops below 200 cells per cubic millilitre of blood.

93. (a) Congenital refers to a condition or disease which is present at birth. The condition can be inherited (genetic) or caused by environmental factors. Some maternal infections, such as HIV, can be passed onto the child and cause a congenital condition. Maternal factors such as alcohol or drug consumption, nutritional intake and placental health can all cause congenital problems. অ্যাডভান্স

Examples

● Congenital heart defects are those which affect the structure of the heart and the way blood flows through it. Ranging from minor– with no symptoms–to life-threatening, these are the most common type of birth defect

● Cleft lip and palate, which affect the development of the roof of the mouth and upper lip. A cleft lip can be caused by genes passed down from the parents, environmental toxins, viruses or may occur in concert with other birth defects.

● Neural tube defects such as spina bifida

● Down Syndrome caused by an extra chromosome অ্যাডভান্স

94. (a) A vaccine is a preparation that improves immunity to a particular disease. It is a biological prepared product which contains typical agents resembling a microorganism that causes disease, made from weakened or dead forms of the microbes, one of its surface proteins or its toxins. It helps in the stimulation of the immune system and to identify the invaded microbes as the foreign agent and destroy it so that the immune system can be recognized and destroy any microorganism encountered later. A vaccine is an antigenic substance that develops immunity against a disease which can be delivered through needle injections or by mouth or by aerosol. Vaccination is the injection of a dead or weakened organism that forms immunity against that organism in the body. Immunization is the process by which an animal or a person stays protected from diseases. Vaccines are Safe and Effective: Vaccines are the perfect defense against a preventable and contagious disease that can be deadly. Vaccines are one of the safest medical products available but there are some preventive measures one should adopt. Precise information of the values of vaccines

along with their possible side-effects assist people to take decisions on vaccines.

How Well Do Vaccines Work? অ্যাচিভার্স

No medicine can be labelled as perfect but most of the vaccines produce immunity for about 90-100% of the cases. Certainly, better sanitation and hygiene can help prevent the spread of disease but the germs that are responsible still stay around. The germs continue to make people sick as long as their existence. Every vaccine has to be licensed by the Food and Drug Administration abbreviated by FDA before being brought into use in the United States. A vaccine needs to go through extensive tests to confirm that it is safe before the approval of FDA. Among these tests are the clinical tests trials that compare groups of people who get a control such as a placebo with the group of people who get a vaccine. A vaccine is approved only when FDA confirms that it is safe for intended use. Vaccines save millions of lives every year. When a particular section of a city or town is immunized against a communicable disease, several members of the same community are shielded against the diseases as the opportunity for an outbreak is minimum. The principle of immunity refers to the control of various contagious diseases that involve rabies, mumps, influenza, measles and pneumococcal disease. অ্যাচিভার্স

95. (c) Various Causes of Water Pollution

1. Industrial waste: Industries produce a huge amount of waste which contains toxic chemicals and pollutants which can cause air pollution and damage to us and our environment. They contain pollutants such as lead, mercury, sulfur, asbestos, nitrates, and many other harmful chemicals.

Many industries do not have a proper waste management system and drain the waste in the fresh water which goes into rivers, canals and later into the sea. The toxic chemicals have the capability to change the color of water, increase the number of minerals, also known as eutrophication, change the temperature of water and pose a serious hazard to water organisms.

2. Sewage and wastewater: The sewage and wastewater that is produced by each household is chemically treated and released into the sea with fresh water. The sewage water carries harmful bacteria and chemicals that can cause serious health problems. Pathogens are known as a common water pollutant; The sewers of cities house several pathogens and thereby diseases. অ্যাচিভার্স

Microorganisms in water are known to be causes of some very deadly diseases and become the breeding grounds for other creatures that act as carriers. These carriers inflict these diseases via various forms of contact onto an individual. A very common example of this process would be Malaria.

3. Mining activities: Mining is the process of crushing the rock and extracting coal and other minerals from underground. These elements when extracted in the raw form contains harmful chemicals and can increase the number of toxic elements when mixed up with water which may result in health problems. Mining activities emit a large amount of metal waste and sulphides from the rocks which is harmful to the water. অ্যাচিভার্স

4. Marine dumping: The garbage produced by each household in the form of paper, aluminum, rubber, glass, plastic, food is collected and deposited into the sea in some countries. These items take from 2 weeks to 200 years to decompose. When such items enter the sea, they not only cause water pollution but also harm animals in the sea.

5. Accidental oil leakage: Oil spill poses a huge concern as a large amount of oil enters into the sea and does not dissolve with water; thereby opens problem for local marine wildlife such as fish, birds and sea otters. For e.g.: a ship carrying a large quantity of oil may spill oil if met with an accident and can cause varying damage to species in the ocean depending on the quantity of oil spill, size of the ocean, the toxicity of pollutant. অ্যাচিভার্স

6. The burning of fossil fuels: Fossil fuels like coal and oil when burnt produce a substantial amount of ash in the atmosphere. The particles which contain toxic chemicals when mixed with water vapor result in acid rain. Also, carbon dioxide is released from the burning of fossil fuels which result in global warming.

7. Chemical fertilizers and pesticides: Chemical fertilizers and pesticides are used by farmers to protect crops from insects and bacteria. They are useful for the plant's growth. However, when these chemicals are mixed up with water

produce harmful for plants and animals. Also, when it rains, the chemicals mix up with rainwater and flow down into rivers and canals which pose serious damages for aquatic animals.

8. Leakage from sewer lines: A small leakage from the sewer lines can contaminate the underground water and make it unfit for the people to drink. Also, when not repaired on time, the leaking water can come on to the surface and become a breeding ground for insects and mosquitoes.

9. Global warming: An increase in earth's temperature due to the greenhouse effect results in global warming. It increases the water temperature and results in the death of aquatic animals and marine species which later results in water pollution. অ্যাচিভার্স

10. Radioactive waste: Nuclear energy is produced using nuclear fission or fusion. The element that is used in the production of nuclear energy is Uranium which is a highly toxic chemical. The nuclear waste that is produced by radioactive material needs to be disposed of to prevent any nuclear accident. Nuclear waste can have serious environmental hazards if not disposed of properly. Few major accidents have already taken place in Russia and Japan.

11. Urban development: As the population has grown, so has the demand for housing, food, and cloth. As more cities and towns are developed, they have resulted in increasing use of fertilizers to produce more food, soil erosion due to deforestation, increase in construction activities, inadequate sewer collection, and treatment, landfills as more garbage is produced, increase in chemicals from industries to produce more materials. অ্যাচিভার্স

12. Leakage from the landfills: Landfills are nothing but a huge pile of garbage that produces the awful smell and can be seen across the city. When it rains, the landfills may leak and the leaking landfills can pollute the underground water with a large variety of contaminants.

13. Animal waste: The waste produced by animals is washed away into the rivers when it rains. It gets mixed up with other harmful chemicals and causes various water-borne diseases like cholera, diarrhea, jaundice, dysentery and typhoid.

14. Underground storage leakage: Transportation of coal and other petroleum products through underground pipes is well known. Accidentals leakage may happen anytime and may cause damage to the environment and result in soil erosion. অ্যাচিভার্স

96. (b) On 28th June 2023, Pralhad Joshi, the Union Minister of Mines, released the first-ever report on "Critical Minerals for India" which was constituted by the Ministry of Mines. This landmark report identifies 30 essential minerals crucial to sectors such as defence, agriculture, energy, pharmaceuticals, and telecom. The comprehensive list marks a significant milestone for India, aligning with the nation's Atma Nirbhar Bharat (self-reliance) roadmap.

i. The report sheds light on the indispensable role of these critical minerals in driving economic development and ensuring national security. Industries such as high-tech electronics, telecommunications, transportation, and defence heavily rely on these minerals.

• List of identified minerals: Antimony, Beryllium, Bismuth, Cobalt, Copper, Gallium, Germanium, Graphite, Hafnium, Indium, Lithium, Molybdenum, Niobium, Nickel, PGE, Phosphorus, Potash, REE, Rhenium, Silicon, Strontium, Tantalum, Tellurium, Tin, Titanium, Tungsten, Vanadium, Zirconium, Selenium and Cadmium. অ্যাচিভার্স

97. (c) Mahindra Last Mile Mobility (LMM), a division of Mahindra & Mahindra Ltd (M&M), becomes first firm to receive Automotive PLI certificate under the Rs. 25,938-crore production-linked incentive scheme for automobiles (PLI-AUTO)

i. The Automotive Research Association of India (ARAI), a testing agency under the Ministry of Heavy Industry (MHI), awarded the eligibility certificate to LMM forits flagship electric 3-wheeler.

Note- The Ministry of Heavy Industries notified the PLI Scheme for PLI-AUTO Scheme on September 23, 2021, with a budgetary outlay of INR 25,938 crore. অ্যাচিভার্স

98. (b) According to the World Economic Forum (WEF) report titled "Fostering Effective Energy Transition 2023", published in collaboration with Accenture, India is ranked 67th on the Energy Transition Index (ETI) 2023.

• The report also stated that India is the only major economy with energy transition momentum accelerating across the ETI's equitable, secure and sustainable dimensions.

i. ETI 2023, the list of 120 counties, is topped by Sweden with an ETI score 78.5 followed by Denmark (76.1) and Norway (73.7) in 2nd and 3rd rank respectively.

ii. India and China, the emerging and developing countries in Asia with high populations have improved their ETI score by 12% in the past 10 years.

অ্যাচিভার্স

99. (c)

100. (d) Direction generale de l'armement (DGA– Directorate General of Armaments), the French Government Defense procurement and technology agency, successfully conducted its first test firing of a V–MaX (Vehicule Manoeuvrant Expérimental or experimental manoeuvring vehicle), a Hypersonic Glide Vehicle (HGV) to develop new missile technology capable of evading the most sophisticated air defences.

অ্যাচিভার্স

i. The French V-MaX program is being developed by Ariane Groupe, a defence company specializing in space launches and best known for Ariane rockets.

ii. A sounding rocket carrying the V-MaX HGV was launched from the Biscarosse missile test site on the Bay of Biscay, southwestern France.

iii. Hypersonic gliders, a type of warhead for ballistic missiles that can operate freely and glide at hypersonic speed, designed to carry a nuclear or conventional warhead.

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