All India Civil Services Coaching Centre

(Under the aegis of Government of Tamil Nadu)

Answer Key Explanation

Test 8 – GS Paper I

Maximum Questions: 100 **Maximum Marks: 200**

1. **Correct Option: (b)**
Exp: Option (b) is correct

DPSP Implementation

- The 73rd Amendment Act (1992) has been enacted to provide constitutional status and protection to these Panchayati Raj Institutions.
- It aims to achieve Gandhiji's dream of every village being a republic and self-sufficient.
- The adherence to policy of non-alignment and Panchsheel will promote international peace and security.
- The Maternity Benefit (Amendment) Act 2017 has been made to protect the interests of women workers.
- National Commission for Backward Classes will promote and protect the social, educational and economic interests of the weaker sections of the society.
- Untouchability (Offences) Act, 1955 was passed to give effect of the Article 17 (Fundamental Right)

2. **Correct Option: (d)**
Exp:
- The Indo-Greeks rulers were the first rulers in India to issue coins. Punch marked coins were the earliest coins than the coins issued by the Greeks and cannot be assigned with any dynasty.
- Hellenistic art was not a purely Greek art; it was the outcome of the Greek contact with non - Greek conquered peoples after Alexander's death which was introduced under the Greek rule. Greeks were followed by the Shakas, who controlled a much larger part of India than the Greeks did.

3. **Correct Option: (b)**

4. **Correct Option: (b)**
Exp: Option b is correct.
- Our solar system consists of our star, the Sun, and everything bound to it by gravity.
- The planets of solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune (first four are called inner planets and later ones are called outer planets).
- Solar system consists of dwarf planets such as Pluto; dozens of moons; and millions of asteroids, comets, and meteoroids.
- Statement 1 is incorrect: Most of the planets rotate on an axis that is more or less perpendicular to the plane of their respective orbits around the Sun.
- But Uranus's axis lies almost parallel to its orbital plane, which means that the planet spins nearly on its side, its poles taking turns pointing toward the Sun as the planet travels in its orbit.
- Statement 2 is correct: The inner Solar System– Mercury, Venus, Earth, and Mars are so named because they orbit closest to the Sun. These planets are rocky and terrestrial, composed mostly of silicates and metals, whereas the outer planets are gas giants.
- The terrestrial inner planets are composed largely of minerals, such as the silicates, which form their crusts and mantles, and metals such as iron and nickel which form their cores.

- Statement 3 is incorrect: Outer planets lie outside the Frost line. (Frost line represents the boundary in a system where conditions are warm enough that hydrogen compounds such as water, ammonia, and methane are able to take liquid form).
- In outer planets, due to extreme low temperatures, hydrogen compounds such as water, ammonia, and methane condense into ice grains and are not able to take liquid form.
- Inner planets lie in the region within the "frost line," and hydrogen compounds are able to take liquid form that is essential for sustenance of life. Some scientists refer to the frost line as the "Goldilocks Zone", where conditions for life may be "just right."

5. Correct Option: (c)

Exp: Option c is correct.

- Landslide is a rapid movement of rock, soil, and vegetation down the slope under the influence of gravity. It may be induced by natural agencies, e.g., heavy rain, earthquake, or it may be caused by human overinterference with the slope – stability.
- Statement 1, 2 and 4 are correct. The techniques used for mitigation measure for Landslides are: Drainage Techniques for Landslide Mitigation: Groundwater is one of the major contributors in triggering a landslide. Therefore, to hamper the initiation of a landslide proper drainage system is required to prevent erosion and potential slumping of the surface.
- A smooth topography of the slide surface can prevent surface water from ponding or connecting with the groundwater. Depressions of the slope might cater to the standing water, which in turn can lead to debris flow.
- Infilling and sealing the cracks on the surface by grading the soil mass are beneficial and prevent surface water to reach the failure plane.
- Gabion wire mesh: Gabion type retaining structures constitute one of the most economical and efficient solutions for stabilization of natural ground slope. Gabion walls are also preferred for the efficiency of the drainage instead of gravity walls.
- Excavation includes removal of rocks or debris from the slope by digging a sizable hole on the surface.
- Geotechnical professionals use this method to improve the stability of the slope by reducing the velocity of the flow. Removal of soil from the head of the slope is to regulates the driving force of the debris, thereby, improving the stability, thus the process of excavation comes in handy. It is mostly suitable for cuts into deep soil where rotational landslides may occur.
- Excavation to remove rock and soil from the head of a landslide reduce the driving force, and filling rock at the toe of the landslide to increase resistance against movement. This method is only suitable for cuts into deep soil where rotational failures may occur. It is ineffective on planar failures on "infinite" slopes, or on flow type landslides.
- Statement 3 is incorrect: Shifting Cultivation reduces forest cover and leads to soil erosion and increases the chances of landslides. Terrace farming should be encouraged in the northeastern hill states where Jhumming (Slash and Burn/Shifting Cultivation) is still prevalent.

6. Correct Option: (b)

Exp:

- Statement 1 is incorrect: An APA is an agreement between a tax payer and tax authority determining the transfer pricing methodology for pricing the tax payer's international transactions with its

associated enterprises (AE's) for future years.

- Statement 3 is incorrect: The term of APA can be a maximum of 5 years. There is no minimum period. An APA is an agreement between a tax payer and tax authority determining the transfer pricing methodology for pricing the tax payer's international transactions for future years. The methodology is to be applied for a certain period of time based on the fulfillment of certain terms and conditions (called critical assumptions).
- An APA can be unilateral, bilateral, or multilateral.
- Unilateral APA: an APA that involves only the tax payer and the tax authority of the country where the tax payer is located.
- Bilateral APA (BAPA): an APA that involves the tax payer, associated enterprise (AE) of the tax payer in the foreign country, tax authority of the country where the tax payer is located, and the foreign tax authority.
- Multilateral APA (MAPA): an APA that involves the tax payer, two or more AEs of the tax payer in different foreign countries, tax authority of the country where the tax payer is located, and the tax authorities of AEs.
- An APA provides the following benefits- Certainty with respect to tax outcome of the tax payer's international transactions, by agreeing in advance the arm's length pricing or pricing methodology (ies) to be applied to the tax payer's international transactions covered by the APA;
- Removal of an audit threat (minimize rigours of audit), and deliverance of a particular tax outcome based on the terms of the agreement;
- Substantial reduction of compliance costs over the term of the APA; and For tax authorities, an APA reduces cost of administration and also frees scarce resources. Consequently, APAs provide a win-win situation for all the stakeholders involved.
- There are no monetary limits or other prescribed criteria for a tax payer to be eligible for applying for an APA.
- Under the provisions of the Act and the scheme, the APA can determine the Arm's length price by application of any of the prescribed methods or any other method with such adjustments or variation as may be necessary or expedient to do.
- Any tax payer who has undertaken an international transaction or is contemplating to undertake an international transaction is eligible to file for an APA.
- The APA process is legally binding on both the parties for a period of five consecutive years or less as agreed between the tax payer and the CBDT. The regular transfer pricing audit is carried on a year on year basis. APA provides certainty and reduces litigation.

7. Correct Option: (c)

Exp:

- Statement 2 is incorrect: Poverty line estimation in India is based on the consumption expenditure and not on the income levels
- Supplementary notes: Poverty estimation: A common method used to estimate poverty in India is based on the income or consumption levels and if the income or consumption falls below a given minimum level, then the household is said to be Below the Poverty Line (BPL).
- Poverty Line Calculation: Poverty estimation in India is now carried out by NITI Aayog's task force through the calculation of poverty line based on the data captured by the National Sample Survey Office under the Ministry of Statistics and Programme Implementation (MOSPI).
- Data Collection Methods: Uniform Resource Period (URP): Up until 1993-94, the poverty line was based on URP data, which involved asking people about their consumption

expenditure across a 30-day recall period that is the information was based on the recall of consumption expenditure in the previous 30 days.

- Mixed Reference Period (MRP): From 1999-2000 onwards, the NSSO switched to an MRP method which measures consumption of five low-frequency items (clothing, footwear, durables, education and institutional health expenditure) over the previous year, and all other items over the previous 30 days. That is to say, for the five items, survey respondents are asked about consumption in the previous one year. For the remaining items, they are asked about consumption in the previous 30 days

8. Correct Option: (a)

Exp:

- A foreign citizen, a citizen of India who is not a resident of India, a foreign company need to take permission from the National Biodiversity Authority for any biological resource occurring in India or knowledge associated thereto for research or for commercial utilization or for biosurvey and bio-utilization.
- No person, who is a citizen of India or a body corporate, association or organization which is registered in India, shall obtain any biological resource for commercial utilization, or bio-survey and bio-utilization for commercial utilization except after giving prior intimation to the State Biodiversity Board concerned:
- Provided that the provisions of this section shall not apply to the local people and communities of the area, including growers and cultivators of biodiversity, and vaids and hakims, who have been practicing indigenous medicine.

9. Correct Option: (b)

Exp:

- Bioremediation is the use of living micro-organisms to degrade the environmental contaminants into less toxic forms. It uses naturally occurring bacteria and fungi or plants to degrade or detoxify substances hazardous to human health and/or the environment.
- The micro-organisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site. Contaminant compounds are transformed by living organisms through reactions that take place as a part of their metabolic processes. Biodegradation of a compound is often a result of the actions of multiple organisms.
- Bioremediation can be effective only where environmental conditions permit microbial growth and activity. The application often involves the manipulation of environmental parameters to allow microbial growth and degradation to proceed at a faster rate.

Salient Features

- It is cost effective. No construction or additional infrastructure is required.
- These microbes are effective in controlling odour, reducing TSS (Total suspended solids), BOD (Biochemical Oxygen Demand), oil / grease accumulation in sewage / polluted water and solids.
- These microbial consortia exhibit growth at wider temperature range.
- These strains maintain a satisfactory level of DO (Dissolved Oxygen) and therefore aerators, which consume high power, can be avoided or its use can be reduced.
- Control the nutrient level in water, thus helps in controlling "Eutrophication" process.

10. Correct Option: (b)

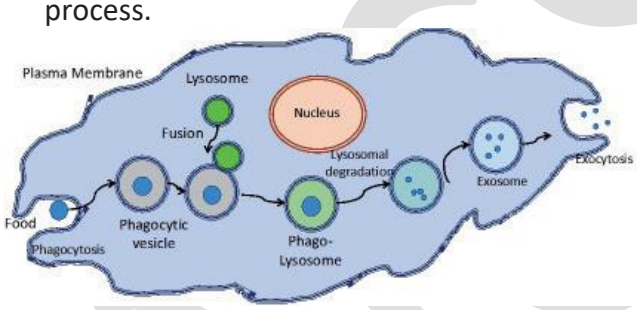
Exp: Option (b) is correct

- Supplementary notes:

Endocytosis/Phagocytosis

Endocytosis is a cellular process in which substances are brought into the cell. The material to be internalized is surrounded by an area of the cell membrane, which then buds off inside the cell to form a vesicle containing the ingested material.

- Endocytosis includes pinocytosis (cell drinking) and phagocytosis (cell eating). It is a form of active transport.
- Phagocytosis is the process by which a cell uses its plasma membrane to engulf a large particle (≥ 0.5 µm), giving rise to an internal compartment called the phagosome. It is one type of endocytosis.
- A cell that reforms phagocytosis is called a phagocyte. The engulfing of a pathogen by a phagocyte In a multicellular organism's immune system, phagocytosis is a major mechanism used to remove pathogens and cell debris. The ingested material is then digested in the phagosome.
- Bacteria, dead tissue cells, and small mineral particles are all examples of objects that may be phagocytized. Some protozoa use phagocytosis as means to obtain nutrients.
- A simple schematic of the phagocytic/ endocytic pathway is shown below with all the main organelles involved in the process.



Golgi complex, Nucleus, and Ribosomes are not directly part of the phagocytic/ endocytic pathway.

11. Correct Option: (c)

Exp:

- Statement 1 is incorrect: CRISPR-Cas9 is a gene-editing technology and not a sequencing technology.
- Supplementary notes: CRISPR-Cas9 Technology CRISPR-Cas9 was adapted from a naturally occurring genome editing system in bacteria.
- The bacteria capture snippets of DNA from invading viruses and use them to create DNA segments known as CRISPR arrays.
- The CRISPR arrays allow the bacteria to "remember" the viruses (or closely related ones). If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA. The bacteria then use Cas9 or a similar enzyme to cut the DNA apart, which disables the virus.
- The CRISPR-Cas9 system works similarly in the lab. Researchers create a small piece of RNA with a short "guide" sequence that attaches (binds) to a specific target sequence of DNA in a genome. The RNA also binds to the Cas9 enzyme.
- As in bacteria, the modified RNA is used to recognize the DNA sequence, and the Cas9 enzyme cuts the DNA at the targeted location.
- Although Cas9 is the enzyme that is used most often, other enzymes (for example Cpf1) can also be used. Once the DNA is cut, researchers use the cell's own DNA repair machinery to add or delete pieces of genetic material, or to make changes to the DNA by replacing an existing segment with a customized DNA sequence.
- Human Genome is made up of 23 chromosome pairs with a total of about 3 billion DNA base pairs. There are 24 distinct human chromosomes: 22 autosomal chromosomes, plus the sexdetermining X and Y chromosomes.
- The main goals of the Human Genome Project were first articulated in 1988 by a special committee of the U.S. National Academy of Sciences, and later adopted through a detailed series of five-year plans jointly written by the National Institutes of Health and the Department of Energy.
- The Human Genome Project was started in 1990 with the goal of sequencing and identifying all base pairs in the human genetic instruction set, finding the genetic roots of disease and then developing treatments.

12. Correct Option: (d)

Exp:

- The Voluntary Retention Route (VRR):

- Introduced by the RBI in March, 2019, to enable the FPIs to invest in debt markets in India.
- Broadly, the investments through the Route are free from the macro-prudential and other regulatory norms applicable to the FPI investments in debt markets. However, for availing such a benefit, the FPIs should voluntarily commit to retain a required minimum percentage of their investments in India for a period.
- RBI's Regulations on VRR: Any FPI registered with SEBI is eligible to participate through this Route. Participation through this Route shall be voluntary.
- The FPIs are eligible to invest in any Government Securities, i.e., the Central Government dated Securities (G-Secs), Treasury Bills (T-Bills), as well as the State Development Loans (SDLs). They can also investment in the Corporate Bonds.
- The RBI imposes a limit on investment under this Route. Presently, it is Rs. 1.5 lakh crores.
- Minimum retention period for the investment is 3 years.
- Minimum percentage of investment, which has to retained, is 75%.
- The FPIs that wish to liquidate their investments under the Route, prior to the end of the retention period, may do so by selling their investments to another FPIs. However, the FPI buying such investment shall abide by all the terms and conditions applicable under the Route.
- New Announcement: The RBI has decided to increase the investment limit under VRR from Rs. 1.5 lakh crores to Rs. 2.5 lakh crores.

13. Correct Option: (b)

Exp:

- Saffron is the most expensive spice, known for its aroma and colour, and used for flavouring, colouring and in medicinal and pharmaceutical industries.
- Cultivation: Saffron production is restricted to well-drained Karewa soils in the Union Territory of Jammu and Kashmir. Pampore region is commonly known as 'the Saffron Bowl of Kashmir'.
- Other important areas include: Budgam, Srinagar and Kishtwar districts. Production: Total world production of saffron is around 300 tons per year. Iran, India, Spain and Greece are the major saffron producing countries.
- Productivity: Though, India occupies the 2nd largest area, but produces only 7% of the total world production. This clearly highlights that the countries, such as Iran, Spain and Greece, have much higher productivity of saffron due to technological adoption and efficient processing.

14.Correct Option: (d)

Exp:

- Statement 2 is incorrect: Presidential form of government gives narrow representation.
- Supplementary notes: Presidential Government Presidential form of government gives narrow representation.
- Parliamentary form of government gives wider representation and that is one of the reasons for its adoption by our constitutional makers. Once the president is elected he can rule with/without any party support until the next election. So it is the stable government.
- The doctrine of separation of powers is the basis of the presidential system. Ex: In U.S.A. President cannot dissolve the House of Representatives the lower house of the Congress. Presidential form of government also characterized by Single executive, Non- responsibility, Political homogeneity may not exist, Single membership, Domination of president.

15.Correct Option: (a)

Exp:

- Statement 3 is incorrect: The concept of Equality before law is borrowed from the English Common Law.
- Supplementary notes: Equality before Law The concept of Equality before law is borrowed from the English Common Law.

It has origin in the concept of 'Rule of Law'. It implies the absence of any special privilege due to birth, position, gender, creed etc.

- There is no one above the law of the land, privileged, underprivileged and unprivileged are equal before law. Thus it has slightly negative connotation. It connotes the 'equal protection of laws' which we have taken from the American Constitution. It is a more positive concept, implying the right to equality of treatment in equal circumstances.

16.Correct Option: (d)

Exp: All statements are correct

- Supplementary notes: The duties and functions of the CAG He audits the accounts related to all expenditure from the Consolidated Fund of India, consolidated fund of each state and consolidated fund of each union territory having a Legislative Assembly.
- He audits all expenditure from the Contingency Fund of India and the Public Account of India as well as the contingency fund of each state and the public account of each state.
- He audits all trading, manufacturing, profit and loss accounts, balance sheets and other subsidiary accounts kept by any department of the Central Government and state governments.
- He audits the receipts and expenditure of the Centre and each state to satisfy himself that the rules and procedures in that behalf are designed to secure an effective check on the assessment, collection and proper allocation of revenue.
- He audits the receipts and expenditure of the following: All bodies and authorities substantially financed from the Central or state revenues. Government companies. Other corporations and bodies, when so required by related laws.
- He audits all transactions of the Central and state governments related to debt, sinking funds, deposits, advances, suspense accounts and remittance business. He also audits receipts, stock accounts and others, with approval of the President, or when required by the President.
- He audits the accounts of any other authority when requested by the President or Governor. For example, the audit of local bodies.
- He advises the President with regard to prescription of the form in which the accounts of the Centre and the states shall be kept (Article 150).
- He submits his audit reports relating to the accounts of the Centre to President, who shall, in turn, place them before both the Houses of Parliament (Article 151).
- He submits his audit reports relating to the accounts of a state to governor, who shall, in turn, place them before the state legislature (Article 151).
- He ascertains and certifies the net proceeds of any tax or duty (Article 279). His certificate is final. The 'net proceeds' means the proceeds of a tax or a duty minus the cost of collection.
- He acts as a guide, friend and philosopher of the Public Accounts Committee of the Parliament.
- He compiles and maintains the accounts of state governments. In 1976, he was relieved of his responsibilities with regard to the compilation and maintenance of accounts of the Central Government due to the separation of accounts from audit, that is, departmentalization of accounts.
- He audits the accounts of Panchayati Raj Institutions and Urban Local Bodies but with the permission of the State government.

17. Correct Option: (a)

Exp:

- Statement 1 is correct: The paintings of the Upper Palaeolithic phase are linear representations, in green and dark red, of huge animal figures, such as bisons, elephants, tigers, rhinos and boars besides stick-like human figures. A few are wash

paintings but mostly they are filled with geometric pattern.

- Statement 2 is correct: At Bhimbetka caves, the themes of paintings found are of great variety, ranging from mundane events of daily life in those times to sacred and royal images. These include hunting dancing, music, horse and elephant riders, animal fighting, etc.
- Statement 3 is not correct: The rock shelters on banks of the River Suyal at Lakhudiyar, about twenty kilometres on the Almora– Barechina road, bear these prehistoric paintings. Lakhudiyar literally means one lakh caves.
- The paintings here can be divided into three categories: man, animal and geometric patterns in white, black and red ochre.
- Humans are represented in stick-like forms. A long-snouted animal, a fox and a multiple legged lizard are the main animal motifs. Wavy lines, rectangle-filled geometric designs, and groups can be seen.

18. Correct Option: (b)

Exp:

- In Gujarat, once stood a large and prosperous port; known as Bharukaccha then, Greek and Roman merchants knew it as Barygaza. This port was the present day Bharuch Port.
- The earliest historical reference comes from the 1st Century CE Greco Roman text known as the Periplus of the Erythrean Sea. The book refers to Barygaza as a 'commercial emporium' that had trade contacts with Egypt, Persia, Ceylon and the Far east.

19. Correct Option: (d)

Exp:

- In 2014, new discoveries led to archaeologists at the Harappan site of Rakhigarhi in Hisar district, Haryana, to establishing it as the biggest Harappan civilisation site. Until now, specialists in the Harappan civilisation had argued that Mohenjo-daro in Pakistan was the largest among the 2,000 Harappan sites.
- Mohenjo-daro, Harappa and Ganweriwala (all in Pakistan) and Rakhigarhi and Dholavira (both in India) are ranked as the first to the fifth biggest Harappan sites.
- Pair 1 is correctly matched: A terracotta plough model is found in Banawali. It is important as it is a complete specimen found so far in Harappan Culture.
- Pair 2 is correctly matched: Lothal is believed to be 3,700 years old and is the only major port-town of the IVC, discovered so far. First discovered in 1954, Lothal was excavated from 1955-1960 by S R Rao of the Archaeological Survey.
- Pair 3 is correctly matched: Chanhudaro (also Chanhu Daro) is an archaeological site belonging to the post-urban Jhukar phase of Indus valley civilization.
- Etched carnelian beads are a hallmark of the Harappan phase and copies of them in different materials are found during this period illustrating their value to the people of the Indus Valley Civilization. However, within the first month of excavation at Chanhudaro, in November of 1935, the archaeologists found more etched carnelian beads at this one site than were known at that time.

20. Correct Option: (c)

Exp:

- Sedimentary rocks are formed from pre-existing rocks or pieces of once-living organisms. They form from deposits that accumulate on the Earth's surface.
- Sedimentary rocks often have distinctive layering or bedding. Many of the picturesque views of the desert southwest show mesas and arches made of layered sedimentary rock.
- Statement 1 is correct. The sedimentary rocks are distinguished from the other rock types in their characteristic layer formation and are termed as the Stratified Rocks. The Strata may vary in thickness from a few inches to many feet. The rocks may be course or fine grained, soft or hard.

- Statement 2 is correct. Sedimentary rocks are formed from the sediment accumulated over long periods, usually under the water.
- Statement 3 is incorrect. They are generally non-crystalline in nature and often contain fossils of animals, plants and other micro-organisms. Sedimentary rocks are thus the most varied in their formation of all the rocks.
- Statement 4 is correct. Limestone and Chalk are the sedimentary rocks of organic origin derived from the accumulation of corals and shells in the sea. In its pure state, limestone is made up of calcite or calcium carbonate, but where magnesium is also present it is Dolomite.
- Knowledge Base: Common sedimentary rocks include sandstone, limestone, and shale. These rocks often start as sediments carried in rivers and deposited in lakes and oceans. When buried, the sediments lose water and become cemented to form rock. Tuffaceous sandstones contain volcanic ash.
- Source: Certificate Physical and Human Geography by GC Leong; Chapter 2-Page-13

21. Correct Option: (a)

Exp:

- Like the Richter Scale to measure the intensity of earthquakes, scientists have developed a Volcanic Explosivity Index to measure volcanoes.
- Statement 1 is correct - The Volcanic Explosivity Index(VEI) is a relative measure of the explosiveness of volcanic eruption. It was devised by Chris Newhall of the United States geological survey and Stephen Self at the University of Hawaii in 1982. The scale is logarithmic.
- Statement 2 is incorrect – The scale doesn't take into account the damage to life and property and fatalities. Volume of products, eruption cloud height, and qualitative observations (using terms ranging from "gentle" to "mega-colossal") are used to determine the explosivity value. It measures how much volcanic material is ejected, the height of the material thrown into the atmosphere, and how long the eruptions last.
- Source: http://ete.cet.edu/gcc/?/volcanoes_explosivity/

22. Correct Option: (b)

Exp:

- Physical or Mechanical weathering involves mechanical disintegration of rocks due to temperature changes, freeze-thaw cycles, wet-dry cycles, crystallization of salts, animal and plant activity, etc.
- Mechanical weathering involves mechanical processes that break up a rock: for example, ice freezing and expanding in cracks in the rock; tree roots growing in similar cracks; expansion and contraction of rock in areas with high daytime and low nighttime temperatures; cracking of rocks in forest fires, and so forth. Examples of mechanical weathering include frost and salt wedging, unloading and exfoliation, water and wind abrasion, impacts and collisions, and biological actions.
- All of these processes break rocks into smaller pieces without changing the physical composition of the rock.
- Statement 1 is correct. During the warm season, the water penetrates the pore spaces or fractures in rocks. During the cold season, the water freezes into ice, and its volume expands as a result, this exerts tremendous pressure on rock walls to tear apart even where the rocks are massive. Frost weathering occurs due to the growth of ice within pores and cracks of rocks during repeated cycles of freezing and melting. These processes include frost shattering, frost-wedging, and freeze-thaw weathering.
- Statement 2 is incorrect. Rust occurs on iron is the example of Oxidation under Chemical weathering. Oxidation occurs when oxygen reacts with metal elements in rock or on other surfaces creating oxides. This process weakens the structure of the

materials, often producing a reddish-brown color.

- Statement 3 is correct. The main process in mechanical weathering is abrasion, a physical process by which rocks and clasts are reduced in size. Abrasion by ice, water, and wind processes loaded with sediments can have immense cutting power. The world's greatest gorges, valleys, and ravines are largely a result of abrasion. Statement 4 is correct. Over time, sheets of rock break away from the exposed rocks along the fractures, a process known as exfoliation. Exfoliation due to pressure release is also known as "sheeting "Thermal stress weathering results from the subsequent expansion and contraction of rocks caused by diurnal and seasonal variations in the temperatures.

23. Correct Option: (d)

Exp:

- Supplementary notes: Priority sector lending: Priority sector means those sectors which are considered as important for the development of the basic needs of the country and are to be given priority over other sectors.
- It should constitute 40% of the adjusted net bank credit. It includes following categories:
  Agriculture
  Renewable energy
  MSMEs
  Education loan
  Housing
  Social infrastructure
  Loans to minorities
- Overdraft up to Rupees 5000 under Pradhan Mantri Jan Dhan Yojana Start- up companies
- Recently, the Reserve Bank has expanded the scope of priority sector lending to include startups funding up to Rs 50 crore, and loans to farmers for installation of solar plants and compressed biogas plants.

24. Correct Option: (a)

Exp:

- Statement 3 is incorrect: Non-Bank Financial Corporations (NBFCs) are outside the purview of this reserve requirement.
- Statement 4 is incorrect: Banks are not paid any interest on CRR.
- Supplementary notes: Cash Reserve Ratio (CRR) Cash Reserve Ratio refers to the fraction of the total Net Demand and Time Liabilities (NDTL) of a Scheduled Commercial Bank held in India, that it has to maintain as cash deposit with the Reserve Bank of India (RBI).
- The requirement applies uniformly to all banks in the country irrespective of an individual bank's financial situation or size. In contrast, certain countries e.g. China stipulates separate reserve requirements for 'large' and 'small' banks.
- As per the RBI Act 1934, all Scheduled Commercial Banks (that includes public and private sector banks, foreign banks, regional rural banks and co-operative banks) are required to maintain a cash balance on average with the RBI on a fortnightly basis to cater to the CRR requirement.
- Presently, banks are not paid any interest on behalf of the RBI for parking the required cash. If a bank fails to meet its required reserve requirements, the RBI is empowered to impose a penalty by charging a penal interest rate.

25. Correct Option: (c)

Exp:

- Receipts on account of disinvestment of part of government equity in central public sector enterprises, proceeds from strategic disinvestment and other such transactions.
- Supplementary notes: Revenue receipts Revenue Budget – It consists of the Revenue Expenditure and Revenue Receipts.
- Revenue Receipts are receipts which do not have a direct impact on the assets and

liabilities of the government. It consists of the money earned by the government through tax (such as excise duty, income tax) and non-tax sources (such as dividend income, profits, interest receipts).

- Revenue Expenditure is the expenditure by the government which does not impact its assets or liabilities. For example, this includes salaries, interest payments, pension, and administrative expenses.

26. Correct Option: (d)

Exp:

- Statement 1, correct: Black carbon is a particulate matter which acts has heat trapping system. It is said that black carbon is the most solar energy-absorbing component of particulate matter and can absorb one million times more energy than CO2. But unlike CO2, which can stay in the atmosphere for hundreds to thousands of years, black carbon, because it is a particle, remains in the atmosphere only for days to weeks before it returns to earth with rain or snow.
- Statement 2 &3, correct: Because black carbon absorbs solar energy, it warms the atmosphere. When it falls to earth with precipitation, it darkens the surface of snow and ice, reducing their albedo (the reflecting power of a surface), warming the snow, and hastening melting. Because of its inherent GHG properties, its effect includes depletion of ozone layer.
- Addl Info: Around the world, three billion people cook their food and heat their homes by burning biomass or coal in crude stoves or open fires. So, Ujjwala Yojana can be a potential scheme for reduction of GHG emission. At the Paris climate talks in 2015, the Climate and Clean Air Coalition comprised of government and industry groups, agreed on plans to tackle the emissions of "short-lived climate pollutants" which include black carbon, HFCs, methane and ground-level ozone.

27. Correct Option: (c)

Exp:

- Smog is air pollution that reduces visibility. Smog is common in industrial areas and remains a familiar sight in the cities.
- Most of the smog seen is photochemical smog. Photochemical smog is produced when sunlight reacts with nitrogen oxides and at least one volatile organic compound (VOC) in the atmosphere. Nitrogen oxides come from car exhaust, coal power plants and factory emissions.
- VOCs are released from gasoline, paints and many cleaning solvents. When sunlight hits these chemicals, they form airborne particles and ground-level ozone — or smog.
- Smog is unhealthy to humans and animals, and it can kill plants. Smog is also ugly. It makes the sky brown or gray. Smog is common in big cities with a lot of industries and traffic. Cities located in basins surrounded by mountains may have smog problems, because the smog is trapped in the valley and cannot be carried away by wind. Los Angeles, California; and Mexico City, Mexico, both have high smog levels, partly because of this kind of landscape.

28. Correct Option: (c)

Exp:

- The ill effects of sand mining on wildlife are not confined to beaches and sandbanks, but also include underwater ecosystems. When sand is mined from sea beds or river beds, it can create turbidity in the water. The machines and human disturbance induced by such processes can also adversely impact aquatic wildlife. The turbidity can create a barrier that prevents sunlight from entering the water, which is harmful to corals that need sunlight.
- By sucking too much sediment out of the world's rivers, unsustainable sand mining will contribute to bank erosion and shrinking, sinking deltas – with the loss of agriculture land, houses and infrastructure, including failure of roads, dikes and bridges.

29. Correct option: (a)

Exp:

- Statement 2 is incorrect: Nuclear fuel (generally Uranium, U235) is rare and exhaustible substances.
- Statement 3 is incorrect: Thorium itself is not considered as a fissile material as it cannot directly undergo nuclear fission in the power plants.
- Supplementary notes:
  Nuclear Energy and thorium-232
  Nuclear energy is the energy contained within the core or nucleus of an atom. Within this nucleus are protons which hold a positive electric charge, and electrons, that hold a negative electric charge, with bonds holding these particles together. When these bonds within the atom core are broken, through a process called nuclear fission, it produces a significant amount of energy we can use to produce electricity.
- Nuclear energy is produced when atoms are split apart during nuclear fission to release energy. The most common fuel used for nuclear fission in nuclear power plants is uranium. However, only a certain type of uranium (U-235) is suitable, and in some plants, plutonium is used instead.
- Nuclear fission takes place when a neutron collides with a fuel atom. This causes the atom to split apart, releasing heat and radiation energy, as well as more neutrons which will go on to collide with more fuel atoms, and so the cycle continues. The cycle is called a nuclear chain reaction.
- A nuclear chain reaction can be controlled within the reactors of a nuclear plant to produce heat, which in turn heats a cooling agent to produce steam. The steam produced turns turbines or wheels that drive generators to create electricity we can use.
- Nuclear energy is usually considered another non-renewable energy source. Although nuclear energy itself is a renewable energy source, the material used in nuclear power plants is not.
- Nuclear fuel (generally Uranium, U235) is rare and exhaustible substances. Even if the U235 becomes possible to synthesize from other elements such as thorium and uranium- 238, since the usable energy comes from the fission of the metallic nuclei and not from the breaking of some chemical bond the nuclear material is bound to exhaust.
- Thorium
  Thorium is a basic element of nature, like Iron and Uranium. Like Uranium, its properties allow it to be used to fuel a nuclear chain reaction that can run a power plant and make electricity (among other things).
- Thorium itself will not split and release energy. Rather, when it is exposed to neutrons, it will undergo a series of nuclear reactions until it eventually emerges as an isotope of uranium called U-233, which will readily split and release energy next time it absorbs a neutron. Thorium is therefore called fertile, whereas U-233 is called fissile.
- The following figure indicates the estimated share of thorium reserves (country-wise) and distribution of thorium reserves in India.
- Indeed, India has one of the largest reserves of thorium in the world. Some estimates suggest that India and Australia together might have approx. half of the world's total thorium reserves. But, Thorium itself is not considered as a fissile material as it cannot directly undergo nuclear fission in the power plants.

30. Correct Option: (c)

Exp:

- Statement 2 is incorrect: Carbohydrates in the food serve as the primary sources of energy but in a situation of 'low energy' or low glucose level or prolonged starvation any carbon-containing nutrient especially fats and proteins (in the same order) can serve as an energy source.
- Statement 4 is incorrect: Human body can synthesize only vitamin B3 (niacin) and

vitamin D, other vitamins must be supplied by the diet.

- Supplementary notes: Nutrients in the human diet The nutrients that provide energy are commonly referred to as macronutrients (carbohydrates, lipids, and proteins). Carbohydrates (CHOs) and proteins provide a similar amount of energy per gram of food. Lipids are a concentrated source of energy and provide almost twice the amount of energy supplied by proteins and carbohydrates. CHOs = 16 kJ per gram of CHO Protein = 17 kJ per gram of protein. Lipids = 37 kJ per gram of lipid. Water-soluble vitamins (B complex group and vitamin C)
- Eight of the water-soluble vitamins are known as the vitamin B-complex group: thiamin (vitamin B1), riboflavin (vitamin B2), niacin (vitamin B3), vitamin B6 (pyridoxine), folate (folic acid), vitamin B12, biotin, and pantothenic acid. The B vitamins are widely distributed in foods, and their influence is felt in many parts of the body. They function as coenzymes that help the body obtain energy from food.
- The body needs vitamin C, also known as ascorbic acid or ascorbate, to remain in proper working condition. Vitamin C benefits the body by holding cells together through collagen synthesis; collagen is a connective tissue that holds muscles, bones, and other tissues together.
- Vitamin C also aids in wound healing, bone, and tooth formation, strengthening blood vessel walls, improving immune system function, increasing absorption and utilization of iron, and acting as an antioxidant.
- Vitamin C works with vitamin E as an antioxidant.
- Humans cannot synthesize vitamins A, B1 (thiamine), B2 (riboflavin), B5 (pantothenic acid), B6 (pyridoxine), B7 (biotin), B9 (folate), B12 (cobalamin), E, and K but can synthesize some vitamin B3 (niacin) and D.
- Food digestion in the oral/buccal cavity The extensive chemical process of digestion begins in the mouth. As food is chewed, saliva, produced by the salivary glands, mixes with the food. Saliva is a watery substance produced in the mouths of many animals.
- Three major glands secrete saliva: the parotid, the submandibular, and the sublingual.
- Saliva contains mucus that moistens food and buffers the pH of the food. Saliva also contains immunoglobulins and lysozymes, which have antibacterial action to reduce tooth decay by inhibiting the growth of some bacteria. In addition, saliva contains an enzyme called salivary amylase that begins the process of converting starches in the food into a disaccharide called maltose.
- Another enzyme, lipase, is produced by the cells in the tongue. It is a member of a class of enzymes that can break down triglycerides.
- Lingual lipase begins the breakdown of fat components in the food. The chewing and wetting action provided by the teeth and saliva shape the food into a mass called the bolus for swallowing.
- The tongue aids in swallowing by moving the bolus from the mouth into the pharynx. The pharynx opens to two passageways: the trachea, which leads to the lungs, and the esophagus, which leads to the stomach.
- The tracheal opening, the glottis, is covered by a cartilaginous flap, the epiglottis. When swallowing, the epiglottis closes the glottis, allowing food to pass into the esophagus, not into the trachea, preventing food from reaching the lungs.

31. Correct Option: (b)

Exp:

- Statement 2 is incorrect: Signal-strength received by a satellite dish antenna is indeed a direct function of the area of the dish but the receiver of the antenna is not the concave surface, but the actual receiver is kept at the focal point of the concave surface.

- Supplementary notes: Optical fibre
  An optical fibre is a flexible, transparent fibre made by drawing glass (silica) or plastic to a diameter slightly thicker than that of a human hair. Optical fibres are used most often as a means to transmit light between the two ends of the fibre and find wide usage in fibre-optic communications, where they permit transmission over longer distances and at higher bandwidths (data transfer rates) than electrical cables.
- Fibres are used instead of metal wires because signals travel along them with less loss; in addition, fibres are immune to electromagnetic interference, a problem from which metal wires suffer.
- Optical fibres typically include a core surrounded by a transparent cladding material with a lower index of refraction. Light is kept in the core by the phenomenon of total internal reflection which causes the fibre to act as a waveguide.
- Parabolic antenna
  A parabolic antenna is an antenna that uses a parabolic reflector, a curved surface with the cross-sectional shape of a parabola, to direct the radio waves. The most common form is shaped like a dish and is popularly called a dish antenna or parabolic dish.
- The feed antenna at the reflector's focus is typically a low-gain type such as a halfwave dipole or more often a small horn antenna called a feed horn. In more complex designs, such as the Cassegrain and Gregorian, a secondary reflector is used to direct the energy into the parabolic reflector from a feed antenna located away from the primary focal point. The feed antenna is connected to the associated radio-frequency (RF) transmitting or receiving equipment by means of a coaxial cable transmission line or waveguide.
- Image on the retina
  Image formed on the retina is similar to the image formed on a screen through pin hole (iris) by a convex lens. The image will be inverted in all directions or in the other words rotated 180° along the principle axis of the lens. The image formation by the human eye is illustrated bellow.

32. Correct Option: (d)

Exp:

- Malaria is a potentially life-threatening disease caused by parasites (Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale) that are transmitted through the bite of infected female Anopheles mosquitoes.
- Statement 1 is correct: Countries that have achieved at least three consecutive years of zero indigenous cases can apply for WHO certification of their malaria-free status. They must present rigorous evidence and demonstrate the capacity to prevent transmission re-emerging.
- Statement 2 is correct: In 2021, two countries El Salvador on February 25 and China on June 29 were declared malaria-free by the WHO. Since 1900, 127 countries have registered malaria elimination.
- Statement 3 is correct: In the WHO South-East Asia Region, three countries accounted for 98% of the total reported cases in the region, the main contributor being India (58%), followed by Indonesia (30%) and Myanmar (10%).

33. Correct Option: (b)

Exp:

- Manali – Leh Highway crosses four passes, Rohtang La, Baralacha La, Lungalacha La and Tanglang La. The Highway opens only between July and September when snow is cleared from the road.

34. Correct Option: (d)

Exp:

- Project BOLD (Bamboo Oasis on Lands in Drought) aims at serving the combined national goals of reducing desertification and providing livelihood and multi-

disciplinary rural industry support to the local population

- Statement 1 is correct: In the first of its kind, aims to develop green cover in the Indian deserts of Rajasthan.
- Statement 2 is correct: Project BOLD was launched on 4th July from a tribal village Nichla Mandwa in Udaipur district in Rajasthan with plantation of 5000 saplings of special bamboo species over 25 bigha of arid land.
- Statement 3 is correct: The initiative has been launched as part of KVIC's "Khadi Bamboo Festival" to celebrate 75 years of independence "Azadi ka Amrit Mahotsav".

35. Correct Option: (b)

Exp:

- Kandla Special Economic Zone (KASEZ), the oldest export zone in the country, has become the "first green industrial city" in India to receive a platinum rating under IGBC Green Cities Rating for existing cities in the industrial cities category.
- KASEZ used plastic waste to line the artificial water bodies created inside the area to prevent water seepage and mix with the saline water. The SEZ initiatives with solar energy and LED lighting was also among the factors that contributed to the IGBC rating.

36. Correct Option: (a)

Exp:

- Statement 3 is incorrect: The Leader of the largest Opposition Party having not less than one- tenth seats of the total strength of the House is recognized as the leader of the Opposition in that House.
- Leader of opposition in Lok Sabha The leader of opposition in the Lok sabha and Rajya Sabha were accorded statutory recognition in 1977. They are entitled to the salary, allowances and other facilities equivalent to that of a cabinet minister
- In each house of the Parliament, there is the 'Leader of the opposition'. The Leader of the largest Opposition Party having not less than one- tenth seats of the total strength of the House is recognized as the leader of the Opposition in that House.
- In the parliamentary system of the government, the leader of the opposition has significant role to play. His main functions are to provide a constructive criticism of the policies of the government and to provide an alternative government.

37. Correct Option: (b)

Exp:

- The Fundamental Rights that are available to both the citizens and the foreigners are:
- Equality before law and equal protection of laws (Article 14).
- Protection in respect of conviction for offences (Article 20).
- Protection of life and personal liberty (Article 21).
- Protection against arrest and detention in certain cases (Article 22).
- Prohibition of traffic in human beings and forced labour (Article 23).

38. Correct Option: (b)

Exp:

- The doctrine of severability means that when some particular provision of a statute offends or is against a constitutional limitation, but that provision is severable from the rest of the statute, only that offending provision will be declared void by the Supreme Court and not the entire statute.
- Doctrine of Harmonious construction is a principle of statutory interpretation used in the Indian legal system. It holds that when two provisions of a legal text seem to conflict, they should be interpreted so that each has a separate effect and neither is redundant or nullified. This doctrine has been invoked by the Supreme Court to balance the freedom enshrined in the Fundamental Rights of the Constitution and the social justice aspects included in Directive Principles of State Policy.

39. Correct Option: (b)

Exp:

- The Writ of Mandamus – It literally means 'we command'. It is a command issued by the court to a pubic official asking him to perform his official duties that he has failed or refused to perform.
- It can also be issued against any public body, a corporation, an inferior court, a tribunal or government for the same purpose.
- The writ of Mandamus cannot be issued
  (a) against a private individual or body;
  (b) to enforce departmental instruction that does not possess statutory force;
  (c) when the duty is discretionary and not mandatory;
  1.to enforce a contractual obligation;
  2.against the President of India or the State Governors;
  3. against the Chief Justice or a High Court acting in Judicial Capacity.
- The Writ of Prohibition – Literally, it means 'to forbid'. It is issued by a higher court to a lower court or tribunal to prevent the latter from exceeding its jurisdiction or usurping a jurisdiction that it does not posses. Thus, unlike mandamus that directs activity, prohibition directs inactivity.
- The writ of Prohibition can be issued only against judicial and quasi-judicial authorities. It is not available against administrative authorities, legislative bodies and private individuals or bodies.

40. Correct option: (d)

Exp:

- Supplementary notes:
  Bhakti Movement in North India Historians have not found evidence of anything resembling the compositions of the Alvars and Nayanars till the fourteenth century in North India.
- In north India this was the period when several Rajput states emerged. In most of these states Brahmanas occupied positions of importance, performing a range of secular and ritual functions. There seems to have been little or no attempt to challenge their position directly.
- At the same time other religious leaders like Naths, Siddhas and Jogis, who did not function within the orthodox Brahmanical framework, were gaining ground. Many of them came from artisanal groups, including weavers, who were becoming increasingly important with the development of organized craft production. [Demand for such production grew with the emergence of new urban centres, and long-distance trade with Central Asia and West Asia].
- Many of these new religious leaders questioned the authority of the Vedas, and expressed themselves in languages spoken by ordinary people.
- A new element in the situation was the coming of the Turks which culminated in the establishment of the Delhi Sultanate (thirteenth century). This undermined the power of many of the Rajput states and the Brahmanas who were associated with these kingdoms.

41. Correct Option: (a)

Exp:

- Statement 1 is incorrect: Sher Shah did not make many changes in the administrative divisions prevailing since the Sultanate period. He apparently continued the central machinery of administration which had developed during the Sultanate period.
- Statement 2 is incorrect: Sher Shah did not initiate any new liberal policies. Jizyah continued to be collected from the Hindus.
- Supplementary notes:
  Sher Shah and the Sur Empire (1540-1555)
  Sher Shah ascended the throne of Delhi at the age of 54. His original name was Farid and his father was a small jagirdar at Jaunpur. The title of Sher Khan was given to him by his patron for killing a tiger or for services rendered.
- As a ruler, Sher Shah ruled the mightiest empire which had come into existence in north India since the time of Muhammad bin Tughlaq. His empire extended from Bengal to the Indus, excluding Kashmir. In

the west, he conquered Malwa, and almost the entire Rajasthan.

- The Sur Empire may he considered in many ways as a continuation and culmination of the Delhi Sultanate, the advent of Babur and Humayun being in the nature of an interregnum.
- Amongst the foremost contributions of Sher Shah was his re-establishment of law and order across the length and breadth of his empire. He dealt sternly with robbers and dacoits and with zamindars who refused to pay land revenue or disobeyed the orders of the government.
- Sher Shah paid great attention to the improvement of communications in his kingdom. For e.g. he restored the old imperial road called the Grand Trunk Road, from the river Indus in the west to Sonargaon in Bengal. He also built a road from Agra to Jodhpur and Chittor, evidently linking up with the road to the Gujarat seaports. He built a third road from Lahore to Multan.
- For the convenience of travelers, Sher Shah built a sarai at a distance of every two Kos (about eight km) on these roads.
- Sher Shah also introduced other reforms to promote the growth of trade and commerce.
- In his entire empire, customs duty for goods was paid only at two places. His attempt to fix standard weights and measures and a uniform standard for coins all over the empire were also helpful for trade and commerce.
- Sher Shah did not make many changes in the administrative divisions prevailing since the Sultanate period.
- A number of villages comprised a pargana. The pargana was under the charge of the shiqdar, who looked after law and order and general administration, and the munsif or amil who looked after the collection of land revenue. He apparently continued the central machinery of administration as he did not favor leaving too much authority in the hands of ministers.
- He paid special attention to the land revenue system. He insisted on measurement of the sown land. A crop rate (called ray) was drawn up, laying down the state's share of the different types of crops.
- Sher Shah did not initiate any new liberal policies. Jizyah continued to be collected from the Hindus.
- His nobility was drawn almost exclusively from the Afghans. Thus, the state under the Surs remained an Afghan institution based oil race and tribe.

42. Correct Option: (c)

Exp:

- The inscriptions on rocks are called Rock Edicts, and those on Pillars, Pillar Edicts. The Ashokan inscriptions are found in India, Nepal, Pakistan and Afghanistan.
- Altogether, they appear at 47 places. However, the name of Ashoka occurs only in copies of Minor Rock Edict found at three places in Karnataka and one in Madhya Pradesh.
- All other inscriptions refer to him as devanampiya (beloved of the gods) and piyadasi. These inscriptions are generally located on ancient highways.
- The inscriptions of Ashoka were written in four different scripts. In Afghanistan area they were written in Greek and Aramaic languages and scripts, and in Pakistan area, in Prakrit language and Kharosthi script. Inscriptions from all other areas are in Prakrit language, written in Brahmi script.

43. Correct Option: (a)

44. Correct Option: (b)

Exp:

- Stupas were constructed over the relics of the Buddha at Rajagraha, Vaishali, Kapilavastu, Allakappa, Ramagrama, Vethadipa, Pava, Kushinagar and Pippalvina.

45. Correct Option: (b)

Exp:

- Temperature decreases with increasing altitudes in the troposphere at an average rate of 6.5°C per 1000 metres (normal lapse rate). But sometimes the trend is reversed, temperature increases as we move upward. Thus, warm air layer lies over cold air layer. This phenomenon meteorologically is called inversion of temperature. Some of the types of inversion of temperature are:
- Statement 1 is correct. The Frontal or cyclonic inversion is caused in the temperate zone due to temperate cyclones. It is formed due to convergence warm airmass (warm sector) and cold airmass (cold sector). The warm airmass is pushed up by the cold airmass. Thus, the existence of the warm air above and cold air below reverse the normal lapse rate. As a result, inversion of temperature occurs.
- Statements 2 is correct. The Surface inversions of temperature is related to the inversion of the temperature which occurs when there is an advection i.e., warm air invades the area of cold air or cold air moves into the area of warm air. Thereafter, arm air being lighter is pushed upward by relatively denser cold air, resulting into inversion of temperature. Such an inversion occurs over continents in winter and over oceans in summer. Such phenomenon occurs in the low latitude.
- Statement 3 is incorrect. Valley inversion (also called as vertical advectional inversion of temperature) occurs in the mountainous valleys. It is occurred due to radiation cooling and vertical movement of air.
- At night, the upper parts of the valleys see rapid rate of loss of heat through terrestrial radiation and becomes cold and air coming in contact also becomes cool. On the other hand, the temperature of the valley floor does due to low rate of loss of heat through terrestrial radiation remains warmer. Hence, cold air comes down and pushes the warm and light air of the valley floor during night, not during daytime. Thus, there is warm air aloft and cold air in the valley floor and inversion of temperature is caused.
- Statement 4 is correct. Ground surface inversion (also called as radiation inversion or non- advectional inversion). It occurs near the earth's surface due to radiation mechanism (nocturnal cooling of the ground surface due to rapid rate of loss of heat through outgoing long-wave terrestrial radiation). It occurs when there is a static atmospheric condition i.e., no horizontal or vertical movement of air. It normally occurs during the long cold winter nights in the snow-covered regions of the middle and high latitudes.

46. Correct Option: (b)

Exp:

- One of the greatest hazards to cold weather flight is aircraft icing. It destroys the smooth flow of air, increasing drag, while decreasing the ability of an air foil to create lift.
- Many aircraft are prohibited from flying in icing conditions or more specifically, known icing conditions.
- In order for icing to exist, there are three key factors which must exist
- Statement 1 is incorrect. This condition develops when Aircraft Surface temperature is 0°C or colder. It happens when the outside air temperature is actually above freezing, and if the aircraft surface temperature is below freezing point. This condition may exist when an aircraft has recently descended from cooler temperatures.
- Statement 2 is correct. There must be sufficient liquid water in the air for ice to accrete on an aircraft in flight. Here, the sufficient liquid water refers to any visible moisture which may be in the form of a cloud or liquid precipitation (rainfall). And, water in the form of vapor, wet snow (different from dry snow), or ice will contribute little or nothing to the overall ice build-up. It is because they generally not stick to an airplane's external surfaces.

47. Correct Option: (d)

Exp:

- The World Migration Report 2022 published by the International Organization for Migration (IOM) of the UN focuses on developments in migration over the last two-year period, with an emphasis on providing analysis that considers historical and contemporary factors.
- Statement 1 is correct. The current United Nations global estimate is that there were around 281 million international migrants in the world in 2020, which equates to 3.6 per cent of the global population. The scale of international migration has increased from 2000 which accounted for only 2.8% of global population; although at a reduced rate due to COVID-19.
- Statement 2 is incorrect. Currently a larger number of male than female international migrants worldwide and the gap have increased over the past 20 years. In 2000, the male to female split was 50.6 to 49.4 per cent (or 88 million male migrants and 86 million female migrants). In 2020 the split is 51.9 to 48.0 per cent, with 146 million male migrants and 135 million female migrants. The share of female migrants has been decreasing since 2000, while the share of male migrants has increased by 1.4 percentage.
- Statement 3 is correct. With nearly 18 million people living abroad, India has the largest emigrant population in the world, making it the top origin country globally and Europe is currently the largest destination for international migrants, with 87 million migrants (30.9% of the international migrant population).

48. Correct Option: (b)

Exp:

- The GDP is calculated by taking into account 3 different prices –
- Factor Cost: Cost of factors of production, such as land, labour and capital.
- Basic Price (Price expected to be received by the producer): Factor Cost + Production Taxes- Production Subsidies.
- Market Price (Price expected to be paid by the consumer): Basic Price+ Product Taxes- Product Subsidies.
- Hence, GDP at Basic Price = GDP at Factor Cost + Production Taxes - Production Subsidies.
- GDP at Market Price = GDP at Basic Price + Product Taxes- Product Subsidies.

49. Correct Option: (d)

Exp:

- Based on its origin, inflation is categorised into 'demand-pull inflation' and 'cost-push inflation'.
- Cost-push Inflation: Caused by rise in the prices of the factors of production, such as increased cost of raw materials, electricity, rent, labour etc.
- Demand-pull Inflation: It occurs in a situation where demand increases due to excess money supply with the people, without increase in supply level. In other words, it occurs when too much money is chasing too few goods.
- Apart from demand and supply factors, inflation sometimes is also caused by 'Structural Bottlenecks' in the economy.
- Agricultural Bottleneck: Structural problems in agriculture leading to demand-supply mismatch. Examples: Poor marketing infrastructure, lack of cold chain infrastructure etc.
- Resource Constraint: Poor resource base in a country leading to demand-supply mismatch. Example: Poor resource of crude oil in India
- Forex Reserves Constraint: Lack of adequate forex reserves leads to inability to pay for essential imports, leading to demand-supply mismatch. Example: Inability of the poor economies to pay for food imports
- Public Finance: Lower tax revenue, but higher expenditure obligations in the developing and poor economies.

50. Correct Option: (d)

Exp:

- Bank Rate – It is the rate of interest charged by the RBI for lending money to the banks against eligible securities. In the era of controlled and regulated banking, the bank rates were raised to discourage the banks to borrow from the RBI for increasing liquidity, as a way to reduce liquidity. It also served as a benchmark for determining other rates of interest by the RBI.
- Bank rate, though still continuing, is not used as a tool for liquidity management by the RBI, as there is already a secondary market for such securities and it has lost its significance. It is presently used as a penalty rate imposed by the RBI on the banks for the violations of the RBI directives.

51. Correct Option: (d)

Exp:

- All currency notes are printed at the printing presses functioning under the RBI and the coins are minted at the government mints under the Ministry of Finance, Government of India.
- If the deficit is financed through the printing of money, it is known as the printing of money, it is known as the monetization of deficit or monetized deficit.
- Any monetized deficit will lead to inflation. Realizing the dangers of monetizations, the governments have switched to marked borrowings for meeting to prevent build-up of inflationary pressures, for the past several decades.

52. Correct Option: (d)

Exp:

- Statement 1, incorrect & Statement 3, correct: A carbon credit is a permit or certificate allowing the holder to emit carbon dioxide or other greenhouse gases. The credit limits the emission to a mass equal to one ton of carbon dioxide. The issuance of carbon credits aims to reduce the emission of greenhouse gases into the atmosphere. It has its origins in Kyoto Protocol.
- Statement 2, correct: A World Bank study has mentioned that China followed by India are the biggest seller of carbon credits.
- Explanation: Statement 1, correct: Rising temperatures will cause productivity drop across the equatorial region. This is because, for photosynthesis very high intensity (both due to duration of sunlight and intensity)is not feasible. So balance this loss of productivity, fertilizers have to be used more. https://krishijagran.com/featured/climate-change-to-increase-fertiliser-consumption/
- Statement 2& 3, correct: As we move up the latitude, climate change and resultant increase in temperature will increase the rate of glacier melts. This will mean that more land will be available for agriculture in polar.
- In temperate, due to harsh winter, growth of plants is subdued. This will change due to increase in temperature. Across sea shore, there will be increase in sea level and this results in inundation of coastal areas. This can lead to loss of arable lands.

53. Correct Option: (b)

Exp:

- Statement 1, incorrect: Cyclopentane is a hydroflorocarbon with zero ozone depletion potential and low global warming potential.
- Statement 2, correct: India is in the process of phasing out HCFC by 2030 as per the existing agreement signed by India in the Montreal protocol. HCFC is a commonly used refrigerant gas. t is also used in foam blowing agents, solvents, aerosols and fire extinguishers.
- MoEFCC has suggested that it will propose for the funding of foam industries to ease shift from using ozone-depleting Hydrochlorofluorocarbons (HCFC) to chemical Cyclopentane.

- https://www.downtoearth.org.in/news/climate-change/india-decides-to-put-a-break-on-hfo-in-foam-sectorfor-now-55227

54. Correct Option: (d)

Exp:

- Statement 1, correct: Such burning releases SOx& NOx pollutants which are primarily responsible for acid rain.
- Statement 2, correct: The pH value of rain water is about 5.6 which means its slightly acidic
- Statement 3, correct: Any base can act as neutraliser for acid rain and calcareous regions/soil are one such.
- Addl Info: The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone sets national emission ceilings for 2010 up to 2020 for four pollutants: sulphur (SO2), nitrogen oxides (NOx), volatile organic compounds (VOCs) and ammonia (NH3).

55. Correct Option: (c)

Exp:

- The world's first integrated quantum communication network Chinese scientists have established the world's first integrated quantum communication network, combining over 700 optical fibers on the ground with two ground-to-satellite links to achieve quantum key distribution over a total distance of 4,600 kilometers for users across the country.
- The team, led by Jianwei Pan, Yuao Chen, Chengzhi Peng from the University of Science and Technology of China in Hefei, reported in Nature their latest advances towards the global, practical application of such a network for future communications. Unlike conventional encryption, quantum communication is considered unhackable and therefore the future of secure information transfers for banks, power grids, and other sectors.
- The core of quantum communication is quantum key distribution (QKD), which uses the quantum states of particles—e.g. photons—to form a string of zeros and ones, while any eavesdropping between the sender and the receiver will change this string or key and be noticed immediately.
- So far, the most common QKD technology uses optical fibers for transmissions over several hundred kilometers, with high stability but considerable channel loss.
- Another major QKD technology uses the free space between satellites and ground stations for thousand-kilometer-level transmissions.
- In 2016, China launched the world's first quantum communication satellite (QUESS, or Mozi/Micius) and achieved QKD with two ground stations which are 2,600 km apart.
- In 2017, an over 2,000-km long optical fiber network was completed for QKD between Beijing and Shanghai.

56. Correct Option: (a)

Exp:

- Statement 3 is incorrect: LEDs require a low-voltage DC power source while incandescent bulbs can be designed to use both AC and DC as power sources.
- Supplementary notes: Light-Emitting Diodes
  In a light-emitting diode, the recombination of electrons and electron holes in a semiconductor produces light (be it infrared, visible, or UV), a process called "electroluminescence".
- The wavelength of the light depends on the energy bandgap of the semiconductors used. Since these materials have a high index of refraction, design features of the devices such as special optical coatings and die shape is required to efficiently emit light.
- Unlike a laser, the light emitted from an LED is neither spectrally coherent nor even highly monochromatic. However, its spectrum is sufficiently narrow that it appears to the human eye as a pure (saturated) color. Also unlike most lasers, its radiation is not spatially coherent, so it cannot approach the very high brightnesses characteristic of lasers.

- LEDs have many advantages over incandescent light sources, including lower power consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. In exchange for these generally favorable attributes, disadvantages of LEDs include electrical limitations to low voltage and generally to DC (not AC) power, inability to provide steady illumination from a pulsing DC or an AC electrical supply source, and lesser maximum operating temperature and storage temperature.
- In contrast to LEDs, incandescent lamps can be made to intrinsically run at virtually any supply voltage, can utilize either AC or DC interchangeably, and will provide steady illumination when powered by AC or pulsing DC even at a frequency as low as 50 Hz.
- LEDs usually need electronic support components to function, while an incandescent bulb can and usually does operate directly from an unregulated DC or AC power source.

57. Correct Option: (b)

Exp:

- A mosquito protein, called AEG12, strongly inhibits the family of viruses that cause yellow fever, dengue, West Nile, and Zika, and also weakly inhibits coronaviruses.
- While the researchers demonstrated that AEG12 was most effective against flaviviruses – the family of viruses to which Zika, West Nile, and others belong – they felt it is possible AEG12 could be effective against SARS-CoV-2, the coronavirus that causes Covid-19.
- But it will take years of bioengineering to make AEG12 a viable therapy for Covid-19. Part of the problem is AEG12 also breaks opens red blood cells, so researchers will have to identify compounds that will make it target viruses only.

58. Correct Option: (d)

Exp:

- The RoDTEP Scheme has replaced the popular Merchandise Exports from India Scheme (MEIS), as the latter has been found to violate global trade norms following a compliant from the United States at the World Trade Organization.
- Under the Scheme, the embedded central, state and local duties or taxes will get refunded and credited in an exporter's ledger account with customs. This can be used to pay basic customs duty on imported goods. The credits can also be transferred to other importers.
- Benefits of Remission of Duties and Taxes on Exported Products (RoDTEP) Scheme are extended to all export goods from January 1, 2021.
- The G.K. Pillai headed committee had sought data and evidence from industry that have suggested higher remission rates than 2%, 3% and 5%, payable as a percentage of realised free-on-board value as incentives under MEIS.

59. Correct Option: (b)

Exp:

- Recently, Project RE-HAB (Reducing Elephant – Human Attacks using Bees) was launched at four locations on the periphery of the Nagarhole National Park in Kodagu district of Karnataka.
- It is a unique, cost-effective way of preventing elephant – human conflicts without causing any harm to both, the animals and the humans.
- Under this project, bee boxes are used as a fence to prevent elephants from entering human habitation, thus reducing loss of lives and property.
- Elephants fear that the honey bees might sting them in their eyes and the inner side of the trunk. Also, the buzz of the bees irritates the elephants the most.
- Bee fences have reduced the movement of elephants at these points to a great extent. Night vision cameras installed at these locations have captured amazing footage of elephants' behaviour on seeing bee boxes.

- A number of elephants are seen returning to the jungles fearing honey bees. Also, no destruction of crops or property by elephants has been reported in these areas since the bee boxes have been placed on the passageways of elephants.

60. Correct Answer : (d)

Exp:

- Adjournment Motion is the procedure for adjournment of the business of the House for the purpose of discussing a definite matter of urgent public importance, which can be moved with the consent of the Speaker.
- The Adjournment Motion, if admitted, leads to setting aside of the normal business of the House for discussing the matter mentioned in the motion.
- To be in order, an adjournment motion must raise a matter of sufficient public importance to warrant interruption of normal business of the House and the question of public importance is decided on merit in each individual case.
- The purpose of an Adjournment Motion is to take the Government to task for a recent act of omission or commission having serious consequences.
- Its adoption is regarded as a sort of censure of the Government.
- It involves an element of censure against the government and hence Rajya Sabha is not permitted to make use of this device.
- The discussion on an adjournment motion should last for not less than two hours and thirty minutes. Hence, option (d) is correct.

61. Correct Answer : (c)

Exp:

- Equal Status with Lok Sabha In the following matters, the powers and status of the Rajya Sabha are equal to that of the Lok Sabha:

  1. Introduction and passage of ordinary bills.
  2. Introduction and passage of Constitutional amendment bills.
  3. Introduction and passage of financial bills involving expenditure from the Consolidated Fund of India.
  4. Election and impeachment of the president.
  5. Approval of ordinances issued by the President.
  6. Approval of proclamation of all three types of emergencies by the President.

- Special Powers of Rajya Sabha

  The Rajya Sabha has been given four exclusive or special powers that are not enjoyed by the Lok Sabha:

  1. It can authorise the Parliament to make a law on a subject enumerated in the State List (Article 249).
  2. It can authorise the Parliament to create new All-India Services common to both the Centre and states (Article 312).
  3. It alonecan initiate a move for the removal of the vice-president. In other words, a resolution for the removal of the vice-president can be introduced only in the Rajya Sabha and not in the Lok Sabha (Article 67).

  Hence, option (c) is correct.

62. Correct Option: (c)

Exp:

- The Viceroy, Lord Minto, and the Secretary of State for India, John Morley, agreed that some reforms were due so as to placate the Moderates, as well as the Muslims. They worked out a set of measures that came to be known as the Morley Minto (or Minto Morley) Reforms, that translated into the Indian Councils Act of 1909.
- The elective principle was recognised for the non-official membership of the Councils in India. Indians were allowed to participate in the election of various Legislative Councils, though on the basis of class and community.
- For the first time, separate electorates for the Muslims for election to the Central Council were established.
- The number of elected members in the Imperial Legislative Council and the Provincial Legislative Councils was

increased. In the Provincial Councils, non-official majority was introduced, but since some of these non-officials were nominated and not elected, the overall non-elected majority remained.

- The elected members were to be indirectly elected. The local bodies were to elect an electoral college, which in turn would elect the members of the Provincial Legislatures, who in turn would elect the members of the Central Legislature.
- The powers of the Legislatures – both at the Centre and in the Provinces— were enlarged and the Legislatures could now pass resolutions (which may or may not be accepted), ask questions and supplementaries, vote separate items in the budget, though the budget as a whole could not be voted upon.
- One Indian was to be appointed to the Viceroy's Executive Council (Satyendra Sinha was the first Indian to be appointed in 1909).

63. Correct Option: (d)

Exp:

- Dandi March (March 12-April 6, 1930) – On March 2, 1930, Gandhi informed the Viceroy of his plan of action. According to this plan (few realized its significance when it was first announced), Gandhi, along with a band of 78 members of Sabarmati Ashram, was to march from his headquarters in Ahmedabad through the villages of Gujarat for 240 miles. On reaching the coast at Dandi, the Salt Law was to be violated by collecting salt from the beach.
- Even before the proposed March began, thousands thronged to the Ashram.

  Gandhi gave the following directions for future action:
- Wherever possible Civil Disobedience of the Salt Law should be started. Foreign liquor and cloth shops can be picketed.
- We can refuse to pay taxes if we have the requisite strength.
- Lawyers can give up practice.
- Public can boycott law courts by refraining from litigation.
- Government servants can resign from their posts.
- All these should be subject to one condition – truth and non-violence as means to attain Swaraj should be faithfully adhered to.
- Local leaders should be obeyed after Gandhi's arrest.

64. Correct Option: (b)

Exp:

- Salient Features of the Swadeshi Movement –
  1. Tying of Raksha Bandhan was observed across Bengal that reflect unity between West Bengal and East Bengal.
  2. There was widespread boycott of imported clothes.
  3. There was increase in industrial unrest.
  4. There was promotion of domestic industry.

  The Swadeshi Movement is criticized as the movement was confined to the Bengali Bhadralok. There was no peasant involvement.

65. Correct Option: (d)

Exp:

- Tropical cyclones are violent storms that originate over oceans in tropical areas and move over to the coastal areas bringing about large-scale destruction caused by violent winds, very heavy rainfall and storm surges.
- Statement 1 is correct: Over the globe, about 80-85 tropical cyclones (with wind speed 34 knots or more) form every year and about 2/3 of these reach the very severe (wind speed 64 knots or more) stage. Most of the cyclone formations (87%) take-place between 20 N and 20 S. Tropical cyclones does not form over the equator because the Coriolis force is zero at the equator. Over the North Indian Ocean, (the Bay of Bengal and the Arabian Sea), on an average, about 5- 6 tropical cyclones form every year, out of which 2-3

may be severe. More cyclones form in the Bay of Bengal than in the Arabian Sea.

- Statement 2 is correct: About two-thirds of all cyclones occur in the Northern Hemisphere and twice as many tropical cyclones occur in the Eastern as compared to the Western Hemisphere. These differences are due to absence of tropical cyclones in the South Atlantic and the Eastern South Pacific Oceans.
- Tropical cyclones are seasonal phenomena and most basins have maximum frequency of formation during the summer to early Fall period with peak occurring during January to March in the Southern Hemisphere and July to September in the Northern Hemisphere (NH) with the exception of North Indian Ocean where the frequency of tropical cyclone is bi-modal in character with primary peak in November and secondary peak in May.
- Statement 3 is correct: Tropical cyclones in the North Indian Ocean (NIO) form between 5 degrees North and 20-degree North latitudes. Unlike other oceans in the Northern Hemisphere where there is only one season from May to November, there are two distinct seasons of tropical cyclones in the North Indian Ocean, (and not North Atlantic Ocean) One is from May to June and the other, from mid-September to December. This is a special feature of the NIO region only.
- May, June, October and November are known for severe storms in the Indian seas i.e., in the Bay of Bengal and the Arabian Sea. Almost the entire East Coast is vulnerable to cyclones with varying frequency and intensity.

66. Correct Option: (c)

Exp:

- Land resources in India Gross Cropped Area: It represents the total area sown once as well as more than once in a particular year. When the crop is sown on a piece of land for twice, the area is counted twice in GCA.
- Net Area Sown: It represents the total area sown with crops. The area sown more than once in the same year is counted only once.
- The cultivable/agriculture land has reduced by about 2.74 million hectare during the last two decades. However, during the same period the Gross Cropped Area (GCA) has increased from 182.28 million hectare to 196.50 million hectare, with net area sown remaining largely unchanged at 140 million hectare.

67. Correct option: (c)

Exp:

- Suitable Conditions Required for the Growth of Tea Climate: For the cultivation of tea, major geographical conditions required include a moderate temperature between the range of 21°C to 29°C and high rainfall between 150-200 cm.
- Relief: Mountain slopes have been adopted for tea gardens all over the tea regions of the monsoon lands. Undulating and well watered tracts, where the water escapes freely without serious soil erosion, offer best conditions for tea cultivation.
- Soils: Tea is grown in variety of soils. The best, however, is a light; friable loam with porous sub-soil which permits a free percolation of water, for tea is highly intolerant to stagnant water. In general the most suitable soils are slightly acidic and without calcium.
- Shade: Tea shrubs grow better when shielded from strong sunlight or violent winds. It is therefore usual in plantations to plant some large trees in between the shrubs to give shade not only to tea plants but also to the pickers.

68. Correct Option: (c)

Exp:

- Impacts of Rupee depreciation – Under Devaluation, the Central Bank intervenes in the forex market and buys the dollars. This leads to artificial shortage of dollars leading to increase in the value of Dollar

and decrease in the value of Rupee. It is mainly done to boost exports.

- It increases a country's export activity as its products and services become cheaper to buy and its imports become costly.
- Devaluation of rupee is good for NRIs repatriating money home as the foreign currency becomes more valuable with depreciating rupee.
- There is no guarantee that GDP growth rate increases drastically with devaluation of a rupee, since GDP growth rate depends on many other factors like Savings, Investments etc.

69. Correct Option: (b)

Exp:

- The Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement: The protection of the IPRs (The Intellectual Property Rights) under different Treaties – The Paris Convention (Industrial Property); The Berne Convention (Copyrights); The TRIPS Agreement – Certain minimum standards for the IPRs and applicable to all the member countries.
- The IPRs covered under the Agreement: Patents; Copyrights; Trademarks; GI Tags; Industrial Designs; Layout Design of Integrated Circuits; and Trade Secrets.
- 3 criteria for issuing the patents: Novel; Inventive step; and Capable of industrial application.
- Frivolous invention: Invention that harms the public order/morality/health of the animals, plants and humans; a method of agriculture or horticulture; traditional knowledge; computer programme; inventions related to atomic energy; plants and animals; and mere discovery of scientific principle cannot be patented under the Agreement.

70. Correct Option: (b)

Exp:

- Statement 1 is incorrect: Invasive species results in loss of biodiversity.
- Statement 4 is incorrect: Invasive species introduce pathogens that reduce crop and stock yields.

Invasive species

- Aliens are species that occur outside their natural range. Alien species that threaten native plants and animals or other aspects of biodiversity are called alien invasive species.
- They occur in all groups of plants and animals, as competitors, predators, pathogens and parasites, and they have invaded almost every type of native ecosystem.
- Biological invasion by alien species is recognised as one of the major threats to native species and ecosystems. This is because when non-native species are introduced into new areas, they have few or no natural predators to keep their populations in check.

Effects

- The effects on biodiversity are enormous and often irreversible.
- Loss of Biodiversity
- Decline of Native Species (Endemics)
- Habitat Loss
- Introduced pathogens reduce crop and stock yields
- Degradation of marine and freshwater ecosystems

71. Correct Option: (d)

Exp:

Wildlife Conservation

- Wildlife conservation refers to the well planned practice of ensuring protection for wild animal species, their habitats, and plants.
- Protected Areas, viz., National Parks, Sanctuaries, Conservation Reserves and Community Reserves covering important wildlife habitats have been created all over the country under the provisions of the Wild Life (Protection) Act, 1972 to conserve wild animals and their habitats.
- Financial and technical assistance is provided to the State/ Union Territory

Governments under the Centrally Sponsored Schemes of 'Integrated Development of Wildlife Habitats', 'Project Tiger' and 'Project Elephant' for providing better protection to wildlife, and improvement of its habitat.

- The Central Bureau of Investigation (CBI) has been empowered under the Wild Life (Protection) Act, 1972 to apprehend and prosecute wildlife offenders.
- The State/Union Territory Governments have been requested to strengthen the field formations and intensify patrolling in and around the Protected Areas.
- The Wildlife Crime Control Bureau has been set up to strengthen the enforcement of law for control of poaching and illegal trade in wildlife and its products.
- The Global Tiger Forum (GTF) is the only inter- governmental international body established with tiger range countries as members from willing countries to embark on a global campaign for addressing international issues related to tiger conservation and to protect the tiger. A Global Tiger Forum of Tiger Range Countries has been created for addressing international issues related to tiger conservation.

72. Correct Option: (a)

Exp:

- Statement 3 is incorrect: First five-year program for nano-research called 'nanomission' was launched in the year 2007.

Nanotechnology in India

- Efforts to promote research in nanotechnology in India began early in the millennium. The "NanoScience and Technology Initiative" started with a funding of Rs. 60 crores. In 2007, the government launched a 5-year program called Nano Mission with wider objectives and larger funding of USD 250 million. The funding spanned multiple areas like basic research in nanotechnology, human resources development, infrastructure development, and international collaboration. Multiple institutions like the Department of Information Technology, Defence Research and Development Organisation, Council of Scientific and Industrial Research, and Department of Biotechnology provided the funding to researchers, scholars, and projects.
- National Centers for Nanofabrication and Nanoelectronics were started in the Indian Institute of Science, Bangalore, and the Indian Institute of Technology, Mumbai.
- The efforts have paid off well. India published over 23000 papers in nanoscience in the past 5 years. In 2013, India ranked third in the number of papers published, behind only China and the USA.
- There have been 300 patent applications in the Indian Patent Office in 2013, ten times that of 2006. This points to the success of the Nano Mission initiative.
- But there is a lot of room for improvement. The amount India spends on nanotechnology research is still just a fraction of the research spending of countries like Japan, the USA, France, and China. The quality of research has shown only a little improvement from the NSTI phase (till 2006) to the nano mission phase (post-2007). Only 16 papers from India appeared in the top 1% of the publications in 2011. Also, the number of patents applied from India to the US patent office contributes to only 0.2% of the total applications.
- Central Institute of Fisheries Technology (CIFT) has developed nanotechnology solutions to prevent biofouling.
- CIFT's technology uses polyaniline and nano copper oxide. Aquaculture cages are fabricated primarily with high-density polyethylene (PE) webbings whose surface is to be coated with polyaniline and nano copper oxide and exposed in the open sea and estuarine environment. P Muhammed Ashraf, the Principal Scientist at CIFT, said field exposure studies were conducted at Vishakapatnam (open sea) for six months by exposing two treated webbings. The

results showed a significant biofouling resistance.

- The study concluded that the nano copper oxide present in the matrix acted as a point source above the electron clouds of polyaniline, preventing the initialization of biofilm.
- The First advanced microelectronics and nano energy facilities in NE India.
- The Indian Institute of Technology (IIT), Guwahati has established advanced microelectronics and nano energy facilities at its Centre for Nanotechnology which is the first-of-its-kind in the Northeast, according to officials.
- The centre aims at meeting future challenges and augmenting academic partnerships with industry in nanotechnology, will carry out multidisciplinary translational research in the fields of health care, nano biomaterials, micro and nanoelectronics, nano-energy devices, and sensors.

73. Correct Option: (c)

Exp:

- Empowering the Electoral Registration Officer:
  The Representation of the People Act (RPA), 1950, provides that a person may apply to the Electoral Registration Officer for inclusion of his/her name in the electoral roll of a constituency.
- According to the Election Laws (Amendment) Bill, 2021, the Electoral Registration Officer may ask for the Aadhaar Number of a person –
  to verify and establish the identity of the person;
  to authenticate entry in the Electoral Rolls; and
  to weed out multiple enrollments of the same person in the same or different constituencies.
- Note: Application for the inclusion of the name in the Electoral Rolls shall not be denied or the name from the Electoral Rolls shall not be deleted, if an individual does not furnish the Aadhaar Number, but furnishes other details, as prescribed by the Election Commission.
- The Bill provides 4 qualifying dates for the registration of the names in the Electoral Rolls in a calendar year, which will be the first day of January, April, July and October.

Gender Neutral Provisions:

- As per the RPA, 1950, the wives of the persons holding service qualifications are also deemed to be ordinarily residing in the same constituency of their husband.
- The RPA, 1951 Act enables the wife of a person holding a service qualification to vote either in person or by postal ballot.
- The Bill replaces the term 'wife' with 'spouse' in both the Acts.

74. Correct Option: (c)

Exp:

- 2,300 years old Buddhist site in AP's Kodavali under threat from mining. Kodavali Buddhist site comes from the golden era of Buddhism in coastal Andhra Pradesh.
- One of the first Buddhist rock edicts in Brahmi script was also found (dated to the 2nd Century CE).

75. Correct Option: (b)

Exp:

- Articles 239 to 241 in Part VIII of the Constitution deal with the union territories. Even though all the union territories belong to one category, there is no uniformity in their administrative system
- Statement 1 is incorrect: The Parliament (not the Supreme Court) can establish a high court for a union territory or put it under the jurisdiction of the high court of adjacent state.
- Statement 2 is correct: The Constitution does not contain any separate provisions for the administration of acquired territories. But, the constitutional provisions for the administration of union territories also apply to the acquired territories.
- Knowledge Base:
  During the British Rule, certain areas were

constituted as 'scheduled districts' in 1874. Later, they came to be known as 'chief commissioners provinces'. After independence, they were placed in the category of Part 'C' States and Part 'D' Territories. In 1956, they were constituted as the 'union territories' by the 7th Constitutional Amendment Act (1956) and the States Reorganisation Act (1956).

- Source: Indian Polity, M. Laxmikanth, 6th Edition Chapter 40

76. Correct Option: (b)

Exp:

- Various Civil and personal laws that govern marriage and other personal practices for communities prescribe certain criteria for marriage, including age of the bride and groom. For example, Section 5(iii) of The Hindu Marriage Act, 1955, sets a minimum age of 18 for the bride and 21 for the groom. This is the same for Christians under the Indian Christian Marriage Act, 1872 and the Special Marriage Act.
- Statement 1 is incorrect: The Prohibition Of Child Marriage (Amendment) Bill, 2021, which seeks to raise the legal age of marriage for Indian women from 18 to 21 years, was sent to a parliamentary standing committee. Since it is not passed yet, it doesn't have the force of the law. The Bill aims to eradicate child marriage and bring about parity in the marriageable age for men and women.
- Statement 2 is correct: The age limit is prescribed in the Prohibition of Child Marriage Act, 2006. This would require amendment to change the minimum age limit. It would also need to be followed by necessary changes in laws like the Hindu Marriage Act, the Indian Christian Marriage Act and the Special Marriage Act as well as personal laws.
- Statement 3 is correct: The latest health survey shows the bitter reality of child marriage in modern India, which seems to be on a decline but nowhere close to eradication. Every fourth woman surveyed in the age group of 20 to 24 was married before they turned 18. Although, there is a drop in the overall rate of child marriages, from 26.8 per cent in the earlier National Family Health Survey (NFHS) to 23.3 per cent in NFHS 5.
- Source: https://indianexpress.com/article/explained/legal-age-marriage-for-women-india-law-7676748/ https://www.indiaspend.com/indiaspend interviews/law-not-sufficient-to-bring social-change-thatwill-end-child-marriage-803628#:~:text=Mumbai%3A%20The%20Prohibition%20Of%20Child,age%20for%20men%20and%20wo men.

  https://www.edexlive.com/news/2021/nov/25/nfhs-5-every-fourth-woman-aged-20-24-fell-prey-tochild-marriage-even-as-percentage-drops-25844.html

77. Correct Option: (a)

Exp:

- The Committee of parliament on official languages is required to submit its report along with its recommendations to the President after reviewing the position regarding the use of Hindi in Central Government Offices on the basis of its observations.
- Statement 1 is correct: The Official Languages Act (1963) provided for the setting up of a Committee of Parliament on Official Language to review the progress made in the use of Hindi for the official purpose of the Union. Under the Act, this Committee was to be constituted after ten years of the promulgation of the Act (i.e., 26th January, 1965). Accordingly, this Committee was set up in 1976. This Committee comprises of 30 members of Parliament, 20 from Lok Sabha and 10 from Rajya Sabha.
- Statement 2 is correct: The Constituent Assembly made a provision to constitute two Commissions on the Official Language and a Committee of Parliament on Official Language in this respect under Article 344. Article 344 provides for the Commission

and Committee of Parliament on official language. It says that the President shall constitute a Commission representing the different languages specified in the English Schedule.

- Statement 3 is incorrect: The Secretariat of the Committee is headed by the Secretary of the Committee itself. The Secretary is assisted by the officers of the level of Under Secretary and other officials. They extend all required assistance in performing the various activities of the Committee. For administrative purposes, this office is subordinate office of Department of Official Language, Ministry of Home Affairs.
- Source: Indian polity by M laxmikanth. 6th edition pdf. Page no.1111 to 1113.

78. Correct Option: (b)

Exp:

- Statement 1 is incorrect: Peshwa Baji Rao II fled to British protection, and signed the Treaty of Bassein (1802) with the British East India Company, ceding territory for the maintenance of a subsidiary force and agreeing to treaty with no other power. Daulat Rao Scindia, Raghuji Bhonsle combined their forces and tried to enlist Jaswant Rao Holkar's support. But even in the face of such national peril, Holkar kept himself out of the combination. Gaikwar also remained neutral. Thus, it was not fought by the British East India Company against the united confederacy of Maratha chiefs of the Peshwas, Gaekwads, Holkars, Scindias and Bhonsle.
- Statement 2 is correct: The British defeated all of the Maratha army in these conflicts. In 1803 the Scindias signed the Treaty of Surjianjangaon. In 1803, the Bhonsles signed the Treaty of Deogaon, by which the English obtained Cuttack, Balasore, and the region west of the Wardha River. The Holkars signed the Treaty of Rajpurghat in 1805, giving away Tonk, Bundi, and Rampura to the British and with this it came to an end.
- Statement 3 is correct: By the treaty of Deogaon (Dec. 18,1803) Bhonsle ceded the Province of Cuttack including Balasore and all his territory west of the river Warda. Scindia after his defeat signed the treaty of Surjiarjangao (Dec. 30, 1803) surrendered all his territories between the Ganges and the Jumna and his forts and territories north of Jaipur, Jodhpur and Gohad. Ahmandnagar, Broach and all territories west of the Ajanta hills were also surrendered. As a result of the conflict, the British gained control over significant swaths of central India.
- Source: https://www.historydiscussion.net/maratha/the-second-anglo-maratha-war anoverview/5936
- Spectrum revised edition 2019 Chapter-5 page-105

79. Correct Option: (a)

Exp:

- The policy of ring fence was followed during the period of 1765 to 1813.
- Statement 1 is correct: Warren Hastings followed a policy of ring fence. The British kept the states of their allied rulers as buffer states between their territory and the territory of an enemy ruler and, later on, they attempted to manage their foreign policies according to their desires with a view to checking their combination against them
- Statement 2 is incorrect: During this period, the British treated native states as independent states. By that time, the British had not become the supreme power of India. Therefore, they could not interfere everywhere nor could claim complete sovereignty over those native rulers who became their allies
- Statement 3 is incorrect: The policy of annexation was not abandoned to create buffer states. The buffer states emerged initially with the idea of defence of the frontiers of the Company. With the arrival of Wellesley, the Company's relations with the Indian states underwent a massive

change. Wellesley sought to reduce the Indian states into a position of dependence on the Company. He aimed at bringing the Indian states under the jurisdiction of British political power and the military protection. The policy of annexation was abandoned after the revolt of 1857 and not before that.

- Source: Spectrum revised edition 2019 Chapter-5 page-119, 120

80. Correct Option: (d)

Exp:

- The Revolt of 1857 started on 10th May was a major uprising in India in 1857–58 against the rule of the British East India Company which functioned as a sovereign power on behalf of the British Crown. It is also named as the Sepoy Mutiny, the Indian Mutiny, the Great Rebellion, the Revolt of 1857, the Indian Insurrection, and the First War of Independence. It occurred as the result of an accumulation of different factors over time, rather than any single event.
- Statement 1 is correct. The East India Company created a lot of discontent and disaffection among the dispossessed ruling families and their successors by her conquest. Many dependents on the ruling families who lost their means of livelihood and other common people were disillusioned and disaffected with the alien rule. Like- the annexation of Punjab by Lord Dalhousie adding humiliation to the ruling family.
- Statement 2 is correct. The British policy of territorial annexations led to the displacement of many rulers and chiefs. The vigorous application of the policies of Subsidiary Alliance and Doctrine of Lapse angered the ruling sections of the society. Discontent and dissatisfaction were especially strong in those regions, which were believed to have been lost their independence. As a consequence of Subsidiary Alliance, lakhs of soldiers and officers were deprived of their hereditary livelihood, spreading misery and degradation in the country.
- Statement 3 is correct. Rampant corruption in the Company's administration, especially among the police, petty officials and lower law courts, was a major cause of discontent.
- Statement 4 is correct. The Indian sepoy was unhappy with his emoluments compared to his British counterpart. Also, the Indian sepoy was made to feel a subordinate at every step and was discriminated against racially and in matters of promotion and privileges.

81.Correct option: (d)

Exp:

Frost Wedging

- Frost wedging (or ice wedging) happens when water seeps into cracks, and then expands upon freezing. The expansion enlarges the cracks.
- The effectiveness of frost wedging depends on how often freezing and thawing occurs.
- Frost wedging won't be as important in warm areas where freezing is infrequent, in very cold areas where thawing is infrequent, or in very dry areas, where there is little water to seep into cracks.
- Frost wedging is most effective in Canada's climate, where for at least part of the year temperatures oscillate between warm and freezing.
- A common feature in areas of effective frost wedging is a talus slope — a fan-shaped deposit of fragments removed by frost wedging from the steep rocky slopes above.

82. Correct option: (b)

Exp:

- Statement 1 is incorrect: Himalayan Rivers are example of antecedent drainage system while Peninsular Rivers are example of consequent drainage system.

Drainage System in India

- The Himalayas are drained by 19 major rivers, of which the Indus and the Brahmaputra are the largest, each having

catchment basins in the mountains of about 100,000 square miles (260,000 square km) in extent.

- Five of the 19 rivers, with a total catchment area of about 51,000 square miles (132,000 square km), belong to the Indus system—the Jhelum, the Chenab, the Ravi, the Beas, and the Sutlej—and collectively define the vast region divided between Punjab state in India and Punjab province in Pakistan.
- Of the remaining rivers, nine belong to the Ganges system—the Ganges, Yamuna, Ramganga, Kali (Kali Gandak), Karnali, Rapti, Gandak, Baghmati, and Kosi rivers—draining roughly 84,000 square miles (218,000 square km) in the mountains, and three belong to the Brahmaputra system—the Tista, the Raidak, and the Manas—draining another 71,000 square miles (184,000 square km) in the Himalayas.
- The Peninsular river system is older than the Himalayan river system. It is evident from the broad, largely-graded shallow valleys, and the maturity of the rivers.
- The Western Ghats running close to the western coast is the main water divide between the major Peninsular Rivers, discharging their waters in the Bay of Bengal and as small rivulets joining the Arabian Sea.
- Most of the major Peninsular Rivers except Narmada, Tapi, Sabarmati and Mahi flow towards the west.
- Mahanadi, Kaveri, Godavari, Krishna rivers have a fixed course and there is an absence of meanders, and the flow of water is non-perennial. And Narmada and Tapi flow through the rift valley

83. Correct Option: (b)

Exp:

- Statement 1 is incorrect:The phenomenon Western disturbances are usually associated with cloudy sky, higher night temperatures and unusual rain.

Impact of Western Disturbances in India

- Western Disturbances are the cause of the most winter and pre-monsoon season rainfall across North-West India. This phenomenon is usually associated with cloudy sky, higher night temperatures and unusual rain.
- It is estimated that India gets close to 5-10% of its total annual rainfall from western disturbances.
- In winter, western winds bring moderate to heavy rain in low lying areas and heavy snow to mountainous areas of the Indian subcontinent.
- India is a rain dependent country and while the south west monsoon covers most of India, parts of North India don't get much rain from it. These regions depend upon snow and rain from western disturbance during the winter season from November to March.
- Precipitation during the winter season has great importance in agriculture particularly for Rabi crops including wheat, which is one of the most important Indian crops.
- They start declining after winter. During the summer months of April and May, they move across North India and at times help in the activation of monsoon in certain parts of northwest India.
- During the monsoon season, western disturbances may occasionally cause dense clouding and heavy precipitation.
- Weak western disturbances are associated with crop failure and water problems across north India.
- Strong western disturbances can help residents, farmers and governments avoid many of the problems associated with water scarcity.

84. Correct Option: (c)

Exp:

- The share of Railways in transportation of surface freight has declined sharply since independence – from 89% in 19050-51 to just 30% in 2011-12. Many of the reasons for this phenomenon are the same as the various larger systemic issues plaguing the railways.
- Option 1 is correct: The Economic Survey 2017-18 identified Non-Competitive Tariffs as the primary reason for the fall in the

railways' share of surface freight transportation. This means that the prices charged by the Railways for transportation of freight are very high compared to other modes such as waterways and roads. This is because of the policy of cross subsidisation. This means that in order to keep prices of passenger tickets relatively unchanged (to remain competitive compared to air fare as well as to support the poor section of the society) for the past many decades, despite high inflation rates, the Railways has to charge high rates for freight transportation in order to at least break even. This makes railways a less profitable option for transportation for businesses, who subsequently choose other modes.

- Option 2 is incorrect: The network of the railways and the number of wagons dedicated to freight movement are very vast and adequate, especially compared to the relatively new and fledgling modes like waterways. So, this statement is incorrect.
- Option 3 is correct: Due to a combination of factors like
  1) the high traffic of passenger trains which are often given a priority over goods trains
  2) Little to no new addition of new railway lines
  3) old, non-updated safety and switching infra (mostly manual)
  The speed of freight trains is quite slow and often railways prove to be a time taking and a time inefficient way to get things transported for businesses. So, they prefer other faster transportations like roadways which have drastically improved in the last few decades, for e.g. the ever-increasing high quality fast national highway system.
- Option 4 is correct: The Railways have not covered the issue of last mile connectivity. Once the freight reaches from one place to another, the business has to take steps to manage its transportation to and from the railway station. There are no seamless last mile connectivity services like feeder buses that would ease the task for businesses. So, they instead prefer transportation like the roadway where they get doorstep delivery and don't have to worry or spend on local transportation and personnel to oversee last mile connection.
- Source: https://prsindia.org/policy/analytical reports/state-indian-railways https://economictimes.indiatimes.com/industry/transportation/railways/railways-freight-trafficdeclining-on-non-competitive-tariff-survey/articleshow/62696638.cms?from=mdr

85. Correct Option: (b)

Exp:

- India first opened up the insurance sector in the year 2000 under the Atal Bihari Vajpayee government when it allowed private sector firms to set up insurance companies and allowed FDI of 26 per cent.
- The parliament passed the Insurance Amendment Bill 2021 to increase the foreign direct investment (FDI) limit in the insurance sector to 74% from 49%. It is an important shift in stance as the increase in the FDI cap means insurance companies can now be foreign-owned and -controlled as against the earlier situation wherein they are only Indian-owned and -controlled.
- Statement 1 is correct: A higher FDI limit will help insurance companies access foreign capital to meet their growth requirements. Foreign investment can give the much-required financial shot in the arm for expanding distribution and operations
- A higher FDI cap will also mean that more promoters could now completely exit or bring down their stakes in their insurance joint ventures. It will also provide a reprieve to many state-owned banks who are dependent on the government to meet their own regulatory capital requirement and are being discouraged from putting more money into what is considered as a 'non-core' business.
- Statement 2 is correct: Overall insurance penetration in India is close to 4%, compared to a global average of around 7%. Non-life penetration stood at barely 1%

- With a population of more than 1.3 billion, India requires far higher insurance penetration than any other nation. Increase in foreign investment limits, which will boost insurance distribution, is also likely to positively impact insurance penetration.
- Another area getting impacted from a consumer point of view could be higher inclusion of the rural and semi-urban population.
- Statement 3 is incorrect: Another positive impact area would be job creation. More investments are likely to trigger expansion plans for insurance companies that will look at reaching out to more people and create more jobs in the process.
- Statement 4 is correct: Higher FDI limits could see more global insurance firms and their best practices entering India. This could mean higher competition and better pricing of insurance products. Policy holders will get a wide choice, access to more innovative products and a better customer service and claims settlement experience. It will translate into better services, competitive products and pricing, technological innovations etc.
- Source: https://www.financialexpress.com/industry 74-fdi-in-insurance-sector-boost-in insurancedistribution-jobs-creation-what-it means-for-consumers/2278429/ https://theprint.in/theprint-essential/74-fdi-in-insurance-what-this-means-for-policy-holdersindian-companies-promoters/624624/

86. Correct Option: (a)

Exp:

- India's textiles sector is one of the oldest industries in the Indian economy, dating back to several centuries.
- India's Textiles industry has around 4.5 crore employed workers including 35.22 lakh handloom workers across the country. The industry contributed 7% to the industry output (by value) in 2018-19. The Indian textiles and apparel industry contributed 2% to the GDP, 12% to export earnings and held 5% of the global trade in textiles and apparel in 2018-19. e Indian textile and garment industry employs 45 million people, out of which more than 60 percent are women. This makes it the biggest formal employer of women in a country.
- Recently, PM MEGA INTEGRATED TEXTILES REGION AND APPAREL PARK (MITRA) Scheme has been launched with a view to attract investment, boost employment generation and position India strongly in the global textile market
- Source: https://pib.gov.in/Pressreleaseshare.aspx?RID=1776857 https://www.ibef.org/industry/tourism-hospitality-india.aspx Economic Survey 2021-2022: Chapter 8 Industry and Infrastructure

87. Correct Option: (c)

Exp:

- Statement 2 is incorrect: Unburnt hydrocarbons are converted into carbon dioxide and water. Nitric oxide is converted into nitrogen.
- Statement 3 is incorrect: Motor vehicles equipped with catalytic converter should use unleaded petrol.

Catalytic Converters

- Catalytic converters, having expensive metals namely platinum, palladium and rhodium as the catalysts, are fitted into automobiles for reducing the emission of poisonous gases.
- As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water, and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas, respectively.
- Motor vehicles equipped with catalytic converter should use unleaded petrol because the lead in the petrol inactivates the catalyst.

88. Correct Option: (c)

Exp:

- Statement 1 is incorrect: Gross Primary Productivity is the rate production of organic matter during photosynthesis.
- Statement 2 is incorrect: Net Primary Productivity is available as biomass for consumption by heterotrophs.

Productivity

- Primary productivity in ecosystem is defined as the rate of biomass/organic matter production by plants during photosynthesis.
- It can be divided into gross primary productivity (GPP) and net primary productivity (NPP).
- Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis.
- A considerable amount of GPP is utilized by plants in respiration.
- Gross primary productivity minus respiration losses (R) is the net primary productivity (NPP).

GPP – R = NPP

- Net primary productivity is the available biomass for the consumption to heterotrophs (herbivores and decomposers).
- Secondary productivity is defined as the rate of formation of new organic matter by consumers.

89. Correct Option: (d)

Exp:

Nitrogen fixation:

- Plants need nitrogen to make themselves.
- Without nitrogen, a plant cannot make the proteins, amino acids and even its very DNA.
- This is why when there is a nitrogen deficiency in the soil, plants are stunted.
- They simply cannot make their own cells. If there is nitrogen all around us, as it makes up 78 percent of the air we breathe.
- In order for plants to use the nitrogen in the air, it must be converted in some way to nitrogen in the soil. This can happen through nitrogen fixation, or nitrogen can be "recycled" by composting plants and manure.
- There are two routes to go when fixing a nitrogen deficiency in the soil, either organic or non-organic.

Organic

- To correct a nitrogen deficiency using organic methods requires time, but will result in a more even distribution of the added nitrogen over time.

Some organic methods of adding nitrogen to the soil include:

- Adding composted manure to the soil Planting a green manure crop, such as borage Planting
- Nitrogen fixing plants like peas or beans.
- Adding coffee grounds to the soil. Non-organic
- Nitrogen as a plant fertilizer is common when purchasing chemical fertilizers.
- When looking to specifically add nitrogen to your garden, choose a fertilizer that has a high first number in the NPK ratio. The NPK ratio will look something like 10-10-10 and the first number tells you the amount of nitrogen.
- Using a nitrogen fertilizer to fix a nitrogen deficiency in the soil will give a big, fast boost of nitrogen to the soil, but will fade quickly.

90. Correct Option: (c)

Exp:

- Statement 2 in incorrect: Edge computing distributes processing, storage, and applications across a wide range of devices and data centers, which makes it difficult for any single disruption to take down the entire network.

Edge computing

- It is estimated that by 2025 75% of data generation and processing will happen outside of traditional centralised data centers — that is, at the "edge" of the cloud.
- Edge computing allows data to be analysed, processed, and transferred at the edge of a network. So, the data is will be analysed locally where it is stored in real-time without latency.

- The most important benefit of localized processing in edge computing is that it will increase network performance by reducing latency.
- Benefits of edge computing Speed: The most important benefit of edge computing is its ability to increase network performance by reducing latency (ability to process very high volumes of data with minimal delay). It allows for quicker data processing and content delivery.
- Security: Centralized cloud computing architecture is vulnerable to distributed denial of service (DDoS) attacks and power outages. Edge computing distributes processing, storage, and applications across a wide range of devices and data centers, which makes it difficult for any single disruption to take down the network. Since more data is being processed on local devices rather than transmitting it back to a central data center, edge computing also reduces the amount of data actually at risk at any one time.
- Scalability: Expanding data collection and analysis no longer requires companies to establish centralized, private data centers, which can be expensive to build, maintain, and replace when it's time to grow again. Edge computing offers a far less expensive route to scalability, allowing companies to expand their computing capacity through a combination of IoT devices and edge data centers.

91. Correct Option: (a)

Exp:

- Statements 3 is incorrect: SAARC satellite project has the participation of all the SAARC member countries except Pakistan.

Cartosat series satellite:

- Cartosat satellites are earth observation satellites, used mainly for large-scale mapping of the Earth through highresolution cameras.
- They help to detect changes in natural geographical or man-made features.
- ISRO successfully launched Cartosat-3 and 13 commercial nanosatellites from Satish Dhawan Space Centre (SDSC), Sriharikota.
- Cartosat-3 satellite is a third-generation agile advanced satellite having high resolution imaging capability.
- The mission life of the Cartosat-3 is 5 years.
- It will be followed by additional satellites of the same design, namely Cartosat-3A and 3B, next year.
- Orbit Type: Sun synchronous polar orbit (SSPO) at altitude of 509 km.
- SSPO are polar orbits which are synchronous with the Sun i.e. in these orbits, Earth's surface is always illuminated by the Sun at the same angle when viewed from the satellite.

Launch Vehicle: PSLV-C47

- It was navigated for the first time using the indigenous Vikram processor designed by the ISRO and fabricated within the country.
- The Vikram Processor is to be used for rocket's navigation, guidance and control and also for general processing applications.

Types of the orbit:

- Polar Sun-Synchronous orbit: It is a nearly polar orbit around a planet, in which the satellite passes over any given point of the planet's surface at the same local mean solar time.
- Geosynchronous orbit: It is an orbit around Earth of a satellite with an orbital period that matches Earth's rotation on its axis, which takes one sidereal day.
- Geostationary orbit: It is a circular geosynchronous orbit 35,786 km (22,236 mi) above Earth's equator and following the direction of Earth's rotation.
- SAARC Satellite: Also known as GSAT-9, it is a geosynchronous communications and meteorology satellite by launched by ISRO.

- It was launched for the South Asian Association for Regional Cooperation (SAARC) region.
- Afghanistan, Bangladesh, Bhutan, Nepal, Maldives and Sri Lanka are the users of the multi-dimensional facilities provided by the satellite. Pakistan has refused to participate in the programme.
- By launching the GSAT-9 'South Asia satellite', India has reaffirmed the ISRO's scientific prowess, but perhaps it is more geopolitical than geospatial.

92. Correct Option: (b)

Exp:

- Ukraine borders Belarus, Hungary, Moldova, Poland, Romania, Russia and Slovakia.

93. Correct Option: (d)

Exp:

Issues with Application for Crypto Currencies:

- Currency qualities and monetary regulations have developed and are well regulated, and it is unclear if crypto currencies are compatible with them.
- Macro-economic consequences of Blockchain-based crypto currencies are not well-understood.
- The value of the crypto assets is determined by their ability to be swapped for other currencies.
- Unclear Price Determination: Because the crypto assets are only used to trade a small number of commodities, their price determinations in relation to the sovereign fiat currencies are uncertain.
- Induces Inequality: Apart from the critical price stability difficulties, they also have the potential to exacerbate inequality, as only a few have access to it.
- Environmental Impact: The overall carbon footprint of the crypto currencies is comparable to that of a few megacities, and mining assets in this manner is unwieldy, energy- inefficient and unsustainable.

94. Correct Option: b

Exp:

- Scheduled castes and scheduled castes and scheduled tribes and those castes or tribes as the President may by public notification. Articles 341 and 342 of the Constitution of India define as to who would be Scheduled Castes and Scheduled Tribes with respect to any State or Union Territory.
- Statement 1 is incorrect: The Constitution does not specify the castes or tribes which are to be called the SCs or the STs. It leaves to the President the power to specify as to what castes or tribes in each state and union territory are to be treated as the SCs and STs. Thus, the lists of the SCs or STs vary from state to state and union territory to union territory. Similarly, the constitution has not specified the classes of citizens who are to be called the socially and educationally backward classes, also known as Other Backward Classes (OBCs).
- Statement 2 is correct: In case of the states, the President issues the notification after consulting the governor of the state concerned. But, any inclusion or exclusion of any caste or tribe from Presidential notification can be done only by the Parliament and not by a subsequent Presidential notification. Presidents have issued several orders specifying the SCs and STs in different states and union territories and these

have also been amended by the Parliament.

- Statement 3 is incorrect: Any inclusion or exclusion of any caste or tribe from Presidential notification can be done only by the Parliament and not by a subsequent Presidential notification.
- Source: Indian polity by M laxmikanth. 6th edition pdf. Page no. 1140.

95. Correct Option: (c)

Exp:

- Despite of India's rapid economic growth, begging as a social problem has existed in our society since inception of human civilization and still persists even after our government intended to abolish it by taking lot of measures and bringing in legislations.
- Statement 1 is incorrect. Begging is a state subject, and there isn't a central law governing this. As per the 7th Schedule of the Constitution of India and under serial no. 9 of State List, the subject matter of "Relief of the disabled and unemployable" comes under the purview of State List. The States are responsible for taking necessary preventive and rehabilitative steps.
- Statement 2 is incorrect. India has no central law on begging and destitution. As many as 20 States and 2 Union Territories have either enacted their own Anti Beggary Legislation or adopted legislations enacted by other States/UTs. i.e., the Bombay Prevention of Begging Act, 1959, which carries a penalty of detention of three to 10 years in beggar homes.
- Statement 3 is correct. The Juvenile Justice (Care and Protection of Children) Act, 2015 is the primary law for children in the country. As per the law, whoever employs or uses any child for the purpose of begging or causes any child to beg shall be punishable with imprisonment for a term which may extend to five years and shall also be liable to fine of one lakh rupees.
- Source: https://www.legalserviceindia.com/legal article-1367-beggary-laws-in-india-a constitutionalanalysis.html

  https://www.hindustantimes.com/editor als/the-supreme-court-is-right-on begging 101627471711972.html#:~:text=India%2h as%20no%20federal%20law,10%20years %20in%20beggar%20homes.

  https://pib.gov.in/Pressreleaseshare.asp? PRID=1564072

  https://pib.gov.in/PressReleaseIframePag e.aspx?PRID=1697420#:~:text=As%20per %20Section%2076%20of,fine%20of%20on e%20lakh%20rupees.

96. Correct Option: (b)

Exp:

- Under Article 352, the President can declare a national emergency when the security of India or a part of it is threatened by war or external aggression or armed rebellion (earlier internal disturbances). Its history of invoking is as under:
- Statement 1 is incorrect. Since Independence, three National Emergency has been proclaimed (1962, 1971 and 1975). The first two proclamations (1962 and 1971) were made on the ground of 'external aggression'. The first proclamation was issued in 1962 on account of Chinese aggression in the NEFA (North-East Frontier Agency). It was in force till January 1968. Hence, a fresh proclamation was not needed at the time of war against Pakistan in 1965. The second proclamation of national emergency was made in December 1971 in the wake of attack by Pakistan.
- Statement 2 is correct. The 1975 National Emergency was declared on 25 June 1975. It was made on the ground of 'internal disturbance', that is, certain persons have been inciting the police and the armed forces against the discharge of their

duties and their normal functioning. For example, Jayaprakash in a massive demonstration in Delhi's Ramlila grounds on 25 June 1975 asked the army, the police and government employees not to obey "illegal and immoral orders".

- Statement 3 is incorrect. The Bihar Movement was a political movement initiated by students in the Indian state of Bihar in 1974. It was launched before emergency were declared.
- The Bihar Movement (1974-75) under the leadership of Jayaprakash Narayan aimed at a 'Total Revolution' in the country. It was against misrule and corruption in the state government. It later turned against Prime Minister Indira Gandhi's government in the central government. It was also called Sampoorna Kranti and JP Movement.
- Source: Political Science, Class 12th Chapter 6. Crisis of democratic order Laxmikanth, 4th Edition, Chapter 16, Emergency Provisions

97. Correct Option: (b)

Exp:

- Statement 1 is incorrect. Dupleix was recalled in 1754 due to the initial defeat of the French army in the Second Carnatic War. The Battle of Wandiwash was a decisive battle of the Third Carnatic War, which was won by the English on January 22, 1760 at Wandiwash (or Vandavasi) in Tamil Nadu.
- Statement 2 is correct. The victory at Wandiwash left the English East India Company with no European rival in India.
- Statement 3 is incorrect. Significantly, in the Battle of Wandiwash, natives served in both the armies-of English and French-as sepoys.
- Source: (Spectrum revised edition 2019; chapter-3 Advent of Europeans in India, page -49,50,51)

98.Correct Answer : (c)

Exp:

Indian Councils Act of 1861

- The features of this Act were as follows:

1. It made a beginning of the representative institutions by associating Indians with the law-making process. It, thus, provided that the Viceroy should nominate some Indians as non-official members of his expanded council. In 1862, Lord Canning, the then Viceroy, nominated three Indians to his legislative council–the Raja of Benaras, the Maharaja of Patiala and Sir Dinkar Rao.

2. It initiated the process of decentralization by restoring the legislative powers to the Bombay and Madras Presidencies. It, thus, reversed the centralizing tendency that started from the Regulating Act of 1773 and reached its climax under the Charter Act of 1833. This policy of legislative devolution resulted in the grant of almost complete internal autonomy to the provinces in 1937.

Hence, statement 2 is incorrect.

3. It also provided for the establishment of new legislative councils for Bengal, North-Western Provinces and Punjab, which were established in 1862, 1886 and 1897,respectively.

4. It empowered the Viceroy to make rules and orders for the more convenient transaction of business in the council. It also gave a recognition to the 'portfolio' system, introduced by Lord Canning in 1859. Under this, a member of the Viceroy's council was made in-charge of one or more departments of the Government and was authorized to issue final orders on behalf of the council on matters of his department(s).

5. It empowered the Viceroy to issue ordinances, without the concurrence of the legislative council, during an emergency. The life of such

99. Correct Option: (d)

Exp:

Biosphere reserves

- Biosphere reserves are sites established by countries and recognized under

UNESCO's Man and the Biosphere (MAB) Programme to promote sustainable development based on local community efforts and sound science.

Biosphere reserves are demarcated into following 3 inter-related zones:

- Core Zone: Core zone must contain suitable habitat for numerous plant and animal species, including higher order predators and may contain centres of endemism.
- Core areas often conserve the wild relatives of economic species and also represent important genetic reservoirs having exceptional scientific interest. A core zone being National Park or Sanctuary/protected/regulated mostly under the Wildlife (Protection) Act, 1972.
- Whilst realizing that perturbation is an ingredient of ecosystem functioning, the core zone is to be kept free from human pressures external to the system.
- Buffer Zone: The buffer zone, adjoins or surrounds core zone, uses and activities are managed in this area in the ways that help in protection of core zone in its natural condition.
- These uses and activities include restoration, demonstration sites for enhancing value addition to the resources, limited recreation, tourism, fishing, grazing, etc; which are permitted to reduce its effect on core zone. Research and educational activities are to be encouraged.
- Human activities, if natural within BR, are likely to continue if these do not adversely affect the ecological diversity.
- Transition Zone: The transition area is the outermost part of a biosphere reserve. This is usually not delimited one and is a zone of cooperation where conservation knowledge and management skills are applied and uses are managed in harmony with the purpose of the biosphere reserve. This includes settlements, crop lands, managed forests and area for intensive recreation and other economic uses characteristics of the region.
- A site that must contain an effectively protected and minimally disturbed core area of value of nature conservation.
- The core area must be typical of a biogeographical unit and large enough to sustain viable populations representing all trophic levels in the ecosystem.
- The management authority to ensure the involvement/cooperation of local communities to bring variety of knowledge and experiences to link biodiversity conservation and socio-economic development while managing and containing the conflicts.
- Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of environment.

100. Correct Option: (b)

Exp:

- Statement 3 is incorrect: Since the availability of carbonate ions decreases, calcification is harder to achieve and the shells ends up being thinner and fragile.

Ocean Acidification

- Increase in CO_2 concentrations not only leads to warmer oceans but also to more acidic oceans.
- As the uptake of atmospheric carbon dioxide by the ocean increases, the concentration of hydrogen ions in the ocean increases, the concentration of carbonate ions decreases, the pH of the oceans decreases and the oceans become less alkaline – this process is known as ocean acidification.
- Carbonic acid reacts with carbonate ions in the water to form bicarbonates. Ocean Acidification will convert more carbonate ions (which are required for shell-building by marine organisms) into bicarbonates, the animals need to expend more energy to build their shells. As a result, the shells end up being thinner and more fragile.
- In the long run, this reaction will allow the ocean to soak up excess carbon dioxide because more acidic water will

dissolve more rock, release more carbonate ions, and increase the ocean's capacity to absorb carbon dioxide

- Deep, cold ocean waters are naturally under saturated with carbonate ions causing the shells of most calcifying organisms to dissolve.
- Surface waters are over saturated with carbonate ions and do not readily dissolve shells of calcifying organisms.
- The saturation horizon is the level below which calcium carbonate minerals undergo dissolution.
- Ocean acidification causes this horizon to rise vertically in the water column so more and more calcifying organisms will be exposed to under saturated water and thus vulnerable to dissolution of their shells and skeletons.
- The saturation horizon of calcite (relatively less soluble mineral form found in the shells of planktonic algae, some corals, echinoderms, and some mollusks) occurs at a greater ocean depth than that for aragonite (more soluble form of calcium carbonate; it is found in most corals, most mollusks)
- The current increased rate of dissolution of atmospheric CO2 into the ocean results in an imbalance in the carbonate compensation depth (CCD), the depth at which all carbonate is dissolved.
- As the pH of the ocean falls, it results in a shallowing of the CCD, thus exposing more of the shells trapped in the sediments to under saturated conditions causing them to dissolve, which will help buffer ocean acidification but over a long time scale of a thousand years.