

**Q1: Answer: a**

Option 1: This statement is correct. Cyclogenesis and frontogenesis are distinct processes. Cyclogenesis refers to the development or intensification of a cyclone, while frontogenesis is the formation or strengthening of fronts. Although they can occur in proximity, they are not directly dependent on each other.

Option 2: This statement is incorrect. Occluded fronts occur when a warm front is overtaken by a cold front, not the other way around. The lifting of both air masses results in an occluded front.

Option 3: This statement is incorrect. Warm air masses are generally more effective in frontogenesis, as they tend to lift over denser, cold air masses, leading to the development of fronts.

Option 4: This statement is correct. Trowal, short for Trough of Warm Air Aloft, is a term used to describe the transition zone between two different air masses. It is associated with the occluded front of a mature cyclone.

Hence, the answer is A) 1 and 4 only.

**TRIVIA**

**Cyclogenesis:**

Cyclogenesis refers to the process of development or formation of a cyclone or low-pressure system. Cyclones are large-scale atmospheric systems characterized by rotating winds around a low-pressure center. There are different types of cyclones, including tropical cyclones, extratropical cyclones, and mesocyclones. The term is often used in the context of extratropical cyclones, which typically form at mid-latitudes.

**Key Features of Cyclogenesis:**

1. **Baroclinic Zones:**
  - Cyclogenesis often occurs in regions with temperature gradients, known as baroclinic zones. These zones provide the necessary conditions for the development of low-pressure systems.
2. **Fronts:**
  - Fronts, which are boundaries between air masses with different temperatures and humidity, play a crucial role in cyclogenesis. The interaction of warm and cold air masses at fronts can lead to the development of low-pressure centers.
3. **Upper-Level Support:**
  - Upper-level disturbances, such as troughs in the jet stream, can contribute to cyclogenesis by providing a favorable environment for the ascent of air.
4. **Convergence and Lifting:**
  - Air convergence along a front leads to lifting, and as air rises, it cools and forms clouds. This process contributes to the intensification of the low-pressure system.
5. **Rotation:**
  - The Coriolis effect, caused by the Earth's rotation, induces the rotation of the developing low-pressure system. In the Northern Hemisphere, cyclones

rotate counterclockwise, while in the Southern Hemisphere, they rotate clockwise.

6. **Maturity and Occlusion:**

- The mature stage of a cyclone involves the occlusion process, where the warm sector is lifted off the surface, and the low-pressure center becomes less well-defined.

**Frontogenesis:**

Frontogenesis is the process of the development or strengthening of a front, which is a transition zone between two air masses with different properties, such as temperature, humidity, and air density. Frontogenesis is crucial for the intensification of weather systems and the formation of cyclones.

**Key Features of Frontogenesis:**

1. **Temperature Contrasts:**
  - Frontogenesis often occurs in regions where there are significant temperature contrasts between air masses. Warm air rises over cold air, leading to the development of a front.
2. **Convergence:**
  - Convergence of air along the front results in the lifting of air, leading to cloud formation and potential precipitation.
3. **Enhanced Vertical Motion:**
  - Frontogenesis enhances the vertical motion of air, contributing to the intensification of weather systems.
4. **Shear in Wind Fields:**
  - Shear in the horizontal wind fields plays a role in frontogenesis. The convergence of winds at different speeds can lead to the development or strengthening of fronts.
5. **Upper-Level Support:**
  - Similar to cyclogenesis, upper-level support, such as the presence of an upper-level trough, can contribute to frontogenesis.

**Q2: Answer: A**

**Explanation:**

- 1) Reduced government borrowing from external sources: This is partially true. Increased reliance on WMAs can initially reduce the need for government borrowing from external sources like the bond market. However, if WMAs are not repaid within the stipulated time frame, they eventually need to be converted into long-term bonds or other instruments, potentially leading to higher borrowing in the future.
- 2) Inflationary pressures due to increased money supply: This is highly likely. When the government borrows from the RBI through WMAs, it injects additional money into the economy. This can lead to increased money supply, which can put upward pressure on prices and fuel inflation, especially if not managed effectively.

3) Stabilization of interest rates in the financial market: This is unlikely. WMAs are temporary and short-term, so their impact on long-term interest rates is minimal. Additionally, increased reliance on WMAs can create uncertainty and potentially lead to higher borrowing costs for the government, which could destabilize the financial market.

D) Strengthening of the national currency in the forex market: This is very unlikely. WMAs primarily affect domestic money supply and inflation, not the foreign exchange market. If increased reliance on WMAs leads to inflationary pressures, it could weaken the national currency in the forex market.

Therefore, the most likely impact of increased reliance on WMAs is statement 2, Inflationary pressures due to increased money supply. However, it's important to remember that the overall impact depends on various factors like the economic context, the extent of reliance on WMAs, and how they are managed by the government and the RBI.

**Q3: Answer: c**

Statement 1 is correct: Oligarchy and plutocracy represent distinct forms of governance where power is concentrated among a select few. Oligarchy refers to governance by a small, privileged group, while plutocracy denotes rule by the wealthy elite, whose economic influence often translates into political power. Both systems highlight the concentration of power in the hands of a limited segment of society.

Statement 2 is correct: Kleptocracy refers to a government system characterized by corrupt leaders who use their authority to exploit and embezzle resources for personal gain. Kakistocracy, on the other hand, signifies governance by individuals who are morally or intellectually unfit for leadership roles. Both terms describe dysfunctional or corrupt governance structures in different ways.

Statement 3 is correct: Technocracy advocates for governance by experts or professionals possessing specialized knowledge in their respective fields. Gerontocracy, in contrast, emphasizes rule by the elderly, where decision-making often relies on the wisdom and experience gained over time. Both systems highlight distinct approaches to leadership based on expertise or age-related experience.

**Q4: Answer: a**

1. Loamy Soils for Cotton and Groundnuts:
  - Statement 1 is correct. Loamy soils, with their balanced texture of sand, silt, and clay, are well-suited for the cultivation of crops like cotton and groundnuts.
2. Contour Ploughing and Sandy Soils:
  - Statement 2 is correct. Contour ploughing is an effective practice in areas with sandy soils to prevent soil erosion by reducing water runoff.

3. Black Soils (Regur Soils) and Cereals:
  - Statement 3 is incorrect. While black soils are known as Regur soils, they are more commonly associated with the cultivation of crops like cotton, oilseeds, and pulses, rather than cereals.

4. Lateritic Soils and Water Conservation:
  - Statement 4 is correct. Lateritic soils are characterized by their high iron and aluminum content, making them prone to rapid weathering. They often have poor water retention capacity and can experience water scarcity, especially during dry periods. Therefore, adopting water conservation measures, such as rainwater harvesting, moisture-retaining techniques, and efficient irrigation practices, is crucial in regions with lateritic soils to ensure sustainable agricultural practices and address water scarcity challenges. Therefore, the correct answer is A) 1, 2 and 4 only.

**Q5: Answer: a**

Doctrine allowing courts to decline jurisdiction when another court, not necessarily more convenient, is a more appropriate forum for the case's resolution. - D) Forum Non Conveniens

- A principle employed to interpret constitutions narrowly, avoiding deciding constitutional questions unless absolutely necessary for the case's resolution. - C) Principle of Constitutional Avoidance
- A doctrine permitting national authorities a certain degree of discretion in implementing and interpreting human rights obligations. - B) Margin of Appreciation
- Principle requiring that limitations on rights or freedoms by the government must be proportional and not exceed what is necessary to achieve a legitimate aim. - A) Proportionality Principle

**Q6: Answer: c**

This definition emphasizes freedom from interference or coercion by external forces or authorities. Negative liberty, within the realm of political philosophy, focuses on the absence of constraints or restrictions imposed on individuals, allowing them to act or make choices without external interference.

**Q7: Answer: b**

Explanation:

Statement 1 is incorrect:

4. Orangutans are great ape's native to the rainforests of Indonesia and Malaysia.
  5. They are now found only in parts of Borneo and Sumatra.
  6. They have proportionally long arms and short legs and have reddish-brown hair covering their bodies.
- Statement 2 is correct and 3 is incorrect:
7. Bornean and Sumatran orangutans differ in appearance and behavior.

The Bornean orangutan is categorised as critically Endangered species as per IUCN status.

9. The Sumatran are categorized as Critically Endangered as per IUCN status.

10. The Tapanuli orangutan is the most endangered of all great apes.

**Q8: Answer: c**

Notable Operations:

- Operation Pawan (1987): MARCOS assisted in capturing the harbors of Jaffna and Trincomalee, Sri Lanka, as part of the Indian Peace Keeping Force. Notable for a successful amphibious raid against a Liberation Tigers of Tamil Eelam (LTTE) base at Guru Nagar.
- Operation Cactus (1988): MARCOS played a vital role in defending the Maldivian government from a coup attempt, supporting India's military aid by preventing a Sri Lankan militant group's escape with hostages.
- Operation Rakshak (Ongoing): Engaged in counter-insurgency operations in Jammu and Kashmir, particularly the Jhelum River and Wular Lake, effectively curbing militant activities.
- Other Operations: Participation in UN missions (UNOSOM II), anti-piracy operations, Kargil War involvement, Yemen rescue operation, anti-terrorism activities, and more.
  - Operation Tasha (1991)
  - Operation Zabardust (1992)
  - Operation Rahat in Yemen (2015)
  - Operation Black Tornado in Mumbai attack (2008)
  - Anti-Piracy Operations (2008, 2011, 2013, 2017)
  - Exercise 'Balance Iroquois' 03-1/Vajra Prahar (2003)
  - Abduction of Dubai princess Sheikha Latifa (2018)
  - China-India skirmishes (2020)

**Q9: Answer: b**

Statement 1 is correct: For horizontal devolution, it has suggested 12.5% weightage to demographic performance, 45% to income, 15% each to population and area, 10% to forest and ecology and 2.5% to tax and fiscal efforts.

Statement 2 is incorrect: It has recommended post-devolution revenue deficit grants amounting to about Rs. 3 trillion over the five-year period ending FY26. The number of states qualifying for the revenue deficit grants decreases from 17 in FY22, the first year of the award period to 6 in FY26, the last year.

Statement 3 is correct: The 15th Finance Commission was constituted by the President of India in November 2017, under the chairmanship of NK Singh. Its recommendations will cover a period of five years from the year 2021-22 to 2025-26.

**Q10: Answer: d**

- Rule 373 grants the Speaker the authority to direct the immediate withdrawal of a member from the House if the Speaker deems their conduct to be grossly disorderly. However, this particular rule does not include provisions for subsequent suspension proceedings or sanctions beyond the immediate withdrawal from the House.
  - Rule 374 comes into play when a member persistently and willfully obstructs the business of the House, allowing the Speaker to name the member. Subsequently, a motion is initiated to suspend the named member from the service of the House for a period not exceeding the remainder of the session. However, this rule was not invoked in the scenario provided.
  - Rule 374A, introduced in 2001, deals with severe violations or charges. It automatically suspends a member from the service of the House for five consecutive sittings or the remainder of the session, whichever is less, following the Speaker's order. However, this rule wasn't invoked in the hypothetical scenario.
- Therefore, in the situation described, the Speaker's use of Rule 373 leads only to the immediate withdrawal of Member X from the House, without entailing subsequent suspension proceedings, as per the Rules of Procedure in the Lok Sabha.

**Q11: Answer: d**

1. Posting false information likely to cause fear or alarm to the public - The Information Technology Act, 2000
  - This pair is incorrect. The action described falls under Section 505 of the Indian Penal Code (IPC), which deals with statements conducing to public mischief.
2. Spreading fake news that can lead to communal disharmony - The Epidemic Diseases Act, 1897
  - This pair is incorrect. The spreading of fake news that can disrupt communal harmony is generally covered under various sections of the Indian Penal Code (IPC) dealing with offenses related to promoting enmity between different groups.
3. Public dissemination of sensitive government information compromising national security - The Indian Penal Code (IPC)
  - This pair is partially correct. While dissemination of sensitive government information compromising national security is punishable under various sections of the Indian Penal Code (IPC), the specific act regarding official secrets and compromising national security falls under the Official Secrets Act, 1923.

4. Inciting violence or promoting hatred based on religion, race, caste, or community affiliation - The Religious Institutions (Prevention of Misuse) Act, 1988

• This pair is incorrect. Inciting violence or promoting hatred based on religion, race, caste, or community affiliation usually comes under various sections of the Indian Penal Code (IPC) dealing with offenses related to promoting enmity between different groups, and not specifically under The Religious Institutions (Prevention of Misuse) Act, 1988.

**Q12: Answer: a**

The Mitakshara and Dayabhaga are two prominent schools of Hindu law in India that differ significantly in their principles regarding inheritance, ancestral property, and the rights of sons and daughters within a family.

Mitakshara Law School:

- **Origin:** The term Mitakshara is derived from the name of a commentary written by Vijnaneswara on the Yajnavalkya Smriti.
- **Geographical Application:** Observed in various parts of India, including Benares, Mithila, Maharashtra, and Dravida schools.
- **Son's Rights:** In Mitakshara, a son, by birth, acquires an interest in the ancestral property of the joint family. Sons enjoy coparcenary rights during the father's lifetime.
- **Ownership and Disposal:** The share of each coparcener (son) is undefined and cannot be disposed of by the individual coparcener during the father's lifetime.
- **Rights of Wife:** A wife in the Mitakshara system cannot demand partition but has the right to a share in any partition between her husband and her sons.

Dayabhaga Law School:

- **Origin:** The term Dayabhaga is derived from a text written by Jimutavahana.
- **Geographical Application:** Primarily observed in Bengal and Assam.
- **Son's Rights:** In Dayabhaga, a son does not have an automatic ownership right by birth but acquires it on the death of his father. Sons do not enjoy coparcenary rights when the father is alive.
- **Ownership and Disposal:** The share of each coparcener (son) is defined and can be disposed of by the individual coparcener.
- **Rights of Wife:** In the Dayabhaga system, women do not have the same rights as in Mitakshara. Sons cannot demand partition as the father is considered the absolute owner; hence, women don't have the right to claim a share in partitions between the father and sons.

**Q13: Answer: C**

Explanation:

Biomagnification refers to the tendency of pollutants to concentrate as they move from one trophic level to the next.

• Thus in biomagnification there is an increase in concentration of a pollutant from one link in a food chain to another.

In order for biomagnification to occur, the pollutant must be: long-lived, mobile, soluble in fats, and biologically active.

Statement 1 is incorrect: If a pollutant is short-lived, it will be broken down before it can become dangerous.

Statement 2 is correct: If it is not mobile, it will stay in one place and is unlikely to be taken up by organisms.

Statement 3 is correct: If the pollutant is soluble in water, it will be excreted by the organism.

Statement 4 is correct: Pollutants that dissolve in fats, however, may be retained for a long time.

**Q14: Answer: A**

Explanation:

Statement 1 is correct: A floating island unit is essentially a platform designed using styrofoam, bamboo, gunny bags and coir and it performs the function of a wetland. The Nekkampur Lake, Hyderabad is the largest floating treatment wetland in the country.

Statement 3 is incorrect: Estuaries are water bodies where the flow of freshwater from rivers mixes with salt water transported, by tide, from the ocean. Estuaries are the most productive water bodies in the world.

Statement 2 is incorrect: Floating treatment wetland works on the basis of hydroponics technique. Hydroponics permits plants to grow on the water with the help of sunlight (no need of soil). Aquaponics and hydroponics are both soilless ways of growing plants. The main difference between the two is with aquaponics, fish waste is used as nutrients for the plants. On the other hand, hydroponics used nutrient solutions mixed directly with water to grow the plants.

**Q15: Answer: C**

Explanation:

The year 2023 marks the first major conference of the United Nations (UN) dedicated to water since 1977. Hence, statement 1 is correct.

According to the report, 26 per cent of the world's population doesn't have access to safe drinking water and 46 per cent lack access to basic sanitation. Hence, statement 2 is correct.

The UN World Water Development Report 2023 painted a stark picture of the huge gap that needs to be filled to meet UN goals to ensure all people have access to clean water and sanitation by 2030.

The UN 2023 Water Conference focuses on progress towards water- and sanitation-related goals, coinciding with the mid-term comprehensive review of the

International Decade for Action, 'Water for Sustainable Development 2018–2028'. Hence, statement 3 is correct.

Sustainable Development Goal 6 (SDG 6) is to ensure the availability and sustainable management of water and sanitation for all by 2030.

Therefore, option (c) is the correct answer.

**Q16: Answer: c**

Forum shopping refers to the practice of deliberately choosing a specific court for a legal case in the hope of getting a favorable outcome. It can compromise the principle of natural justice, which requires that every person should have a fair hearing before an impartial tribunal. It can violate the principle of comity, which requires that courts should respect and defer to each other's decisions on matters of common interest. It can hamper the principle of finality, which requires that litigation should end at some point and not be prolonged indefinitely.

**Q17: Answer: A**

Explanation:

Statement 1 is incorrect:

More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 percent of the total.

Statement 2 is correct and 3 is incorrect:

Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total. That means, out of every 10 animals on this planet, 7 are insects.

The number of fungi (e) species in the world is more than all the vertebrates.

**Q18: Answer: B**

Explanation:

Statement 1 is incorrect: Sariska Tiger Reserve is a tiger reserve in Alwar district, Rajasthan, India. It stretches over an area of 881 km<sup>2</sup> (340 sq mi).

Statement 2 is correct: It comprises scrub-thorn arid forests, dry deciduous forests, grasslands, and rocky hills. This area was a hunting preserve of the Alwar state and was declared a wildlife sanctuary in 1958.

Statement 3 is correct: It was given the status of a tiger reserve making it a part of India's Project Tiger in 1978. The wildlife sanctuary was declared a national park in 1982, with a total area of about 273.8 km<sup>2</sup> (105.7 sq mi). It is the first reserve in the world with successfully relocated tigers. It is an important biodiversity area in the Northern Aravalli leopard and wildlife corridor.

**Q19: Answer: A**

Explanation:

Statement 1 is correct: The Ministry of Environment, Forest and Climate Change is implementing Nagar Van

Yojana (NVY) since the year 2020 which envisages creation of 400 Nagar Vans and 200 Nagar Vatika in the country during the period 2020-21 to 2024-25 under the funds available under National Compensatory Afforestation Fund (CAMPA).

Statement 2 is incorrect: The Nagar Van Yojana aims to enhance the green cover in the urban and peri-urban areas including biological diversity, provide ecological benefits and improve the quality of life of city dwellers.

Statement 3 is incorrect: The compensatory Afforestation Fund (CAMPA fund) is being utilized by States/UTs for taking up compensatory afforestation as per the approved Annual Plan of Operations for compensating the loss of forest & tree cover due to diversion of forest land for developmental projects as per provisions of Compensatory Afforestation Fund Act, 2016 (CAF Act) and CAF Rules, 2018.

**Q20: Answer: D**

Statement 1 is correct: Raj Narain, who had been defeated in the 1971 parliamentary election by Indira Gandhi, lodged cases of election fraud and use of state machinery for election purposes against her in the Allahabad High Court. On 12 June 1975, Justice Jagmohanlal Sinha of the Allahabad High Court found the prime minister guilty on the charge of misuse of government machinery for her election campaign. The court declared her election null and void and unseated her from her seat in the Lok Sabha. The court also banned her from contesting any election for an additional six years

Statement 2 is correct: Indira Gandhi challenged the High Court's decision in the Supreme Court. Justice V. R. Krishna Iyer, on 24 June 1975, upheld the High Court judgement and ordered all privileges Gandhi received as an MP be stopped, and that she be debarred from voting. However, she was allowed to continue as Prime Minister pending the resolution of her appeal.

Statement 3 is correct: Jayaprakash Narayan and Morarji Desai called for daily anti-government protests. The next day, Jayaprakash Narayan organised a large rally in Delhi, where he said that a police officer must reject the orders of government if the order is immoral and unethical as this was Mahatma Gandhi's motto during the freedom struggle. Such a statement was taken as a sign of inciting rebellion in the country. Indira Gandhi requested a compliant President Fakhruddin Ali Ahmed to proclaim a state of emergency. Within three hours, the electricity to all major newspapers was cut and the political opposition arrested. The proposal was sent without discussion with the Union Cabinet, who only learnt of it and ratified it the next morning.

**Q21: Answer: b**

1. Rafah Crossing serves as the sole land connection between the Gaza Strip and Egypt.

- This statement is correct. Rafah Crossing is indeed the primary border crossing between the Gaza Strip and Egypt, serving as a crucial conduit for the movement of people and goods.

2. The Camp David Accords of 1978 resulted in the establishment of Rafah Crossing.

- This statement is incorrect. The Camp David Accords, signed between Egypt and Israel in 1978, did not specifically result in the establishment of Rafah Crossing. The crossing's history and establishment are more closely tied to subsequent events and agreements involving the Palestinian territories.

3. The European Union has played a direct role in the management and monitoring of Rafah Crossing.

- This statement is not included in the correct answer. While various international entities have been involved in discussions about Rafah Crossing, the direct involvement of the European Union in its management and monitoring is not a well-established fact.

4. Rafah Crossing has been a point of contention between Fatah and Hamas, reflecting internal Palestinian political dynamics.

- This statement is correct. Rafah Crossing has been a source of tension and disagreement between the Palestinian factions Fatah and Hamas. The control and operation of the crossing have been linked to broader political dynamics within the Palestinian territories.

**Q22: Answer: a**

1. A) Vienna - Danube: Vienna, the capital of Austria, is situated along the Danube River.

2. B) Melbourne - Yarra: Melbourne, a city in Australia, is located on the banks of the Yarra River.

3. C) Lagos - Niger: Lagos, a major city in Nigeria, is situated along the coast but not directly on the Niger River.

4. D) Montreal - St. Lawrence: Montreal, in Canada, is situated on the St. Lawrence River.

Therefore, option A is the correct pairing of cities with the rivers.

**Q23: Answer: C**

Explanation:

A zero-coupon, zero-principal (ZCZP) bond is a type of bond that pays no interest and returns no principal at maturity. Instead, the bond is issued at a deep discount to its face value and redeemed at par. The difference between the purchase price and the face value represents the investor's return. ZCZP bonds are attractive to investors who want to lock in a certain amount of money at a future date without reinvesting the interest payments. ZCZP bonds are also useful for issuers who want to defer their cash outflows until maturity.

**Q24: Answer: C**

Explanation:

The "Paat-Mitro" mobile app has been in the news for providing crucial information about jute cultivation techniques, along with essential details regarding Minimum Support Price (MSP) for jute farmers, thereby aiding them in their agricultural practices.

**Q25: Answer: A**

Explanation:

Professor Savita Ladage from the Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research (TIFR), has been awarded the Royal Society of Chemistry's (RSC) Nyholm Prize for Education.

The Nyholm Prize for Education is a prestigious recognition by the Royal Society of Chemistry (RSC) for outstanding contributions to chemistry education.

Professor Ladage has been recognized for her exceptional contributions to chemistry education, emphasizing the importance of chemical education. Her efforts go beyond personal contributions, extending to mentoring chemistry educators and leading various programs. These initiatives benefit both teachers and students, aiming to advance chemistry education across India.

The Nyholm Prize includes £5,000, a medal, and a certificate, reflecting the substantial commitment and impact Professor Ladage has had in the domain of chemistry education.

**Q26: Answer: D**

Explanation:

Statement 1 is correct:

The Bahmani Sultanate was known for a certain level of religious tolerance. While they did not consistently enforce strict Islamic policies and employed Hindus in administrative positions, their rule wasn't entirely free of religious conflicts or the imposition of Islamic practices. The extent of respect for diverse religious practices varied across different rulers and periods.

Statement 2 is correct:

Persian culture and language had a significant influence on the Bahmani Sultanate. Persian was the language used in the court, administration, literature, and art. The sultans patronized Persian scholars, leading to a flourishing of Persian culture during their reign.

Statement 3 is correct:

The Bahmani Sultanate had a significant presence in maritime trade, especially along the western coast of India. They established trade connections with foreign powers, including those in the Middle East, Africa, and Southeast Asia, contributing to the economic growth of the region.

Statement 4 is correct:

The Bahmani Sultanate faced internal conflicts and eventually disintegrated into five smaller sultanates known as the Deccan Sultanates - the Qutb Shahi Dynasty, the Adil Shahi Dynasty, the Nizam Shahi

Dynasty, the Barid Shahi Dynasty, and the Imad Shahi dynasty. The Bahmani Sultanate was a Muslim empire that ruled the Deccan Plateau in South India from 1347 to 1518. It was founded by Alauddin Hasan Bahman Shah, a former military commander of the Delhi Sultanate.

**Bahmani Sultanate**

The Bahmani Sultanate was a powerful and influential empire that played a significant role in the history of India. It was a centre of trade, culture, and learning, and it helped to spread Islam in the Deccan.

Alauddin Hasan Bahman Shah was born in the Deccan Plateau in the early 14th century. He was a talented military commander and rose to prominence in the Delhi Sultanate. In 1347, he led a rebellion against the Delhi Sultanate and established the Bahmani Sultanate. The Bahmani Sultanate initially consisted of a small territory in the Deccan Plateau. However, it quickly expanded under the rule of Alauddin Hasan Bahman Shah and his successors. By the end of the 14th century, the Bahmani Sultanate controlled most of the Deccan Plateau.

The Bahmani Sultanate reached its peak during the reign of Muhammad Shah III (1463-1482). Muhammad Shah III was a capable ruler who promoted trade, culture, and learning. He also built a number of impressive monuments, including the Gol Gumbaz, one of the largest domes in the world. During the golden age of the Bahmani Sultanate, the Deccan Plateau became a centre of trade, culture, and learning. The Bahmani Sultans promoted trade with other parts of India, the Middle East, and Southeast Asia. They also patronized artists, poets, and scholars, and the Deccan Plateau became a centre of Persianate culture.

The Bahmani Sultanate began to decline in the early 16th century. Internal power struggles weakened the empire, and it came under increasing pressure from the Vijayanagara Empire to the south. In 1518, the Bahmani Sultanate finally collapsed. It was divided into five independent Deccan Sultanates: Bijapur, Ahmadnagar, Golconda, Berar, and Bidar.

The Bahmani Sultanate had a significant impact on the history of India. It was a powerful and influential empire that played a role in the spread of Islam in the Deccan. The Bahmani Sultanate also helped to promote trade, culture, and learning in the Deccan Plateau.

**Q27: Answer: C**

Explanation:

Statement 1 is correct: Mangroves are trees and bushes growing below the high water level of spring tides which exhibits remarkable capacity for saltwater tolerance.-FAO

Statement 2 is incorrect: Mangroves occur in a variety of configurations. Some species (e.g. Rhizophora) send arching prop roots down into the water. While others

(e.g. Avicennia) send vertical "Pneumatophores" or air roots up from the mud.

Statement 3 is correct: Most mangrove vegetation has lenticellate banks which facilitate more water loss and produce coppices. Leaves are thick and contain salt-secreting glands.

Mangroves exhibit a Viviparity mode of reproduction. i.e. seeds germinate in the tree itself (before falling to the ground). This is an adaptive mechanism to overcome the problem of germination in saline water.

**Q28: Answer: C**

Explanation:

Savitribai Phule was a pioneering figure in the field of education and social reform in 19th-century India. Born in 1831 in Naigaon, Maharashtra, she married Jyotiba Phule at the age of nine. Jyotiba, an advocate for education for all, including women, played a significant role in Savitribai's education. Despite facing abuse and humiliation while walking to school, Savitribai persevered and became a teacher after completing a training course.

Savitribai and Jyotiba worked together to establish two educational trusts: the Native Female School in Pune and the Society for Promoting the Education of Mahars, Mangs, and others. Savitribai extended her efforts beyond girls' education and became a vocal advocate against various social evils.

She founded the Mahila Seva Mandal to raise awareness about women's rights and campaigned against the dehumanization of widows, advocating for widow remarriage. Savitribai organized a successful barbers' strike to protest the inhumane practice of shaving widows' heads. In 1863, she and Jyotiba established Balhatya Pratibandhak Griha, a home to prevent infanticide, providing a safe space for unwed mothers and widows facing unfortunate circumstances.

Savitribai and Jyotiba also challenged the evil of untouchability by opening their water storage to everyone. After Jyotiba's death, Savitribai took over the Satya Shodhak Samaj, actively participating in social and humanitarian work, including caring for plague victims. Unfortunately, she succumbed to the plague in 1897 while caring for a patient.

Apart from her social activism, Savitribai was also a poet, with two collections of her poetry titled "Kavyaphule" and "Bavankashi Subodh Ratnakar." In recognition of her significant contributions, the University of Pune was renamed Savitribai Phule Pune University in August 2014. Savitribai Phule's legacy continues to inspire generations, and her work has left an indelible mark on the history of social reform and education in India.

**Q29: Answer: D**

Explanation:

All four statements are correct descriptions of aerogels. Aerogels are highly porous materials derived from a gel, with the liquid component replaced by gas. They are composed of interconnected nanoparticles or polymers, and common materials used to make aerogels include silica, carbon, metal oxides, and polymers. Aerogels have a variety of properties that make them versatile, including low density, high porosity, thermal insulation, and acoustic insulation. As a result, aerogels are used in a wide range of applications, including insulation, environmental remediation, electronics, and aerospace.

**Q30: Answer: b**

Statement 1 is correct: It's a special power, and the only independent political tool given to the secretary-general in the UN Charter. It allows him to call a meeting of the Security Council on his initiative to issue warnings about new threats to international peace and security and matters that are not yet on the council's agenda.

Statement 2 is incorrect: The provision has been rarely invoked. Past examples include the upheaval in the Republic of the Congo in 1960 following the end of Belgium's colonial rule and a complaint by Tunisia in 1961 against France's naval and air forces launching an attack.

**Q31: Answer: c**

Overview of the 14 traditions and rituals from India included on the 'Intangible Cultural Heritage of India' list:

- o Ramlila (2008): Traditional performance of the Ramayana during the Autumn festival of Dussehra, recounting episodes from the epic through dialogue, narration, recital, and song.
- o Tradition of Vedic chanting (2008): Recitation of Sanskrit Vedas, symbolizing ancient cultural traditions and the foundation of Hinduism, practiced with specific tonal accents and pronunciation.
- o Kutiyattam, Sanskrit theatre (2008): A 2,000-year-old theatrical tradition from Kerala, combining Sanskrit classicism with local elements, featuring extensive training for performers.
- o Ramman, religious festival and ritual theatre of the Garhwal Himalayas (2009): Celebrating the guardian god Bhumiya Devta through music, theatre, and historical reconstructions in the villages of Saloor-Dungra, Uttarakhand.
- o Mudiyettu, ritual theatre and dance drama of Kerala (2010): An annual ritual dance drama performed in Kerala villages based on the battle between the goddess Kali and the demon Darika.
- o Kalbelia folk songs and dances of Rajasthan (2010): Expressive dances by the Kalbelia tribe from the Thar Desert, symbolizing their traditional way of life and adapting to socio-economic changes.

- o Chhau dance (2010): Traditional dance form from eastern India, enacting local folklore, epics, and featuring distinct styles from different regions.
- o Buddhist chanting of Ladakh (2012): Recitation of sacred Buddhist texts in the Ladakh region, representing different sects and forms of Buddhism.
- o Sankirtana, ritual singing, drumming, and dancing of Manipur (2013): Art forms celebrating religious occasions and life stages of the Vaishnava people, promoting community bonding.
- o Traditional brass and copper craft of utensil making among the Thatheras of Jandiala Guru, Punjab (2014): Skilled craftsmen practicing traditional brass and copper utensil-making techniques, defining their livelihood and community status.
- o Yoga (2016): An ancient practice involving postures, meditation, controlled breathing, and chanting for holistic well-being, influencing Indian society's health, education, and arts.
- o Traditions of Nawruz (Parsi New Year) (2016): Celebrations marking the Parsi New Year with rituals, ceremonies, and cultural events symbolizing brightness, purity, and livelihood.
- o Kumbh Mela, North India (2017): The world's largest spiritual congregation held every four years, where devotees bathe in holy rivers to absolve sins and gain spiritual freedom.
- o Durga Puja, Kolkata (2021): Annual festival in honor of the Hindu goddess Durga, celebrated with sculpting figurines, rituals, and immersion of the goddess in rivers.

**Q32: Answer: B**

Explanation:

Statement 1 is incorrect:

Myristica swamps are not saltwater swamp forests; they are freshwater swamp forests. These swamps are predominantly composed of species belonging to the Myristica genus. They are characterized by their occurrence in freshwater habitats, often in areas with poor drainage that leads to waterlogged conditions.

Statement 2 is correct:

Myristica swamps are referred to as live fossils due to the ancient lineage of the species found within them. The biodiversity in these swamps is significant, and they are predominantly populated by evergreen trees belonging to the Myristicaceae family. The presence of these ancient species contributes to their designation as living fossils.

Statement 3 is correct:

Myristica swamps have evolved unique adaptations to survive in inundated conditions. Stilt roots and knee roots are specialized structures that provide stability and aid in nutrient uptake in waterlogged environments. Stilt roots emerge above the water level, providing support to the trees, while knee roots rise



from the ground, often above the water level, assisting in oxygen exchange and structural support.

Statement 4 is incorrect:

Myristica swamps are primarily concentrated in specific regions of India. They are notably found in the Uttara Kannada district of Karnataka State and the southern parts of Kerala. These regions, especially in the Western Ghats, provide suitable conditions—such as high rainfall and specific soil types—for the existence of Myristica swamps. They are not present in Odisha or the eastern parts of India.

**Q33: Answer: C**

Explanation:

Statement 1 is incorrect:

The World Energy Employment 2023 report, released by the International Energy Association, reveals some interesting trends in the global energy sector. The report shows how the pandemic affected employment levels in different energy industries and how the recovery has been uneven across regions and sectors.

Statement 2 is correct:

The global energy sector showed a net increase in employment, with 67 million people employed in 2022, surpassing pre-pandemic levels by 3.4 million. The clean energy sectors played a significant role in driving this growth, adding 4.7 million jobs and reaching a total of 35 million. In contrast, the fossil fuel sectors lagged, remaining 1.3 million below their pre-pandemic levels at 32 million.

Statements 3 and 4 are correct:

India emerged as a positive outlier, experiencing job growth in both clean energy and fossil fuel sectors compared to 2019. Additionally, India ranked fourth globally in terms of new clean energy jobs created in the past three years.

**Q34: Answer: b**

1. Siachen Glacier, located in the eastern Karakoram Range, is the smallest glacier in India.

- This statement is incorrect. The Siachen Glacier is indeed located in the eastern Karakoram Range, but it is not the smallest glacier in India. It is, however, the largest glacier in the Karakoram Range and the second-longest glacier in the world's non-polar areas.

2. Gangotri Glacier, a primary source of the Ganges River, is situated in the state of Himachal Pradesh.

- This statement is incorrect. The Gangotri Glacier is one of the primary sources of the Ganges River, but it is situated in the state of Uttarakhand, not Himachal Pradesh. The glacier is located in the Garhwal Himalayas.

3. The glacier known as Pindari is located in the Zaskar Range of the Himalayas.

- It is incorrect. The Pindari Glacier is situated in the Kumaon Himalayas, not the Zaskar Range.

4. Drang Drung Glacier, an important glacier in Jammu and Kashmir, is a source for the Chenab River.

- This statement is correct. The Drang Drung Glacier is located near the Suru River in the Zaskar Range of Jammu and Kashmir and is indeed a source for the Chenab River.

**Q35: Answer: B**

Explanation:

The Colombo Security Conclave (CSC) is a regional security grouping that aims to enhance and strengthen cooperation among the Indian Ocean littoral states on various aspects of maritime security. The CSC was formed in 2011 as a trilateral initiative of India, Sri Lanka and the Maldives, and has since expanded to include Mauritius as the fourth member, with Bangladesh and Seychelles as observers.

The CSC serves as India's outreach to the Indian Ocean, emphasizing regional cooperation and shared security objectives. It also aims to counter China's influence in the region and reduce the Chinese footprint in member countries.

The CSC focuses on enhancing and strengthening regional security in five pillars:

1. Maritime Safety and Security
2. Countering Terrorism and Radicalization
3. Combating Trafficking and Transnational Organized Crime
4. Cyber Security and Protection of Critical Infrastructure and Technology
5. Humanitarian Assistance and Disaster Relief

**Q36: Answer: C**

Explanation:

Barracuda, India's fastest solar-electric boat, is a remarkable achievement of engineering and innovation. It was designed and built by a team of students from the Indian Institute of Technology Madras.

Barracuda is acclaimed as India's fastest solar-electric boat, capable of reaching speeds up to 12.5 knots (approximately 23 kmph). This achievement is a testament to the advanced engineering and innovation applied by the team of students from the Indian Institute of Technology Madras and Naval Solar and Electric Boats.

The boat's eco-friendly design sets it apart, relying solely on clean energy sources. With twin 50 kW electric motors, a marine-grade LFP battery, and 6 kW of solar power, Barracuda minimizes air pollution, reduces noise and vibration, and exemplifies a sustainable approach to maritime transportation.

**Q37: Answer: B**

Explanation:

Statement 1 is correct: The Black Swan Theory, proposed by Nassim Nicholas Taleb, describes unexpected events that have significant consequences and are frequently explained after the fact. It highlights the importance of effective risk management tactics.

Statement 2 is correct: The Black Swan Theory suggests that systems and institutions can mitigate the impact of Black Swan events by being robust and flexible.

So, both statements are correct, but Statement-2 is not the correct explanation for Statement-1. Therefore, the answer is B) Both Statement-1 and Statement-2 are correct, and Statement-2 is not the correct explanation for Statement-1. The Black Swan Theory does imply a need for preparation for unpredictable events (Statement 1), and it also suggests that robustness and flexibility can help minimize the impact of such events (Statement 2). However, the latter is not an explanation for the former, but rather a complementary aspect of the theory.

**Q38: Answer: c**

Indian Sports and Games Abroad Chess, snakes and ladder, playing cards, Polo, the martial arts of Judo and Karate which is played worldwide actually originated in ancient India.

1. The game of snakes and ladders was created by the 13th century poet saint Gyandey. It was originally called 'Mokshapat'. The ladders in the game represented virtues and the snakes indicated vices.
2. Chess is believed to have originated in Eastern India in the Gupta Empire where its early form was known as Chaturanga. It also finds its mention in Mahabharata. Kho-Kho originated in Maharashtra in ancient times where Kho-Kho was played on 'raths' or chariots, and was known as RATHERA. It is now played in different countries.
3. India invented card game called Suits. Kridapatram which also means painted rags for playing', is an ancient suits game.

**Q39: Answer: c**

The Guntupalle or Guntupalli Group of Buddhist Monuments is located near Kamavarapukota, Eluru district, in the state of Andhra Pradesh in India.

1. The rock-cut part of the site has two Buddhist caves, a chaitya hall and a large group of stupas.
2. The chaitya hall has a rare carved stone entrance replicating wooden architecture, a simpler version of that at the Lomas Rishi Cave.
3. There are remains of structural buildings in brick and stone, including remains of two vihara made of brick, as well as excavated caves at two levels, including an unusual structural chaitya hall (that is, one built above ground). The core of this consists of the stone stupa with an enclosed path around it allowing ritual parikrama (circumambulation).

4. During excavation, three relic caskets were found. The caskets had many precious elements like gold, silver, crystal beads. The bronze image of Padmapani was found along with one of the caskets. The inscription on the casket was in the Devanagari script which indicates the year as from the 9th to 10th century CE.

**Q40: Answer: b**

- Amarnath Cave Temple - This shrine is dedicated to Lord Shiva and is located near the Lidder River, not the Jhelum. So, this pair is not correct.
- Gangotri Temple - Gangotri is situated on the banks of the Bhagirathi River, which is the upper stream of the Ganges. So, this pair is correct.
- Kanchipuram Ekambareswarar Temple - Kanchipuram is not associated with the Palar River. It is situated near the Vegavathy River. So, this pair is not correct.

**Q41: Answer: b**

The Meruvaradhanaswami temple at Pandrethan near Srinagar in Jammu and Kashmir. Pandrethan, now mostly in ruins, is one of Kashmir's historic capitals, said to have been founded by king Pravarsena in the 6th century AD, according to Kalhana in his poetical account of Kashmiri history called Rajatarangini.

**Q42: Answer: c**

- Chorarajju was a tax collected for the search of a thief, which could be crucial for maintaining law and order, including supporting the army's efforts in dealing with criminal activities.
- Pranaya, being an emergency tax, could be associated with the income of individuals during times of crisis, making it similar in nature to income tax.
- Pindakaras, collected annually from the entire village, could be seen as a form of custom duty imposed on the village as a whole, contributing to the community's welfare.
- Vishti, related to forced labor, might be connected with the need for labor in areas through which imported goods passed. This could be considered a form of import duty in terms of contributing labor.

**Q43: Answer: a**

- Minor Rock Edicts:
  - o Concentrated in the South and Central parts of the empire.
  - o Highlight Ashoka's activity as a Buddhist disciple, representing personal history and summarizing Dhamma.
  - o The edict at Kandahar is bilingual, inscribed in Greek and Aramaic.
  - o Minor Rock Edict III (Bairat) is addressed to the Buddhist clergy.

- Title Used by Ashoka:
  - o The title most commonly adopted by Ashoka in his edicts is "Devanampiya Piyadassi" (beloved of the Gods).
- Locations of Minor Rock Edicts:
  - o Located at various places including Bairat (Rajasthan), Jatinga-Rameshwar (Karnataka), Sahsaram (Bihar), Rupanath (Madhya Pradesh), Gavimath (Mysuru), Brahmagiri (Karnataka), Maski (Karnataka), Gujjara (Madhya Pradesh), Palkigundu (Karnataka), Rajula-Mandagiri (Andhra Pradesh), Siddapura (Karnataka), Suvarnagiri (Karnataka), Yerragudi (Andhra Pradesh), Nittur (Karnataka), Udegolam (Karnataka), and Kandahar (Afghanistan).
- Major Pillar Edicts:
  - o Found at Delhi-Topra, Delhi-Meerut, Ram-Purva, Lauriya-Areraj, Lauriya-Nandangarh, and Allahabad-Kosam.
  - o The Ashokan Pillar at Allahabad contains two later inscriptions, one of the Gupta ruler Samudragupta-Prayaga Prasasti and another of the Mughal emperor Jahangir.
  - o The complete set of seven edicts is found at only one place - Topra.

**Q44: Answer: b**

Statement 2 is accurate as per the Forest Rights Act. Even if a family has been cultivating forest land for generations, the Act places a limit of 4 hectares for ownership rights. Hence, the family exceeding this limit might face the risk of being denied ownership rights, despite their historical cultivation. Statements 1 and 3 are inaccurate as the Gram Sabha's recommendation is subject to the prescribed limits and provisions outlined in the Forest Rights Act.

**Q45: Answer: b**

- Statement 1 is correct. The Bengal Judicature Act 1781 provided that public servants of the company were not to be subject to the jurisdiction of the Supreme Court for things done by them in their official capacity.
- Statement 2 is incorrect. The act also provided that the Supreme Court had no jurisdiction in any matter regarding revenue and its collection. Revenue collectors and judicial officers of the company's courts were also exempted from the jurisdiction of the Supreme Court for things done by them in their official capacity.
- Statement 3 is correct. Under the act, the Supreme Court was to have jurisdiction over all the residents of Calcutta. The Supreme Court was required to take into consideration and respect the religious and social customs and usages of the Indians while enforcing the degrees and processes.

**Q46: Answer: c**

Name	Founder	Language
Samachar Darpan	Baptist Missionary Society	Bengali
Sambad Kaumudi	Raja Ram Mohun Roy	Bengali
Mirat-ul-Akhbar	Raja Ram Mohun Roy	Persian
Sambad Parvakar	Ishwar Chandra Gupta	Bengali
Indian Mirror	Manmohan Ghosh and Devendranath Tagore	English

**Q47: Answer: c**

Treaty of Gandamak : this Treaty was signed in 1879 to officially in the first phase of the second Anglo Afghan war.

Treaty of Yandabo : this Treaty was a peace Treaty that was signed in 1826. It ended the first Anglo Burmese war.

Treaty of Sugauli : the Treaty was signed in 1816 and formally ended the Anglo Nepal war. The Nepalese were finally defeated and forced to signed the Treaty.

Treaty of Lahore: the Treaty of Lahore was signed in 1846 and marked the end of the first Anglo Sikh war.

**Q48: Answer: b**

- Nicolo Conti: He was an Italian merchant and explorer, not Portuguese.
- Abdur Razzaq: He was a Persian ambassador and traveler, not Portuguese.
- Domingo Paes: Domingo Paes was indeed a Portuguese traveler who visited the Vijayanagara Empire during the reign of Krishna Deva Raya.
- Fernao Nuniz: Fernao Nuniz was also a Portuguese traveler who visited the Vijayanagara Empire during the reign of Krishna Deva Raya.

**Q49: Answer: b**

- Chola Dynasty: The emblem associated with the Chola dynasty is a "Tiger". The Cholas were known for their military prowess, and the tiger symbolizes their strength and valor.
- Pandya Dynasty: The emblem associated with the Pandya dynasty is a "Fish". The Pandya kings used the fish emblem, which is a symbol of prosperity and abundance, reflecting the rich resources of their kingdom.
- Chera Dynasty: The emblem associated with the Chera dynasty is a "Bow and Arrow". The Cheras were known for their proficiency in archery, and the bow and arrow symbolize their martial skills.

**Q50: Answer: c**

Statement 1 is incorrect.

Second Anglo-Sikh War (1848-49):

- Cause: Murder of East India civil service officers and a rebellion by Sikh troops.
- Participants: Sikhs versus English.
- Result:

- o The final battle at Gujrat near Chenab in 1849, won by the British forces.
- o Acquisition of the Koh-i-Noor diamond by the British as part of the Treaty of Lahore after the second Anglo-Sikh war.
- o The diamond, previously willed by Maharaja Ranjit Singh to the Puri Jagannath Temple of Odisha, was not executed by the British.

Statements 2 and 3 are correct. The diamond's first verifiable record comes from the 1740s when Nader Shah looted it from the Mughal Peacock Throne in Delhi. It changed hands in south and west Asia until given to Queen Victoria in 1849 after the British East India Company annexed the Punjab.

**Q51: Answer: d**

All India Women's Conference (AIWC), 1927:

- Founders:
  - o Margaret Cousins
  - o Maharani Chimnabai Gaekwad
  - o Rani Sahiba of Sangli
  - o Sarojini Naidu
  - o Kamla Devi Chattopadhyaya
  - o Lady Dorab Tata
- Significance:
  - o First women's organization with an egalitarian approach.
- Objectives:
  - o Society should be based on principles of social justice, integrity, equal rights, and opportunities.
  - o Secure for every human being the essentials of life, not determined by the accident of birth or sex but by planned social distribution.
- Duration:
  - o Worked both before and after Independence.

**Q52: Answer: a**

Kalahari Desert:

- The Kalahari Desert is located in southern Africa, covering parts of Botswana, Namibia, and South Africa.
- It is the second-largest desert in Africa, characterized by vast stretches of sand, grasslands, and acacia trees.
- Although it is a desert, the Kalahari receives more rainfall compared to other deserts, and it supports a diverse range of flora and fauna.

Sahara Desert:

- The Sahara Desert is the largest hot desert in the world, spanning across North Africa.
- It is known for its vast stretches of sand dunes, rocky plateaus, and extreme temperatures.
- The Sahara is significantly larger than any other desert, covering an area of over 9 million square kilometers (3.6 million square miles).

Gobi Desert:

- The Gobi Desert is a cold desert located in northern China and southern Mongolia.
- It is the largest desert in Asia and has a unique landscape featuring sand dunes, gravel plains, and rocky mountains.
- Despite being a cold desert, the Gobi experiences extreme temperature variations, with hot summers and cold winters.

Great Victoria Desert:

- The Great Victoria Desert is the largest desert in Australia, situated in the central and western parts of the continent.
- It is characterized by vast sand dunes, salt pans, and sparse vegetation.
- The Great Victoria Desert is the fourth-largest desert globally and is part of the arid interior of Australia.

**Q53: Answer: D**

Explanation:

Statement 1 is correct:

The open acreage policy under HELP allows companies to choose any block for exploration based on available data and their preferred strategy, eliminating pre-defined blocks and enabling companies to focus on areas they believe hold the most potential.

Statement 2 is correct:

HELP replaces the profit-sharing model of the New Exploration Licensing Policy (NELP) with a revenue-sharing model. The government receives a fixed share of the revenue net of royalty generated by successful production, removing the need to scrutinize cost details and reducing disputes.

Statement 3 is correct:

HELP grants contractors the freedom to market and price crude oil in the domestic market through transparent bidding processes. This allows them greater control over their product and fosters competition, potentially leading to better pricing for consumers.

Statement 4 is correct:

HELP simplifies the licensing process by offering a single license for all forms of hydrocarbon exploration and production, including conventional oil and gas, coal-bed methane, shale oil, and gas hydrates. This eliminates the need for separate licenses for different types of hydrocarbons, streamlining the process for companies.

Hydrocarbon Exploration and Licensing Policy (HELP)

The Hydrocarbon Exploration and Licensing Policy (HELP) is a policy implemented by the Indian government in 2016 to boost domestic oil and gas production by simplifying regulations and attracting investment.

Objectives

Reduce India's dependence on imported hydrocarbons, currently at around 80%.

Streamline the licensing process and make it more investor-friendly.

Encourage domestic and foreign companies to invest in hydrocarbon exploration and production.

Key Components

**Uniform License:** A single license for all forms of hydrocarbon exploration and production, including conventional oil and gas, coal-bed methane, shale oil, and gas hydrates. This eliminates the need for separate licenses for different types of hydrocarbons.

**Open Acreage Policy:** Companies can choose any block for exploration based on available data and their preferred strategy. This allows them to focus on areas they believe hold the most potential, rather than being restricted to pre-defined blocks.

**Revenue Sharing Model:** Instead of the profit-sharing model used in the previous New Exploration Licensing Policy (NELP), HELP operates on a revenue-sharing model. The government receives a fixed share of the revenue (net of royalty) generated from successful production, simplifying calculations and reducing disputes.

**Marketing and Pricing Freedom:** Contractors have the freedom to market and price crude oil in the domestic market through transparent bidding processes. This gives them greater control over their product and fosters competition, potentially leading to better pricing for consumers.

**Extended Exploration and Production Periods:** Compared to NELP, HELP offers longer exploration and production periods, particularly for deep water and frontier areas. This provides flexibility for companies to conduct thorough exploration and optimize production activities.

**Reconnaissance Contract (RC):** This allows companies to gather exploration data and secure exclusive rights to lease the block for development and production later. This provides an initial stage for assessing an area's potential before committing to full-fledged exploration.

Overall, HELP represents a significant shift in the Indian government's approach to hydrocarbon exploration and production. Its success will depend on its ability to attract investment, ensure responsible development, and address environmental and social concerns.

**Q54: Answer: A**

Explanation:

Statement 1 is incorrect:

This statement is unlikely to contribute to a decrease in export revenues. An increase in foreign demand typically leads to higher export revenues, as there would be more demand for the country's goods and services. Similarly, stable currency rates usually support export competitiveness, rather than causing a decline in export revenues. Therefore, this statement is incorrect in explaining the decrease in export revenues.

Statement 2 is incorrect:

Tariff reductions and trade agreements generally foster trade and often lead to increased export revenues by facilitating easier access to markets. Hence, a decrease in export revenues is unlikely due to such measures. Therefore, this statement is incorrect in explaining the decline in export revenues.

Statement 3 is correct:

This statement is likely to contribute significantly to the decrease in export revenues. A global economic slowdown can reduce demand for exports from Country X as other countries may cut back on imports due to weakened economic conditions. Additionally, unfavourable exchange rates can make Country X's exports more expensive for foreign buyers, reducing competitiveness and leading to a decline in export revenues.

Statement 4 is incorrect:

This statement is less likely to directly cause a decrease in export revenues. Increased domestic production and consumption might lead to a scenario where fewer goods are available for export, potentially impacting export volumes. However, it might not necessarily lead to a decline in export revenues unless the decrease in exports is due to an oversaturation of domestic markets or a shift in focus away from export-oriented production.

**Q55: Answer: b**

Statement 1 is incorrect; the Native Marriage Act of 1872 set the marriage age for girls below 14 and boys below 18. Statement 2 is correct; the Age of Consent Act of 1891 forbade the marriage of girls below 12. Statement 3 is incorrect; the Sharda Act of 1929 set the marriage age for boys below 18 and girls below 14. Statement 4 is correct; the Child Marriage Restrain (Amendment) Act, 1978, raised the age of marriage for girls to 18 and for boys to 21.

**Q56: Answer: a**

1. Gokla: Gokla was the zamindar of Tilpat who provided leadership to the Jat uprisings in AD 1669, which was suppressed by the Mughal Governor, Hasan Ali Khan.
2. Rajarama: Rajarama was the Zamindar of Sinsani who provided leadership to the Jat uprisings in AD 1685, which was suppressed by Raja Bishan Singh Kachwaha of Amber.
3. Churaman: Churaman obtained Mansab from the Mughal ruler Bahadur Shah I and established the State of Bharatpur. He served in Bahadur Shah's campaign against Banda Bahadur.
4. Badan Singh: Badan Singh, the nephew of Churaman, was given the title of Raja by Ahmed Shah Abdali. He may be regarded as the real founder of the Jat States of Bharatpur.

5. Suraj Mal: Suraj Mal, the adopted son and successor of Badan Singh, successfully welded the scattered Jat Zamindars near Agra into one powerful state. Under him, the Jat kingdom reached its zenith. He had remarkable talents for war and diplomacy.

**Q57: Answer: d**

Statement 1 is correct. Lymphatic filariasis, a prevalent NTD in India, is primarily caused by the parasitic roundworm *Wuchereria bancrofti*, which is transmitted through the bite of infected mosquitoes.

Statement 2 is also correct. Soil-transmitted helminthiases, a group of NTDs, are indeed caused by parasitic worms such as *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms, commonly found in areas with poor sanitation and hygiene.

Statement 3 is correct. Leptospirosis, another significant NTD, is caused by pathogenic *Leptospira* bacteria, commonly transmitted to humans through contact with water or soil contaminated with the urine of infected animals.

Statement 4 is also correct. Buruli ulcer, an emerging NTD in certain regions of India, is caused by *Mycobacterium ulcerans*, a slow-growing environmental mycobacterium that affects the skin and soft tissues.

**Q58: Answer: c**

RNA interference (RNAi) is a biological process that involves the suppression of gene expression by utilizing small RNA molecules, such as small interfering RNAs (siRNAs) or microRNAs (miRNAs), to degrade or inhibit the target mRNA sequences. This mechanism plays a crucial role in regulating gene expression and controlling various cellular functions. By interfering with the translation of specific mRNA molecules, RNAi can effectively silence the expression of targeted genes, thereby influencing the protein production and cellular activities associated with those genes.

**Q59: Answer: c**

1. Baglihar Dam (B): Located on the Chenab River in Jammu and Kashmir.

2. Hirakud Dam (A): Built on the Mahanadi River in Odisha.

3. Koyna Dam (C): Situated on the Koyna River in Maharashtra.

4. Nathpa Jhakri Dam (D): A run-of-the-river project on the Satluj River in Himachal Pradesh.

Therefore, the correct answer is option (C), where each hydropower project is correctly matched with its respective river.

**Q60: Answer: d**

Statement 1 is correct as it represents the use of advanced behavioral analytics and artificial intelligence (AI) in cybersecurity, enabling the detection and

mitigation of sophisticated cyber threats, including zero-day attacks and polymorphic malware. These technologies play a critical role in identifying and addressing evolving cybersecurity risks.

Statement 2 is also correct, emphasizing the significance of secure and privacy-preserving computation protocols, such as homomorphic encryption and secure multi-party computation (MPC). These protocols enable secure data processing and analysis, ensuring that sensitive information remains protected from unauthorized access during computational operations.

Statement 3 is also correct, highlighting the implementation of quantum-resistant cryptographic algorithms to safeguard sensitive data from potential security threats posed by quantum computing advancements. These algorithms are specifically designed to ensure the long-term security of data, even in the face of quantum computing developments that could potentially compromise traditional cryptographic methods.

**Q61: Answer: d**

Security alarm systems with motion detectors often use passive infrared technology, which operates in the infrared spectrum, not the terahertz range, making option 3 incorrect.

Microwave ovens with advanced sensor technology typically use microwave radiation, which operates in the gigahertz frequency range, and not within the terahertz range, making option 4 incorrect.

Terrestrial television receivers typically operate in the lower frequency range, usually within the UHF and VHF bands, which are below the terahertz frequency range. Bluetooth-enabled devices operate within the 2.4 GHz frequency band, which is well below the terahertz frequency range, making options 1 and 2 incorrect.

**Q62: Answer: d**

- Open-source applications are known for providing their source code to users, enabling them to view, modify, and distribute it freely. This promotes collaboration and transparency in software development, as multiple individuals can contribute to improving the application.

- Closed-source applications, on the other hand, restrict access to their source code, making it difficult for users to customize or understand how the software operates.

- The collaborative nature of open-source software often leads to a vibrant community of developers who continuously work on the application, resulting in frequent updates, bug fixes, and improvements to the software.

Therefore, statements 1, 2, and 3 correctly represent the characteristics of open-source and closed-source applications.

**Q63: Answer: a**

Statement 1 is correct. Gravitational waves are generated as a result of the collision of two massive celestial bodies such as neutron stars. These waves cause ripples in space-time, which have been detected by specialized equipment on Earth, affirming the theoretical predictions of Einstein's theory of general relativity.

Statement 2 is correct. The extreme pressure and temperatures generated by the collision of two neutron stars can lead to the formation of heavy elements such as gold and platinum. This process helps explain the presence of these elements in the universe.

Statement 3 is correct. High-energy gamma-ray bursts are often observed during the collision of neutron stars. These bursts are a form of electromagnetic radiation and can be detected by specialized telescopes. They provide crucial insights into the nature of such cataclysmic events and their impact on the surrounding space.

Statement 4 is incorrect because there is no evidence to suggest that the collision of two neutron stars would create a wormhole connecting distant points in the universe. While such a concept is popular in science fiction, it remains purely theoretical and has not been observed or proven in astrophysics.

**Q64: Answer: b**

According to the Election Commission's guidelines:

For a party to be recognized as a national party, it needs to meet any of the following conditions:

1. Be recognized in four or more states.
2. Secure at least 6% of total valid votes in at least 4 states (in the latest Lok Sabha or Assembly elections) and have at least 4 MPs in the last Lok Sabha polls.
3. Win at least 2% of total seats in the Lok Sabha from at least 3 states.

In the scenario provided:

- Party A received 5% of the total valid votes in four different states, which does not meet the requirement for being recognized in four or more states.
- In the Lok Sabha elections, it obtained 6% of the total valid votes in three states and won a single Lok Sabha seat in each of these states. However, it didn't secure a minimum of 4 MPs in the Lok Sabha elections.

Based on the criteria, Party A doesn't meet the requirements to be recognized as a national party as it doesn't fulfill any of the specified conditions.

Regarding the state party recognition criteria:

- Party A secured 5% of the total valid votes in four different states without winning any seats in the legislative assemblies of those states.
- It secured 6% of the total valid votes in three states and won a single Lok Sabha seat in each of these states.

According to the conditions for recognizing a party as a state party:

- It should secure 6% of the valid votes polled in the state assembly elections and win at least 2 seats in the same state assembly, or
- Attain 6% of total valid votes in the state during Lok Sabha elections and win 1 Lok Sabha seat in that state.

Party A didn't fulfill these criteria either, as it didn't win any seats in the state legislative assemblies despite obtaining 5% votes and only secured 6% votes and 1 seat in each of the Lok Sabha elections in three states.

Therefore, based on the given scenario and criteria, Party A doesn't qualify as either a national or a state party in the mentioned states. Hence, the correct option would be:

B) Party A doesn't meet the criteria for either a national or a state party in any of these states.

**Q65: Answer: b**

Materials in increasing order of their resistivity are: Highly Polished Brass, Stainless Steel, Anodised Aluminium, Graphite.

The Emissivity of the surface of a material is its effectiveness in emitting energy as thermal radiation. Thermal radiation is electromagnetic radiation that most commonly includes both visible radiation (light) and infrared radiation, which is not visible to human eyes. The emissivity of a surface depends on its chemical composition and geometrical structure. Quantitatively, it is the ratio of the thermal radiation from a surface to the radiation from an ideal black surface at the same temperature.

**Q66: Answer: d**

A Quantum Dot is a human-made nanoparticle that has semiconductor properties. Hence, statement 1 is correct. They're tiny, ranging in size from two to 10 nanometers, with the size of the particle dictating the wavelength of light it emits, and therefore the color. When Quantum Dots are hit with a light source, each dot emits a color of a specific bandwidth: Larger dots emit light that is skewed toward red, and progressively smaller dots emit light that is skewed more toward green.

Quantum Dots are usually applied to a sheet of film that sits as a layer in that "sandwich" in front of the LED backlight that's used to illuminate an LCD. The light passes through the LCD display stack, with the Quantum Dot color filter layer enhancing and enabling the LCD to reveal a wider and more saturated range of colors than would otherwise be possible. QD-LEDs are characterized by pure and saturated emission colors with narrow bandwidth, with FWHM (full width at half maximum) in the range of 20–40 nm.

QDs are either photo-emissive (photoluminescent) or electro-emissive (electroluminescent) allowing them to

be readily incorporated into new emissive display architectures. Quantum dots naturally produce monochromatic light, so they are more efficient than white light sources when color filtered and allow more saturated colors. Hence, statement 2 is correct.

A widespread practical application is using quantum dot enhancement film (QDEF) layer to improve the LED backlighting in LCD TVs. Light from a blue LED backlight is converted by QDs to relatively pure red and green, so that this combination of blue, green and red light incurs less blue-green crosstalk and light absorption in the color filters after the LCD screen, thereby increasing useful light throughput and providing a better color gamut. LED-backlit LCDs are the main application of photo-emissive quantum dots. Hence, statement 4 is correct.

Quantum dots only require a small amount of energy to work, and this can be achieved by a single blue light. Hence, statement 3 is correct.

In fact, they can produce a 30 percent increase in brightness while using about 30 to 50 percent less power. This reduced power consumption results in lower costs. Unlike conventional LCDs that waste energy combining and balancing different colors, QLED screens emit precise colors for improved energy efficiency.

As quantum dots can be tuned to emit the precise amount of light, it means the color produced will be more accurate. The nanocrystals can render a wider spectrum color at maximum brightness without losing saturation. This allows pictures to be shown clearly even in brightly lit rooms.

As QLED displays are based on existing LCD technology, they benefit from having a longer lifespan as they rely on modern and energy-efficient backlighting. Quantum dot technology also does not degrade over time, meaning QLED displays are less prone to burn-in. Burn-in is when part of an image will appear like a "ghost" on the screen and would not go away. This only happens when each self-lighting pixel dims over time.

**Q67: Answer: c**

Bioinformatics, as related to genetics and genomics, is a scientific subdiscipline that involves using computer technology to collect, store, analyze and disseminate biological data and information, such as DNA and amino acid sequences or annotations about those sequences.

What type of biological data can be used in bioinformatics?

Transcriptomics: the study of the transcriptome, the full set of RNA transcripts in a cell.

Genes aren't constantly active. They can be turned on and off by proteins and chemical messengers.

Proteomics: the study of the complete set of proteins in a cell or system.

Genes provide the information our cells use to make proteins, which are the machinery of the cell.

Scientists can analyse a tissue sample and see what proteins can be found in it.

Phenomics: the study of phenotypes at a genome-wide scale.

A phenotype is the way scientists describe something that can be measured about a person. A phenotype might be 'risk of diabetes' or 'eye colour'. Bioinformatics lets us look for possible links between our DNA and a phenotype.

Chemoinformatics: the computational analysis of chemical and biochemical data.

Drug research generates lots of experimental data.

Big databases of drug information can help scientists develop new drugs, by providing examples of chemicals that target a certain protein.

Limitations of Bioinformatics databases

Based on their contents, biological databases can be roughly divided into three categories: primary databases, secondary databases, and specialized databases. Primary databases contain original biological data. They are archives of raw sequence or structural data submitted by the scientific community

One of the problems associated with biological databases is over-reliance on sequence information and related annotations, without understanding the reliability of the information.

What is often ignored is the fact that there are many errors in sequence databases. There are also high levels of redundancy in the primary sequence databases. Hence, statement 4 is correct.

Annotations of genes can also occasionally be false or incomplete. Hence, statement 2 is correct.

All these types of errors can be passed on to other databases, causing propagation of errors.

Most common errors in bioinformatics database

1. Sequencing error

Most errors in nucleotide sequences are caused by sequencing errors. Some of these errors cause frameshifts that make whole gene identification difficult or protein translation impossible

2. Cloning vector contamination

Sometimes, gene sequences are contaminated with sequences from cloning vectors. Hence, statement 1 is correct.

3. Redundancy of data

Redundancy is another major problem affecting primary databases. There is tremendous duplication of information in the databases, for various reasons. The causes of redundancy include repeated submission of identical or overlapping sequences by the same or different authors, revision of annotations, dumping of expressed sequence tags (EST) data, and poor database



management that fails to detect the redundancy. This makes some primary databases excessively large and unwieldy for information retrieval.

#### 4. Human error

The other common problem is erroneous annotations. Often, the same gene sequence is found under different names resulting in multiple entries and confusion about the data. There are also some errors that are simply caused by omissions or mistakes in typing.

Steps taken to reduce error in biological database

The National Center for Biotechnology Information (NCBI) has now created a nonredundant database, called RefSeq, in which identical sequences from the same organism and associated sequence fragments are merged into a single entry. Proteins sequences derived from the same DNA sequences are explicitly linked as related entries. Sequence variants from the same organism with very minor differences, which may well be caused by sequencing errors, are treated as distinctly related entries.

#### Q68: Answer: c

The La Pérouse Strait is a narrow strait that separates the Russian island of Sakhalin from the Japanese island of Hokkaido. It connects the Sea of Japan to the south with the Sea of Okhotsk to the north. This strait is significant in the context of regional geography and maritime navigation.

Some notable straits around the world:

**Strait of Gibraltar:** Connects the Mediterranean Sea to the Atlantic Ocean, separating Europe from Africa.

**Bering Strait:** Separates Russia and Alaska, connecting the Arctic Ocean to the Bering Sea.

**Strait of Hormuz:** Connects the Persian Gulf to the Gulf of Oman and the Arabian Sea, a critical passage for oil transportation.

**Malacca Strait:** Links the Andaman Sea to the South China Sea, serving as a major shipping route between the Indian Ocean and the Pacific Ocean.

**English Channel:** Separates southern England from northern France, connecting the North Sea to the Atlantic Ocean.

**Bosporus Strait:** Connects the Black Sea to the Sea of Marmara, dividing European Turkey from Asian Turkey.

**Dover Strait:** Separates England from France, connecting the North Sea to the English Channel.

**Taiwan Strait:** Separates Taiwan from mainland China, connecting the East China Sea to the South China Sea.

**Cook Strait:** Divides the North Island and South Island of New Zealand, connecting the Tasman Sea to the Pacific Ocean.

**Strait of Juan de Fuca:** Connects the Pacific Ocean to Puget Sound and the Strait of Georgia, separating Washington state (USA) and Vancouver Island (Canada).

**Hudson Strait:** Links the Atlantic Ocean to Hudson Bay in Canada.

**Mozambique Channel:** Separates the island of Madagascar from the southeastern coast of Africa, connecting the Indian Ocean to the Mozambique Channel.

**Davis Strait:** Connects Baffin Bay to the Atlantic Ocean, separating Greenland from Canada.

**Gulf of Aden:** Connects the Red Sea to the Arabian Sea.

**Florida Strait:** Separates Florida (USA) from Cuba, connecting the Atlantic Ocean to the Gulf of Mexico.

**Mackinac Strait:** Links Lake Michigan and Lake Huron, connecting the Upper and Lower Peninsulas of Michigan, USA.

**Formosa Strait (Taiwan Strait):** Separates Taiwan from mainland China, connecting the East China Sea to the South China Sea.

**Bonifacio Strait:** Separates Corsica (France) from Sardinia (Italy), connecting the Tyrrhenian Sea to the western Mediterranean.

**Torres Strait:** Separates northern Australia from the island of New Guinea, connecting the Coral Sea to the Arafura Sea.

**Kerch Strait:** Connects the Black Sea to the Sea of Azov, separating the Crimean Peninsula from the Taman Peninsula.

**Tsushima Strait:** Separates Japan from the Korean Peninsula, connecting the Sea of Japan to the East China Sea.

**Gibraltar Strait:** Connects the Mediterranean Sea to the Atlantic Ocean, separating Europe from Africa.

**Dampier Strait:** Separates Raja Ampat islands in Indonesia.

**Palk Strait:** Separates India and Sri Lanka, connecting the Bay of Bengal to the Gulf of Mannar.

#### Q69: Answer: c

C) All Four

Lagrange points are positions in space where objects sent there tend to stay put. At Lagrange points, the gravitational pull of two large masses precisely equals the centripetal force required for a small object to move with them. Hence, statement 1 is correct.

These points in space can be used by spacecraft to reduce fuel consumption needed to remain in position.

There are five special points where a small mass can orbit in a constant pattern with two larger masses.

Of the five Lagrange points, three are unstable and two are stable. The unstable Lagrange points - labeled L1, L2 and L3 - lie along the line connecting the two large masses. The stable Lagrange points - labeled L4 and L5 - form the apex of two equilateral triangles that have the large masses at their vertices. L4 leads the orbit of earth and L5 follows.

The L1 point of the Earth-Sun system affords an uninterrupted view of the sun and is currently home to

the Solar and Heliospheric Observatory Satellite SOHO. Hence, statement 3 is correct.

The L2 point of the Earth-Sun system was the home to the WMAP spacecraft, current home of Planck, and future home of the James Webb Space Telescope. L2 is ideal for astronomy because a spacecraft is close enough to readily communicate with Earth, can keep Sun, Earth and Moon behind the spacecraft for solar power and (with appropriate shielding) provides a clear view of deep space for our telescopes. The L1 and L2 points are unstable on a time scale of approximately 23 days, which requires satellites orbiting these positions to undergo regular course and attitude corrections.

Scientists are unlikely to find any use for the L3 point since it remains hidden behind the Sun at all times. Hence, statement 2 is correct.

The idea of a hidden planet has been a popular topic in science fiction writing.

The L4 and L5 points are home to stable orbits so long as the mass ratio between the two large masses exceeds 24.96. This condition is satisfied for both the Earth-Sun and Earth-Moon systems, and for many other pairs of bodies in the solar system. Objects found orbiting at the L4 and L5 points are often called Trojans.

**Position and Characteristics**

**L1:** Located on the line connecting the two massive bodies, closer to the larger body. Objects placed at L1 move in sync with the Earth's orbital motion, making it suitable for space observatories like the James Webb Space Telescope.

**L2:** On the line connecting the two bodies, beyond the larger body. Objects at L2 enjoy a constant view of the night sky and are used for solar and Earth observations. Hence, statement 4 is correct.

**L3:** Opposite to the larger body, forming a straight line with the two massive bodies. It's unstable, making objects there prone to perturbations and drift.

**L4 and L5:** Form equilateral triangles with the two massive bodies. Objects at these points tend to accumulate over time due to gravitational forces, forming regions known as Trojan asteroids or Lagrange point clouds.

**Applications of Lagrange Points**

**Space Observatories:** L1 and L2 are commonly used for space observatories. Their stable positions allow telescopes to maintain consistent views of distant objects, free from atmospheric interference.

**Solar and Planetary Observation:** Observatories positioned at L1 and L2 provide continuous views of the Sun, monitoring solar activities and space weather phenomena.

**Communication Relays:** L4 and L5 could potentially serve as communication relay points for future deep-space missions, providing continuous coverage for signals.

**Asteroid Exploration:** Lagrange points have been considered as staging areas for missions to study asteroids, given their relatively stable positions.

**Q70: Answer: a**

The official seal shall have the Emblem enclosed in an oval or a round frame, with the name of the ministry or department written within the frame. State Government can use the Emblem or a part of it after taking permission from the Central Government.

The Emblem can be displayed on important government buildings like Rashtrapati Bhawan, Parliament House, Supreme Court and Central Secretariat, Raj Bhavan or Raj Niwas and State Legislature, High Courts and Secretariat buildings of the States or the Union territories, premises of India's Diplomatic Mission abroad, Indian consulates abroad.

Emblem cannot be used by former functionaries of the Government, Commission or Committee, Public Sector Undertaking, Bank, Municipal Council, Panchayat Raj Institution, Parishad, non-government organisation, University.

The State Emblem of India (Regulation of Use) Rules, 2007 lays down the persons who can use the Emblem in official stationery, on cars, etc.

**Q71: Answer: d**

In 1982 the cabinet secretariat issued guidelines. Foreign visits by members of the State governments in their official capacity would require clearances from the Ministry of External Affairs (MEA), Ministry of Home Affairs, Finance Ministry, and the Central Administrative Ministry.

Further, another order circulated in 2004, modifying the provisions to the extent that the final orders were to be issued by the Finance Ministry. Again in 2010, another directive was issued that made political clearances mandatory before private visits of Ministers in State governments.

**Q72: Answer: d**

**Cascade Range:** Located in the Pacific Northwest region of North America, running from northern California through Oregon and Washington.

**Rocky Mountains:** Running from the northernmost part of British Columbia in Canada down to New Mexico in the United States, the Rocky Mountains are a major mountain range in western North America.

**Mackenzie Mountains:** The Mackenzie Mountains are located in the western part of Canada's Northwest Territories and north eastern British Columbia. These mountains form part of the northern part of the Rocky Mountains and are named after the Mackenzie River, one of the longest rivers in North America, which flows through the region. The Mackenzie Mountains are

characterized by rugged terrain, alpine landscapes, and are known for their natural beauty and wilderness.

Appalachian Mountains: Stretching from the eastern United States up to south eastern Canada, this mountain range runs parallel to the U.S. East Coast.

Therefore, the correct sequence is 4 -1-2-3 making option D) the correct answer.

**Q73: Answer: B**

Explanation:

Supply elasticity refers to the responsiveness of the quantity supplied of a good or service to a change in its price. In Sarah's case, the cost of flour, a key input in her bakery's production process, has increased due to a global shortage. This increase in input cost can affect the quantity of baked goods that Sarah can supply at a given price. If the price of her baked goods remains the same, she may have to reduce the quantity supplied due to the increased cost of production. Conversely, if she decides to pass on the increased cost to her customers by increasing the price of her baked goods, the quantity demanded by her customers might change.

A) Demand Elasticity: Demand elasticity measures how sensitive the quantity demanded of a product or service is to changes in its price. It's calculated as the percentage change in quantity demanded divided by the percentage change in price.

- Elastic Demand: When demand is elastic, a change in price leads to a relatively larger change in quantity demanded. For example, consider the market for a specific brand of smartphones. If the price of this smartphone decreases by 20%, and as a result, the quantity demanded increases by 40%, the demand is elastic. Consumers are highly responsive to price changes.

- Inelastic Demand: In contrast, when demand is inelastic, changes in price result in proportionally smaller changes in quantity demanded. For instance, the demand for essential goods like medications tends to be inelastic. If the price of a life-saving medication increases by 10%, and the quantity demanded only decreases by 2%, the demand is inelastic.

B) Supply Elasticity: Supply elasticity measures how sensitive the quantity supplied of a product or service is to changes in its price. It's calculated similarly to demand elasticity.

- Elastic Supply: A market with elastic supply will experience a relatively larger change in quantity supplied in response to a change in price. For instance, in the case of agricultural products like oranges, if the price of oranges rises significantly, farmers might quickly increase their output by employing more resources to produce more oranges, resulting in an elastic supply.

- Inelastic Supply: Inelastic supply means that changes in price result in proportionally smaller changes in

quantity supplied. For example, if a product requires specialized machinery that takes a long time to produce or has limited availability, its supply might be inelastic. Even if the price increases substantially, the quantity supplied might not change significantly.

C) Opportunity Cost: Opportunity cost refers to the value of the next best alternative forgone when a decision is made. It represents what you give up to choose something else.

- Example: Suppose you have the choice between studying for an exam or working at a part-time job. If you choose to work, the opportunity cost is the potential grade you could have achieved by studying. Conversely, if you decide to study, the opportunity cost is the money you could have earned by working.

D) Production Possibility Frontier: The production possibility frontier (PPF) represents the maximum output combinations of two goods or services an economy can produce, given its resources and technology.

- Example: Imagine an economy that produces only two goods: cars and computers. The PPF shows the trade-offs between producing cars and computers. If the economy decides to produce more cars, it must allocate fewer resources to producing computers, and vice versa. If the economy operates efficiently at a point on the frontier, it's using its resources to the fullest extent. If it's inside the frontier, it's not utilizing all resources, and if it's beyond the frontier, it's currently unattainable with the given resources and technology.

**Q74: Answer: A**

Explanation:

The potential impact of the government's policy on private investment could be A) Increase due to higher public spending

Here's why:

A) Increase due to higher public spending: Increased public spending on infrastructure projects can stimulate economic activity and create jobs. This can lead to increased demand for goods and services, which can encourage private companies to invest more to meet this demand.

B) Decrease due to increased interest rates: While it's true that borrowing from international financial institutions could lead to higher interest rates, this is more likely to affect the cost of borrowing for the government rather than private investment directly.

C) Unaffected by government policy: It's unlikely that private investment would be completely unaffected by government policy, especially a significant fiscal policy change such as this.

D) No impact on overall investment: This is unlikely as the government's policy is specifically aimed at stimulating economic activity, which would typically have an impact on overall investment.

However, the actual impact could vary depending on a range of factors, including the specifics of the infrastructure projects, the state of the economy, and the reactions of private investors. It's also important to note that while increased public spending can boost economic activity in the short term, it's crucial to ensure that this spending is sustainable and doesn't lead to excessive debt or inflation in the long term.

**Q75: Answer: c**

Baku's development in the late 19th and early 20th centuries was greatly influenced by the establishment of the world's first modern oil well in the Bibi-Heybat suburb of Baku in 1846. This event marked the beginning of the region's significant involvement in the oil industry, shaping the city's economic and industrial growth.

**Q76: Answer: c**

The following two feats are mandatory:

- Get a FIDE rating of over 2500
- Win three GM norms

A GM norm is achieved with an excellent performance at a viable tournament. Again, the rules here are subject to various conditions, but essentially to win a GM norm one needs to achieve a rating performance of 2600 in a tournament of at least 9 rounds, in which  $\frac{1}{2}$  of the opponents are titled (FM, IM, GM, WGM, WIM) and  $\frac{1}{3}$  of the opponents are themselves Grandmasters.

**Q77: Answer: B**

Explanation:

The discovery of *Farlowichnus rapidus*, a new species of dinosaur, is a significant paleontological finding that sheds light on the diversity and adaptability of life during the early Cretaceous period. This small carnivorous dinosaur, about the size of a modern-day seriema bird, inhabited the ancient deserts of what is now Brazil. Its discovery provides valuable insights into the ecological dynamics of these arid environments and highlights the importance of ongoing fossil exploration and analysis.

Key takeaways from the discovery of *Farlowichnus rapidus*:

**Ecological Diversity:** The existence of a small carnivorous dinosaur in an arid desert ecosystem demonstrates the remarkable adaptability of dinosaurs and their ability to thrive in diverse environments. This discovery expands our understanding of the ecological niches occupied by dinosaurs during the Cretaceous period.

**Locomotion and Speed:** The large distance between the footprints attributed to *Farlowichnus rapidus* suggests that this dinosaur was capable of running swiftly across the desert landscape. This ability to move quickly would

have been advantageous for hunting prey and evading predators in the harsh desert environment.

**Importance of Fossil Exploration:** The discovery of *Farlowichnus rapidus* underscores the significance of continuous exploration and analysis of fossil records. Every new fossil specimen unearthed provides valuable clues about the past, helping us reconstruct the evolutionary history and ecological dynamics of ancient life.

Overall, the discovery of *Farlowichnus rapidus* represents an exciting step forward in our understanding of dinosaur diversity and adaptation during the Cretaceous period. It highlights the importance of preserving and studying fossils to gain a deeper understanding of the past and the evolution of life on Earth.

**Q78: Answer: D**

Explanation:

Onattukara sesame, also known as Onattukara ellu, is a special type of sesame seed that grows in the Onattukara region of Kerala, India. This region has a unique soil and climate that gives the sesame seeds a distinctive flavour and aroma. Onattukara sesame seeds have a higher oil content than other sesame seeds, which makes them suitable for extracting oil. The oil is used for various purposes, such as cooking, lighting lamps, and making Ayurvedic medicines.

Onattukara sesame oil is rich in vitamin E, calcium, and magnesium, and has many health benefits. It can help lower cholesterol, improve skin and hair health, and prevent inflammation. Onattukara sesame seeds are also used as an ingredient in many dishes, such as sweets, snacks, and curries. They add a nutty and crunchy taste to the food. Onattukara sesame has been awarded the GI tag, which recognizes its geographical origin and quality. This has helped to boost the popularity and value of Onattukara sesame in the market.

**Q79: Answer: c**

1. Inspiration from Ancient Olympic Games:

- The modern Olympic Games were inspired by the ancient Olympic Games, which were held in Olympia, Greece, starting in 776 BCE. Pierre de Coubertin, a French educator, drew inspiration from the ideals of ancient Greek athleticism, competition, and international unity. The modern Olympics aimed to promote friendship, understanding, and fair play among nations.

2. Olympic Flame and Torch Relay:

- The tradition of the Olympic flame and Torch Relay is a symbolic element of the modern Olympic Games. The flame is ignited using sunlight at the Temple of Hera in Olympia, Greece, using a parabolic mirror. The flame then travels through a Torch Relay to

the host city, symbolizing the passing of the Olympic spirit from ancient to modern times.

3. Founding of the International Olympic Committee (IOC):

- Pierre de Coubertin founded the International Olympic Committee (IOC) in 1894, to organize and promote the modern Olympic Games. The IOC is responsible for overseeing the Games and ensuring they adhere to the principles set out in the Olympic Charter. Coubertin served as the IOC's first President.

4. First Modern Olympic Games in Paris (1896):

- This statement is incorrect. The first modern Olympic Games took place in Athens, Greece, not Paris. The Games were held in 1896 to celebrate the 1,500th anniversary of the ancient Games. Athens was chosen as the inaugural host city to honor the historical and cultural significance of the Olympic tradition.

Therefore, while statements 1, 2, and 3 are correct, statement 4 contains an inaccuracy. The correct answer is C) 1, 2 and 3 only.

**Q80: Answer: b**

The term "Silver Tsunami" encapsulates a profound demographic shift characterized by a substantial increase in the proportion of elderly individuals within a population. As a metaphorical expression, the "silver" component symbolizes the aging demographic, often associated with gray or silver hair.

Key Characteristics:

- **Age Group:** The Silver Tsunami primarily involves individuals aged 60 and above. This demographic cohort experiences a surge in numbers, leading to a higher percentage of elderly citizens within the overall population.

- **Implications for Social Systems:** The aging population has significant implications for various societal systems, including healthcare, pensions, and elderly care services. Increased demand for healthcare services, a strain on pension systems, and a need for specialized care facilities are common challenges associated with the Silver Tsunami.

- **Global Significance:** The Silver Tsunami is a global phenomenon affecting countries worldwide. Factors contributing to this demographic shift include increased life expectancy, declining fertility rates, and advancements in healthcare.

- **Economic and Social Challenges:** As the Silver Tsunami unfolds, societies face economic and social challenges related to providing adequate healthcare, ensuring financial security for retirees, and establishing robust support systems for the elderly.

Silver Economy: Despite challenges, the Silver Tsunami also presents opportunities. The aging population represents a substantial consumer market with specific needs, leading to the emergence of the "silver economy."

This economic sector focuses on products and services catering to seniors, creating new business avenues.

**Q81: Answer: D**

Explanation:

The Narasimham Committee, established in 1991 and led by Dr. C. Rangarajan Narasimham, made several key recommendations for reforming India's financial sector. These recommendations aimed to improve the efficiency, competitiveness, and soundness of the banking system.

Some of the most important proposals:

**Three-tier banking structure:** Recommended creating three categories of banks – national, regional, and local – to cater to different market segments, fostering specialization and efficiency.

**Consolidation of weak banks:** Advocated for mergers and acquisitions to create stronger and more resilient institutions, addressing the problem of numerous small and weak banks.

**Stronger capital adequacy requirements:** Proposed raising the minimum capital adequacy ratio (CAR) for commercial banks from 6% to 8%, improving banks' ability to absorb losses and ensure stability.

**Risk-based supervision:** Introduced a framework where banks with higher risk profiles would be subject to stricter regulatory oversight, making supervision more efficient and targeted.

**Gradual deregulation of interest rates:** Advocated for a gradual shift from government-controlled rates to market-determined ones, enhancing resource allocation and financial system efficiency.

**Greater autonomy for banks in setting lending rates:** Proposed giving banks more freedom in setting lending rates to increase competition and responsiveness, benefitting borrowers with better loan pricing.

**Improved corporate governance:** Emphasized the need for measures to improve governance within banks, including increased transparency, accountability, and professionalization.

**Development of money and capital markets:** Advocated for a more diversified financial system by promoting the growth of money and capital markets, offering alternative funding sources for businesses.

**Greater role for foreign banks:** Recommended allowing more foreign banks to operate in India to introduce new technology and expertise, boosting the banking system.

Impact of the Recommendations:

**Improved efficiency and competitiveness:** Consolidation and market-driven practices led to a more efficient and competitive banking system.

**Enhanced financial stability:** Stricter capital adequacy and risk-based supervision improved overall financial stability.

Increased access to finance: Deregulated interest rates and developed markets offered businesses easier access to financing.

Globalization of the financial sector: Increased foreign bank participation and capital flow liberalization integrated India's financial sector with the global market.

**Q82: Answer: a**

1. The Western states of Rajasthan and Gujarat, despite their arid landscapes, play a pivotal role in the iron and steel industry due to their rich deposits of iron ore and coal.

- This statement is incorrect. The significant iron and steel production is more associated with the Eastern states like Jharkhand, Odisha, and West Bengal, rather than the Western states.

2. Coastal regions, such as Maharashtra and Gujarat, have witnessed significant growth in the iron and steel sector, leveraging their strategic access to ports and markets.

- This statement is correct. Coastal regions, with their accessibility to ports for transportation and markets, have indeed witnessed substantial growth in the iron and steel sector.

3. Southern states like Karnataka and Andhra Pradesh have emerged as leading producers of finished steel products rather than primary steel manufacturing.

- This statement is correct. Southern states, particularly Karnataka and Andhra Pradesh, are known for their significant role in producing finished steel products, leveraging their industrial infrastructure.

4. The northern states of Jammu and Kashmir contribute minimally to the iron and steel industry, primarily due to logistical challenges and limited access to essential raw materials.

- This statement is correct. The northern states, including Jammu and Kashmir, face logistical challenges and limited access to essential raw materials, contributing minimally to the iron and steel industry.

Therefore, the correct answer is A) 1 only.

**Q83: Answer: D**

Explanation:

Statement 1 is correct:

Himalayan black bears play a significant role in maintaining the ecological balance of the ecosystems they occupy. They act as seed dispersers by eating fruits and depositing the seeds in their droppings, contributing to forest regeneration. They also prey on insects and small mammals, helping to regulate populations and maintain a healthy balance in the food chain. Additionally, their presence helps to control plant populations, preventing overgrowth and maintaining the diversity of plant species in the forest. Due to their multifaceted role in maintaining the ecosystem,

Himalayan black bears are considered to be ecological indicators, as their presence or absence can provide valuable insights into the health of the ecosystem. Furthermore, their impact on the ecosystem is so significant that they are classified as keystone species, meaning that their removal would have a disproportionate and detrimental effect on the ecosystem's structure and stability.

Statement 2 is correct:

Himalayan black bears are primarily nocturnal animals, meaning they are most active during the night. This adaptation allows them to avoid conflicts with humans and other predators, which are more active during the day. Their nocturnal behaviour also helps them to conserve energy and focus on foraging for food in the relative safety of darkness. Their elusive nature is further enhanced by their habitat preferences, which often involve dense forests and rugged terrain that provides them with ample cover. This combination of nocturnal activity and elusive behaviour makes them difficult to spot in the wild, contributing to their low population density and making them a challenging species to study and conserve.

Statement 3 is correct:

Himalayan black bears are endemic to Asia, with their primary range confined to the Himalayas. They are found in the mountainous regions of India, Bhutan, Nepal, China, and Pakistan. Their distribution is primarily limited to higher elevations, ranging from 3,000 to 4,000 meters above sea level, as they prefer the cooler temperatures and dense forests found at these altitudes.

Statement 4 is correct:

The International Union for Conservation of Nature (IUCN) categorizes the Himalayan black bear as a "Vulnerable" species. This designation indicates that the species is at high risk of extinction in the wild due to various threats, including habitat loss, poaching for its fur and traditional medicine, and human-bear conflict. Habitat loss, particularly due to deforestation and encroachment by human activities, has significantly reduced the availability of suitable habitat for the species, fragmenting their populations and making it more challenging for them to find food and mates. Poaching for its fur, which is used in the production of traditional garments, and its body parts, which are used in traditional medicine, pose additional threats to the species' survival. Human-bear conflict, arising from encounters between bears and humans in areas of human habitation, can lead to injury or death for both humans and bears.

Statement 5 is correct:

Himalayan black bears prefer moist temperate forests mixed with deciduous broad-leaved forests. These forests provide them with the necessary resources for survival, including food, shelter, and den sites. The

dense understory of these forests provides ample protection from predators and harsh weather conditions. The trees and shrubs offer a variety of fruits, nuts, and berries that the bears feed on, while the forest floor provides insects, small mammals, and other prey items. These forests also provide den sites for the bears to hibernate during the winter months.

**Q84: Answer: b**

Obliquity of the Earth's axis (1): The obliquity, or tilt, of the Earth's axis changes over long periods (around 41,000 years). This variation influences the intensity of seasons, but its direct impact on shaping the Earth's surface is minimal compared to other factors.

2. Milankovitch cycles (2): Milankovitch cycles refer to variations in Earth's orbit parameters, including eccentricity, axial tilt, and precession. These cycles affect the distribution and intensity of solar radiation, contributing to long-term climate changes. They indirectly influence geological processes such as glaciation and sea level changes, which, over time, can shape the Earth's surface.

3. Eustatic sea level changes (3): Eustatic sea level changes are variations in the global sea level. While they are important for understanding Earth's history and can influence coastlines, they are more directly associated with changes in sea levels rather than shaping the topography of the Earth's surface.

4. Isostatic rebound (4): Isostatic rebound is a geological process that occurs when land masses, previously depressed by the weight of ice sheets during glaciation, start to rise as the ice melts and the load is removed. This process directly shapes the Earth's surface by influencing the elevation of land in glaciated regions.

5. Thermohaline circulation (5): Thermohaline circulation is driven by differences in temperature and salinity in ocean waters, creating ocean currents that redistribute heat around the globe. While its primary impact is on climate patterns, it can indirectly influence geological processes such as erosion and sedimentation.

**Q85: Answer: C**

Explanation:

Redistribution of income, broadly speaking, refers to transferring income or wealth from those with higher incomes or greater wealth to those with lower incomes or less wealth. This is a complex and multifaceted topic with various arguments surrounding its effectiveness, methods, and consequences.

Arguments for Redistribution

Reducing poverty and inequality: Redistribution can alleviate poverty and decrease income inequality. By transferring resources to the less wealthy, basic needs can be met and living standards can improve.

Promoting social mobility: Increased equality of opportunity can be achieved through redistribution, providing everyone with a fairer chance of achieving upward mobility regardless of their starting point.

Boosting economic growth: Some argue that a more equitable distribution of income can lead to higher aggregate demand and consumption, stimulating economic growth.

Promoting social stability and cohesion: Societies with less inequality tend to experience lower crime rates and greater social cohesion, potentially leading to increased stability and well-being.

Arguments against Redistribution

Disincentives to work and invest: Concerns exist that high taxes or income transfers can discourage individuals from working hard and taking risks, potentially hindering economic growth.

Inefficiency and corruption: Inefficiently designed or implemented redistribution programs can lead to waste and corruption, reducing their effectiveness and potential benefits.

Loss of individual freedom: Opponents argue that taking income from individuals restricts their economic freedom and choices, potentially infringing on personal liberty.

Economic distortions: Redistribution can distort market mechanisms and incentives, impacting economic efficiency and resource allocation.

Methods of Redistribution

Progressive taxation: Taxing higher incomes at a higher rate than lower incomes to generate revenue for social programs.

Social welfare programs: Providing direct financial assistance to low-income individuals and families through programs like unemployment benefits, disability payments, and social security.

Education and training: Investing in education and training programs can equip individuals with skills and knowledge to secure higher-paying jobs, ultimately reducing income inequality.

Minimum wage: Setting a minimum wage can ensure all workers receive a certain level of compensation, potentially lifting low-wage earners out of poverty.

Land reform: Redistributing land ownership from large landowners to small farmers or landless peasants can improve livelihoods and promote rural development.

Regulation: Implementing regulations on markets and businesses to prevent unfair competition and ensure fair treatment of workers can contribute to income equity.

Challenges and Considerations

Determining the optimal level of redistribution: Finding the right balance between achieving equity and incentivizing productivity is a complex challenge.

Designing effective programs: Implementing efficient and targeted redistribution programs that minimize waste and corruption is crucial.

Political and social factors: Public support, political feasibility, and societal values significantly influence the design and implementation of redistribution policies.

Global context: International trade and investment flows can impact domestic income distribution, needing careful consideration.

Redistribution of income remains a highly debated topic, with various arguments for and against it. Different methods exist, each with its advantages and disadvantages. The optimal approach depends on a country's specific context, political system, and cultural values. Ultimately, the goal is to find a sustainable and effective way to address income inequality, promote social mobility, and ensure a fairer distribution of opportunities and resources for all.

**Q86: Answer: D**

Explanation:

Statement 1 is correct: The base year for the WPI calculation was revised to 2011-12 from the earlier base year of 2004-05. The WPI measures changes in the average price level of goods traded in bulk, comparing them to the prices prevailing during the base year.

Statement 2 is correct: The WPI indeed covers a wide basket of goods, including primary articles, fuel and power, and manufactured products. The weightage of the three major components in the WPI basket (based on 2011-12) is true:

Primary articles: 22.62%

Fuel and power: 13.15%

Manufactured products: 64.23%

This means that manufactured products have the most significant influence on the overall WPI movement due to their large share. However, changes in prices of primary articles and fuel & power can also have a significant impact, depending on the magnitude of the change and its effect on other sectors.

Statement 3 is correct: The WPI is calculated using a Laspeyres formula, which takes the base year quantities of each good and applies current prices to them. The resulting sum is then compared to the sum of base year prices, weighted by the base year quantities, to calculate the percentage change.

Statement 4 is correct: The WPI is released by the Office of the Economic Adviser (OEA) in the Ministry of Commerce and Industry, usually on the 14th of every month (the next working day, if the 14th is a holiday). This data provides valuable insights into inflationary trends and helps policymakers gauge the state of the economy.

**Q87: Answer: D**

Explanation:

All four statements are correct

RRBs were established under the Regional Rural Banks Act of 1976, following the recommendations of the Narasimham Committee on Rural Credit.

RRBs are regulated by the Reserve Bank of India (RBI) for overall banking activities and compliance with regulations. They are also supervised by the National Bank for Agriculture and Rural Development (NABARD) for their financial and operational aspects pertaining to rural lending and development.

The ownership and capital structure of RRBs is indeed shared by three entities:

Central Government: holds 50% of the share capital.

State Government: holds 15% of the share capital.

Sponsor Bank: holds 35% of the share capital (typically a large public sector bank like SBI).

The mandatory target for priority sector lending by RRBs is currently set at 75%. This means they must allocate at least 75% of their loan portfolio to sectors like agriculture, micro and small enterprises, and other underbanked segments in rural areas.

Regional Rural Banks

Regional Rural Banks (RRBs) are a type of government-owned scheduled commercial banks that operate at the regional level in different states of India. They were established in 1975 under the RRB Act 1976 to provide banking and credit facilities to the rural and underprivileged sections of society, especially small and marginal farmers, agricultural labourers, small artisans, etc. The idea of creating RRBs was first proposed by the Narasimhan Committee on Rural Credit in 1975, which recommended setting up local banks with local feel and local touch to cater to the specific needs of the rural areas. The committee also suggested that these banks should be sponsored by the existing commercial banks and should have a tripartite ownership structure, with 50% shareholding by the central government, 35% by the sponsor bank and 15% by the state government.

The first RRB, Prathama Bank, was set up on 2nd October 1975 in Moradabad, Uttar Pradesh, with Syndicate Bank as its sponsor bank. Since then, more RRBs have been established across the country, reaching a peak of 196 RRBs in 1987. However, due to various issues such as low profitability, high non-performing assets (NPAs), weak capital base and operational inefficiency, many RRBs were merged or amalgamated over time. As of March 2020, 43 RRBs are operating in India, covering 685 districts and serving about 8.66 crore customers.

Structure of RRBs

RRBs are regulated by the Reserve Bank of India (RBI) and supervised by the National Bank for Agriculture and Rural Development (NABARD). They are also subject to periodic inspections by the sponsor banks and audits by the Comptroller and Auditor General of India (CAG). The RRBs have a board of directors comprising representatives from the central government, state



government, sponsor bank and independent directors. The chairman of the board is appointed by the central government in consultation with NABARD and the sponsor bank.

The RRBs have a three-tier organizational structure, consisting of the head office at the state level, regional offices at the district level and branches at the village level. The head office is responsible for policy formulation, planning, coordination and monitoring of the performance of the RRB. The regional offices are responsible for supervising, controlling and guiding the branches under their jurisdiction. The branches are responsible for providing banking services to the customers in their area of operation.

#### Function of RRBs

The main function of RRBs is to provide credit and other banking facilities to the rural population for various purposes such as agriculture, animal husbandry, fisheries, cottage industries, handicrafts, etc. They also participate in various government schemes and programs such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Pradhan Mantri Awas Yojana (PMAY), Pradhan Mantri Jan Dhan Yojana (PMJDY), Pradhan Mantri Kisan Samman Nidhi (PM-KISAN), etc. They also offer various products and services such as savings accounts, current accounts, fixed deposits, recurring deposits, loans, overdrafts, debit cards, credit cards, mobile banking, internet banking, UPI services, etc.

The RRBs play a vital role in promoting financial inclusion and rural development in India. They have a wide network of branches across remote and inaccessible areas where other banks may not have a presence. They have a deep understanding of the local needs and preferences of their customers and offer customized solutions to suit their requirements. They also contribute to social welfare by providing employment opportunities to local people and supporting various social causes such as education, health care, environment protection, etc.

#### Q88: Answer: C

Explanation:

The correct answer is C) Statement-1 is correct, but Statement-2 is incorrect.

Statement 1: The Nominal Effective Exchange Rate (NEER) is indeed computed by considering the exchange rates of a country's trading partners, weighted based on trade volume. This statement is correct.

Statement 2: NEER provides insights into a country's competitiveness, but it's not limited to import competitiveness. It also provides insights into export competitiveness. A higher NEER implies that the home country's currency is strong, which makes imports cheaper but exports more expensive, affecting both

import and export competitiveness. Therefore, this statement is incorrect.

The nominal effective exchange rate (NEER) is an index that measures the average value of a country's currency relative to a basket of other currencies. The NEER is weighted by the trade volume or importance of each currency in the basket. A higher NEER indicates that the domestic currency has appreciated against the foreign currencies, while a lower NEER indicates that the domestic currency has depreciated against the foreign currencies. The NEER can be used to assess the competitiveness of a country's exports and imports, as well as its monetary and exchange rate policies.

The real effective exchange rate (REER) is a measure of the value of a currency against a weighted average of several foreign currencies, adjusted for inflation. The REER is an indicator of a country's international competitiveness, as it reflects not only the nominal exchange rate but also the relative price levels of goods and services. A higher REER means that the domestic currency is overvalued, making exports more expensive and imports cheaper. A lower REER means that the domestic currency is undervalued, making exports cheaper and imports more expensive. The REER can be calculated using different methods, such as the geometric or arithmetic mean, and different weights, such as trade shares or GDP shares. The choice of method and weights can affect the results and interpretation of the REER.

#### Q89: Answer: C

Explanation:

Statement 1 is incorrect: According to the Reserve Bank of India (RBI), which governs PPIs in India, both banks and non-banking entities can issue PPIs, provided they obtain the necessary approval or authorization from the RBI. While banks do play a significant role in issuing PPIs in India, especially open system PPIs like debit and credit cards, they are not the sole issuers. Non-banking entities can also issue PPIs, particularly closed and semi-closed system ones, which cater to specific needs and cater to a wider range of users who may not have access to traditional banking services.

Statement 2 is correct: There are three types of PPIs in India:

Closed System PPIs: These can only be used at a specific group of merchants or for a specific purpose and can be issued by both banks and non-banks.

Semi-closed System PPIs: These can be used at a wider range of merchants but within a specific category or group, and can only be issued by RBI-approved banking or non-banking institutions.

Open System PPIs: These are the most versatile and can be used for practically any transaction, including cash withdrawals. However, only RBI-approved banking institutions can issue them.

Statement 3 is incorrect: Prepaid Payment Instruments (PPIs) in India do not require mandatory linkage with an individual's bank account. They can be loaded/reloaded by cash (not permitted in one type of Small PPI), debit to a bank account, credit and debit cards, PPIs (as permitted from time to time) and other payment instruments issued by entities regulated in India and Indian Rupees (INR) only. So, it's not a requirement for PPIs to be linked with a bank account. However, linking a PPI with a bank account can provide additional functionalities such as seamless fund transfers.

Statement 4 is incorrect: Prepaid Payment Instruments (PPIs) in India can be used for both online and offline transactions. They can be used for purchases at a variety of clearly identified retailers, either by location or at individual businesses that have agreements with the PPIs' issuers to accept them as payment. So, PPIs are not limited to online transactions and can be used for offline purchases as well.

Statement 5 is incorrect: Prepaid Payment Instruments (PPIs) in India do not offer interest on the loaded amount. The monies collected by the PPI issuers are used to make payments to merchants who are part of the acceptance arrangement and for facilitating funds transfer/remittance services on behalf of the PPI holders<sup>12</sup>. So, unlike savings bank accounts, PPIs do not pay interest on the loaded amount.

**Q90: Answer: b**

Passively parallel sequencing, also referred to as next-generation sequencing, has positively changed DNA analysis, allowing further advances in genetics. Its capability of dealing with low quantity/damaged samples makes it an interesting instrument for forensics. Digital Sequence Information, or "DSI", is a policy term that refers broadly to genomic sequence data and other related digital data. This includes the details of an organism's DNA and RNA, which determine its characteristics and unique traits. There is yet no consensus as to the exact interpretation and scope of the term (for example whether it refers only to nucleotide sequences or also to the proteins and metabolites they encode). Hence, option 2 is correct.

Recent advances in sequencing technology and synthetic biology have made it easier than ever before to sequence, store, and share segments of DNA and RNA virtually.

DSI policies outcomes will have far-reaching implications for researchers that generate and use DSI.

DSI and its policy implications for access and benefit-sharing are currently being discussed among Parties to the Convention on Biological Diversity (CBD), and in other fora.

The principle of operation of the Nanopore Sequence Technique is the analysis of the DNA strand directly as

the molecule is drawn through a tiny pore suspended in a membrane. Changes in electrical current, or tunneling currents, are used to read off the chain of bases.

Pyrosequencing is an alternative sequencing technique of small DNA fragments based on the sequencing-by-synthesis principle. Compared to the Sanger method, pyrosequencing is less costly and time consuming, although the applications of this technique do not completely overlap with those of the conventional method.

**Q91: Answer: a**

1. Baratang Island (Option A): As mentioned earlier, Baratang Island is indeed known for its mud volcanoes. This is the correct answer.

2. Gulf of Kachchh (Option B): This is the intentionally confusing option. The Gulf of Kachchh is not generally known for mud volcanoes. However, it does have unique geological features, including tidal flats and extensive mangrove areas.

3. Pulicat Lake (Option C): Pulicat Lake is the second-largest brackish water lagoon in India. While it has ecological significance, it is not known for mud volcanoes.

4. Agatti Island (Option D): Agatti Island is part of the Lakshadweep archipelago and is not associated with mud volcanoes.

Therefore, while Baratang Island is known for mud volcanoes, the intentionally confusing option B (Gulf of Kachchh) may lead candidates to consider it due to the Gulf's association with unique geological features. The correct answer is A) Baratang Island.

**Mud Volcanoes**

Mud volcanoes are geological features that involve the eruption of mud and gases from the Earth's surface. Unlike traditional volcanoes that erupt molten rock, mud volcanoes eject a mixture of water, fine sediments, and various gases, including methane.

□ **Formation:** Mud volcanoes typically form in areas where there is tectonic activity, such as convergent or collision zones between tectonic plates. The mud is often rich in minerals and can vary in consistency from liquid to semi-solid.

□ **Eruption Process:** The eruptions of mud volcanoes are caused by the movement of subsurface fluids, such as water, hydrocarbons, and gases, that force their way to the surface. The pressure builds up, eventually causing the mud and gases to erupt. The mud is often cold, and eruptions can range from gentle flows to violent explosions.

□ **Composition:** The ejected mud is a mixture of water, clay, silt, and other fine particles. Gases released during eruptions include methane, carbon dioxide, and nitrogen. The specific composition can vary depending on the location and geological conditions.

- Global Distribution: Mud volcanoes are found in various parts of the world, but they are most commonly associated with tectonically active regions, such as the Caspian Sea region, the Mediterranean, and parts of Asia. Azerbaijan has one of the largest concentrations of mud volcanoes.
- Landforms: Mud volcanoes can create unique landforms, including conical mounds, craters, and associated mudflows. Some mud volcanoes are small and inconspicuous, while others can be quite large.
- Ecological Importance: Mud volcanoes can have ecological significance as they provide habitats for unique microbial life adapted to extreme conditions. The mud can also contribute to the formation of new land in coastal areas.
- Use in Energy Exploration: Methane released from mud volcanoes is of interest in energy exploration. Some mud volcanoes are associated with significant methane reserves, and researchers study these areas to better understand the Earth's subsurface and potential energy resources.

**Q92: Answer: d**

1. Flax cultivation is well-suited to temperate climates.
  - Explanation: This statement is correct. Flax cultivation is indeed well-suited to temperate climates. Flax (*Linum usitatissimum*) is a cool-season crop that thrives in regions with moderate temperatures, making it suitable for cultivation in temperate zones.
2. Jatropha Tree is commonly cultivated as a source of biofuel.
  - Explanation: This statement is correct. Jatropha (*Jatropha curcas*) is commonly cultivated for its oil-rich seeds, which can be used to produce biodiesel. It gained attention as a potential biofuel crop due to the oil content in its seeds.
3. Jatropha seeds contain toxic compounds, including phorbol esters.
  - Explanation: This statement is correct. Jatropha seeds do contain toxic compounds, particularly phorbol esters. These compounds can be harmful, and precautions are needed during the handling and processing of Jatropha seeds to mitigate potential risks.
4. Bagasse typically has a high moisture content, making it a less efficient fuel for combustion compared to drier biomass materials.
  - Explanation: This statement is correct. Bagasse, being a byproduct of sugarcane processing, often has a relatively high moisture content. The high moisture content can impact its efficiency as a fuel for combustion, making it less efficient compared to drier biomass materials.

**Q93: Answer: d**

MIMO Technology in Wireless Communication

MIMO – (multiple input, multiple output) is an efficient transmission technology used in modern wireless communication. As the name implies, MIMO uses multiple antennas for transmission and reception. Combination of multiple transmission sources enhances higher data rate and system efficiency. Smart devices with wireless standard 802.11n support MIMO technology.

In conventional signal transmission, one antenna send signal and another antenna pick up the signal at the receiving end. In a basis MIMO system more than one transmitting antennas and single or multiple receiving antennas used for signal transmission simultaneously.

Applications of MIMO

1. MIMO in LTE, LTE advanced

MIMO technology can be used in LTE and LTE advanced radio networks for improving network efficiency. With the introduction of MIMO technology, signal disturbances due to multipath have been significantly reduced. MIMO technology make use of multipath phenomenon to maximize transmission by receiving bounced signals from obstructions.

Multipath is a phenomenon in wave propagation. Transmitted signals reflected from buildings, vehicles, trees and other terrain. These reflected signals with slight delay will cause confusion at receiver side and information couldn't be decoded correctly.

In order to increase signal quality and gain, multiple antennas are placed in different directions without interfering the radiation pattern of each antenna. In order to implement MIMO technology, much complex signal processing is required at transmitting and receiver side.

2. MIMO in Wireless LAN

One of the common uses of MIMO technology today is wireless LAN. Wireless routers with multiples antenna become common nowadays. Data rate can be doubled or multiplied many times with effective use of MIMO technology in wireless routers and mobile devices. In order to have an efficient system, both transmitting and receiving devices must be compatible.

3. 5G and Internet of Things

5G and Internet of Things requires massive data rate. MIMO technology with Beamforming is one of the significant transmission terminologies for super charged 5G networks and IoT. Transmission tower will be equipped with multiple antennas. It will locate a particular user at a specific location and will transmit to that user using multiple antennas simultaneously.

Change in user location can be tracked and user will be handled by the antennas located at the specific direction of user. It enables network operators to offers an uninterrupted service effectively.

MIMO can be used in Internet of Things, smart home, smart cities and connected car applications.

### Advantages of MIMO

Higher data rate – with use of multiple Tx and Rx combinations.

Time diversity – a data packet can be transmitted at different time slots. Hence, statement 1 is correct.

Frequency diversity – different frequency channels can be used for transmission. Hence, statement 2 is incorrect.

Reduced signal distortion due to multipath phenomenon. Hence, statement 3 is correct.

Higher accuracy.

Space diversity: Space diversity is the primary basis for MIMO and utilizes the different positions of antennas on a router to leverage various signal paths. Hence, statement 4 is correct.

### Q94: Answer: b

Sprites are electrical discharges that occur high above active thunderstorms. Sprites appear as vertical red columns extending up to 60 miles from the cloud top and have been found to occur in conjunction with and/or as a reaction to +CG lightning. Sprites are mostly red, faintly lit (thus only visible at night), and only last a few seconds, making them nearly invisible to the naked eye and difficult to photograph. Their shape has been described as resembling columns, carrots or jellyfish! Hence, option 1 is correct.

Blue jets emerge from the top of the thundercloud, extending up in narrow cones fanning out and disappearing at heights of 25-35 miles. Blue jets last just a fraction of a second.

Elves are rapidly expanding disk-shaped glowing regions up to 300 miles in diameter. They last less than a thousandth of a second and occur above areas of active CG lightning. Scientists believe elves result when an energetic electromagnetic pulse extends up into the ionosphere. Hence, option 2 is correct.

Anvil Crawlers are tree-like, horizontally-moving IC lightning discharges which tend to appear along the underside of thunderstorm anvils. The human eye can see them due to their slower speed (relative to other lightning!). This type of lightning (sometimes referred to as 'rocket lightning') often covers large distances, resulting in spectacular sky-filling displays. Anvil crawlers are often very high-altitude events and typically result in soft, rolling thunder due to their great distance from the observer. Anvil crawlers can occur independently or entirely within the cloud or in connection with a cloud-to-ground discharge.

A bolt from the blue (sometimes called 'anvil lightning' or 'anvil-to-ground' lightning) is a name given to a cloud-to-ground lightning discharge that strikes far away from its parent thunderstorm. It typically originates in the highest regions of a cumulonimbus cloud, travelling a good distance horizontally away from the thunderstorm before making a vertical descent to earth. Due to the final strike point being up to 10

miles away from the storm, these lightning events can occur at locations with clear 'blue' skies overhead - hence the name. Indeed, this is the origin of the term describing something unexpected: 'out of the blue'!

Bead Lightning is the name given to the decaying stage of a lightning channel, which cools after a return stroke, and its luminosity breaks up into segments. It describes a stage of a normal lightning discharge rather than a type of lightning.

Ribbon Lightning occurs in thunderstorms with high cross winds and many return strokes. The wind blows each successive return stroke sideways into the previous return stroke, causing a ribbon effect (Camera movement during the capture of a lightning photograph can also result in the same effect).

Staccato lightning is a CG lightning strike, a short-duration stroke that often appears as a single very bright flash with considerable branching.

### Ball Lightning

Ball Lightning occurs near the ground during thunderstorms, in close association with cloud-to-ground lightning.

### Virga

Virga is seen in the sky as vertical streaks of clouds. This happens when rain or another type of precipitation falling from the clouds evaporates before it hits the ground. Sometimes, virga can precede microbursts. Hence, option 4 is incorrect.

### Fallstreak hole

Also known as a hole punch cloud or cloud canal, a Fallstreak hole can form inside cirrocumulus or altocumulus clouds. These holes are thought to appear when the water temperature in the clouds is freezing but hasn't formed ice. When ice crystals do form (which can be helped by things like a passing plane), it sets off a chain reaction which can lead to water droplets evaporating and leaving a massive hole behind. Hence, option 3 is incorrect.

### Q95: Answer: a 95.a

Diseases like plague, leprosy, and smallpox have been completely eradicated from India. Hence, option 1 and 2 are correct.

River blindness caused by *Onchocerca volvulus* is considered to be the second most common infectious cause of blindness worldwide. A rare case of cutaneous Onchocerciasis was reported from a nonendemic area of North-East India in 2020. Hence, option 3 is incorrect.

### Q96: Answer: b

B) Only two

Types of Batteries used in automobiles

- Automobile manufacturers have identified three types of rechargeable battery as suitable for electric car use.

- Those types are lead-acid batteries, nickel metal hydride (NiMH) batteries, and lithium-ion (Li-ion) batteries.

#### Lead-acid batteries

- Lead-acid batteries were invented in 1859 and are the oldest form of rechargeable battery still in use. Lead-acid batteries are a kind of wet cell battery and usually contain a mild solution of sulfuric acid in an open container. Hence, statement 3 is incorrect.
- The name comes from the combination of lead electrodes and acid used to generate electricity in these batteries.
- Lead-acid batteries are only currently being used in electric vehicles to supplement other battery loads.
- These batteries are high-powered, inexpensive, safe, and reliable, but their short calendar life and poor cold-temperature performance make them difficult to use in electric vehicles.
- There are high-power lead-acid batteries in development, but the batteries now are only used in commercial vehicles as secondary storage.

#### Nickel metal hydride batteries

- Nickel metal hydride batteries came into commercial use in the late 1980s. They have a high energy density -- that is, a great deal of energy can be packed into a relatively small battery -- and don't contain any toxic metals, so they're easy to recycle.
- Nickel-metal hydride batteries are more widely used in hybrid-electric vehicles, but are also used successfully in some all-electric vehicles. Nickel-metal hydride batteries have a longer life-cycle than lithium-ion or lead-acid batteries. Hence, statement 1 is correct.
- The biggest issues with nickel-metal hydride batteries are their high cost, high self-discharge rate, and the fact that they generate significant heat at high temperatures.
- These issues make these batteries less effective for rechargeable electric vehicles, which is why they are primarily used in hybrid electric vehicles.

#### Lithium-ion batteries

- Lithium-ion batteries, which came into commercial use in the early 1990s, have a very high energy density and are less likely than most batteries to lose their charge when not being used -- a property called self discharge.
- Because of their light weight and low maintenance requirements, lithium-ion batteries are widely used in electronic devices such as laptop computers.
- Some experts believe that lithium-ion batteries are about as close as science has yet come to developing a perfect rechargeable battery, and this type of battery is the best candidate for powering the electric cars of the near future. These batteries are also used in most

portable electronics, including cell phones and computers.

Lithium-ion batteries have a high power-to-weight ratio, high energy efficiency and good high-temperature performance. Hence, statement 2 is incorrect.

- In practice, this means that the batteries hold a lot of energy for their weight, which is vital for electric cars - less weight means the car can travel further on a single charge.
- Lithium-ion batteries also have a low "self-discharge" rate, which means that they are better than other batteries at maintaining the ability to hold a full charge over time.
- Additionally, most lithium-ion battery parts are recyclable making these batteries a good choice for the environmentally conscious.
- The major advantage of lead-acid batteries is that, they are cheap to produce. However, they do produce dangerous gases while being used and if the battery is overcharged there's a risk of explosion.

#### Q97: Answer: d 97.d

1. False: Polyester was not the first commercially successful man-made fiber. Nylon, developed by DuPont in the 1930s, was the first commercially successful synthetic fiber.
2. False: Acrylic is a synthetic fiber and is not derived from natural sources such as soybeans and corn. It is produced through chemical processes using petroleum-based products.
3. False: Spandex is not a natural fiber obtained from the latex of rubber trees. It is a synthetic fiber known for its exceptional elasticity.
4. False: Nomex is not commonly used in the manufacturing of disposable medical gowns. It is a synthetic fiber developed by DuPont and is widely used in flame-resistant applications, such as firefighter suits. Therefore, all statements are incorrect. The correct answer is D) All.

#### Q98: Answer: C

##### A. Pesticides Banned:

1. Alachlor
2. Aldicarb
3. Aldrin
4. Benzene Hexachloride
5. Benomyl
6. Calcium Cyanide
7. Carbaryl
8. Chlorbenzilate
9. Chlordane
10. Chlorofenvinphos
11. Copper Acetoarsenite
12. Diazinon
13. Dibromochloropropane (DBCP)
14. Dichlorovos

15. Dieldrin
16. Endosulfan
17. Endrin
18. Ethyl Mercury Chloride
19. Ethyl Parathion
20. Ethylene Dibromide (EDB)
21. Fenarimol
22. Fenthion
23. Heptachlor
24. Lindane (Gamma-HCH)
25. Linuron
26. Maleic Hydrazide
27. Menazon
28. Methoxy Ethyl Mercury Chloride
29. Methyl Parathion
30. Metoxuron
31. Nitrofen
32. Paraquat Dimethyl Sulphate
33. Pentachloro Nitrobenzene (PCNB)
34. Pentachlorophenol
35. Phenyl Mercury Acetate
36. Phorate
37. Phosphamidon
38. Sodium Cyanide (for Insecticidal purpose only)
39. Sodium Methane Arsonate
40. Tetradifon
41. Thiometon
42. Toxaphene (Camphechlor)
43. Triazophos
44. Tridemorph
45. Trichloroacetic acid (TCA)
46. Trichlorfon

**B. Pesticide Formulations Banned:**

1. Carbofuron 50% SP
2. Methomyl 12.5% L
3. Methomyl 24% formulation
4. Phosphamidon 85% SL

**C. Pesticides Withdrawn:**

1. Dalapon
2. Ferbam
3. Formothion
4. Nickel Chloride
5. Paradichlorobenzene (PDCB)
6. Simazine
7. Sirmate
8. Warfarin

**II. Pesticides Restricted for Use:**

1. Aluminium Phosphide (strictly regulated for specific purposes)
2. Captafol (restricted to seed dresser use)
3. Cypermethrin (restricted use through Pest Control Operators)
4. Dazomet (not permitted on Tea)
5. Dichloro Diphenyl Trichloro ethane (DDT) (restricted for specific purposes)

6. Fenitrothion (banned in agriculture except for locust control)
7. Methyl Bromide (strictly supervised use)
8. Monocrotophos (banned for use on vegetables)
9. Trifluralin (completely banned from August 8, 2018, with specific restrictions)

**Q99: Answer: c**

Hugelkultur is a gardening and farming technique that involves creating raised beds filled with decaying wood and organic materials. This practice has several benefits for soil fertility and overall plant health. The decaying wood acts as a sponge, retaining moisture and providing a steady source of nutrients to plants over an extended period.

Option 1 is incorrect because Hugelkultur does not involve growing crops in containers; instead, it focuses on raised beds.

Option 2 is incorrect because Hugelkultur is not specifically about cultivating miniature trees or plants for ornamental purposes. It is primarily used for growing various crops.

Option 4 is incorrect because Hugelkultur is not a form of precision agriculture using advanced technology. It is a low-tech, sustainable method that relies on natural processes for soil improvement.

In summary, Hugelkultur is a technique that utilizes decaying wood to create raised beds, providing a fertile and moisture-retaining environment for plant growth.

**Q100: Answer: d**

Statement 1 is correct. SSDs utilize NAND-based flash memory to store data. NAND flash memory is a type of non-volatile memory, meaning it retains information even when power is removed. This characteristic makes it suitable for storing data in devices like SSDs.

Statement 2 is correct. Unlike traditional Hard Disk Drives (HDDs), the performance of SSDs is generally not affected by their capacity. Larger capacity SSDs typically have similar read and write speeds as smaller capacity ones. This is because the technology used in SSDs allows for high-speed data access regardless of the storage capacity.

Statement 3 is correct. SSDs indeed have a limited number of write cycles, often referred to as program/erase (P/E) cycles. Each cell in an SSD's NAND flash memory can only be written to a certain number of times before it becomes unreliable. This is a characteristic of NAND flash memory technology. While advancements have been made to increase the lifespan of SSDs and minimize this limitation, it's still a factor to consider when using SSDs, especially for tasks that involve heavy and constant write operations.