

**SCIENCE AND TECHNOLOGY**

**Ransomware Attack**

- ❖ **CONTEXT: The All India Institute of Medical Sciences (AIIMS), New Delhi, may have been subject to a ransomware attack, the hospital said in a statement recently, many services hit.**
- As per American cybersecurity firm Palo Alto Networks' 2021 report, Maharashtra was the most targeted state in India — facing 42% of all ransomware attacks.
- The report stated that India is among the more economically profitable regions for hacker groups and hence these hackers ask Indian firms to pay a ransom, usually using cryptocurrencies, in order to regain access to the data.
- One in four Indian organisations suffered a ransomware attack in 2021 — higher than the global average of 21%.
- Software and services (26%), capital goods (14%) and the public sector (9%) were among the most targeted sectors.
- Increase in such attacks has brought to light the urgent need for strengthening India's cybersecurity.
- **What is it?**
- A ransomware attack is a cyberattack using malware that encrypts the victim's files and requires users to pay a ransom to decrypt the files.
- It is often designed to spread across a network and target database and file servers, and can thus quickly paralyze an entire organization. It is a growing threat, generating billions of dollars in payments to cybercriminals and inflicting significant damage and expenses for businesses and governmental organizations.
- Amid a surge in cyberattacks on India's networks, Centre is yet to implement the National Cyber Security Strategy which has been in the works since 2020.
- **National Cyber Security Strategy**
- The report focuses on 21 areas to ensure a safe, secure, trusted, resilient, and vibrant cyberspace for India:
- **Large scale digitisation of public services:** Focusing on security in the early stages of design in all digitisation initiatives, developing institutional capability for assessment, evaluation, certification, and rating of the core devices and timely reporting of vulnerabilities and incidents.
- **Supply chain security:** Monitoring and mapping of the supply chain of the Integrated circuits (ICT) and electronics products, scaling up product testing and certification, leverage the country's semiconductor design capabilities globally at strategic, tactical and technical level
- **Digital payments:** Mapping and modeling of devices and platform deployed, supply chain, transacting entities, payment flows, interfaces and data exchange, routine threat modeling exercises to disclose vulnerabilities, threat research and sharing of threat intelligence, timely disclosure of vulnerabilities.
- **State-level cyber security:** Developing state-level cybersecurity policies, allocation of dedicated funds, critical scrutiny of digitization plans, guidelines for security architecture, operations, and governance.
- **Security of small and medium businesses:** Policy intervention in cybersecurity granting incentives for higher level of cybersecurity preparedness, developing security standards, frameworks, and architectures for the adoption of Internet of Things (IoT) and industrialization.
- **What Steps Does the Report Suggest?**
- To implement cybersecurity in the above-listed focus areas, the report lists the following recommendations:
- **Budgetary provisions:** A minimum allocation of 0.25% of the annual budget, which can be raised up to 1% has been recommended to be set aside for cyber security.
- ✓ In terms of separate ministries and agencies, 15-20% of the IT/technology expenditure should be earmarked for cybersecurity.
- ✓ The report also suggests setting up a Fund of Funds for cybersecurity and provide Central funding to States to build capabilities in the same field.
- ✓ While managing security of data, it is recommended to adhere to practices based on discovery, visibility and risks of critical information.
- **Research, innovation, skill-building and technology development:** The report suggests investing in modernisation and digitisation of Integrated Circuits (ICT), set up a short and long term agenda for cyber security via outcome-based programs and provide investments deep-tech cyber security innovation.
- ✓ In a bid to attract experts to work on cybersecurity, it is recommended to host hackathons, hands-on workshops, simulations on security on both national and state levels.
- ✓ Furthermore, a national framework should be set in collaboration with institutions like National Skill Development Corporation (NSDC) and ISEA (Information Security Education and Awareness) to provide global professional certifications in security.
- ✓ DSCI further recommends creating a 'cyber security services' with cadres chosen from the Indian Engineering Services.
- **Crisis management:** For adequate preparation to handle crisis, DSCI recommends holding cybersecurity drills which include real-life scenarios with their ramifications.
- ✓ In critical sectors, simulation exercises for cross-border scenarios must be held on an inter-country basis.
- ✓ To identify possible weakness and exploitations in systems, DSCI recommend sharing of threat information between government departments.
- **Cyber insurance:** Cyber insurance being a yet to be researched field, must have an actuarial science to address cybersecurity risks in business and technology scenarios as well as calculate threat exposures.

- ✓ DSCI recommends developing cyber insurance products for critical information infrastructure and quantify the risks involving them.
- **Cyber diplomacy:** Cyber diplomacy plays a huge role in shaping India's global relations. Hence cyber security preparedness of key regional blocks like BIMSTEC and SCO must be ensured via programs, exchanges and industrial support.
- ✓ To further better diplomacy, the government should promote brand India as a responsible player in cyber security and also create 'Cyber envoys' for the key countries/regions, suggests DSCI.
- ✓ For a robust internet infrastructure, DSCI suggests keeping critical infrastructure, root server of programs controlling and governing India, inside India.
- **Cybercrime investigation:** With the increase in cybercrime across the world, the report recommends unburdening the judicial system by creating laws to resolve spamming and fake news.
- ✓ It also suggest charting a 5-year roadmap factoring possible technology transformation, setting up exclusive courts to deal with cybercrimes and remove backlog of cybercrimes by increasing centres providing opinion related to digital evidence under section 79A of IT act.
- ✓ Moreover, DSCI suggests advanced forensic training for agencies to keep up in the age of AI/ML, Blockchain, IoT, Cloud, Automation.
- ✓ Law enforcement and other agencies should partner with their counterparts abroad to seek information of service providers overseas.
- ✓ The report also suggests creating a special cadre of Cybercrime investigators
- Given the increasing number of cyber attacks on critical infrastructure, it is essential for countries like India to develop robust cyber security architecture.

➤ **What is Critical Infrastructure?**

- Critical infrastructure is the body of systems, networks and assets that are so essential that their continued operation is required to ensure the security of a given nation, its economy, and the public's health and/or safety.

- **Need For A Cyber Security Framework**

- **Increasing Attack on Critical Infrastructure:** In recent years, attacks targeting critical infrastructure and businesses have surged.

- ✓ These include the 2017 WannaCry and NotPetya ransomware attacks, the 2015 attack on Ukrainian power grids and 2010 Stuxnet attack on Iranian nuclear reactor.

- ✓ Most recently, in 2020, a China-linked hacker group RedEcho targeted India's power sector, ports and parts of the railway infrastructure.

- **Cyber Wars:** States are deploying cybersecurity attacks in order to have geo-political gains.

- ✓ Moreover, to escape responsibility for such debilitating attacks, many States use hacking syndicates as proxies. This has made critical infrastructure protection a major cybersecurity priority for India.

- **Associated Challenges**

- **Reluctance in Sharing Information:** A significant challenge in protecting critical infrastructure is the inhibition in the private (and public) sector to share information about the vulnerability of their systems.

- ✓ By revealing their vulnerabilities and, therefore, their proprietary information, businesses fear exposing themselves and losing a competitive edge over rivals.
- ✓ Due to this, Indian regulators have warned that only reactive measures to cyberattacks overlooks the possibility of concerted cyber warfare by adversarial States against India.

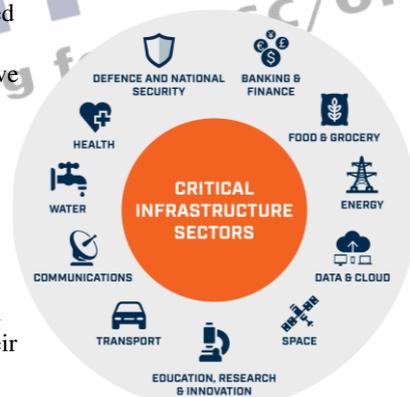
- **Capability Asymmetry:** India lacks indigenization in hardware as well as software cybersecurity tools. This makes India's cyberspace vulnerable to cyberattacks motivated by state and non-state actors.

- **Absence of a Credible Cyber Deterrence Strategy:** Further, the absence of a credible cyber deterrence strategy means that states and non-state actors alike remain incentivized to undertake low-scale cyber operations for a variety of purposes — espionage, cybercrime, and even the disruption of critical information infrastructure.

➤ **Way ahead:**

For now the only plausible option is prevention and risk management in the following ways:

- Regularly patching and updating software released by companies.
- Any important data should be spread across networks with appropriate backups, thus maintaining redundancy.
- Stronger passwords and two-prong authentication should be ensured.
- Continuous real-time monitoring within the system and firewalls to protect against any such attacks.
- In case of an attack, affected network must be isolated to prevent the virus from spreading.



**PRELIMS**

1. Are El Niño-La Niña weather patterns changing?

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❖ **CONTEXT:** A new study projects that climate change will significantly impact El Niño-La Niña weather patterns approximately by 2030 — a decade before what was earlier predicted. This is bound to result in further global climate disruptions.

➤ **What is the El Niño phenomenon?**

- El Niño is the warming of sea water in the central-east Equatorial Pacific that occurs every few years.
- During El Niño, surface temperatures in the equatorial Pacific rise, and trade winds ( east-west winds that blow near the Equator ) weaken. Normally, easterly trade winds blow from the Americas towards Asia.
- Due to El Niño, they falter and change direction to turn into westerlies, bringing warm water from the western Pacific towards the Americas.
- The phenomena of upwelling, where nutrient-rich waters rise towards the surface, is reduced under El Niño. This in turn reduces phytoplankton. Thus, fish that eat phytoplankton are affected, followed by other organisms higher up the food chain.
- Warm waters also carry tropical species towards colder areas, disrupting multiple ecosystems.
- Since the Pacific covers almost one-third of the earth, changes in its temperature and subsequent alteration of wind patterns disrupt global weather patterns.
- El Niño causes dry, warm winter in Northern U.S. and Canada and increases the risk of flooding in the U.S. gulf coast and southeastern U.S. It also brings drought to Indonesia and Australia.

➤ **What is La Niña?**

- La Niña is the opposite of El Niño. La Niña sees cooler than average sea surface temperature (SST) in the equatorial Pacific region. Trade winds are stronger than usual, pushing warmer water towards Asia.
- On the American west coast, upwelling increases, bringing nutrient-rich water to the surface. Pacific cold waters close to the Americas push jet streams (narrow bands of strong winds in the upper atmosphere) northwards. This leads to drier conditions in Southern U.S., and heavy rainfall in Canada.
- La Niña has also been associated with heavy floods in Australia.
- Two successive La Niña events in the last two years caused intense flooding in Australia, resulting in significant damage.

➤ **What were the study's findings?**

- The combination of El Niño, La Niña, and the neutral state between the two opposite effects is called the El Niño Southern Oscillation (ENSO). Southern oscillations are large-scale changes in sea level pressure in the tropical Pacific region.
- ENSO's scale is significant enough to influence global climate.
- According to the study, increased SST variability from ENSO in the eastern Equatorial Pacific (EP) will emerge around 2030 (error margin of +/- 6 years), more than a decade earlier than that of the central Pacific (CP) ENSO.
- If CP and EP are not separated, SST variability from ENSO will occur almost four decades earlier than previously suggested. Changes in the equatorial Pacific will be visible first due to a stronger increase in the EP-ENSO rainfall response, leading to increased SST variability.

➤ **What is the effect on India's monsoons?**

- In India, El Niño causes weak rainfall and more heat, while La Niña intensifies rainfall across South Asia, particularly in India's northwest and Bangladesh during the monsoon.
- At present, India, like the rest of the globe, is witnessing an extended 'triple dip' La Niña. As reported, this is why India saw surplus rain in September 2022, a month that usually sees the monsoon retreat, for the third year in a row.

## 2. United Nations Convention on the Law of the Sea (UNCLOS)

❖ **CONTEXT:** India hopes that the ongoing negotiations on the Code of Conduct for the South China Sea will be fully consistent with international law, in particular, United Nations Convention on the Law of the Sea (UNCLOS), and should not prejudice the legitimate rights and interests of nations that are not party to these discussions

➤ **What is UNCLOS?**

- UNCLOS is otherwise called the **Law of the Sea Convention** or the **Law of the Sea Treaty** that characterizes the freedoms as well as expectations of countries towards the utilization of the world's seas.
- The United Nations Convention on the Law of the Sea sets out an exhaustive system of peace and lawfulness on the planet's seas and oceans laying out rules administering all purposes of the seas and their assets.
- It cherishes the thought that all issues of sea space are firmly interrelated and should be tended to in general.
- Three new international institutions have been established as a result of the Convention:
  - ✓ The International Tribunal for the Law of the Sea,
  - ✓ The International Seabed Authority
  - ✓ The Commission on the Limits of the Continental Shelf.

➤ **Features**

- Countries are given full cash privileges by **UNCLOS** for a 200-mile zone along the coastline.

- The ocean and maritime bed reaching out to this area are respected to be **the Exclusive Economic Zone (EEZ)** of a nation and that nation can involve these waters for their financial usage.
- One more significant association that assumes an essential part in UNCLOS activities is the **International Maritime Organization (IMO)**.
- Other significant gatherings associated with Nautical Law and its working are the International Seabed Authority and the **International Whaling Commission**.

➤ **Significant Conventions**

There have been three major UNCLOS conventions:

- **UNCLOS I:** It resulted in the successful implementation of a number of conventions concerning territorial seas and adjacent zones, continental shelf, high seas, and fishing rights.
- **UNCLOS II:** There was no agreement on the territorial seas' breadth.
- **UNCLOS III:** added a number of new provisions. Setting limits, navigation, archipelagic status and transit regimes, exclusive economic zones (EEZs), continental shelf jurisdiction, deep seabed mining, the exploitation regime, marine environment protection, scientific research, and dispute resolution was among the most important topics discussed.

3. **RKVY-RAFTAAR scheme**

❖ **CONTEXT:** Secretary to Ministry of Agriculture & Farmers Welfare, (Department of Agriculture & Farmers Welfare) interacted with farmers at the Precision Farming Development Centre created under National Committee on Precision Agriculture & Horticulture (NCPAH). He also visited the RKVY- RAFTAAR Agri-start up Agribusiness Incubator (R-ABI) and the Integrated Beekeeping Development Centre (IBDC).

- Rashtriya Krishi Vikas Yojana – Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation (RKVY-RAFTAAR) is aimed at strengthening infrastructure in Agriculture and Allied sectors to promote Agripreneurship and Agribusiness by facilitating financial aid and nurturing a system of business incubation.

- The main objective of Rashtriya Krishi Vikas Yojana is to develop farming as the main source of economic activity. Some of the objectives also include:
  - Risk mitigation, strengthening the efforts of the farmers along with promoting agri-business entrepreneurship through the creation of agri-infrastructure.
  - Providing all the states with autonomy and flexibility in making plans as per their local needs.
  - Helping farmers in increasing their income by encouraging productivity and promoting value chain addition linked production models.
  - To reduce the risk of farmers by focusing on increasing the income generation through mushroom cultivation, integrated farming, floriculture, etc.
  - Empowering the youth through various skill development, innovation, and agri-business models.
- The sub-schemes includes national priorities such
  - ✓ Bringing Green Revolution to Eastern India (BGREI),
  - ✓ Crop Diversification Program (CDP),
  - ✓ Reclamation of Problem Soil (RPS),
  - ✓ Foot & Mouth Disease – Control Program (FMD-CP),
  - ✓ Saffron Mission,
  - ✓ Accelerated Fodder Development Programme (AFDP).
- **Relevance of scheme:**
  - ✓ The scheme will incentivize states to enhance more allocation to Agriculture and Allied Sectors.
  - ✓ It will strengthen farmer's efforts through creation of agriculture infrastructure that will help in supply of quality inputs, market facilities etc.
  - ✓ It will further promote agri-entrepreneurship and support business models that will maximize returns to farmers.

**RKVY-RAFTAAR**  
**Agri-Business Incubator**

The infographic details the stages of the Agri-Business Incubator and the focus areas for applications. The stages are: Agri-preneurship Orientation Program, Idea stage incubation, Pre seed stage support up to Rs 5 lakhs, Platform to launch product, Expansion stage incubation, Seed stage support up to Rs.25 lakhs, and Scaling up of operations. The incubation process is divided into two phases: ANKURAN (Start-up) and PRASFUTAN (Expansion). ANKURAN includes training, coaching, and stipend for innovative ideas. PRASFUTAN includes training, lab testing, and seed stage grant for MVPs. Application focus areas include Agri Inputs, Post-Harvest & Food Technology, Animal Husbandry, Agri Ext Education, Natural Resource Management, Precision Farming, Agricultural Machinery, Agri Clinics & Farm Health services, Waste to Wealth, Secondary Agriculture, Agricultural Supply Chain, IoT, ICT and AI in Agriculture, Farm Mechanisation, Organic Farming, and Agricultural Biotechnology.

**4. Global Conference on Antimicrobial Resistance**

❖ **CONTEXT: Union Minister of State for Health and Family Welfare, Dr Bharati Pravin Pawar participated in the 'Third Global High-Level Ministerial Conference on Antimicrobial Resistance' to be held in Muscat, Oman on 24-25 November, 2022.**

- Under the theme “The AMR Pandemic: from Policy to One Health Action,” the Conference aims to accelerate tackling antimicrobial resistance at national, regional, and global levels and to enhance international cooperation.
- Its objectives include promoting the importance of a political commitment to the One Health approach in addressing AMR; highlighting the role of the environment in the spread of AMR and promoting the importance of surveillance and monitoring of both AMR and antimicrobial use across humans, animals and the environment.
- It also aims to share successful examples of the whole-of-government and One Health approaches to tackle AMR, as well as providing opportunities for collaboration and partnership between countries and international organisations to address AMR in the context of Sustainable Development Goals.
- **Antimicrobial Resistance (AMR):** According to WHO, Antimicrobial resistance (AMR) is the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others.
- **Factors Causing AMR in India**
  - Inappropriate consumption of broad-spectrum (last resort) of antibiotics is high because of changing prescription practice in the healthcare system due to the non-availability of a narrow spectrum of antibiotics.
  - Inappropriate antibiotic use among the general public like self-medication to avoid the financial burden, Doctors may perceive that they are compelled to give antibiotics as patients come with a preconceived idea of quick relief.
  - Nexus between doctors and pharmaceutical companies put pressure on doctors and pharmacists to prescribe new antibiotics.
  - Use of antibiotics as growth promoters in food animals and poultry is a common practice and later it evolves in the food chain.
  - The large proportion of sewage is disposed of untreated into receiving water bodies, leading to gross contamination of rivers with antibiotic residues, antibiotic-resistant organisms.
- **Challenges Posed by AMR:** Antibiotic resistance is emerging as the threat to successful treatment of infectious diseases, organ transplantation, cancer chemotherapy and major surgeries.
  - The issue of AMR causes out of pocket expenditure on health care, especially on medicines. The use of high order drugs or second-line expensive antibiotics pushing treatment cost high.
  - Neonates and elderly both are prone to infections and are vulnerable.
- **India's Initiative**
  - To prevent the Over the counter sales of antibiotics, the central drug standard control organisation (CDSO) prohibits medical stores from selling 24 key antibiotics without a doctor's prescription.
  - India's Red Line campaign: Which demands that prescription-only antibiotics be marked with a red line, to discourage the over-the-counter sale of antibiotics– is a step forward.
  - National Health Policy, 2017, terms antimicrobial resistance as one of the key healthcare issues and prioritises the development of guidelines regarding antibiotic use and check on restricting the growth of antibiotics.
  - The National Action Plan on Antimicrobial Resistance (NAP-AMR) 2017 has assigned coordinated tasks to multiple government agencies involving health, education, environment, and livestock to change prescription practices and consumer behaviour and to scale up infection control and antimicrobial surveillance.
  - FSSAI has set certain guidelines limiting the antibiotics in food products such as fish and honey.

**ANSWER WRITING**

**Q. What do you understand by nanotechnology and how is it helping in health sector?**

Nanotechnology is the use and the development of techniques to study physical phenomena and develop new material and devices structures in the physical size ranging from 1 to 100 nanometers (nm). Nanotechnology influences almost all areas of our lives, including manufacturing, electronics, computers and information technologies, medicine, the environment and energy storage, chemical and biological technologies, and agriculture.

Contribution of nanotechnology in health sector

- Nanomedicine, the application of nanotechnology in medicine helps in producing precise solutions for disease prevention, diagnosis, and treatment.
- Nanotechnology has broadened itself in the areas of medical tools, knowledge, and therapies currently available to clinicians.
- Better imaging and diagnostic tools enabled by nanotechnology are paving the way for earlier diagnosis, more individualized treatment options, and better therapeutic success rates.
- Nanotechnology in medicine currently being developed involves employing nanoparticles to deliver drugs, heat, light or other substances to specific types of cells (such as cancer cells). This technique reduces damage to healthy cells in the body and allows for earlier detection of disease.

- In contrast to dialysis, which works on the principle of the size related diffusion of solutes and ultrafiltration of fluid across a semi-permeable membrane, the purification with nanoparticles allows specific targeting of substances. Additionally, larger compounds which are commonly not dialyzable can be removed.

Because of their small size, much concern has been expressed about the potential for adverse health effects arising from the ability of nanoparticles to penetrate cell walls and the blood-brain barrier. Therefore, there is a need to identify key gaps in knowledge and areas where further research may be targeted to efficiently exploit the technology.

**MCQs**

- Consider the following statements
  - Antimicrobial resistance happens when our body is resistant to antibiotics or antifungals.
  - Antimicrobial resistance is a naturally occurring process where bacteria and fungi are constantly finding new ways to avoid the effects of the antibiotic and antifungal drugs used to treat the infections they cause.
  - Use of antibiotics as growth promoters in food animals and poultry is a common practice which is one of the major cause of antibiotic resistance in India

Which of the above statement/s is/are correct?

a) 1 and 2 only      **b) 2 and 3 only**      c) 1 and 3 only      d) 1,2 and 3
- Consider the following statements about Rashtriya Krishi Vikas Yojana.
  - It aims at making farming remunerative through strengthening farmer's efforts and promote agribusiness entrepreneurship.
  - It provides funds to states for creation of agriculture infrastructure and help in supply of quality inputs.

Which of the given statement/s is/are correct?

a) 1 only      b) 2 only      **c) Both 1 and 2**      d) Neither 1 nor 2
- With reference to the United Nations Convention on the Law of Sea, consider the following statements:
  - A coastal state has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles, measured from baseline determined in accordance with the convention.
  - Ships of all states, whether coastal or land-locked, enjoy the right of innocent passage through the territorial sea.
  - The Exclusive Economic zone shall not extend beyond 200 nautical miles from the baseline from which the breadth of the territorial sea is measured.

Which of the statements given above are correct?

a) 1 and 2 only      b) 2 and 3 only      c) 1 and 3 only      **d) 1, 2 and 3**
- Consider the following statements with regards to El Nino and La Nina Phenomena
  - La Nina events may last between one and three years, unlike El Nino, which usually lasts no more than a year.
  - Both phenomena tend to peak during the Northern Hemisphere winter.

Which of the above statement/s is/are correct?

a) 1 only      b) 2 only      **c) Both 1 and 2**      d) Neither 1 nor 2
- The terms 'WannaCry, Petya and EternalBlue' sometimes mentioned in the news recently are related to which of the following?
 

a) Exoplanets      b) Cryptocurrency      **c) Cyber attacks**      d) Mini satellites
- With reference to Ransomware cyber attack consider the following
  - Temporary or permanent loss of sensitive or proprietary information,
  - Disruption to regular operations,
  - Financial losses incurred to restore systems and files
  - Potential harm to an organization's reputation.

Which of the above is possible impact of ransomware attack?

a) 1,3 and 4 only      b) 1,2 and 3 only      c) 2 and 3 only      **d) 1,2,3 and 4**
- With reference to exercise Garuda shakti which was recently conducted, consider the following
  - It is a bilateral joint training Exercise between India and Indonesian Special naval Forces
  - The exercise has been conducted at Karawang, Indonesia.

Which of the above statement/s is are correct?

a) 1 only      **b) 2 only**      c) Both 1 and 2      d) Neither 1 nor 2
- With reference to transport in India the name "MANJULA" recently seen in news is related to which of the following?
 

**a) Ferry Craft**      b) Train coach      c) Ropeway      d) Aircraft
- India successfully performed the training launch of the Agni-3 missile from APJ Abdul Kalam Island, Odisha recently, with reference to this consider the following
  - It is an Intermediate Range Ballistic Missile(IRBM)
  - Due to its high range of circular error probable(CEP), Agni-3 missile is known as world's most accurate strategic ballistic missile of its range class.
  - It has a range lower than Agni Prime missile and has the capability of carrying warhead weighing as much as 1.5 tonnes.

Which of the above statement/s is/are correct?

**a) 1 and 2 only**      b) 2 and 3 only      c) 1 and 3 only      d) 1,2 and 3
- With reference to Project 'UNNATI', consider the following statements:
  - The project intends to upgrade the skill base of the Mahatma Gandhi NREGA beneficiaries.
  - The household from which the candidates are selected for the training continues to enjoy 100 days of work under Mahatma Gandhi NREGA.

Which of the above statements is/are correct?

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