Q.1) Which of the following departments are related to Nano-science and nanotechnology in India?

1. Department of Science and Technology (DST)
2. Department of Biotechnology (DBT)
3. Department of Electronics and Information Technology (DeITy)
4. Department of Industrial Policy and Promotion (DIPP)

Select the correct answer using the codes given below.

a) 1 and 2 only
b) 1, 2 and 3 only
c) 1 and 3 only
d) All the above

Q.1) Solution (d)

Department of Science and Technology (DST): DST is the nodal agency in the Indian nanotechnology innovation system. It has since 1980s launched may programmes/schemes to foster R&D on miniature-scale and on Nano-scale.

Department of Biotechnology (DBT): The DBT is basically active in the area of nano biotechnology R&D. In the period around 2007, the Department of Biotechnology (DBT) initiated a programme on Nano biotechnology.

Department of Electronics and Information Technology (DeITy): The DeITy has established Centre for Materials for Electronics Technology (C-MET) at Pune, Hyderabad and Trissur. These centres are involved in nanotechnology R&D activities, particularly in nanomaterials.

Department of Industrial Policy and Promotion (DIPP): DIPP established a Nano Manufacturing Technology Centre (NMTC) and Academy of Excellence for Advanced Manufacturing Technology (AEAMT) at the Central Manufacturing Technology Institute (CMTI) in Bangalore.

Do you know?

- Mission on Nano Science and Technology (Nano Mission) was launched by the **Department of Science and Technology** (DST) to foster, promote and develop all aspects of nanoscience and nanotechnology which have the potential to benefit the country.

THINK!

- Draft Guidelines for Safe Handling of Nanomaterials.

Q.2) Consider the following statements about Carbon Nano Tubes.

1. Carbon nanotubes (CNTs) are an isotope of carbon.
2. Carbon Nanotubes are also known as Carbon fibers.
3. CNT metal matrix composites have excellent electrical properties and are used as reinforcement to metals in order to enhance their electrical properties.

Which of the above statements is/are correct?

a) 1, 2 and 3
b) 1 and 3 only
c) 2 and 3 only
d) 3 only

Q.2) Solution (d)

Carbon nanotubes (CNTs) are an allotrope of carbon- they are cylindrical hollow fibers, comprised of a single sheet of pure graphite (a hexagonal lattice of carbon), having a diameter of 0.7 to 50 nanometers with lengths generally in the range of 10's of microns.

Being a hollow tube comprised entirely of carbon, they are also extremely light weight. They have novel properties that make them potentially useful in a wide variety of applications in nanotechnology, electronics, optics and other fields of materials science.

Carbon fibers are fibers about 5–10 micrometers in diameter and composed mostly of carbon atoms. Some important properties of carbon fiber are- high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion. These make them very popular in aerospace, civil engineering, military and sports.

Stiffness and strength of materials used in load bearing applications is key as they reduce the mass and dimensions of the materials.

CNTs are dispersed homogenously through the metal, with strong interfacial adhesion between the CNTs and the metallic matrix.

CNT metal matrix composites have excellent electrical properties and are used as reinforcement to metals in order to enhance their electrical properties.

Carbon nanotubes have extremely high thermal conductivity that allows metal matrix carbon nanotubes to be used for thermal management.

Do you know?

- CNTs exhibit dimensional and chemical compatibility with biomolecules, such as DNA and proteins. CNTs enable fluorescent and photoacoustic imaging, as well as localized heating using near-infrared radiation.

THINK!

- Potential applications of carbon nanotubes.

Q.3) Environment nanotechnology involves use of nanoscale material for addressing environmental concerns. Consider the following statements.

1. NanoCO_2 harvester which can suck CO_2 from the atmosphere and convert it into methanol can be used as vehicular fuel.
2. The magnetically charged nanoparticles have been proved potent to remove heavy metals and dyes from the water bodies.
3. Due to nanoparticles' ability of long persistence, they may raise concerns such as bio-magnification.

Which of the above statements is/are correct?

a) 1 and 2 only
b) 1 and 3 only
c) 1 only
d) 1, 2 and 3

Q.3) Solution (d)

Environment nanotechnology involves use of nanoscale material for addressing environmental concerns such as bioremediation, water purification, product recycling and recovery, solid waste management.

These nanomaterials have unique properties such as chemical reactivity, electronic properties and antimicrobial activity. Therefore, they hold potential to address issues such as combating Climate Change and reduction of pollution.

Areas where Environment nanotechnology can be used

- **Combating Carbon Emission,** the researchers have developed nanoCO_2 harvester which can suck CO_2 from the atmosphere and convert it into methanol which can further be used as vehicular fuel. The NanoCO_2 Harvester can capture more CO_2 than usual and is more efficient fuel converter.
- **Cleaning Water** The magnetically charged nanoparticles have been proved potent in researches to have effectively carried on adsorption process to remove heavy metals

and dyes from the water bodies and they do not readily degrade. They can also be used to clean the underground water contaminated with toxic materials such as arsenic, lead, chromium and mercury. They can also be used to clean up oil spills by using Nanosponges.

- **Accelerating Biodegradation (Solid Waste Management)** The method of converting the organic waste into organic manures and fertilizers can also be quickened through use of Nanoparticles. Thus, they can reduce the time consumed in solid waste management and increases the production of biogas. According to researchers, Iron oxide particles which are non-toxic can be used for the same.

Challenges

- The Nanoparticles being small in size **have tendency to clump up** which make them inactive with prolonged use.
- Synthesizing useful nanoparticles is also challenging as production of a consistent size is tough. **The viability of Nanoparticles such as nanosponge** still remains a laboratory success and hasn't been tested on large-scale.
- The usage of Nanoparticles also raises health concerns as due to their small size they can be easily transported inside human as well as animal bodies.
- **Due to their ability of long persistence, they may raise concerns such as bio-magnification as well.**

Do you know?

- **Nanosponges are Nano sized particles designed to look like red blood cell and protect the body.** Nanoparticles have been used for unknown preventative measures, such as silverware and wound care products. Silverware contains small silver nanoparticles which contain an antimicrobial agent.
- Nanosponges are introduced to the body by injection and take the form of a red blood cell so that the bacteria or venom attacks it. Once it is attacked, it is trapped within the scaffolding of the nanosponge. After the nanosponge is full of toxins and cannot trap anymore it moves to the liver to filter out the toxins.

THINK!

- Graphene

Q.4) Big data is a term that describes the large volume of data – both structured and unstructured beyond the ability of commonly used software tools to capture, curate, manage, and process data within a tolerable elapsed time. Which of the following are applications of Big data?

1. Better understanding and targeting customers by companies.
2. Tracking and analyzing the supply chain delivery routes.

3. Used in healthcare to find new cures for cancer.
4. Security and law and order management.

Select the correct answer using the codes given below.

a) 1 and 2 only
b) 1, 2 and 4 only
c) 1, 3 and 4 only
d) All the above

Q.4) Solution (d)

Applications of Big Data

- Companies use big data to **better understand and target customers by bringing together data from their own transactions** as well as social media data and even weather predictions.
- Businesses optimize their processes **by tracking and analyzing their supply chain delivery routes and combine that data with live traffic updates.** Others use machine data to optimize the service cycles of their equipment's and predict potential faults.
- **Big Data is used in healthcare to find new cures for cancer**, to optimize treatment and even predict diseases before any physical symptoms appear.
- **Big Data is used to analyze and improve the performance of individuals (at sports, at home or work**) where data from sensors in equipment and wearable devices can be combined with video analytics to get insights that traditionally were impossible to see.
- **Police forces and security agencies use big data to prevent cyber-attacks**, detect credit card fraud, foil terrorism and even predict criminal activity.
- **Big Data is used to improve our homes, cities** and countries by optimizing the heating or lighting in our homes, the traffic flow in our cities, or the energy grid across the country.

Do you know?

- **Big Data Management Policy, 2016.** It was launched by CAG (Comptroller and Auditor General). It paved the wave for Data Analytics Centre (first of its kind in the country).

THINK!

- Big Data in India's governance policy.

Q.5) 5G is a wireless communication technology and the next generation mobile networks technology after 4G LTE networks. Consider the following regarding this:

1. 5G will help aid incorporate Artificial Intelligence in our lives.
2. It will create the ecosystem for Internet of Things (IoT).

Which of the above statements is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) None

Q.5) Solution (c)

5G is a wireless communication technology. It is the next generation mobile networks technology after 4G LTE networks. **The final standard for 5G will be set up by the International Telecommunications Union (ITU).**

Advantages of 5G

- As per the OECD (Organization for Economic Cooperation and Development) Committee on Digital Economic Policy, 5G technologies rollout will help in increasing GDP, creating employment and digitizing the economy.
- The 5G technology will offer far greater upload and download speed available today. This will help cloud systems to stream software updates, music, and navigation data to driverless cars. In other words, **it will help aid incorporate Artificial Intelligence in our lives.**
- It will enable Smart devices to exchange data seamlessly providing the **ecosystem for Internet of Things (IoT).**

Do you know?

- The Internet of Things (IoT) is the network of **physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity** which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

THINK!

- Applications of IoT.

Q.6) The term "digiceuticals" often in news refers to.

a) The use of digital technology for the preparation of medicines.
b) Software that can improve a person's health as much as a drug can.
c) The diseases and syndromes caused due to the overuse of digital tools.
d) Use of digital technology for drug delivery into the patient body.

Q.6) Solution (b)

What if an app could replace a pill? That's the big question behind an emerging trend known as "digital therapeutics." **The idea: software that can improve a person's health as much as a drug can, but without the same cost and side-effects.**

Digital therapeutics, or "digiceuticals," as some call them, have become a Holy Grail in some quarters of Silicon Valley, where investors see the chance to deliver medicine **through your smartphone.**

Do you know?

- Some digiceuticals will work better alongside conventional drugs, rather than on their own—opening up possibilities for alliances between tech and pharma firms. **Voluntis, a startup, develops companion software for specific medications or medical devices.** These programs can monitor side-effects, help manage symptoms and connect patients with doctors and nurses.

THINK!

- Telemedicine

(Source: http://healblock.com/category/digiceuticals/)

Q.7) Which of the following are the India's indigenous robots.

1. Mitra
2. Brabo
3. Shakti
4. Spurti

Select the correct answer using the codes given below.

a) 1 and 3 only
b) 1 and 2 only
c) 1, 3 and 4 only
d) All the above

Q.7) Solution (b)

Mitra has been developed by a Bangalore-based startup Invento Robotics that was set up in October 2015. Mitra has been completely designed and developed in India. The idea behind the robot was to provide customised and contextual information to people.

TAL Manufacturing Systems, **a wholly owned subsidiary of Tata Motors**, which is all set to launch **Tata Brabo** – India's first indigenous industrial-articulated robot.

Tata Brabo – the potential game changer for MSMEs

TAL Manufacturing Systems has rightly identified a vast and untapped niche for mini-industrial robots that seeks to improve manufacturing and assembly efficiency at the floor level, with special focus to meet the needs of the MSME industry in India.

Tata Brabo is geared to handle payloads of 2-kilogram, 5 kilograms and 10 kilogram and will find application in electronics, automotive, pharmaceutical, food processing, logistics, packaging, and several other industries.

Do you know?

- India's labour force faces tough competition from robots. About 20–30 percent of employers in India anticipate a decrease in headcount due to automation taking over low-skill, monotonous jobs. **At Infosys, for example, some 11,000 workers have already lost their jobs to automation, and 3,000 Wipro employees faced the same fat after the company deployed Holmes,** its AI project. These instances leave no doubt that IT industry jobs will downsize, losing 6.4 lakh jobs by 2021, according to HfS Research estimates.

THINK!

- STRIVE (Skill Strengthening for Industrial Value Enhancement).
- SANKALP (Skills Acquisition and Knowledge Awareness for Livelihood Promotion)

Sources

https://www.mapsofindia.com/my-india/business/tata-brabo-indias-first-indigenous-industrial-articulated-robot

https://www.hindustantimes.com/tech/mitra-the-made-in-india-robot-that-stole-the-show-at-ges-hyderabad/story-XLYgp5UnSP3ACv7kMWOC1H.html

http://www.digitalpolicy.org/human-side-indias-robot-economy/

Q.8) Airbus has developed CIMON(Crew Interactive Mobile Companion). Which of the following statements are correct regarding it?

1. It is a 3 – D printed Artificial Intelligence System.
2. It is made up of plastic and metal.
3. It will join the crew aboard the International Space Station (ISS) to assist Astronauts.

Select the code from following:

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.8) Solution (d)

CIMON (Crew Interactive MObile CompanioN)

- It is a 3D-printed artificial intelligence system, described by its creators as a "flying brain".
- It is made up of plastic and metal, created using 3D printing
- It is being developed by Airbus, an aeronautics company based in Netherlands
- It will be the first AI-based mission and flight assistance system
- It will join the crew aboard the International Space Station (ISS) to assist astronauts.
- It is designed to support astronauts in performing routine work

http://www.thehindu.com/todays-paper/tp-in-school/ai-reaches-for-the-skies/article22954336.ece

Q.9) Which of the following statements are correct regarding Distributed Denial of Service (DDoS) attacks?

1. It is a malware which creates a botnet (network of bots) and use that to ping a server at the same time.
2. It corrupts all the files linked with a server and deletes them from the device.
3. It overburdens a server and leads to its crashing.

Select the code from following:

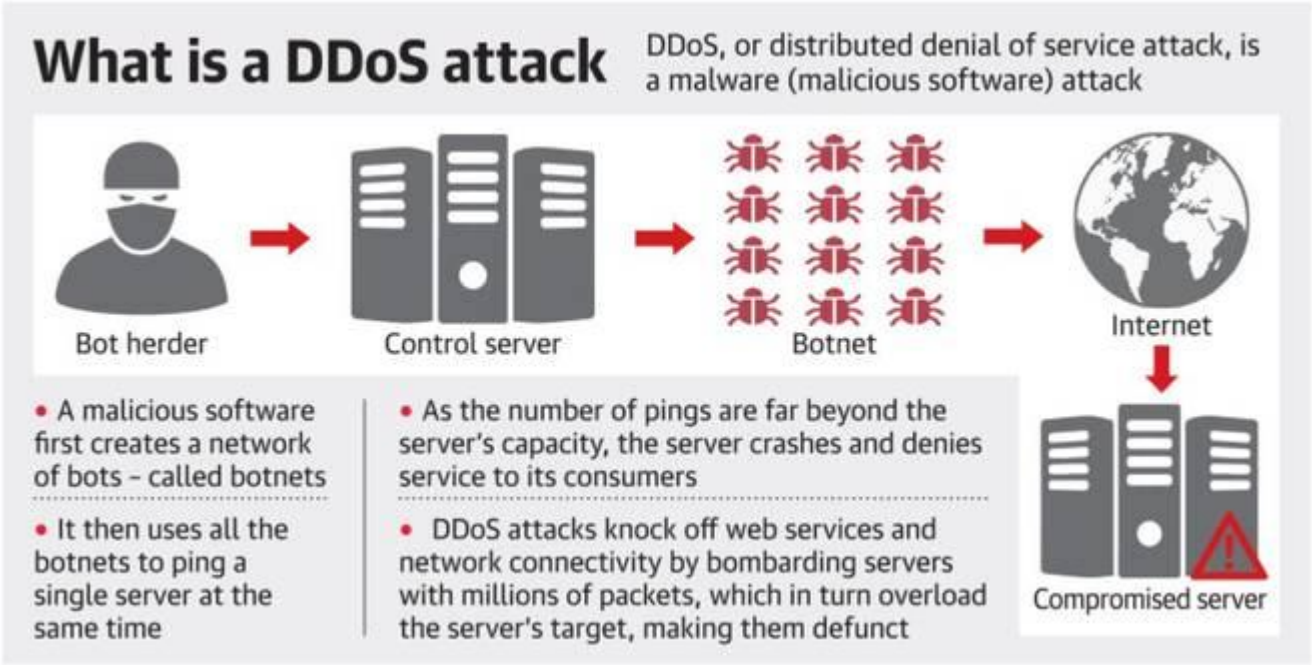
a) 1 and 2
b) 2 and 3

c) 1 and 3
d) All of the above

Q.9) Solution (c)

Distributed Denial of Service (DDoS) attacks

- A DDoS (Distributed Denial of Service) attack is an illegal large-scale cyber campaign where a big number of devices are used to create traffic to a certain server.
- If the number of devices involved is big enough, the overwhelming traffic would be more than what the targeted server is capable of handling.
- Malware first creates a network of bots — called a botnet — and then uses the botnet to ping a single server at the same time.
- In such a case, the server would get overburdened which would lead to crashes.
- After a successful DDoS attack, the customers of the service that had its servers targeted would not be able to use/access the said service due to the server crash triggered by the DDoS attacks.



Do You Know?

- Reaper is a highly evolved malware capable of not only hacking devices like WiFi routers and security cameras, but also able to hide its own presence in the bot — a device taken over by a malware.

Think

- Mirai
- Ransomware
- Saposhi

Q.10) Which of the following correctly defines KeRanger?

a) It is an Artificial Intelligence software for automatic car driving
b) It is a ransomware which targets Mac Operating system.
c) It is a device that can generate electromagnetic radiations from radiowave frequency to gamma ray frequency.
d) None of the above

Q.10) Solution (b)

KeRanger

KeRanger (also known as OSX.KeRanger.A) is a ransomware trojan horse targeting computers running macOS. Discovered on March 4, 2016, by Palo Alto Networks, it affected more than 7,000 Mac users.

KeRanger is remotely executed on the victim's computer from a flaw in Transmission, a popular BitTorrent client. It is hidden in the .dmg file under General.rtf. The .rtf is actually a Mach-O format executable file packed with UPX 3.91. When users click these infected apps, their bundle executable Transmission.app/Content/MacOS/Transmission will copy this General.rtf file to ~/Library/kernel_service and execute this "kernel_service" before any user interface appearing. It encrypts the files with RSA and RSA public key cryptography, with the key for decryption only stored on the attacker's servers. The malware then creates a file, called "readme_to_decrypt.txt", in every folder. When the instructions are opened, it gives the victim directions on how to decrypt the files, usually demanding a payment of one bitcoin.

Q.11) Which of the following statements are correct regarding 'Cryptojackng'?

a) It refers to the use of encrypted code to highjack a network.
b) It refers to use of malware to hack the official sites and data of Banks.
c) It is the secret use of a computer device to mine cryptocurrency.
d) It is a software which decrypts an encrypted data.

Q.11) Solution (c)

Cryptojacking

- Cryptojacking is defined as the secret use of your computing device to mine cryptocurrency.
- Cryptojacking used to be confined to the victim unknowingly installing a program that secretly mines cryptocurrency
- Attackers employ malware to force an entry into the computers of remote users, and then using their hardware to mine for coins.
- This form of distributed computing can be profitable since it eliminates the cost burden of owning a mining rig with hundreds of processors.
- Cryptojackers usually target popular websites which draw audiences numbering in the millions every day.

Q.12) Consider the following statements regarding 'WiMAX':

1. It stands for Worldwide Interoperability for Microwave Access.
2. It is a wireless industry coalition dedicated to the advancement of IEEE 802.16 standards for broadband wireless access (BWA) networks.
3. WiMAX can provide at-home or mobile Internet access across whole cities or countries.

Which of the above statements are correct?

a) 1 only
b) 2 and 3
c) 1 and 3
d) All of the above

Q.12) Solution (d)

Worldwide Interoperability for Microwave Access

- It is a wireless industry coalition dedicated to the advancement of IEEE 802.16 standards for broadband wireless access (BWA) networks.
- WiMAX can provide at-home or mobile Internet access across whole cities or countries. In many cases this has resulted in competition in markets which typically only had access through an existing incumbent DSL (or similar) operator.

- Additionally, given the relatively low costs associated with the deployment of a WiMAX network (in comparison with 3G, HSDPA, xDSL, HFC or FTTx), it is now economically viable to provide last-mile broadband Internet access in remote locations.
- WiMAX is competing with the 3rd Generation Partnership Project (3GPP)'s Long-Term Evolution (LTE) in the 4G market.

Do You Know?

- IEEE 802.16 is a series of wireless broadband standards written by the Institute of Electrical and Electronics Engineers (IEEE).
- The IEEE Standards Board established a working group in 1999 to develop standards for broadband for wireless metropolitan area networks.
- The Workgroup is a unit of the IEEE 802 local area network and metropolitan area network standards committee.

Think

HSPA HSDPA HSUPA HSPA+ LTE (E-UTRA)

Q.13) 'Aadhar Pay' is a cashless method of payment. Which of the following statements are correct regarding this method?

a) A customer has to mention his Aadhar number only to the merchant to make the automatic payment from his bank account.
b) A customer has to swipe one common debit card connected to multiple bank accounts.
c) Customers will have to put their finger impression on a device to shop and withdraw cash instead of swiping credit or debit cards.
d) It is a mobile wallet connected to Aadhar card that can be used to make payment without any extra service charges.

Q.13) Solution (c)

Aadhar Pay

- Aadhaar Pay' — a payment system where customers put their finger impression on a device to shop and withdraw cash instead of swiping credit or debit cards.
- a unique solution that enables merchants across the country to facilitate cashless purchases for customers with just their thumb and Aadhaar number.

- No hassles of multiple apps, card swipes, remembering passwords, downloading e-wallets or even carrying a phone for cashless payments.

As a Customer:

All you need is your Aadhaar linked bank account & your thumb.

As a Merchant:

- All you need is your own Android smartphone with a reliable internet connection, a current account with Aadhar pay enabled Bank (to where the money will be collected) & the Aadhaar Pay app.
- You get immediate credit into your Aadhaar linked bank account.

Think

- Cyber crime
- Privacy issues
- Aadhar

Q.14) Consider the following statements regarding 'Cyber Surakshit Bharat' Initiative:

1. It has been launched by Ministry of Home Affairs with National e – Governance Division and Industry Partners.
2. Cyber Surakshit Bharat will be operated on the three principles of Awareness, Education and Enablement.
3. Cyber Surakshit Bharat is a public-private partnership and will leverage the expertise of the IT industry in cybersecurity.

Which of the above statements are correct?

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.14) Solution (d)

Cyber Surakshit Bharat

- Ministry of Electronics and Information Technology (MeitY), announced the Cyber Surakshit Bharat initiative in association with National e-Governance Division (NeGD) and industry partners
- An aim of the initiative is to spread awareness about cybercrime and building capacity for safety measures for Chief Information Security Officers (CISOs) and frontline IT staff across all government departments.
- Cyber Surakshit Bharat will be operated on the three principles of Awareness, Education and Enablement.
- It will include an awareness program on the importance of cybersecurity; a series of workshops on best practices and enablement of the officials with cybersecurity health tool kits to manage and mitigate cyber threats.
- Cyber Surakshit Bharat is the first public-private partnership of its kind and will leverage the expertise of the IT industry in cybersecurity.

Think

- Cert-In & NIC

Q.15) RADAR and SONAR are both detection systems that can be used to identify objects and their position when they are not visible or at a distance. Consider the following differences between Radar and Sonar:

1. Radar detection relies on electromagnetic waves whereas Sonar detection relies on mechanical waves.
2. Radar uses high frequency radio waves and microwaves for communication whereas sonar uses high frequency sound waves.
3. Absorption of radio waves by sea water is very high, however water molecules and ions cannot absorb mechanical waves much.

Which of the statements given above is/are correct?

a) 3 only
b) 1 and 3 only
c) 1 and 2 only
d) 1, 2 and 3

Q.15) Solution (d)

RADAR and SONAR are both detection systems that can be used to identify objects and their position when they are not visible or at a distance. They are similar in that they both detect

the reflection of a transmitted signal. This makes them easily confused with one another. They also both also serve as acronyms for a much longer description, with RADAR being short for Radio Detection and Ranging and SONAR for Sound Navigation and Ranging.

The primary differences between radar and sonar is going to be the type of signal that they both use for detection.

Radar detection relies on radio waves, which are part of the electromagnetic spectrum. Sonar uses sound waves, which are mechanical waves.

Radar uses high frequency radio waves and microwaves for communication whereas sonar uses high frequency sound waves.

Energy loss of any wave in a medium arises from two important factors namely, scattering and absorption by the particles (atoms or molecules) present in the medium.

In air, radar system sends radio waves and upon reflection from the target, the reflected radio waves will be received. Since density of air is less, the absorption of radio waves by air molecules is very less. But the absorption of radio waves by sea water is very high especially at high frequencies. This is because water molecules and electrically charged ions effectively absorb radio waves. For example, sea water can absorb almost 99 per cent of high frequency radio waves within one metre length. Typically, submarines are inside the sea by several kilometers which makes it very difficult to communicate to them through radio waves. Even if one can try to communicate by low frequency (longer wavelength) radio waves, then the length of the antenna would be of the order of few thousand kilometres, which is practically not possible. Also, usage of low frequency radio waves results in slower data transfer.

However being mechanical waves, sound waves can propagate few hundreds of kilometers and water molecules and ions cannot absorb much. For example, 10 kHz radio wave can propagate only 6m inside sea whereas for the same frequency a sound wave can travel 38 km. However, the absorption of sound waves in air is very high when compared to radio waves. For example, the intensity of sound waves is 3,000 times reduced when compared with sea water. Hence usage of sound waves in air is limited only to short distances.

Q.16) What does haptic communication mean?

a) Communication through hearing
b) Communication through touch
c) Communication through smell
d) None of the above

Q.16) Solution (b)

Haptic communication is a technology that transmits the sensation of touch over the Internet, had been developed by engineers in the Virtual Reality Laboratories at the University at Buffalo (UB).

The breakthrough lead to creation of haptic technologies that convey the sense of touch and taught users how to master skills and activities — such as surgery, sculpture, playing the drums or even golf — that require precise application of 'touch' and movement.

Q.17) Emma Wren Gibson set a new record in November 2017, simply by being born. What was unusual about her birth?

a) She was the first test-tube baby.
b) She was the first product of human cloning.
c) She was the first baby delivered using a human embryo frozen for the longest period**.**
d) She was the first baby to be born in space.

Q.17) Solution (c)

An American woman gave birth to a healthy baby girl from an embryo that was frozen a quarter century ago, in what hospital officials say may be a world record.

The baby, named Emma Wren Gibson, was born November 25, according to the National Embryo Donation Center (NEDC) in Knoxville, Tennessee, which revealed the birth announcement this week.

The embryo was conceived by another couple and frozen on October 14, 1992 and Tina Gibson, the woman who just gave birth to the baby was born in 1991. By some measures, this would make the embryo only about a year younger than her mother.

Q.18) January 1, 2018 marked 124 years since the birth of this scientist who lent his name to a whole class of elementary particles. Name the scientist.

a) Satyendranath Bose
b) Jagadish Chandra Bose
c) Subhash Chandra Bose

d) Albert Einsten

Q.18) Solution (a)

January 1, 2018 – 125th birthday of the famous physicist Satyendra Nath Bose, who was born this day in 1894.

Bose's name was very much in the news when CERN discovered the Higgs boson a few years back.

The word "boson" in "Higgs boson" had been coined from Bose's surname. The Higgs boson is not the only particle, however, to enjoy this honour, and there is in fact a whole class of elementary particles that share a group name – boson.

Q.19) Consider the below statements:

1. Electron, proton and photon are part of matter particles.
2. Neutron and neutrino on the other hand, is a quantum, or tiny bundle, of the electromagnetic field.
3. One fundamental difference between matter particles and field quanta is that while one can squeeze in as many field quanta into a small volume, one cannot do so with matter.

Which of the statements given above is/are correct?

a) 3 only
b) 1 and 3 only
c) 1 and 2 only
d) 1, 2 and 3

Q.19) Solution (a)

All the particles - such as electron, proton, neutron and neutrino (except the photon) - are part of matter particles.

The photon, on the other hand, is a quantum, or tiny bundle, of the electromagnetic field.

The relation between matter particles and field quanta is simple — Matter particles interact with each other by exchanging the appropriate field quanta.

One fundamental difference between matter particles and field quanta is that while you can squeeze in as many field quanta into a small volume, you cannot do so with matter.

To see this, just try sitting close to another person – there is a limit to how close you can get. This is because the electrons, protons etc in our bodies resist being stacked on top of each other. The same is not the case with field quanta, which can be as closely packed as needed.

Matter particles such as electrons, protons etc obey what is known as the Fermi-Dirac statistics and hence are known as 'Fermions'. Field quanta, for instance, obey what is called Bose-Einstein Statistics and are collectively called 'Bosons'.

Q.20) With the boom of the bitcoin – a variety of cryptocurrency – the blockchain technology has come into prominence. What does this technology promise to do, even though it is still in its infancy?

a) Help facilitate secure, online transactions in a decentralized way
b) Keep out malware
c) Connect servers with common reasons for existence, remotely
d) All of the above

Q.20) Solution (a)

Blockchain is the backbone technology on which bitcoins run. Simply put, it is a digital public ledger that records every transaction. Once a transaction is entered in the blockchain, it cannot be erased or modified. Blockchain removes the need for using a trusted third party such as a bank to make a transaction by directly connecting the customers and suppliers. Each transaction is recorded to the ledger after verification by the network participants, mainly a chain of computers, called nodes.

While the origin of the technology is not clear, it is widely believed that a person or group of people by the pseudonym Satoshi Nakamoto, who invented bitcoins, released the technology to support cryptocurrency.

Bitcoin is just one of the applications for the technology, whose use is being tested across industries. It is witnessing a lot of traction within India, in sectors such as banking and insurance. In most of these industries, players are coming together to form a consortium to realise the benefits of blockchain at an industry level.

For example, in India, there is a consortium 'BankChain' which has about 27 banks from India (including State Bank of India or SBI and ICICI) and the Middle East as its members. The consortium is exploring using usage of Blockchain technology to make business safer, faster and cheaper.

The Institute for Development and Research in Banking Technology (IDRBT), an arm of the Reserve Bank of India (RBI), is developing a model platform for blockchain technology.

Blockchain is expected to improve the efficiency of a transaction by eliminating the middlemen, while also reducing the cost of all transactions. It is also likely to increase transparency. and bring down fraud as every transaction would be recorded and distributed on a public ledger.

Q.21) Indian scientists had developed an eco-friendly nanotechnology for water-softening applications that could be used in civic water treatment plants for generating potable water. What is the name of the naturally occurring substance with which these scientists developed eco-friendly nanotechnology for water purification?

a) Resin
b) Chitosan
c) Carcinogens
d) Anticarcinogens

Q.21) Solution (b)

The team from Institute of Advance Study in Science & Technology (IASST) in Assam's Guwahati, had crafted a biopolymer using a naturally occurring substance, called chitosan (obtained from the hard outer skeleton of shellfish, including crab, lobster, and shrimp) as a backbone for the carbon nanoparticles to sit on.

Q.22) Consider the following statements about Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA)

1. All the digitally illiterate person from every rural household is eligible for the scheme
2. National Institute of Electronics & Information Technology is the only National Level Certifying Agency for the scheme
3. CSC e-Governance Services India Limited is the implementing agency

Select the correct statements

a) 1 and 2
b) 2 Only
c) 1 and 3
d) 3 Only

Q.22) Solution (d)

Statement 1 –

- The beneficiary should be Digitally Illiterate
- Only one person per eligible household would be considered for training
- Age Group: 14 - 60 years

Statement 2 –

Independent external evaluation will be conducted by a National level certifying agency like NIELIT, NIOS, IGNOU, HKCL, ICTACT, NIESBUD etc.

Statement 3 –

The scheme will be implemented by CSC e-Governance Services India Limited, a Special Purpose Vehicle (SPV) incorporated under the Companies Act 1956, under the overall supervision of Ministry of Electronics & Information Technology, with active collaboration of all the State Governments and UT Administrations.

Q.23) Which of the following countries are full members of Square Kilometre Array (SKA)?

1. Canada
2. China
3. India
4. Italy

Select the correct code:

a) 2 and 3 Only
b) 1, 2 and 3 Only
c) 1, 2 and 4 Only
d) 1, 2, 3 and 4

Q.23) Solution (d)

The Square Kilometre Array (SKA) is a large multi radio telescope project aimed to be built in Australia, New Zealand, and South Africa.

Organisations from ten countries are currently members of the SKA Organisation – Australia, Canada, China, India, Italy, New Zealand, South Africa, Sweden, the Netherlands and the United Kingdom.

Q.24) The India–Myanmar border has the Free Movement Regime (FMR) which allows the tribes living along the border to travel 16-km across the boundary without visa restrictions. A visa-free movement regime (FMR) exists in which of the following states?

1. Tripura
2. Nagaland
3. Manipur
4. Arunachal Pradesh

Select the correct code:

a) 1, 2 and 3
b) 2, 3 and 4
c) 1, 3 and 4
d) 2 and 3

Q.24) Solution (b)

The India–Myanmar border has the Free Movement Regime (FMR) which allows the tribes living along the border to travel 16-km across the boundary without visa restrictions

A visa-free movement regime (FMR) exists in the four states (Mizoram, Nagaland, Manipur and Arunachal Pradesh) along the Indo-Myanmar border, under which people from both countries can stay for up to 72 hours in the area with effective and valid permits issued by the designated authorities on either side.

Q.25) 'Rafah Crossing Point' is often in news. Where is it located?

a) Egypt and Gaza Strip
b) Jordan and Syria
c) Syria and Iraq
d) Israel and Lebanon

Q.25) Solution (a)

Rafah Border Crossing

- The Rafah Border Crossing or Rafah Crossing Point is the sole crossing point between Egypt and Gaza Strip.

- It is located on the Gaza–Egypt border, which was recognized by the 1979 Israel–Egypt Peace Treaty.
- The original crossing point was named Rafah land port. Only passage of persons takes place through the Rafah Border Crossing.
- All traffic of goods is diverted to the Kerem Shalom border crossing.

Q.26) Which of the following statements about 'Greater bamboo lemur' is/are correct?

a) They are native to Madagascar only
b) They are 'Critically Endangered' under the IUCN Red List
c) Both (a) and (b)
d) Neither (a) nor (b)

Q.26) Solution (c)

Greater bamboo lemur

- It is the largest bamboo lemur, at over five pounds or nearly 2.5 kilograms.
- Its current range is restricted to southeastern Madagascar, although fossils indicate its former range extended across bigger areas of the island, including as far north as Ankarana.
- It almost exclusively eats a single species of bamboo, including the woody trunk, known as culm.
- This species is listed on Appendix I of CITES. This species has also been on the list of the World's 25 Most Endangered Primates.

Q.27) Consider the following statements about 'SELENE'

1. It is a space telescope mainly used to perform high precision observations of electrons and gamma rays
2. It is developed and sponsored by JAXA and NASA

Select the correct statements

a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

Q.27) Solution (d)

SELENE

- Selenological and Engineering Explorer, better known as Kaguya in Japan by its nickname was the second Japanese lunar orbiter spacecraft following the Hiten probe.
- Produced by the Institute of Space and Astronautical Science (ISAS) and the National Space Development Agency (NASDA), the spacecraft was launched in September 2007.
- After successfully orbiting the Moon for a year and eight months, the main orbiter was instructed to impact on the lunar surface near the crater Gill in June, 2009.

Objectives

- Study the origins of the Moon and its geologic evolution
- Obtain information about the lunar surface environment
- Perform radio science, especially precise measurement of the Moon's gravity field