Q.1) Aflatoxins are poisonous carcinogens. Which of the following statements are correct regarding Aflatoxins?

1. Aflatoxins are a family of toxins that are found in synthetic pesticides and herbicides.
2. People can be exposed to aflatoxins by eating contaminated plant products or by consuming meat or dairy products from animals that ate contaminated feed.
3. Farmers and other agricultural workers may be exposed by inhaling dust generated during the handling and processing of contaminated crops and feeds.

Select the code from following:

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

Q.1) Solution (b)

Aflatoxins are a family of toxins produced by certain fungi that are found on agricultural crops such as maize (corn), peanuts, cottonseed, and tree nuts. The main fungi that produce aflatoxins are Aspergillus flavus and Aspergillus parasiticus, which are abundant in warm and humid regions of the world. Aflatoxin-producing fungi can contaminate crops in the field, at harvest, and during storage.

People can be exposed to aflatoxins by eating contaminated plant products (such as peanuts) or by consuming meat or dairy products from animals that ate contaminated feed. Farmers and other agricultural workers may be exposed by inhaling dust generated during the handling and processing of contaminated crops and feeds.

Exposure to aflatoxins is associated with an increased risk of liver cancer.

Q.2) Researchers have created MELISA, which is a Mobile version of "Enzyme Linked Immunosorbent Assay (ELISA)". Which of the following statements is correct regarding it?

a) It is a device used to transmit enzymes directly in the digestive tract in case of pancreatic disorder.
b) It is a method of replenishing ions in the body in case of severe dehydration.
c) It is a technique used to detect an antigen or antibody

d) It is a technique to connect a prosthetic organ with brain so that it can be directly controlled

Q.2) Solution (c)

Mobile Enzyme Linked Immunosorbent Assay (MELISA)

- Researchers have created a mobile version of the "Enzyme Linked Immunosorbent Assay (ELISA)", a technique used to detect the presence of an antibody or antigen
- The device measures progesterone levels, a key hormone that impacts female fertility and is indicative of some cancers
- MELISA consists of a water bath heater that incubates samples at a target temperature and analyses them via images taken by cellphone.
- It uses colour analysis to determine the RGB (red, green, blue) colour components of each sample

Q.3) Hunter Syndrome is a genetic disorder caused by a deficient or absent enzyme iduronate-2-sulfatase (I2S). Which of the following statements are correct regarding Hunter syndrome?

1. Patients may have frequent colds and ear infections, distorted facial features, hearing loss, heart problems, breathing trouble, skin and eye problems, bone and joint flaws, bowel issues and brain and thinking problems.
2. A male can get the syndrome from mother if the infected X chromosome is transferred.
3. Females can carry one abnormal copy of the I2S gene and are usually not affected.

Select the code from following:

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

Q.3) Solution (d)

Hunter Syndrome is a genetic disorder caused by a deficient or absent enzyme iduronate-2-sulfatase (I2S). It primarily affects males.

- In this the cells lack a gene that makes the enzyme that breaks down certain carbohydrates. These build up in cells and cause havoc throughout the body.
- Patients may have frequent colds and ear infections, distorted facial features, hearing loss, heart problems, breathing trouble, skin and eye problems, bone and joint flaws, bowel issues and brain and thinking problems.
- It is passed down from one generation to the next in a specific way.
- Nearly every cell in the human body has 46 chromosomes, with 23 derived from each parent. The I2S gene is located on the X chromosome. Females have two X chromosomes, one inherited from each parent, whereas males have one X chromosome that they inherit from their mother and one Y chromosome that they inherit from their father.
- If a male has an abnormal copy of the I2S gene, he will develop Hunter syndrome. A male can obtain an abnormal copy of the I2S gene in one of two ways.
- His mother is often a carrier; i.e., she has one abnormal and one normal I2S gene, and she passes along the abnormal gene to him.
- Alternatively, during egg and sperm formation, a mutation can develop in the I2S gene on his X chromosome. In this second case, the mother is not a carrier and the risk of a spontaneous mutation occurring again in the future sibling is low but not zero.
- Scientists for the first time have tried editing a gene inside the body in a bold attempt to permanently change a person's DNA to try to cure the disease.
- Females can carry one abnormal copy of the I2S gene and are usually not affected.

Q.4) Blood doping is the practice of boosting the number of red blood cells (RBC) in the bloodstream in order to enhance athletic performance. Which of the following statements are correct regarding Blood Doping?

1. Autologous blood doping is the transfusion of one's own blood, which has been stored (refrigerated or frozen) until needed.
2. Homologous blood doping is the transfusion of blood that has been taken from another person with the same blood type.

Select the code from following:

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

Q.4) Solution (c)

Doping

Types of Blood Doping

- blood transfusions
- injections of erythropoietin (EPO)
- injections of synthetic oxygen carrier

Blood doping is the practice of **boosting the number of red blood cells** (RBC) in the bloodstream in order to enhance athletic performance.

- Autologous blood doping is the transfusion of one's own blood, which has been stored (refrigerated or frozen) until needed.
- Homologous blood doping is the transfusion of blood that has been taken from another person with the same blood type.

Erythropoietin (EPO)

EPO is a hormone produced by the kidney. It regulates the body's production of red blood cells. EPO can be used to treat patients with anemia related to chronic or end-stage kidney disease.

Synthetic oxygen carriers: These are chemicals that have the ability to carry oxygen. Two examples are:

- HBOCs (hemoglobin-based oxygen carriers)
- PFCs (perfluorocarbons)

Gene Doping

Gene doping is defined by the World Anti-Doping Agency as "the non-therapeutic use of cells, genes, genetic elements, or of the modulation of gene expression, having the capacity to improve athletic performance.

Q.5) Iodine-125 is a radioisotope of iodine which has uses in biological assays, nuclear medicine imaging and in radiation therapy as brachytherapy to treat a number of conditions, including prostate cancer, uveal melanomas, and brain tumors. 'I-125 Ocu-Prosta seed' is an ideal choice to treat retinoblastoma and uveal tract melanoma, two forms of rare eye cancers. Which of the following organizations has developed that?

a) BARC
b) Indian Medical Association
c) DRDO
d) ISRO

Q.5) Solution (a)

Iodine-125

- BARC-made 'BARC I-125 Ocu-Prosta seed' is an ideal choice to treat retinoblastoma and uveal tract melanoma, two forms of rare eye cancers.
- Iodine-125 is a radioisotope of iodine which has uses in biological assays, nuclear medicine imaging and in radiation therapy as brachytherapy to treat a number of conditions, including prostate cancer, uveal melanomas, and brain tumors. It is the second longest-lived radioisotope of iodine, after iodine-129.

Q.6) Consider the following:

1. Antacids are the chemical substances which when used binds up with the receptors of our stomach and prevent the release of extra acid in our stomach.
2. Histamines are the chemical substance mainly made of metal hydroxides or metal hydrogencarbonates which helps in neutralizing the harmful effects of excess of stomach acid.

Which of the above statements is/are correct?

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

Q.6) Solution (d)

Antacids and Histamines

- Antacids are the chemical substances mainly made of metal hydroxides or metal hydrogencarbonates which helps in neutralizing the harmful effects of excess of stomach acid. Examples are Cimetidine and Renitidine.
- It is one of the widely used materials in the world.
- Histamines are the chemical substance which when used binds up with the receptors of our stomach and prevents the release of extra acid in our stomach. But they cause allergies and hyperacidity.

- Anti-histamines are used to treat hyperacidity.

Q.7) Consumption of green tea, colourful berries and fruits is emphasized a lot these days as they contain anti – oxidants. What is the role of antioxidants?

a) An antioxidant is a molecule that inhibits the oxidation of other molecules.
b) It is an enzyme which increases the intake of oxygen during the process of respiration.
c) They make more hemoglobin that can bind more oxygen per unit quantity of blood.
d) They allow body to release more carbon dioxide during respiration.

Q.7) Solution (a)

Anti-oxidants and Preservatives

- An antioxidant is a molecule that inhibits the oxidation of other molecules. Oxidation is a chemical reaction that can produce free radicals, leading to chain reactions that may damage cells. Antioxidants such as thiols or ascorbic acid (vitamin C) terminate these chain reactions.
- A preservative is a substance or a chemical that is added to products such as food, beverages, pharmaceutical drugs, paints, biological samples, cosmetics, wood, and many other products to prevent decomposition by microbial growth or by undesirable chemical changes.
- Preservatives used in carbonated drinks, jams, juices, pickles etc.- Sodium Benzoate, Benzoic Acid and Benzoate.
- Preservatives used in cheese, wines and baked goods etc.- Sorbic Acid, Sodium Sorbate and Sorbates.

Q.8) Which of the following Vitamins are fat soluble?

1. A
2. B
3. C
4. D

Select the code from following:

a) 1 and 4

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

Q.8) Solution (a)

Vitamin Deficiency Disease

Vitamin/ Mineral	Deficiency disease/disorder	Symptoms
Vitamin A	Loss of vision	Poor vision, loss of vision in darkness (night), sometimes complete loss of vision
Vitamin B1	Beriberi	Weak muscles and very little energy to work
Vitamin C	Scurvy	Bleeding gums, wounds take longer time to heal
Vitamin D	Rickets	Bones become soft and bent
Calcium	Bone and tooth decay	Weak bones, tooth decay
Iodine	Goiter	Glands in the neck appear swollen, mental disability in children
Iron	Anaemia	Weakness

- Deficiency of protein causes stunted growth, swelling of face, discolouration of hair, skin diseases and diarrhoea.
- If food is deficient in both carbohydrates and proteins, the growth may stop completely; a person becomes very lean, thin and so weak that he/she may not even be able to move.

Note- Fat-soluble vitamins are vitamins A, D, E and K. Water-soluble vitamins include vitamins C and B.

Q.9) Which of the following statements are correct regarding Amyotrophic lateral sclerosis (ALS)?

1. It is a neurological disease which affects the motor neurons and body movement becomes restricted.
2. The disease is progressive, meaning the symptoms get worse over time.
3. People may lose the ability to speak, eat, move and breathe.

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 (d)

ALS, or amyotrophic lateral sclerosis, is a progressive neurodegenerative disease that affects nerve cells in the brain and the spinal cord. A-myo-trophic comes from the Greek language. "A" means no. "Myo" refers to muscle, and "Trophic" means nourishment – "No muscle nourishment." When a muscle has no nourishment, it "atrophies" or wastes away. "Lateral" identifies the areas in a person's spinal cord where portions of the nerve cells that signal and control the muscles are located. As this area degenerates, it leads to scarring or hardening ("sclerosis") in the region.

Motor neurons reach from the brain to the spinal cord and from the spinal cord to the muscles throughout the body. The progressive degeneration of the motor neurons in ALS eventually leads to their demise. When the motor neurons die, the ability of the brain to initiate and control muscle movement is lost. With voluntary muscle action progressively affected, people may lose the ability to speak, eat, move and breathe. The motor nerves that are affected when you have ALS are the motor neurons that provide voluntary movements and muscle control. Examples of voluntary movements are making the effort to reach for a smart phone or step off a curb. These actions are controlled by the muscles in the arms and legs.

Q.10) Which of the following virus are correctly matched with the diseases caused by them?

1. Norovirus – Gastrointestinal illness
2. Rotavirus – Leprosy
3. Human Papillomavirus – AIDS

Select the code from following:

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

Q.10) Solution (a)

- Influenza-Flu by influenza virus
- Common Cold- Rhinovirus
- Hepatitis A- Liver
- Norovirus-Gastro-intestinal illness
- Rotavirus- Diarrhea
- Human Papillomma Virus (HPV)- STD, can cause cancer
- Hepatitis B- Inflammation in the liver

Q.11) Which of the following statements is NOT correct regarding West Nile Fever?

a) West Nile Virus (WNV) can cause neurological disease and death in people.
b) Bats are the natural hosts of West Nile virus.
c) West Nile Virus (WNV) is a member of the flavivirus genus and belongs to the Japanese encephalitis antigenic complex of the family Flaviviridae.
d) WNV is commonly found in Africa, Europe, the Middle East, North America and West Asia.

Q.11) Solution (b)

WEST NILE VIRUS

- West Nile Virus (WNV) can cause neurological disease and death in people. WNV is commonly found in Africa, Europe, the Middle East, North America and West Asia.
- WNV is maintained in nature in a cycle involving transmission between birds and mosquitoes. Humans, horses and other mammals can be infected.
- West Nile Virus (WNV) is a member of the flavivirus genus and belongs to the Japanese encephalitis antigenic complex of the family Flaviviridae. **Birds are the natural hosts of West Nile virus.**

Q.12) LEISHMANIASIS was recently in the news as it became a severe problem amongst the Syrian refuges. Which of the following statements are correct regarding LEISHMANIASIS?

1. It is commonly known as 'Alexandria boils'
2. It causes disfiguring skin ulcerations, and occasionally spreading to internal organs with fatal consequences.
3. It is spread by the bite of sandfly.

Select the code from following:

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

Q.12) Solution (b)

LEISHMANIASIS

- Historically known as "Aleppo boil," this parasitic infection has recently, as the name suggests, become a problem among Syrian refugees.
- Producing disfiguring skin ulcerations, and occasionally spreading to internal organs with fatal consequences, the increase of cases turning up in Europe among migrants has made it the subject of considerable media interest.
- Leishmaniasis is spread by the bite of the sandfly, however, which means it has a northern limit to its range.

Q.13) Moscow Declaration of WHO aims at ending

a) Tuberculosis
b) Small Pox
c) AIDS
d) Polio

Q.13) Solution (a)

Moscow declaration emphasis need for fixing multisectoral responsibility towards ending TB by 2035, the global target. It recognises need for multisectoral accountability framework to end TB, which is both political and technical.

This framework is critical to creating enabling operational environment for multisectoral action, fast-tracking priority interventions, monitoring overall progress, and accelerating advocacy at all levels within different sectors, all of which is necessary to achieve committed milestones and targets to end TB epidemic.

Q.14) To make healthcare more affordable, government is promoting the use of generic drugs. Which of the following statements are correct regarding generic drugs?

1. They contain the same active ingredients as the innovator drug.
2. They are less expensive because the drug manufacturer does not have to duplicate the original clinical trials for effectiveness and safety.
3. They are cheaper than branded drugs as they are low on quality.

Select the code from following:

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

Q.14) Solution (c)

GENERIC DRUG

Health professionals and consumers can be assured that FDA approved generic drugs have met the same rigid standards as the innovator drug. To gain FDA approval, a generic drug must:

- contain the same active ingredients as the innovator drug(inactive ingredients mayvary)
- be identical in strength, dosage form, and route of administration
- have the same use indications
- be bioequivalent
- meet the same batch requirements for identity, strength, purity, and quality be manufactured under the same strict standards of FDA's good manufacturing practice regulations required for innovator products

Although generic drug active ingredients are chemically identical to their branded counterparts, they are typically sold at a cheaper price than the brand-name drug. Generics are less expensive because the drug manufacturer does not have to duplicate the original

clinical trials for effectiveness and safety, which lowers the cost to bring the drug to market. Generics are not less expensive because they are lower in quality.

Q.15) In the context of Pharmaceuticals, what is a Pyrogen Test?

a) It is a test to identify the exact dose of a medicine to be delivered to a patient.
b) It is a test carried out to check impurity or substance that can cause adverse side-effects.
c) It is a test to identify allergies in a patient towards a certain drug.
d) None of the above

Q.15) Solution (b)

Pyrogen test is carried out to check impurity or substance that can cause adverse side-effects. For the test, drug is injected into rabbit and animal is closely observed for feverish symptoms. The abnormal toxicity test is carried out to check potential hazardous biological contamination in vaccine formulations. This batch test is done before product is approved for marketing. In this, mice or guinea pigs are injected with vaccine. The scientists observe if there is death of any animal.

Indian Pharmacopoeia Commission (IPC) has in its 2018 edition of Indian Pharmacopoeia approved modern, animal-free tests for drug manufacturers. It will spare animals from suffering due to drug experiments.

Q.16) Which of the following medical devices has been recently notified as drugs by the Ministry of Health and Family Welfare?

1. Blood Pressure Monitors
2. Nebulisers
3. Digital Thermometers
4. Glucometers

Select the code from following:

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

d) All of the above

Q.16) Solution (d)

Union Ministry of Health & Family Welfare has notified four medical devices including blood pressure monitors, nebulisers, digital thermometers and glucometers as drugs under Drugs and Cosmetics Act, 1940. The decision will enable the government to ensure their quality and performance. Drug Controller General of India (DCGI) will regulate import, manufacture and sale of these devices from January 2020.

Q.17) Last year 22 cases of Zika was confirmed in Rajasthan. Which of the following statements are correct regarding Zika virus?

1. Zika virus Disease is mosquito-borne virus transmitted by Aedes aegypti mosquitoes.
2. Pregnant women infected with Zika virus may give birth to babies with severe brain damage or serious birth defects.

Select the code from following:

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

Q.17) Solution (c)

Zika virus Disease is mosquito-borne virus transmitted by Aedes aegypti mosquitoes which also transmit three other vector-borne diseases Chikungunya, dengue and yellow fever. The virus belongs to family Flaviviridae and Genus Flavivirus. It was first identified in 1947 in Zika Forest, Uganda from where it derives its name. Now it is emerging disease currently being reported by 86 count countries worldwide.

Symptoms: They are similar to other viral infections such as dengue, and include fever, skin rashes, conjunctivitis, muscle and joint pain, malaise, and headache.

Threats: Pregnant women infected with Zika virus may give birth to babies with severe brain damage or serious birth defects i.e. neurological disorders and foetal deformation known as Microcephaly in which infants are born with abnormally smaller heads.

There is no specific treatment or vaccine currently available to treat Zika. The best form of prevention is protection against mosquito bites and clearing stagnant water where mosquitoes breed.

Q.18) Recently IIT Delhi team used Drug-loaded microparticles to manage Parkinson's. Which of the following statements regarding Parkinson's are correct?

1. Parkinson's disease is a progressive nervous system disorder that affects movement.
2. It is inherited and can cause acute dementia.

Select the code from following:

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

Q.18) Solution (a)

Parkinson's disease is a progressive nervous system disorder that affects movement. Symptoms start gradually, sometimes starting with a barely noticeable tremor in just one hand. Tremors are common, but the disorder also commonly causes stiffness or slowing of movement.

In the early stages of Parkinson's disease, your face may show little or no expression. Your arms may not swing when you walk. Your speech may become soft or slurred. Parkinson's disease symptoms worsen as your condition progresses over time.

Although Parkinson's disease can't be cured, medications might significantly improve your symptoms. Occasionally, your doctor may suggest surgery to regulate certain regions of your brain and improve your symptoms.

Statement 2 is incorrect for Parkinson's but correct for Alzheimer's disease.

Q.19) The term SPINK1 Positive is related to

a) Diabetes
b) Prostate Cancer
c) Elephantiasis

d) Alzheimer's Disease

Q.19) Solution (b)

Molecular mechanism of prostate cancer subtype unraveled by a multi-institutional team at IIT Kanpur.

Cancer is caused by accumulated damage to genes. Such changes may be due to chance or to exposure to a cancer causing substance. The substances that cause cancer are called carcinogens. A carcinogen may be a chemical substance, such as certain molecules in tobacco smoke. The cause of cancer may be environmental agents, viral or genetic factors.

The SPINK1-positive prostate cancer subtype derives its name from the excess amount of SPINK1 oncogene (cancer causing)found in the cancer cells. Excess production of SPINK1 gene responsible for tumour and metastasis is not restricted to prostate cancer alone but also seen in colorectal, lung, pancreatic, breast and ovarian cancers.

Q.20) As the temperature across the globe are rising, the infections of Hantavirus are expected to increase. Which of the following statements are correct regarding Hantavirus?

1. It affects the lungs and the disease caused by Hantavirus is called Hantavirus pulmonary syndrome.
2. Virus can only be transmitted through sexual contact.
3. Hantavirus is a virus that is found in the urine, saliva, or droppings of infected deer mice and some other wild rodents.

Select the code from following:

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

Q.20) Solution (c)

Hantavirus is a virus that is found in the urine, saliva, or droppings of infected deer mice and some other wild rodents (cotton rats, rice rats in the southeastern Unites States and the white-footed mouse and the red-backed vole). It causes a rare but serious lung disease called

Hantavirus pulmonary syndrome (HPS). The virus does not remain active for long once outside of its host -- less than 1 week outdoors and a few hours when exposed to direct sunlight.

People can contract the Hantavirus infection through inhalation of respirable droplets of saliva or urine, or through the dust of feces from infected wild rodents, especially the deer mouse. Transmission can also occur when contaminated material gets into broken skin, or possibly, ingested in contaminated food or water.

The disease caused by Hantavirus is called Hantavirus pulmonary syndrome. Symptoms appear within 1 to 5 weeks after exposure. The average is 2 to 4 weeks. This disease is extremely serious since about 40% of the people who get the disease die. The disease begins as a flu-like illness. In the early stage, a worker may experience fever, chills, muscle aches, headaches, nausea, vomiting, and shortness of breath, rapid heartbeat and gastrointestinal problems. However, the disease progresses rapidly and infected people experience an abnormal fall in blood pressure and their lungs will fill with fluid. Severe respiratory failure, resulting in death, can occur within a few days of the early stage symptoms.

Q.21) Mihir is a High Performance Computer (HPC) system installed at the National Centre for Medium Range Weather Forecasting (NCMRWF). Which of the following functions will it perform?

1. Weather forecasts for predicting extreme weather events.
2. Ocean state forecasts like marine water quality forecasts and Tsunami forecasts.
3. Air quality forecasts for various cities.
4. Net cropped region in India.

Select the code from following:

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

Q.21) Solution (b)

Mihir' (meaning 'Sun') a High Performance Computer (HPC) System has been installed at the National Centre for Medium Range Weather Forecasting (NCMRWF).

The new HPC facility is expected to improve the following services:

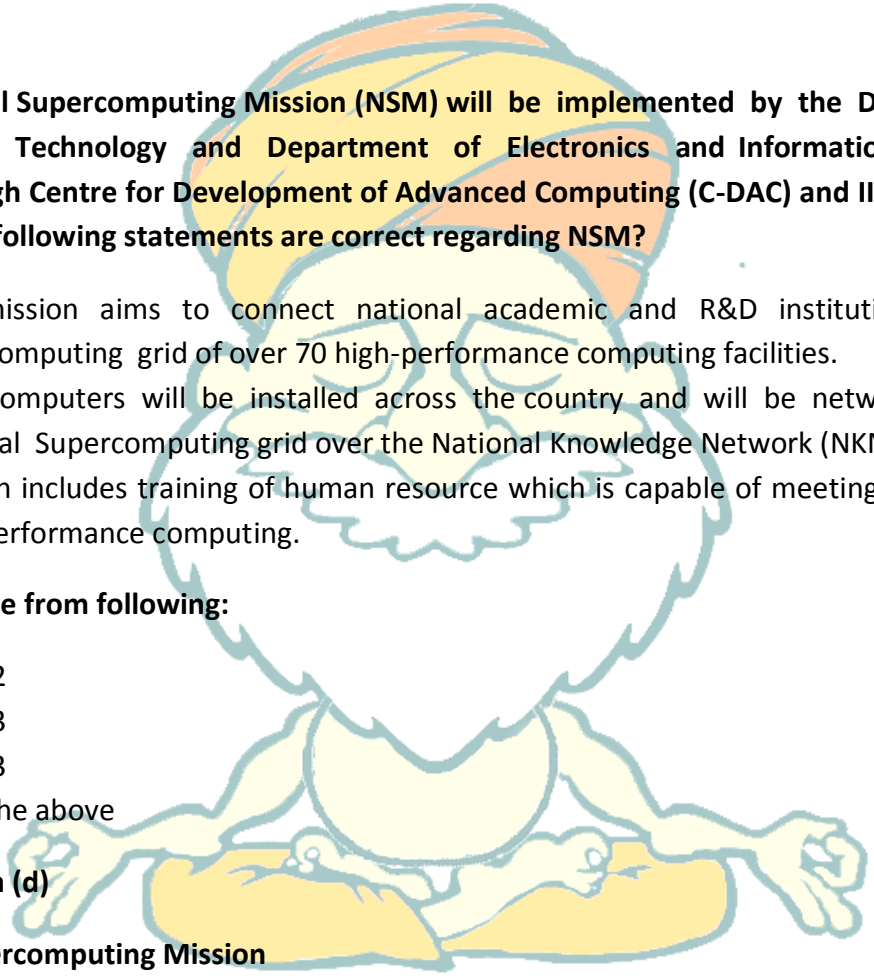
1. Weather forecasts for predicting extreme weather events.

2. High resolution seasonal/extended range forecasts of active/break spells of Monsoon.

3. Very high resolution prediction of cyclones with more accuracy and lead time.

4. Ocean state forecasts like marine water quality forecasts and Tsunami forecasts.

5. Air quality forecasts for various cities.



Q.22) National Supercomputing Mission (NSM) will be implemented by the Department of Science and Technology and Department of Electronics and Information Technology (DeitY) through Centre for Development of Advanced Computing (C-DAC) and IISc, Bangalore. Which of the following statements are correct regarding NSM?

1. The mission aims to connect national academic and R&D institutions with a supercomputing grid of over 70 high-performance computing facilities.
2. Supercomputers will be installed across the country and will be networked on the National Supercomputing grid over the National Knowledge Network (NKN).
3. Mission includes training of human resource which is capable of meeting challenges of High Performance computing.

Select the code from following:

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

Q.22) Solution (d)

National Supercomputing Mission

- India has recently granted contract to French technology firm to build 70 supercomputers under the National Supercomputing Mission.
- The mission aims to connect national academic and R&D institutions with a supercomputing grid of over 70 high-performance computing facilities.
- Supercomputers will be installed across the country and will be networked on the National Supercomputing grid over the National Knowledge Network (NKN).

- It will be implemented by the Department of Science and Technology and Department of Electronics and Information Technology (DeitY) through Centre for Development of Advanced Computing (C-DAC) and IISc, Bangalore.
- The Mission also includes development of highly professional High Performance Computing (HPC) aware human resource for meeting challenges of development of these applications.
- The NKN is another programme of the government which connects academic institutions and R&D labs over a high speed network.

Q.23) Which of the following electronic component can perform logic as well as store data?

a) Transmitter
b) Resistor
c) Memristor
d) Capacitor

Q.23) Solution (c)

Memristors are a special type of resistive device that can both perform logic and store data.

The full form of the memristor is memory + resistor. So this is called the fourth basic element after inductor, resistor and capacitor. The major feature of the memristor is, it has the capability for remembering its state history.

Q.24) Which of the following statements regarding 'Quantum Dots' are correct?

1. Quantum dots display unique electronic properties, intermediate between those of bulk semiconductors and discrete molecules.
2. They can be made to emit or absorb specific wavelengths of light by controlling their size.
3. They are non toxic and can be injected in the blood stream and help in detecting the cancer cells present in body by illuminating them under an MRI.

Select the code from following

a) 1 and 2
b) 2 and 3

c) 1 and 3
d) All of the above

Q.24) Solution (a)

Nanoparticles of semiconductors – quantum dots – were theorized in the 1970s and initially created in the early 1980s. If semiconductor particles are made small enough, quantum effects come into play, which limit the energies at which electrons and holes (the absence of an electron) can exist in the particles. As energy is related to wavelength (or color), this means that the optical properties of the particle can be finely tuned depending on its size. Thus, particles can be made to emit or absorb specific wavelengths (colors) of light, merely by controlling their size.

Quantum dots are artificial nanostructures that can possess many varied properties, depending on their material and shape. For instance, due to their particular electronic properties they can be used as active materials in single-electron transistors.

The properties of a quantum dot are not only determined by its size but also by its shape, composition, and structure, for instance if it's solid or hollow. A reliable manufacturing technology that makes use of quantum dots' properties – for a wide-ranging number of applications in such areas as catalysis, electronics, photonics, information storage, imaging, medicine, or sensing – needs to be capable of churning out large quantities of nanocrystals where each batch is produced according to the exactly same parameters.

Quantum dots enable researchers to study cell processes at the level of a single molecule and may significantly improve the diagnosis and treatment of diseases such as cancers. QDs are either used as active sensor elements in high-resolution cellular imaging, where the fluorescence properties of the quantum dots are changed upon reaction with the analyte, or in passive label probes where selective receptor molecules such as antibodies have been conjugated to the surface of the dots.

Quantum dots could revolutionize medicine. **Unfortunately, most of them are toxic.** Ironically, the existence of heavy metals in QDs such as cadmium, a well-established human toxicant and carcinogen, poses potential dangers especially for future medical application, where qdots are deliberately injected into the body.

Q.25) Microsoft has developed 'Hololens' under its project Baraboo. Which of the following statements regarding Hololens is/are correct?

1. They are smart glasses that can provide augmented reality.
2. HoloLens can help doctors 'see through' organs and tissues in the operating theatre.

Select the code from following:

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

Q.25) Solution (c)

Augmented reality (AR) is alive direct or indirect view of a physical, real-world environment whose elements are "augmented" by computer-generated perceptual information.

Microsoft HoloLens, known under development as Project Baraboo, is a pair of mixed reality smartglasses developed and manufactured by Microsoft. HoloLens was one of the first computers running the Windows Mixed Reality platform under the Windows 10 operating system.

Microsoft's mixed reality HoloLens has helped doctors 'see through' a body, thereby increasing the successes of reconstructive surgeries.

https://indianexpress.com/article/technology/science/microsoft-hololens-mixed-reality-tech-helps-surgeons-see-through-the-body-5052544/

Q.26) Consider the following statements regarding 'Altcoins':

1. Altcoins are the alternative cryptocurrencies launched after the success of Bitcoin.
2. All Altcoins use the same algorithm and mining and exchange process as bitcoin to maintain legitimacy.

Which of the above statements are correct?

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

Q.26) Solution (a)

Altcoins are the alternative cryptocurrencies launched after the success of Bitcoin. Generally, they project themselves as better substitutes to Bitcoin.

"Altcoin" is a combination of two words: "alt" and "coin"; alt signifying 'alternative' and coin signifying (in essence) 'cryptocurrency.' Thus together they imply a category of cryptocurrency that is alternative to the digital currency Bitcoin. After the success story of Bitcoin, many other peer-to-peer digital currencies have emerged in an attempt to imitate that success. While Bitcoin was the first cryptocurrency, and remains the best-known, it is now only one of hundreds of cryptocurrencies, which all seek to improve upon Bitcoin in various ways.

Many of the altcoins are built up on the basic framework provided by Bitcoin. Thus most altcoins are peer-to-peer, involve a mining process by which users solve difficult problems to unlock blocks, and offer efficient and cheap ways to carry out transactions on the web. But even with many overlapping features, altcoins vary widely from each other - altocoins differ themselves from bitcoin with a range of procedural variations, including different proof-of-work algorithms, different means by which users can sacrifice energy to mine blocks, and application enhancements to increase user anonymity.

Q.27) Union telecom ministry had announced 5G technology will be rolled out from 2020. Which of the following statements regarding 5G technology are correct?

1. It will provide 100 times more peak speed as compared to 4G.
2. The speed provided by 5G will be faster than current broadband cable network.
3. It will be able to support large number of interconnected devices making internet of things successful.

Select the code from following:

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

Q.27) Solution (d)

5G is the fifth generation wireless network which promises ultra-reliable, very fast speeds and high bandwidth mobile connectivity and supports massive interconnected devices spread

across wide areas like Internet of things (IoT). It made the worldwide debut in the winter Olympics at Pyeongchang, South Korea.

Their major advantage is that 5G networks achieve much higher data rates than previous cellular networks, up to 10 Gbit/s; which is faster than current cable internet, and 100 times faster than the previous cellular technology, 4G LTE.

Another advantage is lower network latency (faster response time), below 1 ms (millisecond), compared with 30 - 70 ms for 4G. Because of the higher data rates, 5G networks will serve not just cellphones but are also envisioned as a general home and office networking provider, competing with wired internet providers like cable. Previous cellular networks provided low data rate internet access suitable for cellphones, but a cell tower could not economically provide enough bandwidth to serve as a general internet provider for home computers.

Q.28) VdW materials have the potential to replace the current hard drive assemblies in computers and become the key to quantum computing. Which of the following statements are correct regarding VdW materials?

a) It is a composite material where alternate layers of graphene and semiconductor are fused together.
b) These are silicon wafers of nano meter thickness which can show almost superconductivity at room temperature.
c) They consist of individual atomic planes bonded by weak Vander Waal attraction.
d) None of the above

Q.28) Solution (c)

Van der Waals (vdW) materials consist of individual atomic planes bonded by weak vdW attraction. These material display nearly all electronic and optical phenomena found in solids, including plasmonic oscillations of free electrons characteristic of metals, light emission/lasing and excitons encountered in semiconductors, and intense phonon resonances typical of insulators. These phenomena are embodied in confined light-matter hybrid modes termed polaritons—excitations of polarizable media, which are classified according to the origin of the polarization.

Q.29) USBs are household devices in the era of computers. USB stands for

a) Unused Space in Bytes
b) Universal Serial Bus
c) Universal Security Block
d) Universal Space Bus

Q.29) Solution (b)

USB (abbreviation of Universal Serial Bus) is an industry standard that establishes specifications for cables, connectors and protocols for connection, communication and power supply between personal computers and their peripheral devices. Released in 1996, the USB standard is currently maintained by the USB Implementers Forum (USB IF). There have been three generations of USB specifications: USB 1.x, USB 2.0 and USB 3.x; the fourth called USB4 is scheduled to be published in the middle of 2019

Q.30) Consider the following

	Domain name	**Use for**
1.	.com	Profit business
2.	.net	Network service providers
3.	.gov	non profit organisations

Which of the following domains are matched correctly?

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

Q.30) Solution (a)

Domains ending with .COM are generally intended to be used for commercial businesses, which is why they're the most commonly seen domains in the United States. Domains ending with .NET are usually intended for networking services and internet service providers such as Comcast or AT&T's residential email addresses. For instance, an AT&T employee who also used AT&T for their home service would use name@att.com for their business email, but name@att.net for their residential address. .ORG domains are usually intended for non-profit organizations.

However, there's nothing legally preventing anyone from using a .ORG domain for a for-profit business, or a .NET domain for a nonprofit group. Many companies snap up all three variants in order to help protect their branding.

Now, there are other TLD's which are restricted to certain entities. For example, .GOV can only be used by divisions of the federal, state or local government (Whitehouse.gov or Michigan.gov, for instance). .EDU is restricted to public universities and other educational institutes, and .MIL is restricted to divisions of the U.S. military.

Q.31) Which of the following statements correctly explains a botnet?

a) A group of robots connected to the same AI network collectively addressing a task
b) It is a network of devices that has been infected with malicious software
c) It is a virtual bot connected to internet capable of taking voice commands
d) It is an AI imbedded in search engines which provide you with extra links according to your browsing history and choices.

Q.31) Solution (b)

A botnet is a network of devices that has been infected with malicious software, such as a virus. Attackers can control a botnet as a group without the owner's knowledge with the goal of increasing the magnitude of their attacks. Often, a botnet is used to overwhelm systems in a distributed-denial-of-service attack (DDoS) attack.

Q.32) Which of the following statements are correct regarding Phishing?

1. Phishing is the practice of sending fraudulent communications that appear to come from a reputable source, usually through email.
2. The goal is to steal sensitive data like credit card and login information or to install malware on the victim's machine.

Select the code from following:

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

Q.32) Solution (c)

Phishing is the practice of sending fraudulent communications that appear to come from a reputable source, usually through email. The goal is to steal sensitive data like credit card and login information or to install malware on the victim's machine. Phishing is an increasingly common cyberthreat.

Q.33) NIC-CERT, a setup of National Informatics Centre (NIC) to prevent and predict cyber-attacks on government utilities is operated under

a) Ministry of Home Affairs
b) Ministry of Defence
c) Ministry of Finance
d) Ministry of Electronics and Information Technology

Q.33) Solution (d)

The Union Ministry of Electronics and Information Technology (MeitY) launched first NIC-CERT, a setup of National Informatics Centre (NIC) to prevent and predict cyber-attacks on government utilities.

Q.34) ICT Development Index (IDI) is released by

a) World Economic Forum
b) International Telecommunications Unit
c) World Bank
d) UNDP

Q.34) Solution (b)

The ICT Development Index (IDI) is an index published by the United Nations International Telecommunication Union based on internationally agreed information and communication technologies (ICT) indicators. This makes it a valuable tool for benchmarking the most important indicators for measuring the information society. The IDI is a standard tool that governments, operators, development agencies, researchers and others can use to measure

the digital divide and compare ICT performance within and across countries. The ICT Development Index is based on 11 ICT indicators, grouped in three clusters: access, use and skills.

Q.35) Consider the following statements regarding spectrum auction:

1. Reserve price is the highest price cap that is placed over spectrum above which it cannot be sold.
2. In India, Reserve Price is recommended by TRAI.

Which of the above statements are correct?

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

Q.35) Solution (b)

Reserve Price

It is the minimum amount set by the government from which auction starts i.e. it is the starting amount or base price from which auction starts.

Why auction of spectrum is done?

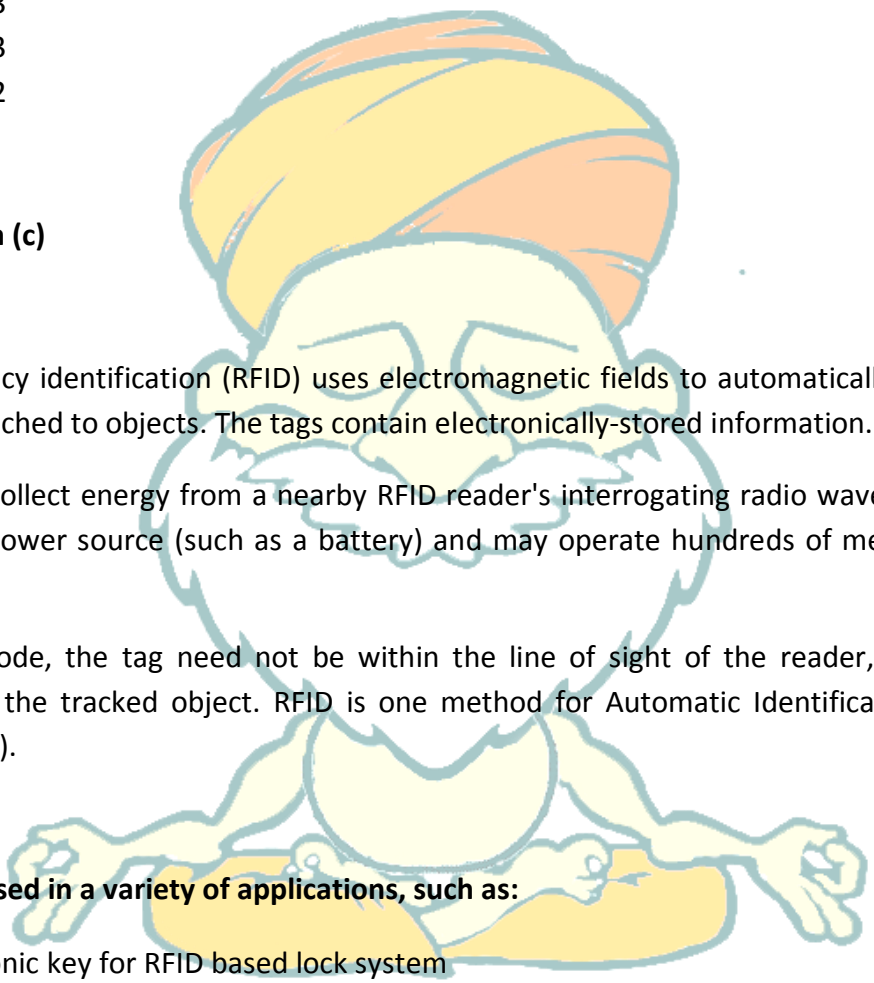
- **Spectrum is a scarce resource.** It needs to be managed efficiently.
- Also, spectrum can't be used by many people. It has to be allocated to some persons who can manage the services under it. Hence it is auctioned.
- Government auctions it because spectrum is a resource & the ownership rights for it are vested in the Government of India**. It is not a private property**. So, government auctions it.
- Also, a lot of revenue is generated by selling the spectrum. That money can be used for developmental programs in India.

Q.36) Which of the following statements are correct regarding RFID tags?

1. These tags contain electronically stored information.
2. Like a barcode, the tag should be within the line of sight of the reader
3. RFID provides a way for organizations to identify and manage stock, tools and equipment (asset tracking), etc. without manual data entry.

Select the code from following:

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



Q.36) Solution (c)

RFID

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information.

Passive tags collect energy from a nearby RFID reader's interrogating radio waves. **Active tags** have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader.

Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

RFID can be used in a variety of applications, such as:

- Electronic key for RFID based lock system
- Access management
- Tracking of goods
- Tracking of persons and animals
- Toll collection and contactless payment
- Machine readable travel documents
- Smartdust (for massively distributed sensor networks)
- Airport baggage tracking logistics

- Timing sporting events
- Tracking and billing processes

RFID provides a way for organizations to identify and manage stock, tools and equipment (asset tracking), etc. without manual data entry.

RFID is used for item level tagging in retail stores. In addition to inventory control, this provides both protection against theft by customers (shoplifting) and employees ("shrinkage") by using electronic article surveillance (EAS), and a self-checkout process for customers.

Yard management, shipping and freight and distribution centers use RFID tracking. In the railroad industry, RFID tags mounted on locomotives and rolling stock identify the owner, identification number and type of equipment and its characteristics. This can be used with a database to identify the lading, origin, destination, etc. of the commodities being carried.

Q.37) Which of the following statements are correct regarding 'Tarang Sanchar' Portal?

1. It is an app to gather feedback from the public regarding the speed of the network and connectivity in a region.
2. The portal has been launched by MeitY.

Select the code from following:

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

Q.37) Solution (d)

Tarang Sanchar Portal

The Tarang Sanchar Portal has been developed in Public Private Partnership (PPP) mode by the Department of Telecommunications (Ministry of Communications) initiative with Industry.

This Portal envisages to disseminate the **information to the public regarding Electro Magnetic Fields (EMF) signals and to allay the misconceptions and fear of health issues** due to EMF emissions from mobile towers. Public, at large will be now able to check the current status of

the mobile tower located anywhere in the country and the EMF signal compliance status of the same.

This Portal also enables the **public to go through the latest developments and corresponding information available in respect of EMF emissions** from mobile towers and to submit their feedback and comments on the same.

Q.38) Which of the following statements are correct regarding CIMON (Crew Interactive Mobile Companion)?

a) It is a 3 D printed AI system that will join the crew aboard the International Space Station (ISS) to assist Astronauts.
b) It is a flying algorithm created by airbus to train commercial pilots
c) It is a 3D printed humanoid that will take place of the crew in long commercial flights.
d) None of the above

Q.38) Solution (a)

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

Q.39) Which of the following is the fastest computer of the World?

a) Summit
b) Sierra
c) Sunway TaihuLight
d) Pratyush

Q.39) Solution (a)

US reclaims both first and second place from China on list of world's fastest supercomputers.

Summit first claimed the #1 spot in June 2018, taking the top rank from China for the first time in 6 years. In the five months since its debut on the June 2018 list, Summit has widened its lead as the number one system, improving its High Performance Linpack (HPL) performance from 122.3 to 143.5 petaFLOPS.

Second place is taken by Sierra and then Sunway TaihuLight

Q.40) Consider the following statements regarding 'WannaCry worm':

1. It is an online game which provokes the players to inflict injury to themself or commit suicide.
2. It can travel between computers without any interaction or authorization.

Which of the above statements are correct?

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

Q.40) Solution (b)

The WannaCry ransomware attack was a May 2017 worldwide cyberattack by the WannaCry ransomware cryptoworm, which targeted computers running the Microsoft Windows operating system by encrypting data and demanding ransom payments in the Bitcoin cryptocurrency. It propagated through EternalBlue, an exploit developed by the US National Security Agency (NSA) for older Windows systems that was released by The Shadow Brokers a few months prior to the attack. While Microsoft had released patches previously to close the exploit, much of WannaCry's spread was from organizations that had not applied these, or were using older Windows systems that were past their end-of-life. WannaCry also took advantage of installing backdoors onto infected systems.