Q.1) Which of the following are the advantages of Voice Over Internet Protocol (VOIP)?

1. Cost of calling is cheaper than normal phone call.
2. No need to carry a dedicated calling device if there is a computer.
3. It does not require internet connectivity to make the call.

Select the code from following:

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

Q.1) Solution (a)

VOIP (Voice over Internet protocol)

- VOIP is IP enabled voice calling technology over internet. Example: Skype, Yahoo messenger, MSN messenger.
- It requires broadband connectivity to make a call along with IP enables devices like Computers, Smartphone etc
- The voice is converted into digital packets and transmitted to destination over packet switched network.

Some of the advantages of VOIP are:

- Cost of calling is cheaper than normal phone.
- No need to carry a dedicated device for calling if u just have a computer with you.
- Its uses existing LANs so need of dedicated wiring features and hence reduce the complexity of calling.
- Call anywhere anytime; do not worry about Roaming Features and Cost.
- One payment , two service : voice calling and broadband data usage

Disadvantages of VOIP are:

- It dependent on broadband network connectivity, no internet no calling.
- The quality of voice depends on broadband bandwidth and speed.
- Power shortage can hamper VOIP calling as it's totally dependent on power enabled devices.
- No emergency calling features like normal and Smartphone.
- Highest disadvantage of VOIP is security. It's really tough to trace the source and identity if an imposter is on work.
- Threats like phishing, spoofing and sniffing, call tampering etc is very common.

Q.2) Which of the following correctly explains WiMAX?

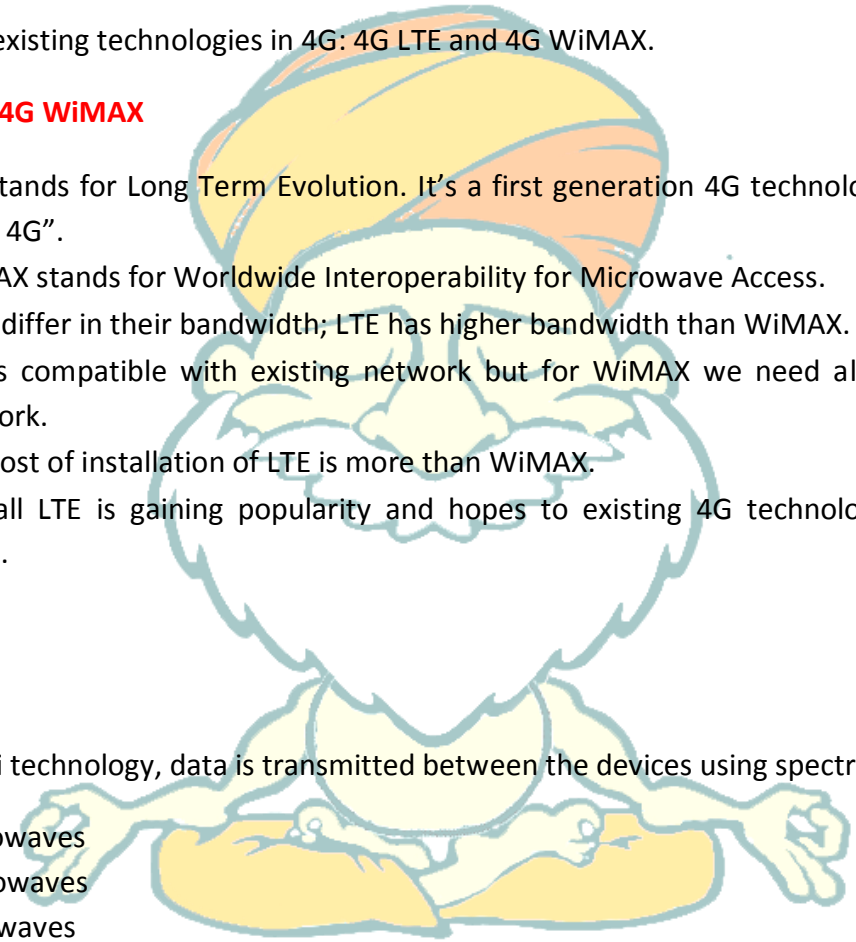
a) Wide Area Network for Maximum Access
b) Worldwide Interoperability for Microwave Access.
c) Worldwide interoperability for Maximum Internet Access
d) Wide Microwave Access

Q.2) Solution (b)

There are 2 existing technologies in 4G: 4G LTE and 4G WiMAX.

4G LTE Vs 4G WiMAX

- LTE stands for Long Term Evolution. It's a first generation 4G technology termed as "true 4G".
- WiMAX stands for Worldwide Interoperability for Microwave Access.
- They differ in their bandwidth; LTE has higher bandwidth than WiMAX.
- LTE is compatible with existing network but for WiMAX we need altogether new network.
- The cost of installation of LTE is more than WiMAX.
- Overall LTE is gaining popularity and hopes to existing 4G technology in coming years.



Q.3) In Li – Fi technology, data is transmitted between the devices using spectrum of

a) Radiowaves
b) Microwaves
c) Lightwaves
d) Infrared Radiations

Q.3) Solution (c)

What is Li-Fi?

- Li-Fi is the latest communication technology which can transmit data **using the spectrum of visible light.**
- Other names for Li-Fi: Optical Wireless technologies / Visible Light Communication (VLC) but mostly called Li-Fi (Light Fidelity)

- Speed possible to Achieve: 10 Gbit/S (Giga bit per second). It is around 250 times faster than the "superfast" broadband.
- The name "Li-Fi" was first coined by Edinburgh University's Prof. Harald Hass in 2001.

How Li-Fi Technology works?

- It works by **sending data over the light.**
- For this purpose **a LED (Light Emitting Diode) light bulb**, anyone at all, can be flicked on and off in order to be able to generate signals. A proper Light Receiver is made for receiving the LED signals.
- The LED bulb will hold a micro-chip that will do the job of processing the data.
- The light intensity can be manipulated to send data by tiny changes in amplitude.
- Properties of LED: (Fundamental property of Li-Fi):
  (1) Intensity can be modulated into very high speeds and varying amplitudes.
  (2) LED can be switched on and off with very high speed.
- The question that comes to mind is that why would someone sit below a flickering light bulb? But this is not the thing. The technology is focusing on making sure that the light bulb is flickered up to billions of times a second! At that rate, the human eye simply cannot notice the light bulb being flicked on and off.
- The LIFI product consists of 4 primary sub-assemblies: Bulb, RF power amplifier circuit (PA), Printed circuit board (PCB) & Enclosure
- The PCB controls the electrical inputs and outputs of the lamp and houses the microcontroller used to manage different lamp functions.
- **An RF (radio-frequency)** signal is generated by the solid-state PA and is guided into an electric field about the bulb. The high concentration of energy in the electric field vaporizes the contents of the bulb to a plasma state at the bulb's center; this controlled plasma generates an intense source of light. All of these sub-assemblies are contained in an aluminum enclosure.

Q.4) What is 'Reserve Price' in the context of Spectrum Auction?

a) It is the amount reserved for PSUs to make them competitive in the market.
b) It is the maximum price over which a company cannot bid.
c) It is the amount that the government has to pay to compensate if entire spectrum is not sold.
d) It is the minimum price set by the government from which the auction starts

Q.4) Solution (d)

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.5) Which of the following is not a type of Multiplexing?

a) Code Division Multiple Access
b) Frequency Division Multiple Access
c) Time Division Multiple Access
d) Amplitude Division Multiple Access

Q.5) Solution (d)

What is Multiplexing? What are its types?

- Any information i.e. voice/date in this case can be sent to another party only by the use of communication channel.
- In this case, the communication channel is the Radio Waves.
- But the spectrum under these radio waves is limited i.e. limited users can use these communication channels. Hence communication channels have to be used efficiently.
- For efficient use, the communication channel is allotted to the users in number of ways which is called Multiplexing.
- **Types of Multiplexing: a) Code Division Multiple Access (CDMA) b) Frequency Division Multiple Access (FDMA) c) Time-Division Multiple Access (TDMA)**
- FDMA: In FDMA, the goal is to divide the frequency spectrum into slots and then to separate the signals of different users by placing them in separate frequency slots.
- TDMA: In TDMA, the goal is to divide time into slots and separate the signals of different users by placing the signals in separate time slots.

- CDMA: In CDMA, signals are sent at the same time in the same frequency band. Signals are either selected or rejected at the receiver by recognition of a user-specific signature waveform, which is constructed from an assigned spreading code.

Q.6) Fiber-optic communication is a method of transmitting information from one place to another using Optical Fiber. Which of the following statements is/are correct regarding this?

1. Data is transferred by sending pulses of light.
2. Signals are transferred through the process of Total Internal Reflection.
3. It is immune to electromagnetic interference.

Select the code from following:

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

Q.6) Solution (d)

Optical Fibre Technology

Fiber-optic communication is a method of transmitting information from one place to another by sending pulses of light through an optical fiber. The light forms an electromagnetic carrier wave that is modulated to carry information.

Fiber is preferred over electrical cabling when high bandwidth, long distance, or immunity to electromagnetic interference are required.

Optical fibre is made up of semiconducting materials and usually has a cylindrical structure. In inner core there is material of higher refractive index than in outer core resulting in Total Internal Reflection (TIR).

Q.7) Which of the following statements are correct regarding RFID tags?

1. These tags contain electronically stored information.
2. Unlike a barcode, the tag need not 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

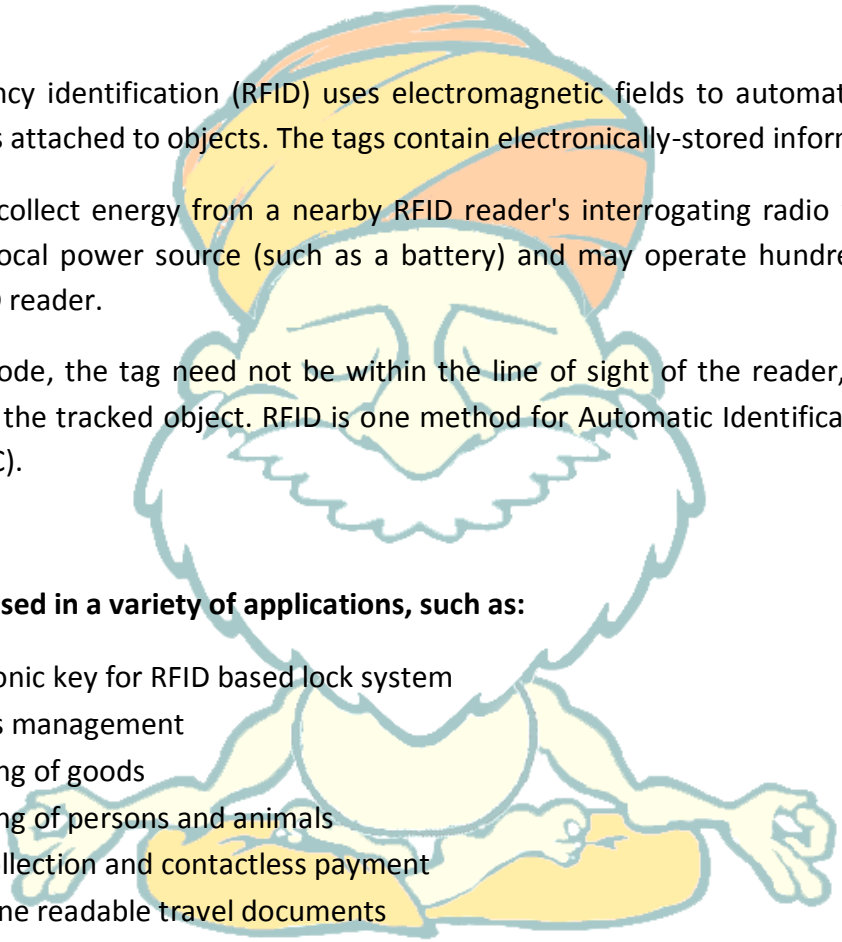
Q.7) Solution (a)

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.

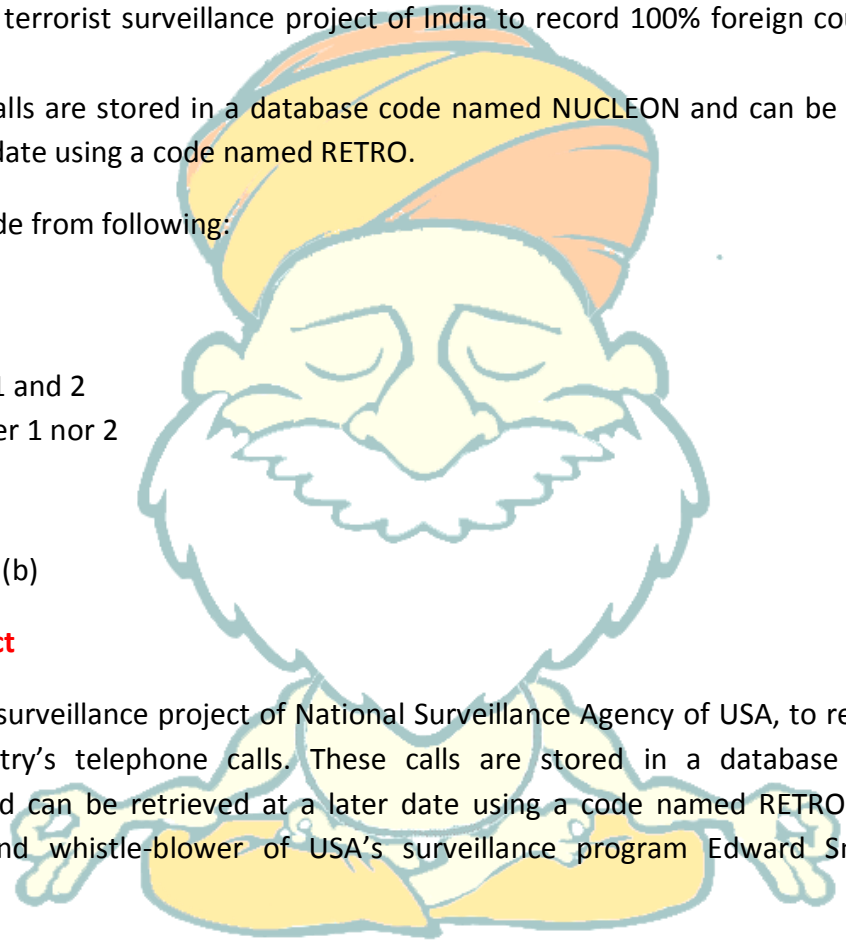
Yard management, shipping and freight and distribution centers use RFID tracking. In the railroad industry, RFID tags mounted on locomotives and rolling stock identify the owner, identification number and type of equipment and its characteristics. This can be used with a database to identify the lading,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

Q.8) Which of the following statements are correct regarding the' Mystic' Programme?

1. It is a terrorist surveillance project of India to record 100% foreign country's phone calls.
2. The calls are stored in a database code named NUCLEON and can be retrieved at a later date using a code named RETRO.

Select the code from following:

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



Q.8) Solution (b)

Mystic Project

It is a secret surveillance project of National Surveillance Agency of USA, to record 100% of foreign country's telephone calls. These calls are stored in a database code named NUCLEON and can be retrieved at a later date using a code named RETRO. Former NSA contractor and whistle-blower of USA's surveillance program Edward Snowden have revealed this.

Q.9) Tarang Sanchar Portal has been developed by the Department of Telecommunications. Which of the following statements regarding Tarang Sanchar Portal are correct?

a) It is an app which updates the users about the availability of network in their regions.
b) It informs public regarding electromagnetic radiations dissipated by communication towers and allays the health concerns of the public regarding their harmful effects.
c) It is an app which updates public about completion of Optical fiber network project in their area

d) It is an app to gather feedback from the public regarding the speed of the network and connectivity in a region.

Q.9) Solution (b)

Tarang Sanchar Portal

The Tarang Sanchar Portal has been developed in Public Private Partnership (PPP) mode by the Department of Telecommunications 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.10) Which of the following missiles are not developed under Integrated guided missile development programme?

a) Prithvi
b) Agni
c) Astra
d) Nag

Q.10) Solution (c)

The Integrated Guided Missile Development Programme (IGMDP) was sanctioned by the Government of India in a bold move to break the total shackles in which India was bound by its own diffidence in the missile field. It was a result of technical initiative, user support and above all political will.

It was conceived by Dr. APJ Abdul Kalam to help India attain self-sufficiency in the field of missile technology.

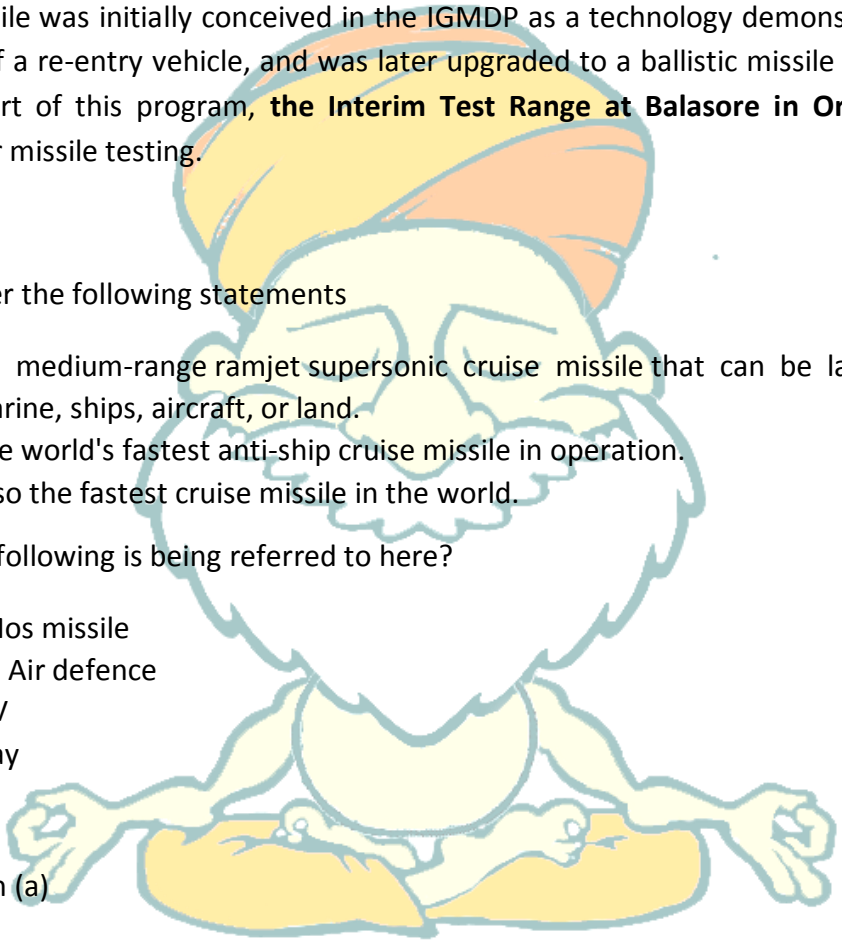
Keeping in mind the requirements of various types of missiles by the defence forces, the team computed by Dr. Kalam recommended the development of five missile systems.

The missiles developed under the programme were

1) Short range surface-to-surface missile (code-named Prithvi)
2) Intermediate range surface to surface ballistic missile (code named Agni)
3) Short range low-level surface-to-air missile (code-named Trishul)
4) Medium range surface-to-air missile (code-named Akash) and
5) Third-generation anti-tank missile (code-named Nag).

Do you know?

The Agni missile was initially conceived in the IGMDP as a technology demonstrator project in the form of a re-entry vehicle, and was later upgraded to a ballistic missile with different ranges. As part of this program, **the Interim Test Range at Balasore in Orissa** was also developed for missile testing.



Q.11) Consider the following statements

1. It is a medium-range ramjet supersonic cruise missile that can be launched from submarine, ships, aircraft, or land.
2. It is the world's fastest anti-ship cruise missile in operation.
3. It is also the fastest cruise missile in the world.

Which of the following is being referred to here?

a) BrahMos missile
b) Prithvi Air defence
c) Agni IV
d) Nirbhay

Q.11) Solution (a)

The BrahMos (designated PJ-10) is a **medium-range ramjet supersonic cruise missile that can be launched from submarine, ships, aircraft, or land**. It is the fastest cruise missile in the world.

It is a joint venture between the **Russian Federation's NPO Mashinostroyeniya and India's Defence Research and Development Organisation (DRDO)** who together have formed BrahMos Aerospace. It is **based on the Russian P-800 Oniks cruise missile** and other similar sea-skimming Russian cruise missile technology.

The name BrahMos is a portmanteau formed from the names of two rivers, the Brahmaputra of India and the Moskva of Russia.

It is **the world's fastest anti-ship cruise missile in operation**. The missile travels at speeds of Mach 2.8 to 3.0, which is being upgraded to Mach 5.0. The land-launched and ship-launched versions are already in service, with the air and submarine-launched versions currently in the testing phase.

India's ballistic missile defence got a fillip with the **development of PAD, which has been given the moniker Pradyumna**. The system was tested with a maximum interception altitude of 80 km, and has been designed to neutralise missiles within a range of 300-2000 km up to a speed of Mach 5.0. The technology employed in the PAD was the precursor to the indigenously developed Advanced Air Defence (AAD) interceptor missile which was tested in 2007, as well as the Barak-2 which was developed in collaboration with Israel.

Carrying forward the success of its predecessor, the Agni III was developed to strike targets within a similar range but with a significantly shorter flight time of 20 minutes. **The Agni IV, which has a two-phase propulsion system, is designed to carry a 1,000 kg payload.**

Nirbhay is a subsonic missile which is ancillary to the BrahMos range. It uses a terrain-following navigation system to reach up to 1,000 km. Nirbhay is capable of being launched from multiple platforms on land, sea, and air.

Do you know?

In 2016, as India became a member of the Missile Technology Control Regime (MTCR), India and Russia are now planning to jointly develop a new generation of Brahmos missiles with 600 km-plus range and an ability to hit protected targets with pinpoint accuracy.

BrahMos-II is a hypersonic cruise missile currently under development and is estimated to have a range of 290 km. Like the BrahMos, the range of BrahMos II has also been limited to 290 km to comply with the MTCR. With a speed of Mach 7, it will have double the speed of the current BrahMos missile, and it will be the fastest hypersonic missile in the world. Development could take 7–8 years to complete.

Q.12) India recently completed the successful development of beyond visual range air to air missile. Which among the following is that missile?

a) Akash
b) Astra
c) Dhanush
d) Prahaar

Q.12) Solution (b)

Astra is an all-weather beyond-visual-range air-to-air missile developed by the Defence Research and Development Organisation, India. **It is the first air-to-air missile developed by India.** It features mid-course inertial guidance with terminal active radar homing.

Astra is designed to be capable of engaging targets at varying range and altitudes allowing for engagement **of both short-range targets at a distance of 20 km and long-range targets up to a distance of 80 km**.

In terms of size and weight, the **Astra is the smallest missile developed by the DRDO**. It was envisaged to intercept and destroy enemy aircraft at supersonic speeds in the head-on mode within a range of 80 km.

Prahaar is a surface-to-surface missile with a range of 150 km that was successfully tested for the first time in July 2011. Stated to be a unique missile, the Prahaar boasts of high manoeuvrability, acceleration and accuracy. Primarily a battlefield support system for the Army, the missile can be fired from road mobile launchers and is extremely mobile in battle situations owing to its lighter build.

Dhanush is a liquid propelled sea-based missile that was envisaged as a **short-range version of the Prithvi II ballistic missile**. It has a range of 350 km and is capable of carrying nuclear warheads. It was successfully test-fired from a naval warship in March 2011, and carries forward the legacy of the K-15 Sagarika.

Akash is a surface-to-air missile with an intercept range of 30 km. It has multi-target engagement capability and is in operational service with the Indian Army and the Indian Air Force.

Q.13) Consider the following statements

1. It has the same orbital period as the rotation of the earth on its own axis.
2. It does not have any inclination with the earth's equator
3. Ground antennas need not track the movement of the satellite as it hovers at a fixed position in the sky

Which of the following satellites is being referred to here?

a) Geosynchronous satellite
b) Geostationary satellite
c) Polar sun synchronous satellite
d) Heliocentric satellite

Q.13) Solution (b)

A geosynchronous satellite is a satellite that remains in geosynchronous orbit around our planet, meaning that its orbital period is the same as that of Earth. In other words, a geosynchronous satellite revolves around the planet at the same speed at which the planet rotates on its axis. That's the reason why this **kind of satellite appears to be in the same region in the sky (at a given time of the day) when viewed from a particular position on Earth.**

The orbital period of a geosynchronous satellite is a sidereal day, i.e., 23 hours, 56 minutes and 4 seconds, which is why it seems to stay in place over a single longitude (although it may drift south/north depending upon the orbit's inclination with Earth's equatorial plane).

The orbits where geosynchronous satellites revolve are known as geosynchronous orbits. A satellite that's in a geosynchronous orbit appears at exactly the same spot in the sky after a period of one sidereal day, when viewed from a specific position on Earth. Geosynchronous orbits that are circular in shape have a radius of 26,199 miles (42,164 km). If the same satellite is observed for an entire day from a particular position on the ground, it either drifts north or south (it traces a distorted path like the number '8') or remains stationary in the same spot.

A geostationary orbit (also known as a geostationary Earth orbit, geosynchronous equatorial orbit, or simply GEO) is a circular orbit located at an altitude of 35,786 kilometres (22,236 miles) above the surface of Earth with zero inclination to the equatorial plane. A satellite in this orbit is known as a geostationary satellite, and has an orbital period of one sidereal day (23 hours, 56 minutes and 4 seconds), which means that it completes one revolution around Earth in exactly the same time as Earth completes one rotation on its axis.

A satellite in geosynchronous orbit has the same orbital period, i.e., one sidereal day, as that of a satellite in a geostationary orbit.

The only difference between the two is that while **a geosynchronous satellite may or may not be following an inclined orbit (with respect to the equatorial plane), a geostationary satellite has to follow a non-inclined orbit.** In other words, a geostationary satellite remains exactly above the Earth's equator at all times. Therefore, 'every' geostationary satellite is a geosynchronous satellite, but it's not (necessarily) true the other way round, i.e., a geosynchronous satellite may or may not be geostationary.

Q.14) Consider the following statements about cryogenic engine

1. It has both fuel and oxidizer stored in liquid form.
2. India is the 4th country in the world to have mastered this technology.

Choose the correct code

a) 1 only
b) 2 only
c) Both 1 and 2
d) None of the above

Q.14) Solution (a)

A cryogenic rocket engine is a rocket engine that uses a cryogenic fuel or oxidizer, that is, its **fuel or oxidizer (or both) is gases liquefied and stored at very low temperatures.**

The engine will power India's mammoth Geosynchronous Satellite Launch Vehicle (GSLV) Mark III rocket capable of propelling a 4-ton class satellites into geo-synchronous orbit - the altitude where satellites revolve in sync with the Earth's rotation.

This engine has been developed after two decades of hard work as the technology was denied to India by Russia under pressure from the US.

The rocket engine **uses liquid hydrogen and liquid oxygen as fuel that are stored at minus 253 degrees centigrade** and then ignited to burn at plus hundreds of degrees centigrade just a few centimetres down engine. A very complex technology, the cryogenic engine has been mastered **only by Russia, USA, France, China, Japan and India**.

India is the 6th country to have mastered this technology.

Do you know?

Rocket engines need high mass flow rate of both oxidizer and fuel to generate a sufficient thrust. During World War II time, oxygen and low molecular weight hydrocarbons were used as oxidizer and fuel pair. At room temperature and pressure, both are in gaseous state. Hypothetically, if propellants had been stored as pressurized gases, the size and mass of fuel tanks themselves would severely decrease rocket efficiency. Therefore, to get the required mass flow rate, the only option was to cool the propellants down to cryogenic temperatures (below −183 °C [90 K], −253 °C [20 K]), converting them to liquid form.

Q.15) Consider the following statements regarding James Webb space telescope scheduled to be launched in 2021.

1. It is developed in collaboration between NASA, CSA and ROSCOSMOS.
2. It will be placed around Lagrange point 1 in space.

Choose the correct code

a) 1 only
b) 2 only
c) Both 1 and 2
d) None of the above

Q.15) Solution (d)

The James Webb Space Telescope (JWST) is a space telescope developed in collaboration **between NASA, the European Space Agency, and the Canadian Space Agency** that will be the scientific **successor to the Hubble Space Telescope**.

The JWST will offer unprecedented resolution and sensitivity, and will enable a broad range of investigations across the fields of astronomy and cosmology.

NASA's James Webb Space Telescope, scheduled for launch in 2021, will probe the cosmos to uncover the history of the universe from the Big Bang to alien planet formation and beyond.

It will focus on four main areas: **first light in the universe, assembly of galaxies in the early universe, birth of stars and protoplanetary systems, and planets (including the origins of life.)**

The James Webb Space Telescope (JWST) will launch on an Ariane 5 rocket from French Guiana, and then take 30 days to fly a million miles to its permanent home: a Lagrange point 2, or a gravitationally stable location in space.

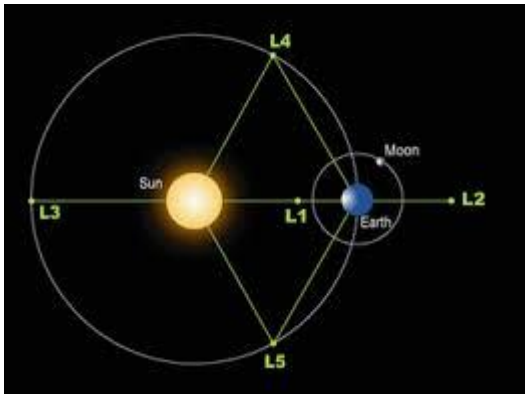
It will **orbit around L2, a spot in space near Earth that lies opposite from the sun**. This has been a popular spot for several other space telescopes, including the Herschel Space Telescope and the Planck Space Observatory.

Do you know?

Lagrange points

A Lagrange point is a location in space where the combined gravitational forces of two large bodies, such as Earth and the sun or Earth and the moon, equal the centrifugal force felt by a much smaller third body. The interaction of the forces creates a point of equilibrium where a spacecraft may be "parked" to make observations.

These points are named after Joseph-Louis Lagrange, an 18th-century mathematician who wrote about them in a 1772 paper concerning what he called the "three-body problem." They are also called Lagrangian points and libration points.



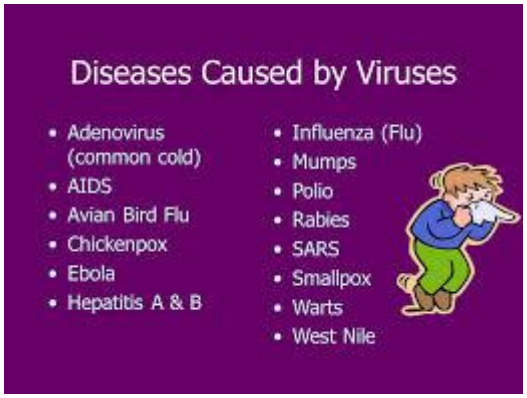
If a spacecraft uses a Lagrange point close to Earth, there are many benefits to the location. L1 and L2 also allows one to have enormous bandwidth because over conventional Ka-band radio, the communication speeds are very high, Otherwise, the data rates just become very slow since a spacecraft in orbit around the sun (known as heliocentric orbit) would eventually drift far from Earth.

Q.16) Which one of the following diseases is not caused by virus?

a) Measles
b) Chicken pox
c) Typhoid
d) Polio

Q.16) Solution (c)

Viruses cause a broad array of human diseases. These microscopic particles spread easily, typically via person-to-person contact or touching contaminated surfaces. Once inside the body, viruses enter cells and reproduce quickly. Viral infections cause a host of different diseases, some mild and others potentially fatal. Unfortunately, effective antiviral medications exist for only a few of the many human viral diseases. In many cases, treatment for a viral illness involves relieving symptoms until the body's immune system clears the infection.



Q.17) Which of the following statements regarding INS Arihant are correct?

1. It is India's First indigenously built submarine.
2. It was jointly developed by the Indian Navy, Bhabha Atomic Research Centre (BARC) and Defence Research and Development Organisation (DRDO).

Select the code from following:

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

Q.17) Solution (b)

Note: INS Arihant is India's first indigenous Nuclear Submarine.

INS Shalki (S46) is a Shishumar-class diesel-electric submarine of the Indian Navy. The submarine was the first ever submarine to be built in India. It was launched in 1987 by the late Prime Minister Rajiv Gandhi.

INS Arihant is India's first nuclear-powered submarine. The ship submersible ballistic, nuclear (SSBN) submarine was launched at the Indian Navy's dockyard in Visakhapatnam, which is the headquarters of India's Eastern Naval Command.

Arihant, India's first indigenously built nuclear submarine, cost $2.9bn. It was jointly developed by the Indian Navy, Bhabha Atomic Research Centre (BARC) and Defence Research and Development Organisation (DRDO) at the naval dockyard in Visakhapatnam. Russian designers assisted in building the vessel.

Think

- k 15 Sagarika Missile

Q.18) Which of the following statements are correct regarding Scorpene class Submarine?

1. It is designed to operate in all theatres including tropics.
2. The hull form, fin and hydroplanes are specifically designed to produce minimum underwater resistance.
3. The attacks can be carried out with torpedoes both while submerged or on the surface
4. Scorpene submarines can undertake various missions such as anti-surface warfare, anti-submarine warfare, intelligence gathering, mine laying and area surveillance.

Select the code from following:

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

Q.18) Solution (d)

India has recently launched 3rd Scorpene Class Subamarine – Karanj.

The Scorpene submarine is designed to operate in all theatres, including the tropics.

The Scorpene class submarines are provided with all means and communications to ensure interoperability with other components of a naval task.

The state-of-the-art features of the Scorpenes include superior stealth and ability to launch crippling attacks with precision-guided weapons.

The submarine has an overall length of 67.5 metre and a height of about 12.3 metres. The hull form, fin and hydroplanes are specifically designed to produce minimum underwater resistance.

The attacks can be carried out with torpedoes both while submerged or on the surface -- in all war theatres including the tropics, giving it an unmatched invulnerability.

Scorpene submarines can undertake various missions such as anti-surface warfare, anti-submarine warfare, intelligence gathering, mine laying and area surveillance. The submarine is designed to operate in all theatres. This is important in light of the Chinese navy presence in the Indian Ocean.

Q.19) Rudra – an indigenously developed helicopter made its maiden appearance in the republic day parade this year. Which of the following statements are correct regarding Rudra?

1. It is a two engine helicopter and can fly even in case of one engine failure.
2. It is fitted with Self Protection Suite consisting of Radar/Laser Missile warning systems and Countermeasures dispensing system.
3. It is an armed helicopter and can also be used in specific missions like surgical strikes on enemy territories.

Select the code from following:

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

Q.19) Solution (d)

Rudra

Indigenously-developed weapon system integrated helicopter Rudra made its maiden appearance in the Republic Day parade on Rajpath on January 26.

The LCH is fitted with Self Protection Suite consisting of Radar/Laser Missile warning systems and Countermeasures dispensing system.

The features that are unique to LCH are sleek and narrow fuselage, tri-cycle crashworthy landing gear, crashworthy and self-sealing fuel tanks, armour protection and low visibility features which makes the helicopter lethal, agile and survivable.

The multi role helicopter is powered by two Shakti Engines.

The attack helicopter comes with a lot of salient features which includes high rate of climb performance and can also fly in the event of single engine failure.

It is also an ideal for operations from unprepared surfaces and slopes. LCH has the distinction of being the first attack helicopter to land in forward bases at Siachen, 5,400 meters above sea level.

The Rudra helicopter can prove to be a deadly flying machine and can also be used in specific missions like surgical strikes on enemy territories.

It comes equipped with a 20 mm Turret Gun and 70 mm Rocket System. The chopper also has a facility for air to air missile system.

Q.20) Which of the following statements are correct regarding Border Security Force (BSF) of India?

1. BSF is a paramilitary force responsible for guarding India's land border during peace time and preventing transnational crime.
2. It functions under the administrative control of Ministry of Defence.
3. BSF is the only Central Armed Police force to have its own Air Wing, Marine Wing and artillery regiments.

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)

Border Security Force (BSF)

Established on December 1, 1965, the BSF is a paramilitary force responsible for guarding India's land border during peace time and preventing transnational crime.

BSF currently stands as the world's largest border guarding force with 186 battalions and 2.57 lakh personnel including an expanding air wing, marine wing, artillery regiments, and commando units.

BSF is a Union Government Agency under the administrative control of Ministry of Home Affairs and is one of many law enforcement agencies of India. The force's motto is 'Duty Unto Death'.

BSF is the only Central Armed Police force to have its own Air Wing, Marine Wing and artillery regiments, which support the General Duty Battalions in their operations. The force also maintains a Tear Smoke Unit (TSU), which is unique in India. The TSU is responsible for producing tear gas munitions required for the Anti-Riot Forces. It also exports a substantial quantity to other countries.

The BSF has now deployed its first batch of women personnel at the border to carry out regular frisking of women as well as other duties performed by their male counterparts, including guarding the border. Over 100 women have been deployed on the highly volatile Indo-Pak border, while around 60 will be deployed on the Indo-Bangla border. In total, 595 women constables will be deployed on the border in different phases.

Q.21) China recently successful tested Xingkong – 2. It is a waverider flight vehicle. What is a waverider flight vehicle?

a) It is flight vehicle that flies in the atmosphere and uses shockwaves generated by its own hypersonic flight
b) It is a flight vehicle which flies against the upper atmospheric winds
c) It is a flight vehicle which can fly in outer space using solar winds
d) None of the above

Q.21) Solution (a)

The Xingkong-2 or Starry Sky-2, was launched in a target range located in Northwest China, state-run China Academy of Aerospace Aerodynamics (CAAA) said in a statement.

The United States and Russia have been carrying out similar experiments. Launched in a rocket, China’s waverider was released in the air after about 10 minutes. It flew independently, made large-angle turning maneuvers, and landed in the targeted area as planned.

The flight vehicle reached 30 kms in altitude at Mach 5.5-6, the statement quoted by the official media today said.

The hypersonic aircraft was designed by the CAAA in collaboration with the China Aerospace Science and Technology Corporation.

Waverider is a flight vehicle that flies in the atmosphere and uses shockwaves generated by its own hypersonic flight with the air to glide at high speed

Q.22) ISRO recently successfully conducted the ground test of High Thrust version of Vikas Engine. Which of the following statements regarding Vikas Engine are correct?

1. It is a solid fuel cryogenic rocket engine.
2. It can be used only for the propulsion of GSLV Mk III launch vehicle.

Select the code from following:

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

Q.22) Solution (d)

Vikas Engine

The Vikas (an acronym for VIKram Ambalal Sarabhai) is a family of liquid fuelled rocket engines conceptualized and designed by the Liquid Propulsion Systems Centre in the 1970s.

Vikas Engine is the workhorse liquid rocket engine powering the second stage of India's Polar Satellite Launch Vehicle (PSLV), second stage and the four strap on stages of Geosynchronous Launch Vehicle (GSLV) and the twin engine core liquid stage (L110) of GSLV Mk-III.

Recently, a high thrust version of the Vikas Engine was successfully qualified through a ground test for a duration of 195 seconds at ISRO Propulsion Complex (IPRC), Mahendragiri, Tamilnadu.

Think

- Cryogenic Engine
- PSLV/GSLV

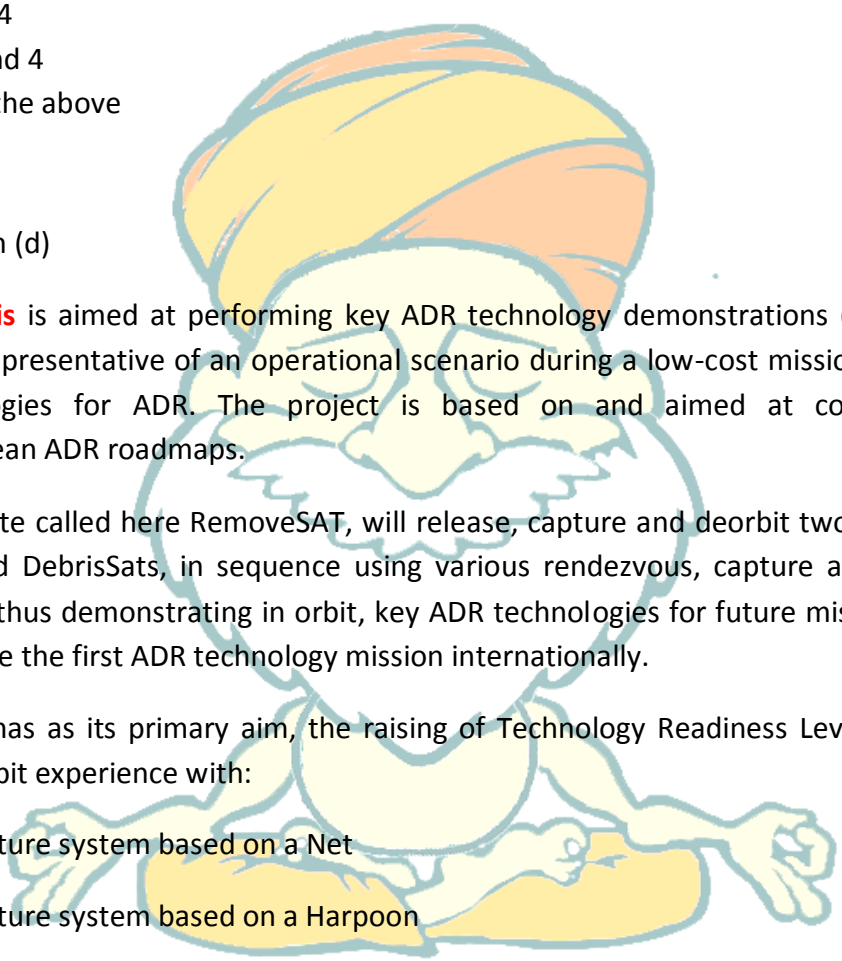
Q.23) 'RemoveDebris' is an EU (European Union) Framework 7 (FP7) research project to develop and fly a low cost in-orbit demonstrator mission that aims to de-risk and verify

technologies needed for future ADR (Active Debris Removal) missions. Which of the following processes is it using to identify and remove debris?

1. A debris capture system based on a Net
2. A debris capture system based on a Harpoon
3. Visual Based Navigation (VBN) using Optical, Infrared and LIDAR cameras
4. Deployable drag augmentation devices (Sails)

Select the code from following:

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



Q.23) Solution (d)

RemoveDebris is aimed at performing key ADR technology demonstrations (e.g., capture, deorbiting) representative of an operational scenario during a low-cost mission using novel key technologies for ADR. The project is based on and aimed at contributing to global/European ADR roadmaps.

A microsatellite called here RemoveSAT, will release, capture and deorbit two space debris targets, called DebrisSats, in sequence using various rendezvous, capture and deorbiting technologies thus demonstrating in orbit, key ADR technologies for future missions in what promises to be the first ADR technology mission internationally.

The mission has as its primary aim, the raising of Technology Readiness Levels (TRL), and gaining on-orbit experience with:

- A debris capture system based on a Net

- A debris capture system based on a Harpoon

- Visual Based Navigation (VBN) using Optical, Infrared and LIDAR cameras

- Deployable drag augmentation devices (Sails)

The core concept behind the mission, is to use a small-satellite (~100kg) as a ‘mothership', on which the payloads are carried, and from which CubeSats (~3 kg) are released and used as ‘pseudo-debris' targets

Q.24) Consider the following statements about ‘Giant Metrewave Radio Telescope (GMRT)’

1. It is a global project with eleven member countries including India
2. It is a large multi radio telescope project aimed to be built in Australia and South Africa

Select the correct statements

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

Q.24) Solution (d)

Giant Metrewave Radio Telescope (GMRT)

- GMRT is an array of thirty fully steerable parabolic radio telescopes of 45-metre diameter.
- It is operated by the National Centre for Radio Astrophysics.
- It is located near Pune.

Source: **https://www.thehindu.com/sci-tech/science/indian-telescope-spots-distant-radio-galaxy/article24648190.ece**

Q.25) Moderators are an important component of Nuclear reactors. The function of moderator is to:

a) Absorb the kinetic energy of the neutrons.
b) Absorb the heat generated by the nuclear reaction.
c) Increase the number of neutrons.
d) Increase the speed of neutrons to cause fission.

Q.25) Solution (a)

A **moderator** is a material used in a **nuclear reactor** to slow down the neutrons produced from fission. By slowing the neutrons down the probability of a neutron interacting with Uranium-235 nuclei is greatly increased thereby maintaining the chain reaction.

Nuclei with low mass numbers are most effective for this purpose, so the moderator is always a low-mass-number material. In a fast reactor there is no moderator, only fuel and coolant. The moderation of neutrons is undesirable in fast reactors. Commonly used moderators include regular (light) water (roughly 75% of the world's reactors), solid

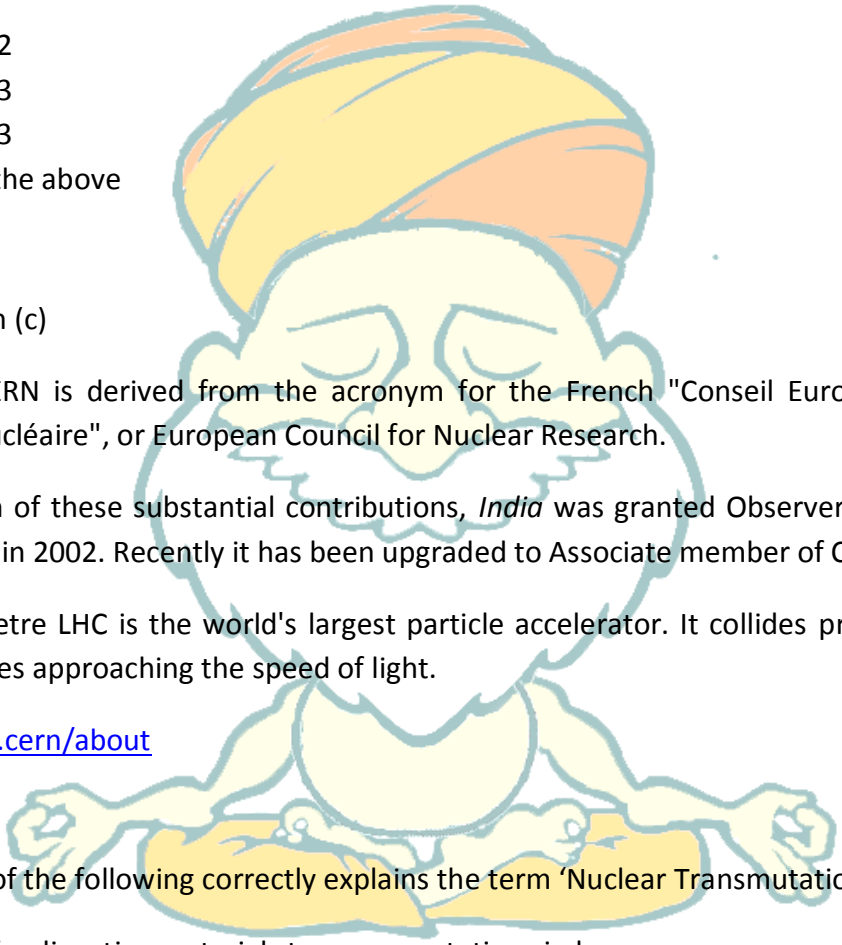
graphite (20% of reactors) and heavy water (5% of reactors). Beryllium and beryllium oxide (BeO) have been used occasionally, but they are very costly.

Q.26) Which of the following statements are correct about CERN?

1. CERN is an acronym for European Organization for Nuclear Research.
2. India is a founding member of CERN.
3. The Large Hadron Collider (LHC) in CERN is the World's largest particle accelerator.

Select the code from below:

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



Q.26) Solution (c)

The name CERN is derived from the acronym for the French "Conseil Européen pour la Recherche Nucléaire", or European Council for Nuclear Research.

In recognition of these substantial contributions, *India* was granted Observer *status* to the *CERN* Council in 2002. Recently it has been upgraded to Associate member of CERN.

The 27-kilometre LHC is the world's largest particle accelerator. It collides protons or lead ions at energies approaching the speed of light.

https://home.cern/about

Q.27) Which of the following correctly explains the term 'Nuclear Transmutation'?

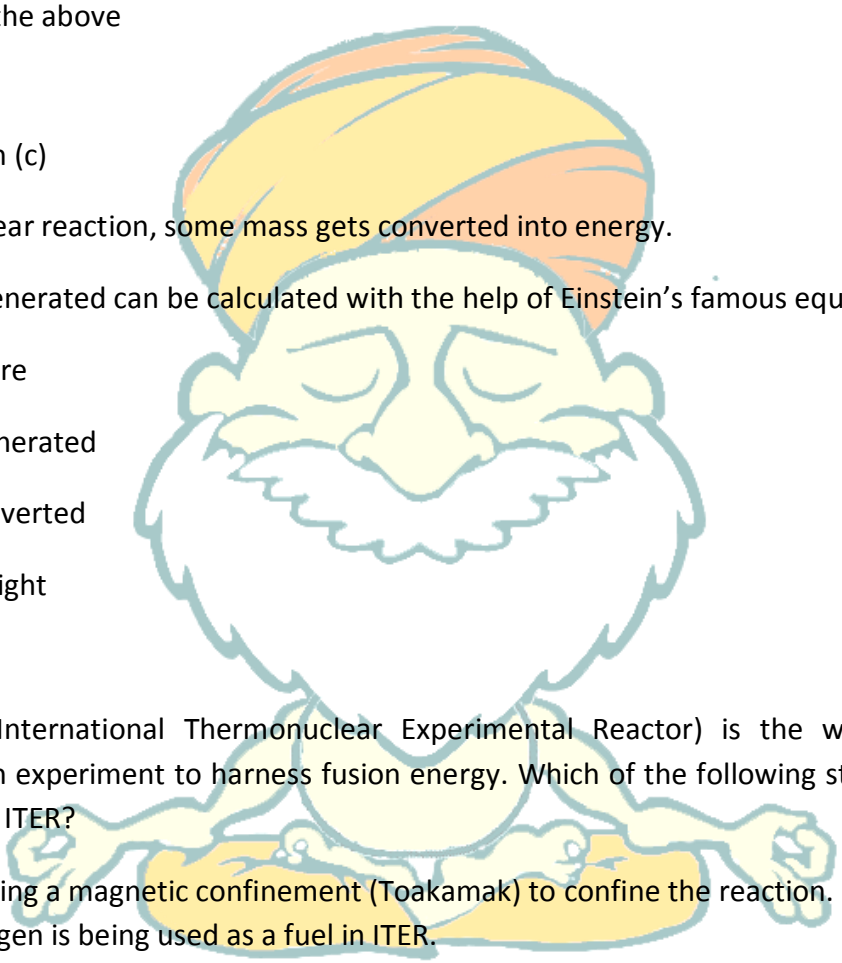
a) Use of radioactive materials to cause mutations in humans
b) Conversion of one chemical element or isotope into another
c) Chemical reaction of two compounds to form a new compound
d) None of the above

Q.27) Solution (b)

Nuclear transmutation is the conversion of one chemical element or an isotope into another. This can occur naturally through radioactive decay or it can be done through nuclear reactions.

Q.28) A large energy is released in a nuclear reaction because,

a) Bonds are broken between the elements as they are hit by neutrons.
b) Kinetic energy of neutrons is converted into heat energy
c) Mass gets converted into energy
d) All of the above



Q.28) Solution (c)

During a nuclear reaction, some mass gets converted into energy.

The energy generated can be calculated with the help of Einstein's famous equation

$E = MC^2$, where

E = Energy generated

M = Mass converted

C = Speed of light

Q.29) ITER (International Thermonuclear Experimental Reactor) is the world's largest nuclear fusion experiment to harness fusion energy. Which of the following statements are correct about ITER?

1. It is using a magnetic confinement (Toakamak) to confine the reaction.
2. Hydrogen is being used as a fuel in ITER.
3. India is one of the member countries participating in ITER.

Select the code from below:

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

Q.29) Solution (d)

ITER (**International Thermonuclear Experimental Reactor**, also Latin for "way") is an international nuclear fusion research and engineering megaproject, which will be the world's largest magnetic confinement plasma physics experiment. It is an experimental tokamak nuclear fusion reactor that is being built next to the Cadarache facility in Saint-Paul-lès-Durance, which is in southern France.

The ITER fusion reactor has been designed to produce 500 megawatts of output power for around twenty minutes while needing 50 megawatts to operate.

The project is funded and run by seven member entities—the European Union, India, Japan, China, Russia, South Korea, and the United States. The EU, as host party for the ITER complex, is contributing about 45 percent of the cost, with the other six parties contributing approximately 9 percent each.

Q.30) Consider the following statements:

1. Genetic Engineering Appraisal Committee (GEAC) is top biotech regulator in India which comes under the Ministry of Environment and Forest.
2. Currently Bt Cotton is the only GM crop which is being cultivated in India.

Which of the above statements are correct?

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

Q.30) Solution (c)

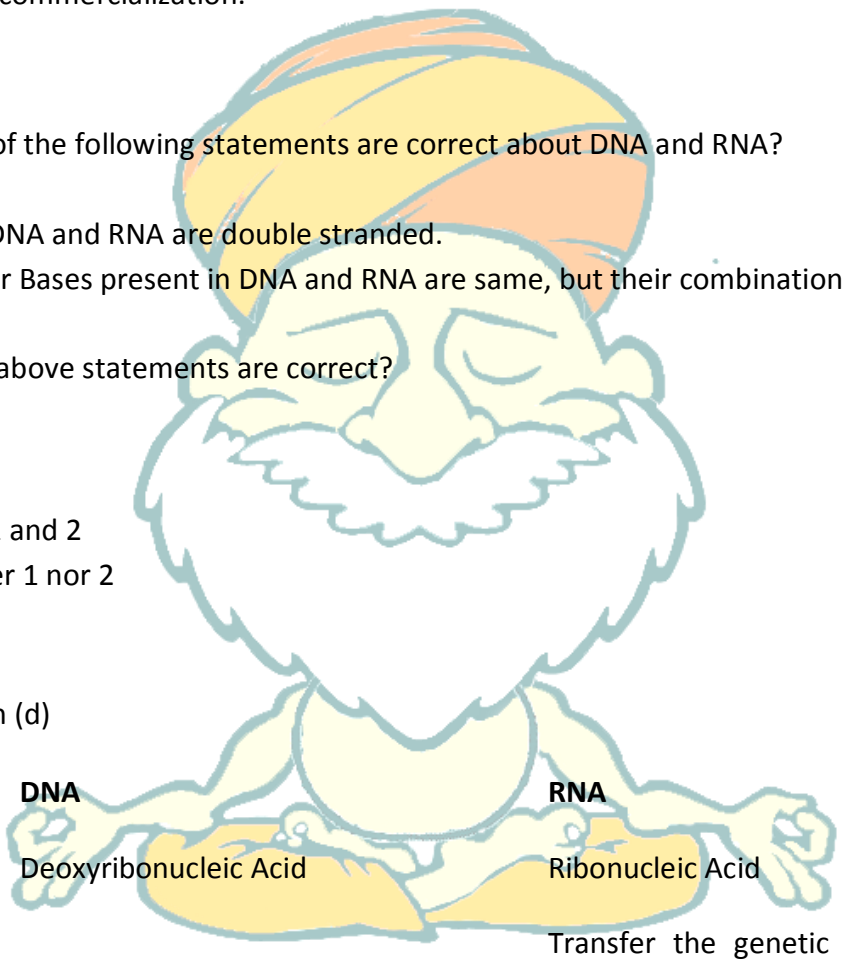
The top biotech regulator in India is Genetic Engineering Appraisal Committee (GEAC). The committee functions as a statutory body under the Environment Protection Act 1986 of the Ministry of Environment & Forests (MoEF). It was earlier known as Genetic Engineering Approval Committee. Under the EPA 1986 Rules for Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells, GEAC is responsible for granting permits to conduct experimental and large-scale open field trials and also grant approval for commercial release of biotech crops.

The country has yet to approve commercial cultivation of a GM food crop. The only genetically modified cash crop under commercial cultivation in India is cotton.

1) Bt Cotton – For the time being, the only genetically modified crop that is under cultivation in India is Bt cotton which is grown over 10.8 million hectares. Bt cotton was first used in India in 2002.

2) Bt Brinjal – The GEAC in 2007, recommended the commercial release of Bt Brinjal, which was developed by Mahyco (Maharashtra Hybrid Seeds Company) in collaboration with the Dharward University of Agricultural sciences and the Tamil Nadu Agricultural University. But the initiative was blocked in 2010.

3) GM Mustard – GEAC has recently given a go ahead for tests of GM mustard before taking a decision on commercialization.



Q.31) Which of the following statements are correct about DNA and RNA?

1. Both DNA and RNA are double stranded.
2. All four Bases present in DNA and RNA are same, but their combination is different.

Which of the above statements are correct?

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

Q.31) Solution (d)

	DNA	**RNA**
Structural Name:	Deoxyribonucleic Acid	Ribonucleic Acid
Function:	Medium of long-term storage and transmission of genetic information.	Transfer the genetic code needed for the creation of proteins from the nucleus to the ribosome. This process prevents the DNA from having to leave the nucleus, so it stays safe. Without RNA, proteins could never be made.
Structure:	Typically a double- stranded molecule with a long chain of nucleotides.	A single-stranded molecule in most of its biological roles and has a shorter chain of nucleotides.

Bases/Sugars:	Long polymer with a deoxyribose and phosphate backbone and four different bases: adenine, guanine, cytosine and thymine.	Shorter polymer with a ribose and phosphate backbone and four different bases: adenine, guanine, cytosine, and uracil.
Base Pairing:	A-T (Adenine-Thymine), G-C (Guanine-Cytosine)	A-U (Adenine-Uracil), G-C (Guanine-Cytosine)
Stability:	Deoxyribose sugar in DNA is less reactive because of C-H bonds. Stable in alkaline conditions. DNA has smaller grooves where the damaging enzyme can attach which makes it harder for the enzyme to attack DNA.	Ribose sugar is more reactive because of C-OH (hydroxyl) bonds. Not stable in alkaline conditions. RNA on the other hand has larger grooves which makes it easier to be attacked by enzymes.
Unique Traits:	The helix geometry of DNA is of B-Form. DNA is completely protected by the body i.e. the body destroys enzymes that cleave DNA. DNA can be damaged by exposure to Ultra-violet rays.	The helix geometry of RNA is of A-Form. RNA strands are continually made, broken down and reused. RNA is more resistant to damage by Ultra-violet rays.

Q.32) Potency of a cell is its ability to develop into differentiated cells. In the light of this statement, consider the following statements:

1. A totipotent cells have the ability to create an entire organism.
2. Embryonic stem cells are totipotent.

Which of the above statements are correct?

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

Q.32) Solution (c)

Totipotency is the ability of a single cell to divide and produce all of the differentiated cells in an organism. Spores and zygotes are examples of *totipotent* cells. In the spectrum of cell potency, *totipotency* represents the cell with the greatest differentiation potential.

Totipotent cells can form all the cell types in a body, plus the extraembryonic, or placental, cells. Embryonic cells within the first couple of cell divisions after fertilization are the only cells that are totipotent. Pluripotent cells can give rise to all of the cell types that make up

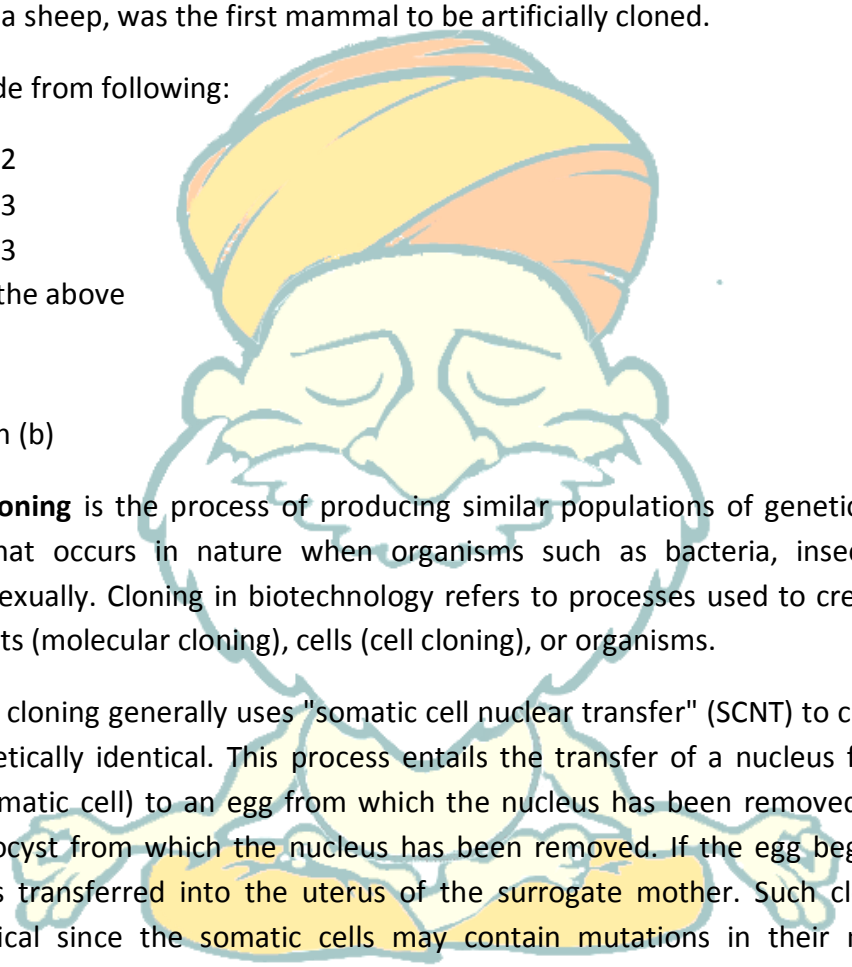
the body; embryonic stem cells are considered pluripotent. Multipotent cells can develop into more than one cell type, but are more limited than pluripotent cells; adult stem cells and cord blood stem cells are considered multipotent.

Q.33) Cloning is the process of producing similar populations of genetically identical individuals. Which of the following statements are correct about cloning?

1. Cloning does not occur naturally.
2. Cloning of organisms can occur through asexual reproduction.
3. Dolly, a sheep, was the first mammal to be artificially cloned.

Select the code from following:

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



Q.33) Solution (b)

In biology, **cloning** is the process of producing similar populations of genetically identical individuals that occurs in nature when organisms such as bacteria, insects or plants reproduce asexually. Cloning in biotechnology refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning), or organisms.

Reproductive cloning generally uses "somatic cell nuclear transfer" (SCNT) to create animals that are genetically identical. This process entails the transfer of a nucleus from a donor adult cell (somatic cell) to an egg from which the nucleus has been removed, or to a cell from a blastocyst from which the nucleus has been removed. If the egg begins to divide normally it is transferred into the uterus of the surrogate mother. Such clones are not strictly identical since the somatic cells may contain mutations in their nuclear DNA. Additionally, the mitochondria in the cytoplasm also contains DNA and during SCNT this mitochondrial DNA is wholly from the cytoplasmic donor's egg, thus the mitochondrial genome is not the same as that of the nucleus donor cell from which it was produced.

Dolly was the first mammal to have been successfully cloned from an adult somatic cell.

Q.34) A new concept of Space Based Solar Power (SBSP) is an idea under consideration to generate clean energy. Which of the following statements is/are correct regarding SBSP?

1. It is the concept of collecting solar power in outer space and distributing it to Earth.
2. Solar collectors will collect the light in space and beam it back to earth as microwaves.

Select the code from following:

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

Q.34) Solution (c)

Space-based solar power (SBSP)

Space-based solar power (SBSP) is the concept of collecting solar power in outer space and distributing it to Earth. Potential advantages of collecting solar energy in space include a higher collection rate and a longer collection period due to the lack of a diffusing atmosphere, and the possibility of placing a solar collector in an orbiting location where there is no night. A considerable fraction of incoming solar energy (55–60%) is lost on its way through the Earth's atmosphere by the effects of reflection and absorption.

Space-based solar power systems convert sunlight to microwaves outside the atmosphere, avoiding these losses and the downtime due to the Earth's rotation, but at great cost due to the expense of launching material into orbit. SBSP is considered a form of sustainable or green energy, renewable energy, and is occasionally considered among climate engineering proposals. It is attractive to those seeking large-scale solutions to anthropogenic climate change or fossil fuel depletion (such as peak oil).

Think

- Suntower concept

Q.35) Consider the following statements regarding hydrogen fuel cells:

1. It is a clean energy device which converts chemical energy into electrical energy.
2. The byproduct of hydrogen fuel cell is Carbon dioxide.

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.35) Solution (a)

Hydrogen Fuel cells

A fuel cell combines hydrogen and oxygen to produce electricity, heat, and water. Fuel cells are often compared to batteries. Both convert the energy produced by a chemical reaction into usable electric power. However, the fuel cell will produce electricity as long as fuel (hydrogen) is supplied, never losing its charge.

Hydrogen is high in energy, yet an engine that burns pure hydrogen produces almost no pollution. NASA has used liquid hydrogen since the 1970s to propel the space shuttle and other rockets into orbit. Hydrogen fuel cells power the shuttle's electrical systems, producing a clean byproduct - pure water, which the crew drinks.

Fuel cells are a promising technology for use as a source of heat and electricity for buildings, and as an electrical power source for electric motors propelling vehicles. Fuel cells operate best on pure hydrogen. But fuels like natural gas, methanol, or even gasoline can be reformed to produce the hydrogen required for fuel cells.

Think

- Extraction of Hydrogen
- Reforming

Q.36) In recent times, there is a rise in the exploration works of the shale gas. Which of the following statements are correct regarding 'Shale Gas'?

1. It is predominantly Methane trapped in Shale rock formations.
2. The source of formation of shale gas is somewhere else and it travels through the permeable shale rocks and gets trapped in the pores.
3. Hydraulic Fracturing is the technique used for extraction of Shale gas.

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.36) Solution (c)

Shale Gas

Shale gas refers to natural gas that is trapped within shale formations. Shales are fine-grained sedimentary rocks that can be rich sources of petroleum and natural gas.

Over the past decade, the combination of horizontal drilling and hydraulic fracturing has allowed access to large volumes of shale gas that were previously uneconomical to produce.

Hydraulic Fracturing

Hydraulic fracturing (commonly called "fracking" or "hydrofracking") is a technique in which water, chemicals, and sand are pumped into the well to unlock the hydrocarbons trapped in shale formations by opening cracks (fractures) in the rock and allowing natural gas to flow from the shale into the well. When used in conjunction with horizontal drilling, hydraulic fracturing enables gas producers to extract shale gas at reasonable cost. Without these techniques, natural gas does not flow to the well rapidly, and commercial quantities cannot be produced from shale.

Shale Gas vs. Conventional Gas

Conventional gas reservoirs are created when natural gas migrates toward the Earth's surface from an organic-rich source formation into highly permeable reservoir rock, where it is trapped by an overlying layer of impermeable rock. In contrast, shale gas resources form within the organic-rich shale source rock. The low permeability of the shale greatly inhibits the gas from migrating to more permeable reservoir rocks. Without horizontal drilling and hydraulic fracturing, shale gas production would not be economically feasible because the natural gas would not flow from the formation at high enough rates to justify the cost of drilling.

Q.37) Which of the following statements correctly defines cold fusion?

a) It is fusion of two molten metals at room temperature.
b) It refers to a nuclear fusion reaction taking place at cryogenic temperatures.
c) It refers to nuclear fusion reaction taking place at room temperature.
d) It refers to nuclear fusion reaction in the stars.

Q.37) Solution (c)

Cold Fusion

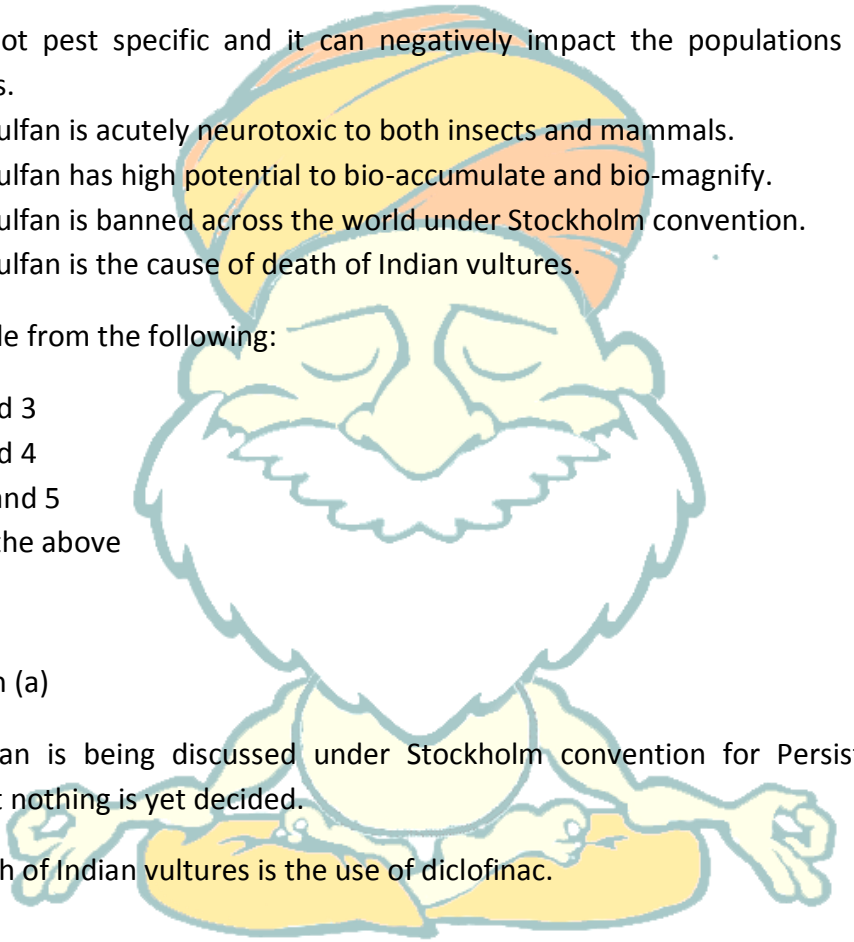
Cold fusion is a hypothesized type of nuclear reaction that would occur at, or near, room temperature. This is compared with the "hot" fusion which takes place naturally within stars, under immense pressure and at temperatures of millions of degrees, and distinguished from muon-catalyzed fusion. There is currently no accepted theoretical model that would allow cold fusion to occur.

Q.38) Endosulfan has been used as a pesticide in agriculture for a long time. India has agreed to phase out completely the use and manufacture of endosulfan by 2017. Which of the following statements are correct about endosulfan?

1. It is not pest specific and it can negatively impact the populations of beneficial insects.
2. Endosulfan is acutely neurotoxic to both insects and mammals.
3. Endosulfan has high potential to bio-accumulate and bio-magnify.
4. Endosulfan is banned across the world under Stockholm convention.
5. Endosulfan is the cause of death of Indian vultures.

Select the code from the following:

a) 1,2 and 3
b) 1,3 and 4
c) 2,3,4 and 5
d) All of the above



Q.38) Solution (a)

Endosulfan ban is being discussed under Stockholm convention for Persistent Organic Pollutants but nothing is yet decided.

Cause of death of Indian vultures is the use of diclofinac.

Q.39) Consider the following statements about GSAT 29

1. It is a multi-beam navigation satellite launched by ISRO to provide navigation services in Jammu & Kashmir and North Eastern regions of India.
2. It was launched aboard the Polar satellite launch vehicle into the sun synchronous polar orbit
3. GSAT-29 was the heaviest satellite, weighing 3,423 kg that was placed in orbit by an Indian launch vehicle.

Choose the correct code

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

Q.39) Solution (b)

GSAT-29 satellite with a lift-off mass of 3423 kg, **is a multi-beam, multiband communication satellite of India**, configured around the ISRO's enhanced I-3K bus. This **is the heaviest satellite launched from India**. The satellite was put into earth's orbit by India's heavy-lift rocket **Geosynchronous Satellite Launch Vehicle (GSLV-Mk III).** The satellite, designed for a mission life of 10 years, has been stationed at 55 degrees East longitude.

It was launched into an **elliptical Geo Transfer Orbit (GTO) with a 190 km perigee**, the point in the orbit of the moon or a satellite at which it is nearest to the earth, and 35,975 km apogee, the farthest or highest point, with an inclination of 21.5 degrees

GSAT-29 carries Ka/Ku-band high throughput communication transponders which will bridge the digital divide of users including those in Jammu & Kashmir and North Eastern regions of India. It also carries Q/V-band payload, configured for technology demonstration at higher frequency bands and Geo-stationary High Resolution Camera carried on board GSAT-29 spacecraft. An optical communication payload, for the first time, will be utilized for data transmission.

Q.40) Which among the following have recently designed India's first indigenous microprocessor called 'Shakti'?

a) Indian Institute of Science
b) IIT Madras
c) IIT Delhi
d) CSIR

Q.40) Solution (b)

The researchers from **Indian Institute of Technology Madras (IIT Madras) have designed India's first indigenous microprocessor called 'Shakti'.** It is aimed at developing industrial-grade microprocessors and other components of the microprocessor ecosystem. It will also help to reduce dependency on imported microchips and risk of cyber-attacks.

The initial batch of 300 chips named RISECREEK and produced under Project Shakti, have been fabricated free at Intel's facility at Oregon, U.S., to run the Linux operating system. At a

frequency of 350 MHz, RISECREEK can meet the demands of defence and strategic equipment such as NAVIC (Indian Regional Navigation Satellite) and Internet of Things (IoT) electronics.

It will reduce dependency on imported microchips especially in communication and defence sectors and thus eliminate risk of cyber-attacks. It can be used in mobile computing, wireless and networking systems. It may also provide power to mobile phones, smart meters and surveillance cameras.

Q.41) Consider the following statements about Parker Solar probe

1. It is a joint mission of NASA and ESA to probe the outer corona of Sun
2. This is the first NASA mission that has been named for a living individual.

Choose the correct code

a) 1 only
b) 2 only
c) Both 1 and 2
d) None of the above

Q.41) Solution (c)

Parker Solar Probe is **a NASA robotic spacecraft en route to probe the outer corona of the Sun**. It will approach to within 9.86 solar radii (6.9 million kilometres or 4.3 million miles) from the center of the Sun and will travel, at closest approach, as fast as 690,000 km/h

NASA's Parker Solar Probe mission will revolutionize our understanding of the sun. Parker Solar Probe will provide new data on solar activity and make critical contributions to our ability to forecast major space-weather events that impact life on Earth. The primary science goals for the mission are to trace the flow of energy and understand the heating of the solar corona and to explore what accelerates the solar wind. Parker Solar Probe provides a statistical survey of the outer corona.

Parker Solar Probe has three detailed science objectives:

1) Trace the flow of energy that heats and accelerates the solar corona and solar wind.
2) Determine the structure and dynamics of the plasma and magnetic fields at the sources of the solar wind.
3) Explore mechanisms that accelerate and transport energetic particles.

In 2017, the mission was renamed for Eugene Parker, the S. Chandrasekhar Distinguished Service Professor Emeritus, Department of Astronomy and Astrophysics at the University of

Chicago. In the 1950s, Parker proposed a number of concepts about how stars—including our Sun—give off energy. He called this cascade of energy the solar wind, and he described an entire complex system of plasmas, magnetic fields, and energetic particles that make up this phenomenon. Parker also theorized an explanation for the superheated solar atmosphere, the corona, which is – contrary to what was expected by physics laws -- hotter than the surface of the sun itself. **This is the first NASA mission that has been named for a living individual.**

Q.42) Which of the following statements are correct regarding Poliovirus?

1. It mainly effect children under the age of 5.
2. It spreads through contaminated water or food.
3. The virus multiplies in the intestine and invades the nervous system and can cause paralysis.

Select the code from following:

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

Q.42) Solution (d)

Poliovirus

Poliomyelitis (polio) is a highly infectious viral disease, which mainly affects young children below age of 5. The virus is transmitted from person-to-person. It mainly spreads through the faecal-oral route (e.g. contaminated water or food). After entering body, it multiplies in the intestine, from where it can invade the nervous system and can cause paralysis. Its initial symptoms include fever, fatigue, headache, vomiting, stiffness in the neck, and pain in the limbs. In some cases, it causes permanent paralysis. There is no cure for polio, however it can only be prevented by immunization.

Q.43) Which of the following diseases are caused by Flavi virus?

1. Zika
2. Japanese encaphelitis
3. Dengue
4. Chikunguniya

Select the code from following:

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

Q.43) Solution (a)

The genus Flavivirus of the family Flaviviridae comprises over 70 viruses, many of which, such as the dengue (DEN) viruses, Japanese encephalitis (JE) virus, St. Louis encephalitis (SLE) virus, and yellow fever (YF) virus are important human pathogens. Dengue and its severe and sometimes fatal forms, dengue hemorrhagic fever and dengue shock syndrome, alone affect nearly 80 million people a year.

Recent outbreak of Zika has taken several lives in India.

Flaviviruses are arboviruses, which means they are spread via infected arthropod vectors such as ticks and mosquitoes.

Some flaviviruses (such as West Nile) exist in a bird-mosquito cycle and infections in humans are typically incidental and a “dead-end” for the virus. This means it cannot be transmitted to a new mosquito.

However, yellow fever, dengue and Zika exist predominantly in a human-mosquito cycle. These viruses grow very well in the human body and therefore allow the re-infection of mosquitoes.

The geographical location of flaviviruses is determined primarily by the distribution of the mosquito or tick vector.

Q.44) Which of the following statements correctly explains the term ‘AngioChip’?

a) It is an injectable tissue bandage that can repair damaged heart tissue.
b) It is a semiconductor chip that can be programmed with the pace maker to see the progress of a heart ailment.
c) It is a resin produced by coniferous trees of Himalayas which can be used to cure heart ailments.
d) None of the above

Q.44) Solution (a)

Scientists from the University of Toronto, Canada have developed an injectable tissue bandage dubbed as AngioChip, smaller than a postage stamp that that can repair damaged hearts.

The AngioChip is a tiny patch of heart tissue with its own blood vessels and heart cells beating with a regular rhythm. It is made out of the biocompatible and biodegradable polymer.

Q.45) Which of the following statements are correct regarding new LDL – Cholesterol drugs?

1. It is expected to lower the cholesterol by 75%.
2. They are given twice a year instead of monthly or weekly like other treatments.

Select the code from below:

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

Q.45) Solution (c)

LDL Cholesterol Drugs

There is a new class of LDL cholesterol-lowering drugs that are expected to be disruptors in the next year. The new drugs are expected to lower cholesterol to unprecedented levels.

When taken with a Statin cholesterol-lowering drug, the new class of drugs is expected to lower cholesterol levels by 75%.

The small interfering RNA therapy to lower LDL was also an innovation in 2017. They are given twice a year instead of monthly or weekly like other treatments.

Q.46) Which of the following statements are correct regarding the components of a drug?

1. Active Pharmaceutical Ingredients is the chemically active substance, which is meant to produce the desired effect in the body.
2. Excipients are the inactive or inert substances present inside a drug.

Select the code from below:

a) 1 only

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

Q.46) Solution (c)

ACTIVE PHARMACEUTICAL INGREDIENTS (APIs)

Any drug is composed of two components or aspects

The first is the actual API or Active Pharmaceutical Ingredients, which is the central ingredient

Active Pharmaceutical Ingredients is the chemically active substance, which is meant to produce the desired effect in the body

EXCIPIENT

The second component is known as an excipient

This refers to the substance inside the drug or tablet

If it is in syrup form, then the excipient will be the liquid that has been used

Excipients are the inactive or inert substances present inside a drug

Q.47) Which of the following statements are correct regarding 'Pin1'?

1. It is known as a master regulator of cancer signalling networks that activates more than 40 cancer-driving proteins and inactivates more than 20 tumour suppressing proteins.
2. It is a primary cancer drug which inhibits the growth of cancer stem cells.

Select the code from following:

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

Q.47) Solution (a)

Pin1

- It is known as a master regulator of cancer signalling networks that activates more than 40 cancer-driving proteins and inactivates more than 20 tumour suppressing proteins.

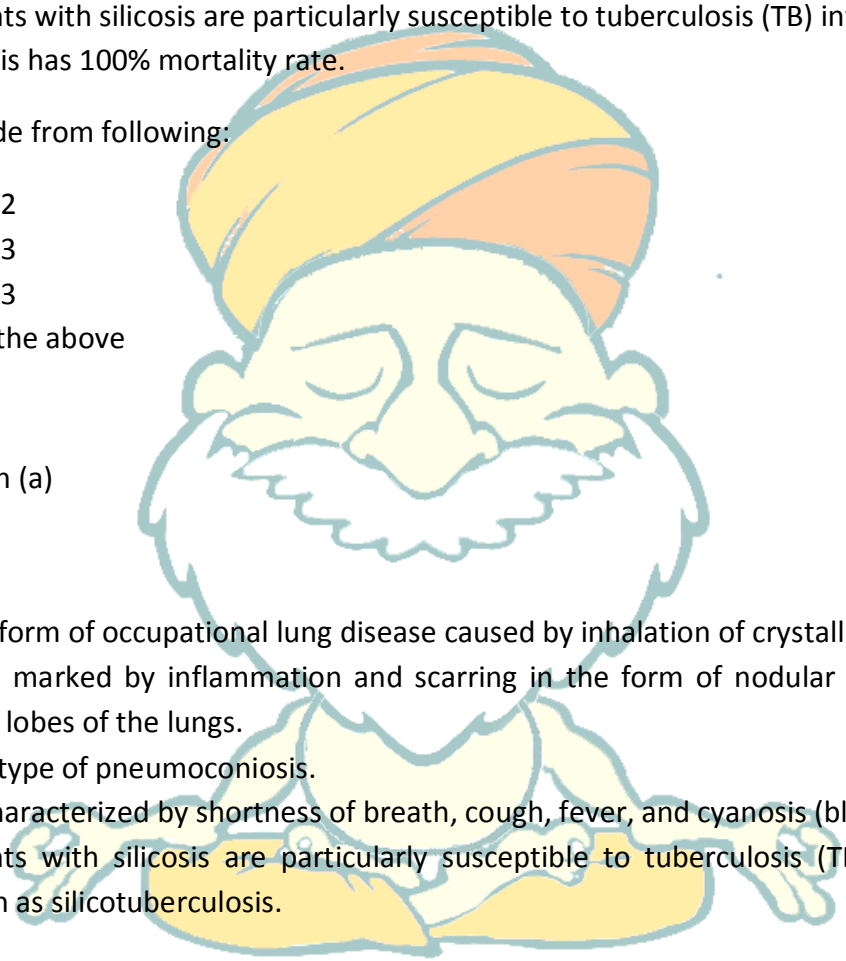
- The enzyme was found to be over-activated in most human cancers and is especially active in cancer stem cells — a subpopulation of cancer cells believed to drive tumour initiation, progression, and metastasis, but not effectively targeted by current therapies.

Q.48) Silicosis is a form of occupational lung disease caused due to inhalation of crystalline silica dust. Which of the following statements regarding Silicosis are correct?

1. It is characterized by shortness of breath, cough, fever, and cyanosis (bluish skin).
2. Patients with silicosis are particularly susceptible to tuberculosis (TB) infection.
3. Silicosis has 100% mortality rate.

Select the code from following:

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



Q.48) Solution (a)

Silicosis:

- It is a form of occupational lung disease caused by inhalation of crystalline silica dust, and is marked by inflammation and scarring in the form of nodular lesions in the upper lobes of the lungs.
- It is a type of pneumoconiosis.
- It is characterized by shortness of breath, cough, fever, and cyanosis (bluish skin).
- Patients with silicosis are particularly susceptible to tuberculosis (TB) infection—known as silicotuberculosis.

Q.49) Which of the following statements are correct regarding 'Scrub Typhus'?

1. It is a parasitic infection that can cause acute encephalitis syndrome.
2. Scrub typhus is transmitted by some species of trombiculid mites which are found in areas of heavy scrub vegetation.

Select the code from following:

a) 1 only

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

Q.49) Solution (c)

Scrub Typhus

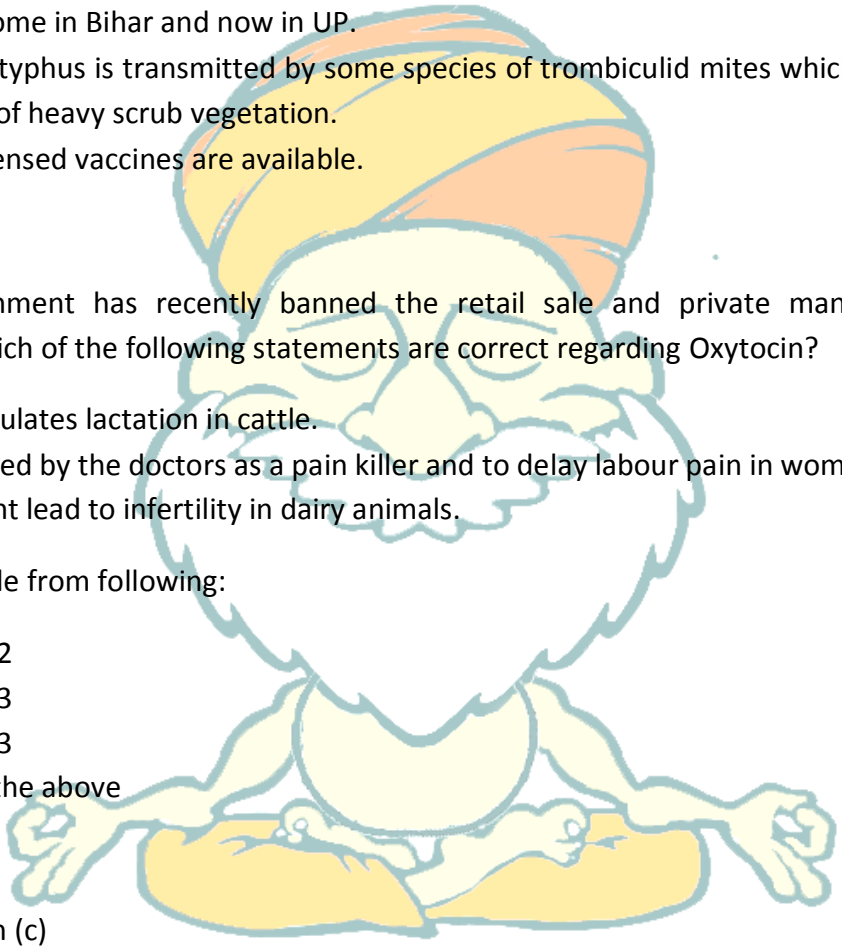
- It is a form of typhus caused by the intracellular parasite Orientia tsutsugamushi.
- It has particularly been shown to be the most common cause of acute encephalitis syndrome in Bihar and now in UP.
- Scrub typhus is transmitted by some species of trombiculid mites which are found in areas of heavy scrub vegetation.
- No licensed vaccines are available.

Q.50) Government has recently banned the retail sale and private manufacturing of Oxytocin. Which of the following statements are correct regarding Oxytocin?

1. It stimulates lactation in cattle.
2. It is used by the doctors as a pain killer and to delay labour pain in women.
3. It might lead to infertility in dairy animals.

Select the code from following:

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



Q.50) Solution (c)

Oxytocin

Ban on the retail sale and private manufacture of oxytocin motivated by the misuse of the hormone in the dairy industry

About

- It is a synthetic version of a human hormone
- It stimulates lactation in cattle

- Doctors use it to induce labour in pregnant women and to stem postpartum bleeding
- WHO recommends it as the drug of choice in postpartum haemorrhage
- It might also lead to infertility in dairy animals.