ForumIAS

# Prelims Marathon

8th to 14th March ,2021

*HISTORY*
*ECONOMICS*
*POLITY*
*SCIENCE AND TECHNOLOGY*
*GEOGRAPHY AND ENVIRONMENT*

# Science

**Q.1)** Consider the following statements regarding the van der Waals (VdW) materials:
1. They are made of atomically thin layers are not mixed through a chemical reaction but rather attached to each other via a weak so called van der Waals interaction.
2. Graphene is a good example of van der Waal (VdW) material.
Which of the statements given above is/are NOT correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: D**
**Explanation:** Until six years ago, such materials did not exist but today, researchers believe that they hold the key to'post-silicon' electronics.

- VdW materials are made of piles of ultra-thin layers that are held together by weak van der Waals bonds, which arise when atoms are in close proximity.
- The success of graphene — a well known vdW material — stimulated scientists to look for other 2D crystals, where layers can be changed, added or removed in order to introduce new physical properties such as magnetism.
- Controlling magnetism, as is typical of such materials, could replace the current hard drive assemblies in computers and even become the key to quantum computing.

Source: The Hindu

**Q.2)** The term "Quadrantids" often seen in news is related to which of the following?
a) Meteor showers
b) Organic farming
c) Nuclear fuel rods
d) Earth like planets

**ANS: A**
**Explanation:** The Quadrantids, which peak during early-January each year, are considered to be one of the best annual meteor showers.

- Most meteor showers have a two day peak, which makes catching sight of these other meteors much more possible.
- The Quadrantids peak, on the other hand, is much shorter—only a few hours. (The reason the peak is so short is due to the shower's thin stream of particles and the fact that the Earth crosses the stream at a perpendicular angle.)
- During its peak, 60 to as many as 200 Quadrantid meteors can be seen per hour under perfect conditions.
- Quadrantids are also known for their bright fireball meteors. Fireballs are larger explosions of light and color that can persist longer than an average meteor streak.
- This is due to the fact that fireballs originate from larger particles of material. Fireballs are also brighter, with magnitudes brighter than -3.

Source: The Hindu

**Q.3)** The term "SPINK1" often seen in news is related to which of the following?
a) Cancer genes (cells)
b) Solar satellite
c) long distance telescope
d) Malarial resistant

**ANS: A**
**Explanation:** The SPINK1-positive prostate cancer subtype derives its name from the excess amount of SPINK1 oncogene 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.
- The molecular mechanism and pathobiology of SPINK1-positive prostate cancer subtype, the second most recurrent and aggressive in nature that affects about 15% of patients has been finally unravelled.
- The insights gained in this study might therefore help in the treatment and disease management of several SPINK1-positive malignancies.
- In addition to excess amount of the SPINK1 oncogene, the researchers found that most cancer cells belonging to this subtype also have more than normal amount of a particular protein called EZH2.
- Also, the levels of two micro RNAs (miRNA-338-5p and miRNA-421) produced in SPINK1-positive cancer cells were much less.

Source: The Hindu

**Q.4)** The **"**Skai**"** sometimes seen in news is related to which of the following?
a) Solar powered car
b) Solar powered flight
c) Hydrogen powered flying car
d) Helium powered flying drone

**ANS: C**
**Explanation:** Massachusetts startup Alaka'i has designed a flying car - Skai - that the company touts as the "first air mobility vehicle powered by hydrogen fuel cells".

- The hydrogen fuel cells give the five-passenger Skai a maximum range of 400 miles (640 km) with a flight time of up to four hours.
- Like a drone, the Skai takes off and lands vertically. It's one of many similar electric flying crafts in production, including prototypes from Boeing and Airbus that made successful test flights this year, according to Vertical Flight Society, an industry group.
- Most are powered by batteries, which can add a lot of weight. The Skai instead uses very light hydrogen fuel cells to run its rotors, giving it a range of 644 km and the capacity to carry 454 kilograms in people or freight, the company says.

Source: ForumIAS factly

**Q.5)** Recently Pubpeer website, which monitors image manipulation and duplication, has disclosed 130 research papers for plagiarism by which of the following institute?
a) Indian Institute of Technology – Dhanbad
b) Indian Institute of Toxicology Research (IITR)
c) Indian Institute of Technology – Bombay
d) Indian Institute of Science – Bangalore

**ANS: B**

**Explanation:** The credibility of the Indian Institute of Toxicology Research (IITR), Lucknow, has come under a cloud after at least 130 papers published by the institute over the years have been listed on a website that monitors image manipulation and duplication.

- The authors and teams of these papers – published between 2004 and 2018 – vary.
- However, Yogeshwer Shukla, the IITR's chief scientist of food, drug and chemical toxicology, is the common name in 49 of the articles that have been flagged by Pubpeer, the monitoring website.

Source: The Hindu

**Q.6)** The "Ai – Da" is sometimes seen in news is related to which of the following?

a) Humanoid (robot) Artist
b) Japanese Satellite
c) Artificial Intelligence (AI) based calculator
d) Artificial Intelligence (AI) based radar system

**ANS: A**

**Explanation:** Billed as "one of the most exciting artists of our time", Ai-Da differs from generations of past masters in one inescapable way: she is a robot.

- Ai-Da is the brainchild of Aidan Meller, who claims she is the world's first ultra-realistic humanoid artist, able to draw creatively thanks to in-built artificial intelligence (AI) technology.
- The 46-year-old art dealer recently unveiled Ai-Da — dressed in a brown wig and period-style painter's blouse — in Oxford, ahead of an exhibition of her first works opening next week in the English University City.

Source: The Hindu

**Q.7)** The "Washi paper" is sometimes seen in news is famous in which of the following country?

a) China
b) Taiwan
c) Mongolia
d) Japan

**ANS: D**

**Explanation:** Once an indispensable part of daily life in Japan, ultra-thin washi paper was used for everything from writing and painting to lampshades, umbrellas, and sliding doors, but demand has plunged as lifestyles have become more westernized.

- Despite its 1,300-year history and UNESCO Intangible Cultural Heritage status, washi paper is struggling to attract consumers and the market value has dropped by more than 50% in the past two decades.
- The world's thinnest paper has helped save historical documents at major museums and libraries — including the Louvre in Paris, the British Museum and Washington's Library of Congress — from decay.
- The traditional hand-made paper is manufactured from plants called kozo, or mulberry, which has fibres that are much longer than materials used for paper in the west such as wood and cotton.

Source: The Hindu

**Q.8)** Consider the following statements regarding the electronic tattoo:

1. It is made of a piezoelectric polymer called polyvinylidene fluoride, capable of generating its own electric charge in response to mechanical stress.
2. It is a wearable device that can be placed on the skin to measure a variety of body responses.

Which of the statements given above is/are correct?

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

**ANS: C**

**Explanation:** A novel electronic tattoo made from stretchy, lightweight material could make heart health monitoring easier and more accurate than existing electrocardiograph machines.

- This is the latest advance in the team's electronic tattoo technology, a graphene-based wearable device that can be placed on the skin to measure a variety of body responses, from electrical to biomechanical signals.
- The latest e-tattoo developed by researchers at the University of Texas at Austin in the U.S. is so light and stretchable that it can be placed over the heart for extended periods with little or no discomfort.
- It also measures cardiac health in two ways, taking electrocardiograph and seismo-cardiograph readings simultaneously.
- The electrocardiogram (ECG) method records the rates of electrical activity produced each time the heart beats.
- Seismocardiography (SCG) is a measurement technique using chest vibrations associated with heartbeats.
- Powered remotely by a smartphone, the e-tattoo is the first ultrathin and stretchable technology to measure both ECG and SCG.
- e-tattoo is made of a piezoelectric polymer called polyvinylidene fluoride, capable of generating its own electric charge in response to mechanical stress.
- The device also includes 3D digital image correlation technology that is used to map chest vibrations in order to identify the best location on the chest to place the e-tattoo.

Source: The Hindu

**Q.9)** The Experimental Advanced Superconducting Tokamak (EAST) nuclear fusion reactor is recently in news was developed by which country?

a) USA
b) Japan
c) France
d) China

**ANS: D**

**Explanation:** Scientists around the world have been trying for decades to recreate the unfathomable power of the sun here on Earth, and a team in China has managed to best our local star. Not for very long, though.

- The team operating the Experimental Advanced Superconducting Tokamak (EAST) managed to heat the reactor's internal plasma to 100 million degrees Celsius (212 million Fahrenheit).

- That's six times hotter than the sun, but it doesn't have any net power generation. In stars, hydrogen fuses into helium, and eventually into heavier elements.
- The fusion process releases large amounts of energy, and the byproducts of fusion aren't radioactive.
- The only nuclear power we've managed to utilize on Earth is fission, which requires dangerous radioactive materials and comes with the risk of a reactor meltdown.

Source: The Hindu

**Q.10)** The "Mission Shakti" is recently launched by Government is related to which of the following?

a) Promote Women welfare
b) Promote girl child rights
c) Promote religious rights
d) To contain space debris

**ANS: D**

**Explanation:** Mission Shakti which was launched recently was done in a low orbit of less than 300 kilometres and at a particular angle to ensure that minimal debris was disbursed above into space to avoid damage to other satellites or the International Space Station (ISS).
Source: The Hindu

# Science

**Q.1)** The "Ophichthus kailashchandrai", sometimes seen in news is related to which of the following?
a) Banana variety
b) Frog species
c) Snake eel species
d) Butterfly species

**ANS: C**
**Explanation:** A new snake eel species residing in the Bay of Bengal has been discovered and documented this month (January) by the Estuarine Biology Regional Centre (EBRC) of the Zoological Survey of India (ZSI) at Gopalpur-on-sea in Odisha.

- This new marine species has been named Ophichthus kailashchandrai to honour the vast contributions of Dr. Kailash Chandra, Director of ZSI, to Indian animal taxonomy.
- Ophichthus kailashchandrai is the eighth species of the Ophichthus genus found on the Indian coast. It is the fifth new species discovered by the Gopalpur ZSI in the last two years.
- The eel family 'Ophichthidae' comprises two sub-families — Myrophinae (69 species) and Ophichthinae (276 species).
- The sub-family Ophichthinae is identified by its hard tail and other osteological (bone) features, and it has 17 genera and 24 species.
- Out of them, seven species from the Ophichthus genus were earlier identified in Indian waters. The recent discovery is the eighth species of this genus.
- The Ophichthus kailashchandrai lives at a depth of around 50 metres in the sea. According to the studied specimens, individuals of this species are around 420 mm to 462 mm in length.
- They are light brown in colour, with white fins. They have a well-developed pectoral fin and also have a dorsal fin.
- Their posterior nostril is a hole covered by a flap on the upper lip opening towards the mouth.
- There are 180-182 total vertebrae in this new species. Their teeth are moderately elongated, conical and sharp.

Source: The Hindu

**Q.2)** Recently, which of the following institute Successfully/efficiently removes heavy metals simultaneously from water?
a) Indian Institute of Technology – Bombay
b) Indian Institute of Technology – Madras
c) Indian Institute of Technology – Kharagpur
d) Indian Institute of Technology – Roorkee

**ANS: A**
**Explanation:** Simultaneously removing heavy metals such as arsenic, chromium, cadmium and mercury from waste water with very high efficiency now appears possible, thanks to the work of researchers at the Indian Institute of Technology (IIT) Bombay.

- The carbon-based nanostructure that the team fabricated shows 80-90% adsorption efficiency for all the four heavy metals studied.
- No electricity is required for the nanostructure to remove heavy metals from water as it allows for gravity-driven purification of the water.
- The nanostructures can be recycled and reused multiple times.
- While there is an initial drop of about 8% after the first cycle, the efficiency remains constant at 75-85% in the subsequent cycles.
- The carbon nanostructure is able to adsorb the heavy metals in the wide range of pH conditions — pH 2 to 13.

Source: The Hindu

**Q.3)** "Truenat" is often seen in news is related to which of the following?
a) CoVID – 19 testing kit
b) Tuberculosis (TB) testing kit
c) Malaria testing kit
d) Japan encephalitis testing kit

**ANS: B**
**Explanation:** In a Rapid Communication published on January 14 – 2020, the World Health Organization (WHO) had mentioned that the India-made Truenat MTB, a molecular diagnostic test to diagnose pulmonary and extrapulmonary TB and rifampicin-resistant TB, has high diagnostic accuracy.

- Truenat MTB has "high diagnostic accuracy as initial test to diagnose TB and to sequentially detect rifampicin resistance", says the WHO Communication.
- Truenat MTB will be used as an initial test to diagnose TB thus replacing sputum smear microscopy.
- Truenat is developed by the Goa-based Molbio Diagnostics.
- The company was provided with technical assistance and resources by the Foundation for Innovative New Diagnostics (FIND) to help commercialize Truenat. Indian Council of Medical Research (ICMR) had assessed and validated the diagnostic tool.

Source: Indian Express

**Q.4)** The Earth's oldest known mineral is found in which of the following Continent?
a) Antarctica
b) North America
c) Africa
d) Australia

**ANS: D**
**Explanation:** A meteorite that crashed into rural southeastern Australia in a fireball in 1969 contained the oldest material ever found on Earth, stardust that predated the formation of our solar system by billions of years, scientists said on January 13 – 2020.

- The oldest of 40 tiny dust grains trapped inside the meteorite fragments retrieved around the town of Murchison in Victoria state dated from about 7 billion years ago, about 2.5 billion years before the sun, Earth and rest of our solar system formed, the researchers said.
- Scientists previously had found a pre-solar grain in the Murchison meteorite that was about 5.5 billion years old, until now the oldest-known solid material on Earth.

- The oldest-known minerals that formed on Earth are found in rock from Australia's Jack Hills that formed 4.4 billion years ago, 100 million years after the planet formed.

Source: The Hindu

**Q.5)** According to the World Health Organization (WHO), which of the following disease (s) is/are considered as Neglected Tropical Disease (NTD)?
1. Chagas disease
2. Dengue fever
3. Rabies

Select the correct answer using the code given below:
a) 1 only
b) 1 and 2 only
c) 2 and 3 only
d) 1, 2 and 3

**ANS: D**

**Explanation:** Neglected tropical diseases (NTDs) – a diverse group of communicable diseases that prevail in tropical and subtropical conditions in 149 countries – affect more than one billion people and cost developing economies billions of dollars every year.
Populations living in poverty, without adequate sanitation and in close contact with infectious vectors and domestic animals and livestock are those worst affected.
As of 2017, the World Health Organization categorizes the following communicable diseases as neglected tropical diseases (NTDs):

- Buruli Ulcer
- Chagas Disease
- Chromoblastomycosisexternal icon
- Cysticercosis
- Dengue Fever
- Dracunculiasis (Guinea Worm Disease)
- Echinococcosis
- Fascioliasis
- Human African Trypanosomiasis (African Sleeping Sickness)
- Leishmaniasis
- Leprosy (Hansen's Disease)
- Lymphatic Filariasis
- Mycetoma
- Onchocerciasis
- Rabies
- Schistosomiasis
- Soil-transmitted Helminths (STH) (Ascaris, Hookworm, and Whipworm)
- Trachoma
- Yawsexternal icon

Source: WHO

**Q.6)** Recently which of the following Indian Institute of Technology (IIT) designed a new sodium sulphur battery which can be operated at room temprature?
a) IIT – Bombay
b) IIT – Hyderabad
c) IIT – Madras

d) IIT – Kanpur

**ANS: C**

**Explanation:** While conventional sodium sulphur batteries require very high temperature (300 degree C) for operation, researchers at the Indian Institute of technology (IIT) Madras have designed a new sodium sulphur battery that can be operated at room temperature.
By operating the battery at room temperature, the team was able to achieve higher charge storage capacity (technically called the specific capacity) and nearly zero self-discharge when the battery is not being used.
Source: The Hindu

**Q.7)** Consider the following statements regarding the benefits of Gene Editing:
1. It can be used to treat many human diseases & genetic disorders like HIV/AIDS, hemophilia.
2. It could form the basis of highly efficient & cost effective next generation antibiotics.
3. It can be used to bring to life extinct species.

Which of the statements given above is/are correct?
a) 1 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2 and 3

**ANS: D**

**Explanation:** It is a type of genetic engineering in which DNA is inserted, deleted or replaced in the genome of an organism using artificially engineered nucleases, or "molecular scissors".

- Human genome editing can be used to treat many human diseases & genetic disorders like HIV/AIDS, hemophilia etc.
- It could substantially bolster disease resistance in humans & increase life span.
- It could form the basis of highly efficient & cost effective next generation antibiotics (based on bacteriophage viruses).
- Gene editing can be used to protect endangered species or bring to life extinct species.
- It can be used to grow healthier food (via fortification) and increasing harvest.
- It has the potential to slow down the spread of diseases by eliminating its means of transmission. E.g. Gene editing can be used to introduce sterile mosquitoes into the environment.

Source: NCERT

**Q.8)** Consider the following statements regarding the "benzoic acid":
1. It is white crystalline organic compound belongs to the family of carboxylic acid.
2. It is commonly used as a pH adjustor and preservative in food.

Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**

**Explanation:** Benzoic acid is an organic compound which is described by the chemical formula C6H5COOH.

- It consists of a carboxyl group attached to a benzene ring. Therefore, benzoic acid is said to be an aromatic carboxylic acid.
- This compound exists as a crystalline, colorless solid under normal conditions.
- It is white and belongs to the family of carboxylic acid.
- The term 'benzoate' refers to the esters and salts of C6H5COOH.
- The commercial production of benzoic acid is done via the partial oxidation of toluene with oxygen, catalyzed by manganese or cobalt naphthenates.

Some important uses of C6H5COOH are listed below.

- The production of phenol involves the use of benzoic acid.
- This compound is used in ointments that prevent or treat fungal skin diseases.
- C6H5COOH is used as a preservative in the food industry.
- Benzoic acid is an ingredient in many cosmetic products, such as lipsticks.
- It is also a precursor to benzoyl chloride.
- One of the components of toothpaste, mouthwash, and face-wash creams is C6H5
- This compound is also used in the manufacture of dyes and in insect repellants.

Source: NCERT

**Q.9)** The term "Keratinocytes" is related to which of the following?
a) Primary skin cell
b) Liver cells
c) Muscle cells
d) Sex cells

**ANS: A**

**Explanation:** Keratinocytes are the primary type of cell found in the epidermis, the outermost layer of the skin.

- In humans they constitute 90% of epidermal skin cells.
- Basal cells in the basal layer (stratum basale) of the skin are sometimes referred to as basal keratinocytes.
- By using an indigenously developed hydrogel made of a polymer (polyacrylamide) in lieu of the conventional plastic tissue culture plates, researchers at the Indian Institute of Technology (IIT) Bombay have been able to achieve many-fold increase in the number of skin cells (keratinocytes) cultured in the lab.
- Unlike traditional methods, no feeder layer or drug is needed when cells are grown on the hydrogel substrate.

Source: The Hindu

**Q.10)** The term "Saggitarus *A" is often seen in news is related to which of the following?
a) Meteorite
b) Black hole
c) Goldilocks zone
d) Asteroids

**ANS: B**

**Explanation:** The center of our Milky Way Galaxy is anchored by a black hole that is nearly 5 million times the mass of our Sun.

- Surrounding it is a chaotic city of stars, gas, and dust that we call Sagittarius A.
- We stacked false-color X-ray, infrared, and radio images into this single picture to show you the different structures hidden inside the core of our Galaxy.
- X-rays (purple) radiate from the super-hot gas trapped in the black hole's grasp.

- The surrounding dust is heated by friction as it chaotically orbits around the black hole and then glows in infrared light (gold).
- And the enormous pools and three-armed rivers of gas shine in radio light (oranges and reds) to trace the complexity of magnetic fields in this violent neighborhood.

NOTE: A language professor has given a Hawaiian name — Powehi — to the black hole depicted in an image produced in a landmark experiment.

Though the Event Horizon Telescope set out to image both M87 and Sagittarius A* the black hole at the centre of the Milky way, they have succeeded only in imaging the former, despite its being much further away.

Source: The Hindu

# Science

**Q.1)** Which of the following pair (s) is/are correctly matched?

| Fruits | : | Vitamin/Antioxidant |
|---|---|---|
| 1. Red grapes | : | Antioxidant resveratrol |
| 2. Mango | : | Vitamin A |
| 3. Banana | : | Vitamin B6 |

Select the correct answer using the code given below:

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

**ANS: D**

**Explanation:** Mangoes are seasonal fruits, and both are high on fibre. The former has vitamin A (a precursor to beta carotene and is antioxidant-rich) and C that helps build immunity.

Banana is one of the easiest snacks to consume: it 'pre-packaged' with B6, magnesium and potassium.

Red wine is made from grapes that contain an antioxidant resveratrol that is good for the heart.

Source: NCERT and The Hindu

**Q.2)** "National Gene Fund" is constituted by Government of India is related to which of the following?

a) pharmaceuticals
b) Animal Cloning
c) Plant verities
d) None of the above

**ANS: C**

**Explanation:** The Government of India has notified the Protection of Plant Varieties and Farmers Rights (Recognition and Reward from the Gene Fund) Rules, 2012, whereby a farmer who is engaged in the conservation of genetic resources of land races and wild relatives of economic plants and their improvement through selection and preservation shall be entitled to "Plant Genome Saviour Farmer Reward & Farmer Recognition" along with cash prize from National Gene Fund.

There are 10 rewards each comprising of citation, memento and cash of Rs. One and half lakh each and 20 recognitions each consisting of a cash prize of Rs. One Lakh, citation and memento in a year.

Source: The Hindu

**Q.3)** Consider the following statements regarding the "Biotherapeutic medicines or biologics":

1. It is a product that is produced from living organisms or contains components of living organisms.
2. Most biologics are complex mixtures that are not easily identified or characterized.

Which of the statements given above is/are correct?

a) 1 only

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

**ANS: C**

**Explanation:** Biological products include a wide range of products such as vaccines, blood and blood components, allergenics, somatic cells, gene therapy, tissues, and recombinant therapeutic proteins.

- Biologics can be composed of sugars, proteins, or nucleic acids or complex combinations of these substances, or may be living entities such as cells and tissues.
- Biologics are isolated from a variety of natural sources - human, animal, or microorganism - and may be produced by biotechnology methods and other cutting-edge technologies.
- Gene-based and cellular biologics, for example, often are at the forefront of biomedical research, and may be used to treat a variety of medical conditions for which no other treatments are available.
- In contrast to most drugs that are chemically synthesized and their structure is known, most biologics are complex mixtures that are not easily identified or characterized.
- Biological products, including those manufactured by biotechnology, tend to be heat sensitive and susceptible to microbial contamination.
- Therefore, it is necessary to use aseptic principles from initial manufacturing steps, which is also in contrast to most conventional drugs.
- Biological products often represent the cutting-edge of biomedical research and, in time, may offer the most effective means to treat a variety of medical illnesses and conditions that presently have no other treatments available.

Source: WHO

**Q.4)** Consider the following statements regarding the "measuring units":
1. Standard units of measure such as the Kilogram, second, metre, ampere, Kelvin, mole and candela defined on the basis of physics constants.
2. The CSIR-NPL is India's official reference keeper of units of measurements.
Which of the statements given above is/are NOT correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: D**

**Explanation:** With the definition of the 'kilogram' getting a global, technical makeover, textbooks — from those used in schools to ones recommended by engineering colleges in India — are set to undergo an update.

- The kilogram derived its provenance from the weight of a block of a platinum-iridium alloy housed at the International Bureau of Weights and Measures in France.
- All other prototypes that served as national reference standards, including the one at New Delhi's CSIR-National Physical Laboratory (NPL), were calibrated to it. No longer.

- The kilogram joined other standard units of measure such as the second, metre, ampere, Kelvin, mole and candela that would no longer be defined by physical objects.
- The measures are all now defined on the basis of unchanging universal, physics constants. The kilogram now hinges on the definition of the Planck Constant, a constant of nature that relates to how matter releases energy.
- The CSIR-NPL, which is India's official reference keeper of units of measurements, on Monday, released a set of recommendations requiring that school textbooks, engineering-education books, and course curriculum update the definition of the kilogram.

Source: The Hindu

**Q.5)** The term "Kibble Balance" is often seen in news is related to which of the following?
a) Device to measure Planck Constant.
b) Device to measure heat balance.
c) Device to measure water balance.
d) Device to measure wind balance.

**ANS: A**
**Explanation:** 'Kibble Balance', is a device that was used to measure the Planck Constant and thereby reboot the kilogram.

- Named after its inventor, Bryan Kibble at the U.K.'s National Physical Laboratory (NPL), who conceptualized it in 1975, the Kibble balance is an exquisitely accurate weighing machine.
- Like any balance, it is designed to equalize one force with another: In this case, the weight of a test mass is exactly offset by a force produced when an electrical current is run through a coil of wire immersed in a surrounding magnetic field.

Source: NCERT & The Hindu

**Q.6)** Which of the following tree is also called as "Magic Tree"?
a) Palm tree
b) Banyan tree
c) Drumstick tree
d) Papaya tree

**ANS: C**
**Explanation:** Magic Moringa Tree has been crowned by WHO as a magical tree. In Europe and America was happening once called as "Miracle Tree".

- Apparently it's called "Kelor Tree" in Indonesia.
- Researchers have finally unravelled how each part of drumstick (Moringa oleifera), the "magic tree", is nutritionally rich compared with other plants such as rice, papaya, spinach and cocoa.
- All the five tissues — stem, root, leaf, flower and seed — of drumstick studied were found to be rich either in certain vitamins or essential minerals.
- A team led by Prof. from the National Centre for Biological Sciences (NCBS), Bengaluru analysed the genes on complimentary DNA (cDNA) of all the five tissues.
- The team found drumstick leaves, which are the most nutritious part of the tree, are rich in vitamins, while the roots are mineral-rich.
- The stem is rich in vitamin C and the flowers and seeds are rich in potassium. The pod and flower also have enzymes that help bring down cholesterol level.

Source: The Hindu

**Q.7)** Recently, India's largest Liquid Hydrogen Storage Tank is established in which of the following state?
a) Tamil Nadu
b) Karnataka
c) Kerala
d) Andhra Pradesh

**ANS: D**
**Explanation:** ISRO Chairman K Sivan flagged off the shipment of India's largest liquid hydrogen storage tank at the VRV Asia Pacific's manufacturing plant at Sri City in Chittoor district of Andhra Pradesh.

- VRV Asia Pacific manufactured the storage tank with a Liquid Nitrogen (LIN) shield, in a collaborative effort with Satish Dhawan Space Centre (SDSC) SHAR, under the Make in India initiative.
- The storage capacity of the tank is 120 kilo liters. Liquid hydrogen is used as fuel for satellite launch vehicles.

Source: The Hindu

**Q.8)** The words "Motion interpolation, video interpolation, and the soap opera effect" is often seen in news is related to which of the following?
a) Frame rate of videos
b) Long distance telescopes
c) Micro telescopes for drug therapy
d) Thermal image radar system

**ANS: A**
**Explanation:** Motion smoothing is also known as motion interpolation, video interpolation, and the soap opera effect, it refers to a process of reducing motion blur by artificially inflating the frame rate of the film or series.

- So, from 24 frames per second (fps) it is increased to 60fps, 120fps or even higher (higher rates are perceived as motion), digitally combining the images to simulate more.
- This effect can be useful when watching sports, as the action moves quickly, and enabling the feature allows viewers to catch more details.

Source: The Hindu

**Q.9)** Recently the World Health Organization said that "burnout" remains an "occupational phenomenon" and it is not considered as a medical condition. Which of the following is/are the characteristics of burnout syndrome?
1. Feelings of energy depletion or exhaustion.
2. Increased mental distance from one's job.
3. Reduced professional efficacy.
Select the correct answer using the code given below:
a) 1 only
b) 1 and 2 only
c) 2 and 3 only
d) 1, 2 and 3

**ANS: D**

**Explanation:** The World Health Organization said on May 28 that "burnout" remains an "occupational phenomenon" that could lead someone to seek care but it is not considered a medical condition.

- The clarification came a day after the WHO mistakenly said it had listed burnout in its International Classification of Diseases (ICD) for the first time.
- While burnout was listed in the previous version, the ICD-10, its definition has been changed in the latest edition of the text. "The definition has been modified based on existing research".
- WHO has now defined burnout as "a syndrome conceptualised as resulting from chronic workplace stress that has not been successfully managed".
- It said the syndrome was characterised by: "1) feelings of energy depletion or exhaustion; 2) increased mental distance from one's job, or feelings of negativism or cynicism related to one's job; and 3) reduced professional efficacy."
- "Burn-out refers specifically to phenomena in the occupational context and should not be applied to describe experiences in other areas of life," according to the definition.

Source: WHO

**Q.10)** Consider the following statements regarding "Poly-metallic Nodules":
1. These are commonly called manganese nodules.
2. These are most abundant on abyssal plains.

Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**

**Explanation:** Of all the mineral resources considered as potential targets for deep-sea mining, poly-metallic nodules (also commonly called manganese nodules) are probably the most likely commodity to be developed into a commercial operation.

- Poly-metallic nodules are rounded accretions of manganese and iron hydroxides that cover vast areas of the seafloor, but are most abundant on abyssal plains at water depths of 4000-6500 metres.
- They form through the aggregation of layers of iron and manganese hydroxides around a central particle (such as a shell or small rock fragment), and range in size from a few millimeters to tens of centimeters.
- The composition of nodules varies with their environment of formation, but in addition to manganese and iron, they can contain nickel, copper and cobalt in commercially attractive concentrations as well as traces of other valuable metals such as molybdenum, zirconium and Rare Earth Elements.

Source: NCERT & Agrahari

# Science & Technology

**Q.1)** Which of the following statements is/are correct about Nuclear Fuel Complex (NFC)?
1. It is the only organization in India which caters to the fuel requirements of nuclear power reactors.
2. It is the only organization in the world today to have a comprehensive manufacturing cycle from ore to core.
Choose the correct code from below given options:
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**
**Explanation:** Nuclear Fuel Complex, Hyderabad is an industrial unit of the Department of Atomic Energy, Government of India.

- NFC is the only organization in India which caters to the fuel requirements of nuclear power reactors.
- Nuclear Fuel Complex, Hyderabad was conceived in late 60's as a pivotal industrial arm of the Department of Atomic Energy with the mandate to fuel the nuclear power program of Govt. of India.
- An ISO certified organization, NFC is the only organization in the world today to have a comprehensive manufacturing cycle from ore to core, involving processing of both Uranium & Zirconium streams under the same roof.

Source: Agrahari

**Q.2)** Consider the following statements with respect to "Vitrification technology":
1. It can be used to contain High Level Waste (HLW) of Nuclear Spent Fuel.
2. At present India imports this technology from Russia.
Which of the following above statements is/are correct?
a) 1 only
b) 2 only
c) both 1 and 2
d) Neither 1 nor 2

**ANS: A**
**Explanation:** The immobilisation of HLW requires the formation of an insoluble, solid waste form that will remain stable for many thousands of years. In general borosilicate glass has been chosen as the medium for dealing with separated HLW.

- The stability of ancient glass for thousands of years highlights the suitability of borosilicate glass as a matrix material. This type of process, referred to as vitrification.
- Most HLW, other than spent fuel itself, arises in a liquid form from the reprocessing of spent fuel. This HLW comprises highly-radioactive fission products and some transuranic elements with long-lived radioactivity.
- To allow incorporation into the glass matrix the waste is initially calcined (dried) to a granular powder.

- The product is then incorporated into molten glass, poured into a robust stainless steel canister about 1.3 metres high, and allowed to cool, forming a solid matrix. The containers are then welded closed and are ready for storage and final disposal.
- India is one of the few countries to have mastered the technology of vitrification. Over the years BARC has developed the technology for vitrification of HLW.
- India has a unique distinction of having operating vitrification plant at Tarapur and Trombay.
- In our existing plant at Trombay vitrification process is essentially batch operation consisting of heating and fusing of pre-concentrated waste and glass forming additives and is carried out in melters based on induction heating.

Source: The Hindu

**Q.3)** "CODIS" is related to which of the following?
a) Food Preservation Index
b) DNA index system
c) Carbon Dioxide measurement Index
d) Biomass Index

**ANS: B**
**Explanation:** CODIS is the acronym for the Combined DNA Index System and is the generic term used to describe the FBI's program of support for criminal justice DNA databases as well as the software used to run these databases.
The National DNA Index System or NDIS is considered one part of CODIS, the national level, containing the DNA profiles contributed by federal, state, and local participating forensic laboratories.
Source: Agrahari

**Q.4)** "JUICE Mission" is going to launch by which of the following Space Agency?
a) NASA
b) ROSCOSMOS
c) French Space Agency
d) European Space Agency

**ANS: D**
**Explanation:** JUICE, also known as the JUpiter ICy moons Explorer, is a European Space Agency mission intended to explore Jupiter and three of its icy moons: Europa, Callisto and Ganymede.

- A single orbital spacecraft, with no lander, will be the first to orbit Ganymede, and one of a handful of spacecraft to visit the Jupiter system since the 1970s. JUICE is targeted to launch in June 2022 aboard an Ariane 5 spacecraft.
- It will take more than 7.5 years to get to Jupiter, using gravity assists from Venus and Earth to speed the spacecraft up and get it into the outer solar system.
- The spacecraft is expected to be inserted in Jupiter's orbit in January 2030, starting a 2.5-year observation session of Jupiter's moons, as well as the planet's atmosphere and magnetosphere.

Source: The Hindu

**Q.5)** Consider the following statements with respect to "Prithvi Missile":
1. India's indigenously developed ballistic missile produced by the Integrated Guided Missile Development Program (IGMDP).
2. It is a surface-to-surface short range ballistic missile.

Which of the following codes below given is correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**

**Explanation:** The Prithvi was India's first indigenously developed ballistic missile produced by the Integrated Guided Missile Development Program (IGMDP).
Prithvi is a road-mobile, surface to surface short range ballistic missile (SRBM) powered by a single-stage, two engines, and liquid-fuel. Development of the Prithvi began in 1983, and it was first tested fired on February 25, 1988.
Source: Agrahari

**Q.6)** The term 'sesbania rostrata' is related to which of the following?
a) Green manure crop
b) Wild banana
c) High yield mango
d) Wild tamarind

**ANS: A**

**Explanation:** Using radiation induced mutations and/or hybridization, Sesbania rostrata crops is being carried out by Baba Atomic Research Centre (BARC).
A late flowering mutant (TSR-1) in Sesbania has been developed with the potential to produce more biomass before flowering and offers an excellent material for green manuring.
Source: BARC

**Q.7)** The term 'MELISA' is related to which of the following?
a) Satellite mission
b) Blood test
c) Malaria eradication in Eastern Africa
d) None

**ANS: B**

**Explanation:** MELISA is an optimized, clinically validated blood test which establishes allergy to a number of different metals from a single blood test. MELISA can also diagnose active Lyme disease.
Source: ForumIAS factly

**Q.8)** Which of the following statement is NOT correct about Shourya Missile?
a) It is a hypersonic missile.
b) Shourya missile is the land-variant of India's K-15 missile.
c) Its operational range is more than 3000km.
d) None.

**ANS: C**

**Explanation:** The Shaurya is a hypersonic surface-to-surface ballistic missile, developed by Defence Research & Development Organization (DRDO) of India.

- It is one of the top 10 missiles in its class with advanced navigation systems, propulsion system and control technologies.

- The Shaurya is actually a land variant of Indian K-15 submarine launched missile. The Shaurya is 6.2 t canister launched missile, with a 10 m length, and 0.74 m diameter.
- It boasts an intermediate operational range of 700 to 1900 km and a payload weight of 180 to 1000 kg.

Source: Business Line

**Q.9)** With reference to the 'Sophia- human-like robot', which of the following statements is/are correct?
1. She is the world's first robot citizen.
2. She is the first robot Innovation Ambassador for the UNDP.
Select the correct answer using the codes given below:
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**
**Explanation:** Hanson Robotics' most advanced human-like robot, Sophia, personifies our dreams for the future of AI.

- As a unique combination of science, engineering, and artistry, Sophia is simultaneously a human-crafted science fiction character depicting the future of AI and robotics, and a platform for advanced robotics and AI research.
- The character of Sophia captures the imagination of global audiences. She is the world's first robot citizen and the first robot Innovation Ambassador for the United Nations Development Programme.

Source: The Hindu

**Q.10)** Which of the following statements is/are correct about 'Protection of Plant Varieties and Farmers' Rights Act'?
1. The act was enacted in 2001.
2. Protection of Plant Varieties and Farmers' Rights Authority was established in 2005.
Select the correct answer using the codes given below:
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**
**Explanation:** India enacted the Protection of Plant Varieties and Farmers' Rights Act in 2001 for the protection of plant varieties, the rights of farmers and plant breeders and to encourage the development of new plant varieties.

- Protection of Plant Varieties and Farmers' Rights Authority was established in New Delhi in November, 2005 as per provision under the Act.
- The Authority has made landmark achievement in last ten years. Registration of plant varieties was started by the Authority with twelve crop species in 2007 and now 114 crop species are covered under the umbrella of PPV&FRA for granting IPR.

Source: The Hindu

# Science & Technology

**Q.1)** "The indigenously developed Cryogenic Upper Stage (CUS) forms the third stage of GSLV Mk II". Cryogenic engine fuel is a mix of which of the following?
a) Liquid Nitrogen and Liquid Hydrogen
b) Liquid Hydrogen and Liquid Oxygen
c) Liquid Oxygen and Liquid Nitrogen
d) Liquid Nitrogen and mono-methyl-hydrazine

**ANS: B**
**Explanation:** Geosynchronous Satellite Launch Vehicle Mark II (GSLV Mk II) is the largest launch vehicle developed by India, which is currently in operation.

- This fourth generation launch vehicle is a three stage vehicle with four liquid strap-ons.
- The indigenously developed cryogenic Upper Stage (CUS), which is flight proven, forms the third stage of GSLV Mk II.
- Cryogenic engine makes use of Liquid Oxygen (LOX) and Liquid Hydrogen (LH2) as propellants which liquefy at -183 deg C and -253 deg C respectively.
- LOX and LH2 are stored in their respective tanks. From there they are pumped in to turbo pump by individual booster pumps to ensure a high flow rate of propellants inside the combustion/thrust chamber.
- The major components of a cryogenic rocket engine are combustion/thrust chamber, igniter, fuel injector, fuel cryo pumps, oxidizer cryo pumps, gas turbine, cryo valves, regulators, the fuel tanks and a rocket engine nozzle.

Source: ForumIAS Factly

**Q.2)** The Vikas engine is/are the workhorse for which of the following Launch Vehicles?
1. Augmented Satellite Launch Vehicle (ASLV)
2. Polar Satellite Launch Vehicle (PSLV)
3. Geo-synchronous Launch Vehicle (GSLV)
Select the correct answer using the code given below:
a) 1 only
b) 1 and 2 only
c) 2 and 3 only
d) 1, 2 and 3

**ANS: C**
**Explanation:** 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.
Source: ForumIAS Factly

**Q.3)** The DART mission is going to launch by NASA in July 2021 is related to which of the following?
a) Asteroids
b) Jupiter Planet
c) Sun
d) Venus Planet

**ANS: A**

**Explanation:** The Double Asteroid Redirection Test (DART) mission is directed by NASA to the Applied Physics Laboratory (APL) with support from several NASA centers: the Jet Propulsion Laboratory (JPL), Goddard Space Flight Center (GSFC), Johnson Space Center (JSC), Glenn Research Center (GRC), and Langley Research Center (LRC).

- DART is a planetary defense-driven test of technologies for preventing an impact of Earth by a hazardous asteroid.
- DART will be the first demonstration of the kinetic impactor technique to change the motion of an asteroid in space.
- The DART mission is in Phase C, led by APL and managed under NASA's Solar System Exploration Program.

Source: ForumIAS Factly

**Q.4)** Which of the following is/are mission/missions related to Mars Planet?

1. Magellan
2. Phoenix
3. Maven

Select the correct answer using the code given below:

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

**ANS: C**

**Explanation:** Mars Missions by NASA:

- Mariner
- Mars Resonance Orbiter
- Phoenix
- MAVEN
- In-Sights Lander
- Curiosity Rover

Magellan mission is related to Planet Venus.

Source: NASA

**Q.5)** Which of the following are examples of Ballistic missiles?

1. Agni Missile
2. Prithvi Missile
3. Dhanush Missile
4. BrahMos Missile

Select the correct answer using the code given below:

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

**ANS: D**

**Explanation:**

**(i) Cruise Missile:** A cruise missile is an unmanned self-propelled (till the time of impact) guided vehicle that sustains flight through aerodynamic lift for most of its flight path and whose primary mission is to place an ordnance or special payload on a target. They fly within the earth's atmosphere and use jet engine technology. These vehicles vary greatly in their speed and ability to penetrate defences.Cruise missiles can be categorised by size, speed (subsonic or supersonic), range and whether launched from land, air, surface ship or submarine.

Depending upon the speed such missiles are classified as:

1) Subsonic cruise missile
2) Supersonic cruise missile
3) Hypersonic cruise missile

Subsonic & Supersonic Cruise Missiles

***Subsonic cruise missile*** flies at a speed lesser than that of sound. It travels at a speed of around 0.8 Mach. The well-known subsonic missile is the American Tomahawk cruise missile. Some other examples are Harpoon of USA and Exocet of France.

***Supersonic cruise missile*** travels at a speed of around 2-3 Mach i.e.; it travels a kilometre approximately in a second. The modular design of the missile and its capability of being launched at different orientations enable it to be integrated with a wide spectrum of platforms like warships, submarines, different types of aircraft, mobile autonomous launchers and silos. The combination of supersonic speed and warhead mass provides high kinetic energy ensuring tremendous lethal effect. **BRAHMOS** is the only known versatile supersonic cruise missile system which is in service.

***Hypersonic cruise missile*** travels at a speed of more than 5 Mach. Many countries are working to develop hypersonic cruise missiles. BrahMos Aerospace is also in the process of developing a hypersonic cruise missile, **BRAHMOS-II**, which would fly at a speed greater than 5 Mach.

**(ii) Ballistic Missile:** A ballistic missile is a missile that has a ballistic trajectory over most of its flight path, regardless of whether or not it is a weapon-delivery vehicle. Ballistic missiles are categorised according to their range, maximum distance measured along the surface of earth's ellipsoid from the point of launch to the point of impact of the last element of their payload. The missile carry a huge payload. The carriage of a deadly warhead is justified by the distance the missile travels. Ballistic missiles can be launched from ships and land based facilities. For example, Prithvi I, Prithvi II, Agni I, Agni II and Dhanush ballistic missiles are currently operational in the Indian defence forces.

Source: BRAHMOS SPACE

**Q.6)** Consider the following statements regarding the Government Instant Messaging System (GIMS):

1. GIMS is the instant messaging platform for Government communication.
2. GIMS is being packaged for employees of Central, State and Local government departments and organizations for intra and inter organization communications.
3. Like WhatsApp, GIMS employs end-to-end encryption for one-to-one messaging.

Which of the statements given above is/are NOT correct?

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

**ANS: C**

**Explanation:** GIMS is the instant messaging platform for Government communication.

- GIMS platform provides GIMS mobile client for instant messaging and GIMS Portal for administration and monitoring of platform.
- Designed to suit the hierarchy and communication policies of the government.
- Adaptable to both the central and state government organizations for intra and inter organization communication.
- It is being developed as a secure Indian alternative without the security concerns attached with apps hosted abroad or those owned by foreign entities.
- Like WhatsApp, GIMS employs end-to-end encryption for one-to-one messaging.

Source: ForumIAS Factly

**Q.7)** Recently which state police has adopted a unique bar-coding software - Trakea - to ensure that thousands of forensic reports that form the backbone of the criminal investigation system?
a) Andhra Pradesh
b) Uttar Pradesh
c) Maharashtra
d) Haryana

**ANS: D**
**Explanation:** Haryana Police has adopted a unique barcoding software — Trakea — to ensure that thousands of forensic reports that form the backbone of the criminal investigation system and subsequent trials in the courts of law, are not tampered with.

- According to the police, Trakea ensures foolproof security of the samples collected from the scene of crime, and the forensic analysis reports, and is different from traditional methods that the state police force has been following for decades.
- Haryana Police claims it is the country's first police force to have introduced this unique barcoding for forensic reports.

Source: The Hindu

**Q.8)** Consider the following statements regarding e-waste clinic in India:
1. India's first e-waste clinic has been inaugurated in Indore, Madhya Pradesh.
2. It would enable segregation, processing and disposal of waste from both household and commercial units.
3. The clinic is set up in accordance with the Solid Waste Management Rules adopted in 2016.

Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) 1 and 3 only
d) 2 and 3 only

**ANS: D**
**Explanation:** India's first e-waste clinic has been inaugurated in Bhopal and will enable segregation, processing and disposal of electronic waste from both household and commercial units.

- It was set up by the Bhopal Municipal Corporation and the Central Pollution Control Board.
- The e-waste clinic is developed on the bases of a three-month pilot project and, if successful, more clinics will be built throughout the country.
- The clinic is set up in accordance with the Solid Waste Management Rules adopted in 2016.

Source: The Hindu

**Q.9)** Consider the following statements regarding the IndiGen programme:
1. It aims to undertake whole genome sequencing of ten thousand Indian individuals representing diverse ethnic groups from India.
2. It is funded by the Council for Scientific and Industrial Research (CSIR).

Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) Both 1 and 2

d) Neither 1 nor 2

**ANS: B**

**Explanation:** IndiGen programme aims to undertake whole genome sequencing of a thousand Indian individuals representing diverse ethnic groups from India.

- The objective is to create a pilot dataset to enable genetic epidemiology of carrier genetic diseases towards enabling affordable carrier screening approaches in India.
- We also hope to mine allele frequencies for genetic variants for estimating population scale prevalence for diverse clinical applications.
- The human genome data sets would also be utilized for prioritizing Pharmacogenomics variants specific for Indian population for optimizing therapy and minimizing adverse events.
- IndiGen is funded by the Council for Scientific and Industrial Research (CSIR).

Source: The Hindu

**Q.10)** Consider the following statements regarding the Indian Science Congress Association (ISCA):

1. It was the brainchild of Acharya Sir Prafulla Chandra Ray.
2. Indian Science Congress is organized by the ISCA every year in the first week of January.

Which of the statements given above is/are correct?

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

**ANS: B**

**Explanation:** The Indian Science Congress Association (ISCA) owes its origin to the foresight and initiative of two British Chemists, namely, Professor J. L. Simonsen and Professor P.S. MacMahon.

- It occurred to them that scientific research in India might be stimulated if an annual meeting of research workers somewhat on the lines of the British Association for the Advancement of Science could be arranged.
- The first meeting of the Congress was held from January 15-17, 1914 at the premises of the Asiatic Society, Calcutta, with the Honourable Justice Sir Asutosh Mukherjee, the then Vice-Chancellor of the Calcutta University, as President.
- One hundred and five scientists from different parts of India and abroad attended and the papers numbering 35 were divided into six sections-Botany, Chemistry, Ethnography, Geology, Physics, Zoology under six Sectional Presidents.
- Indian Science Congress is organised by the Indian Science Congress Association every year in the first week of January.

Source: ForumIAS Factly

# Space & IT

**Q.1)** Which of the following statements is/are correct about "Air Independent Propulsion (AIP) system"?

1. It is a technology which allows a nuclear submarine to operate without the need to access atmospheric oxygen.
2. India is self-sufficient in the AIP system and exports to other countries also.

Select the correct answer using the code given below:

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

**ANS: D**

**Explanation:** Submarines are essentially of two types: conventional and nuclear. Conventional submarines use a diesel-electric engine, and must surface daily for oxygen for fuel combustion.

- If fitted with an Air Independent Propulsion (AIP) system, the submarine needs to take in oxygen only once a week.
- The state-of-the-art "air independent propulsion" (AIP) system that the Defence R&D Organisation (DRDO) is indigenously developing will be ready to drive the Indian Navy's submarines from 2024 onwards.
- Consequently, this AIP will not power the six new submarines that the navy is tendering in a Rs 45,000crore programme called Project 75-I.
- Instead, those six boats (as the navy traditionally refers to submarines) will have AIP systems that the foreign vendor must offer.

Source: Indian Express

**Q.2)** The term "Vyommitra" is recently in news is related to which of the following?

a) Half-humanoid robot
b) Satellite radar system
c) Space education portal
d) None

**ANS: A**

**Explanation:** Recently, Indian Space Research Organisation (ISRO) unveiled its first 'woman' astronaut, named Vyom Mitra who will ride to space in the first test flight of the human space mission, Gaganyaan.

- She is half-humanoid and her body stops at the torso and has no legs. She is capable of switching panel operations, performing Environment Control and Life Support Systems (ECLSS) functions, conversations with the astronauts, recognising them and solving their queries.

Source: ForumIAS factly

**Q.3)** The terms "Antu, Kueyen, Melipal and Yepun" is related to which of the following?

a) Asteroids
b) Planets of Jupiter
c) Telescope
d) Radar systems

**ANS: C**

**Explanation:** The Very Large Telescope array (VLT) is the flagship facility for European ground-based astronomy at the beginning of the third Millennium.

- It is the world's most advanced optical instrument, consisting of four Unit Telescopes with main mirrors of 8.2m diameter and four movable 1.8m diameter Auxiliary Telescopes.
- The telescopes can work together, to form a giant 'interferometer', the ESO Very Large Telescope Interferometer, allowing astronomers to see details up to 25 times finer than with the individual telescopes. The large telescopes are named Antu, Kueyen, Melipal and Yepun.

Source: NASA

**Q.4)** Which of the following statements is/are correct about "Aditya L1 mission"?

1. It is first scientific expedition of ISRO to study Sun.
2. Aditya L1 satellite will be placed in the halo orbit around the Lagrangian point 1 (L1) of the sun-earth system.
3. It will be launched using the Geo-synchronous Satellite Launch Vehicle (GSLV) Mark-III.

Select the correct answer using the code given below:

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

**ANS: B**

**Explanation:** Aditya - L1 First Indian mission to study the Sun. The Aditya-1 mission was conceived as a 400kg class satellite carrying one payload, the Visible Emission Line Coronagraph (VELC) and was planned to launch in a 800 km low earth orbit.

- Satellite will be placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system has the major advantage of continuously viewing the Sun without any occultation/ eclipses.
- Therefore, the Aditya-1 mission has now been revised to "Aditya-L1 mission" and will be inserted in a halo orbit around the L1, which is 1.5 million km from the Earth. The satellite carries additional six payloads with enhanced science scope and objectives.
- The project is approved and the satellite will be launched during 2019 – 2020 timeframe by PSLV-XL from Sriharikota.
- Aditya-1 was meant to observe only the solar corona. The outer layers of the Sun, extending to thousands of km above the disc (photosphere) is termed as the corona.
- It has a temperature of more than a million degree Kelvin which is much higher than the solar disc temperature of around 6000K.
- How the corona gets heated to such high temperatures is still an unanswered question in solar physics.

Source: ISRO

**Q.5)** Which of the following statements is/are correct about "Quantum Computers"?

1. Quantum computers use logical units called quantum bits that can be put into a quantum state where they can simultaneously represent both 0 and 1.
2. Quantum computers works at a temperature of -273 °C (-459 °F) with hardly any atmospheric pressure and isolated from Earth's magnetic field.

Select the correct answer using the code given below:

a) 1 only

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

**ANS: C**

**Explanation:** Quantum Computers work by harnessing the properties of quantum mechanics.

- Statement 1 is correct: As the reality of a quantum computer comes closer, it is useful for us to understand both how one functions and how it's different from a traditional computer. The first thing to bear in mind is that they use different basic units of data: 'bits' and 'qubits'.
- Every element of a classical computer is written in binary code (1s and 0s) and is translated into electricity: high voltage is represented by 1, and low voltage by 0. In quantum computing, qubits are the basic unit and their value can be 1, 0, or 1 and 0 simultaneously, overlapping (superposition) and intertwining (entanglement) according to the laws of physics.
- This means that qubits, as opposed to bits, can take on various values at one time and can perform calculations that a conventional computer cannot.
- Statement 2 is correct: The classical computer, if there is interference with the system; the system can correct itself and continue running. For the time being, this is not the case with quantum computers.
- "External disturbances force the system to define itself as 1 or 0, causing it to lose its quantum coherence.
- To avoid this kind of external 'noise,' the system has to be completely isolated: the atoms have to be very quiet, ensuring nothing makes them collide or interact with the surroundings.
- Quantum computers have to be at a temperature of -273 °C (-459 °F) with hardly any atmospheric pressure and isolated from Earth's magnetic field.

Source: The Hindu

**Q.6)** The term "Muktoshri" is related to which of the following?
a) Life saving drug
b) New variety of rice
c) New variety of maize
d) New endemic banana

**ANS: B**

**Explanation:** West Bengal government's rice research centre has come up with a new variety of rice called Muktoshri that can be grown in arsenic prone areas.
It was developed jointly by the Rice Research Station at Chinsurah, coming under West Bengal's Agriculture Department and the National Botanical Research Institute, Lucknow.
Source: The Hindu

**Q.7)** Which of the following statements is/are correct about "Polycrack Technology"?
1. It is world's first patented heterogeneous catalytic process which converts multiple feed stocks into hydrocarbon liquid fuels, gas, carbon and water.
2. It has high tolerance to moisture hence drying of waste is not required.
3. In polycrack, biological decomposition is not allowed as the Waste is treated as it is received.

Select the correct answer using the code given below:
a) 1 only

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

**ANS: D**

**Explanation:** Polycrack technology is world's first patented heterogeneous catalytic process which converts multiple feed stocks into hydrocarbon liquid fuels, gas, carbon and water. Polycrack Plant can be fed with all types of Plastic, Petroleum sludge, Un-segregated MSW (Municipal Solid Waste) with moisture up to 50%, E–Waste, Automobile fluff, Organic waste including bamboo, garden waste etc., and Jatropha fruit and palm bunch.

Polycrack has the following advantages over the conventional approach of treating solid waste:-

- Pre-segregation of waste is not required to reform the waste. Waste as collected can be directly fed into Polycrack.
- It has high tolerance to moisture hence drying of waste is not required.
- Waste is processed and reformed within 24 hours.
- It is an enclosed unit hence the working environment is dust free.
- Excellent air quality surrounding the plant.
- Biological decomposition is not allowed as the Waste is treated as it is received.
- The foot print of the plant is small hence the area required for installing the plant is less when compared with conventional method of processing.
- All constituents are converted into valuable energy thereby making it Zero Discharge Process.
- Gas generated in the process is re-used to provide energy to the system thereby making it self-reliant and also bring down the operating cost.
- There is no atmospheric emission during the process unlike other conventional methods except for combustion gases which have pollutants less than the prescribed norms the world over.
- Operates around 450 degrees, making it a low temperature process when compared with other options.
- Safe and efficient system with built-in safety features enables even an unskilled user to operate the machine with ease.
- Low capital cost and low operating cost.
- Fully automated system requires minimum man power.

Source: ForumIAS factly

**Q.8)** "Project Soli" is launched by which of the following?
a) Google
b) IBM
c) Facebook
d) Tesla

**ANS: A**

**Explanation:** Project Soli, driven by Google's Advanced Technology and Projects (ATAP) team, was first showcased back in 2015.

The idea is that a radar chip can be used to detect hand movements and gestures to interpret what they could mean.

It's only recently that Google figured out how to reduce the size of this radar chip and fit it on the front of the smart phone, still ensuring accuracy.

Source: The Hindu

**Q.9)** The "LOx methane" is recently in news is related to which of the following?
a) Space rocket engine fuel
b) High speed diesel variant
c) Bio-diesel
d) None

**ANS: A**

**Explanation:** The Indian Space Research Organization (ISRO) is developing methane-powered rocket engines.

- The space agency is developing two 'LOx methane' engines (liquid oxygen oxidiser and methane fuel) engines.
- One of the two projects is trying to convert the existing cryogenic engine, which uses liquid hydrogen for fuel, into a LOx methane engine.
- The other is a smaller engine of 3 tonnes thrust, which will feature an electric motor.
- These are being developed at ISRO's Liquid Propulsion Systems Centre at Trivandrum.

Source: ISRO

**Q.10)** The "Head on Generation (HOG)" technology is sometimes in news is related to which of the following?
a) Driverless car
b) Drones
c) Tractors
d) Trains

**ANS: D**

**Explanation:** The South Central Railway (SCR) announced the introduction of a new technology – Head On Generation (HOG) system – in Telangana Express where power from the engine would be supplied to the entire train for lighting and air-conditioning.

- The trains like these have two power cars known as End On Generators (EOG) on either end to provide electricity to all the coaches.
- These power cars produce electricity by the diesel generators with each using 40 litres of fuel per hour for a non-AC coach and 65-70 litres of diesel per hour per coach in case of an AC coach.
- The new HOG technology obviates the need for using diesel as power is tapped from the overhead electric traction lines through a pantograph to the train engine and the same is distributed to the trailing coaches.
- Earlier, the power supply from the overhead electric traction was being used to only run the engine and haul the coaches.
- "The new system does not require any diesel and hence, will reduce air and noise pollution, besides providing uninterrupted illumination in all the coaches.
- On an average, it will reduce carbon emission by 700 metric tonnes per year per train".

Source: The Hindu

# Science & Technology

**Q.1)** The word "Roc" is often seen in news is related to which of the following?
a) Satellite to study stratosphere
b) Largest aircraft
c) Helium balloon to study stratosphere
d) Drone to study upper atmosphere

**ANS: B**
**Explanation:** The world's largest aircraft took off over the Mojave Desert in California, the first flight for the carbon-composite plane built by Stratolaunch Systems Corp, started by late Microsoft co-founder Paul Allen, as the company enters the lucrative private space market.
The white airplane called Roc, which has a wingspan the length of an American football field and is powered by six engines on a twin fuselage, took to the air shortly before 7 a.m. Pacific time (1400 GMT) and stayed aloft for more than two hours before landing safely back at the Mojave Air and Space Port as a crowd of hundreds of people cheered.
Source: ForumIAS Factly

**Q.2)** Recently, which of the following country unveiled a 3D print of a heart with human tissue and vessels?
a) United States of America
b) China
c) Israel
d) Australia

**ANS: C**
**Explanation:** Scientists in Israel unveiled a 3D print of a heart with human tissue and vessels, calling it a first and a "major medical breakthrough" that advances possibilities for transplants.

- The heart marked "the first time anyone has successfully engineered and printed an entire heart replete with cells, blood vessels, ventricles and chambers," said Tel Aviv University's Tal Dvir, who led the project.
- People have managed to 3D-print the structure of a heart in the past, but not with cells or with blood vessels.

Source: The Hindu

**Q.3)** The "Gravitational Lensing" concept is often seen in news is suggested by which of the following scientist?
a) Albert Einstein
b) Yakov Borisovich Zel'dovich
c) Igor Dmitriyevich Novikov
d) Stephen Hawking

**ANS: A**
**Explanation:** Black holes are not radiant and will not be visible through any telescope.

- However, as first suggested by Albert Einstein, if by chance, a tiny primordial black hole eclipses a distant star, light rays of the star will bend around the black hole due to gravitational effect, resulting in the star appearing to be brighter than it

originally is for a short while. Called `gravitational lensing', this rare phenomena can occur only when the star, the black hole and the observer on the Earth are aligned in a straight line.

- When the black hole is in alignment with a distant star, due to gravitational attraction, light rays are bent inwards like a lens, making the star appear brighter.

Source: ForumIAS factly

**Q.4)** Consider the following statements regarding the "L2 Pro India":

1. It is a website developed by NITI Aayog.
2. It will aid and enable youth, innovators, entrepreneurs in understanding IPRs for their ownership and protection.

Which of the statements given above is/are correct?

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

**ANS: B**

**Explanation:** Secretary Department for Promotion of Industry and Internal Trade (DPIIT), launched the website and mobile application [Learn to Protect, Secure and Maximize Your Innovation] on Intellectual Property Rights (IPRs) today in New Delhi.

- The website and app has been developed by Cell for IPR Promotion and Management (CIPAM)-DPIIT in collaboration with Qualcomm and National Law University (NLU), Delhi.
- The modules of this e-learning platform [L2Pro India IP e-learning Platform and the L2Pro India Mobile App] will aid and enable youth, innovators, entrepreneurs and small and medium industries (SMEs) in understanding IPRs for their ownership and protection, integrate IP into business models and obtain value for their R&D efforts.
- The L2Pro has been successfully implemented in Germany, United Kingdom, Italy and France, benefiting immensely from close collaboration with respective IP organizations and public research institutions.
- The learning app has been customized for India in order to ensure that innovation which is fundamental to startups are protected, managed and commercialised.

Source: ForumIAS factly

**Q.5)** Consider the following statements regarding the "National Supercomputing Mission":

1. Mission launched in 12$^{th}$ Plan period.
2. It was implemented jointly by Department of Science and Technology (DST) and Department of Electronics and Information Technology (DeitY).

Which of the statements given above is/are correct?

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

**ANS: C**

**Explanation:** The Mission, launched in 2015, envisages empowering our national academic and R&D institutions spread over the country by installing a vast supercomputing grid comprising of more than 70 high performance computing facilities.

- The mission would be implemented jointly by Department of Science and Technology (DST) and Department of Electronics and Information Technology (DeitY) through

two organizations the Centre for Development of Advanced Computing (C-DAC) and the Indian Institute of Science (IISc), Bangalore.

- The Mission envisages empowering our national academic and R&D institutions spread over the country by installing a vast supercomputing grid comprising of more than 70 high-performance computing facilities.

Source: Agrahari

**Q.6)** Consider the following statements regarding the "data localization":
1. Justice Srikrishna Committee report recommended that the data stored only locally.
2. Currently, the only mandatory rule on data localization in India is by the Reserve Bank of India for payment systems.
Which of the statements given above is/are correct?
a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

**ANS: C**
**Explanation:** Data localisation laws refer to regulations that dictate how data on a nation's citizens is collected, processed and stored inside the country.

- Among reasons supporting data localisation put out by the Justice Srikrishna Committee report last year, a few key ones are: Data localisation is critical for law enforcement.
- Access to data by Indian law agencies, in case of a breach or threat, cannot be dependent on the whims and fancies, nor on lengthy legal processes of another nation that hosts data generated in India.
- A key observation of the report is that it is ideal to have the data stored only locally, without even having a copy abroad, in order to protect Indian data from foreign surveillance.
- Currently, the only mandatory rule on data localisation in India is by the Reserve Bank of India for payment systems. Other than this, there are only reports or drafts of bills that are yet to be signed into law.
- Among material available in the public domain on data localisation is the white paper that preceded the Jusitce Srikrishna Committee report, inviting public comments.
- The second piece is the Draft Personal Data Protection Bill, 2018 itself which has specific requirements on cross-border data transfers. This is seen as being more restrictive than the recommendations of the Srikrishna Committee.
- The draft e-commerce policy also has clauses on cross-border data transfer. For example, it suggests that if a global entity's India subsidiary transfers Indian users' data to its parent, the same cannot be transferred to a third party even with the user's consent.

Source: ForumIAS factly

**Q.7)** Consider the following statements regarding "World Food Safety Day (WFSD)":
1. The first world food safety day was celebrated in 2015.
2. World food safety day 2019 theme was "Food Safety, everyone's business".
3. It is organized by Food and Agriculture Organization in collaboration with World Health Organization.
Which of the statements given above is/are correct?
a) 1 only

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

**ANS: C**

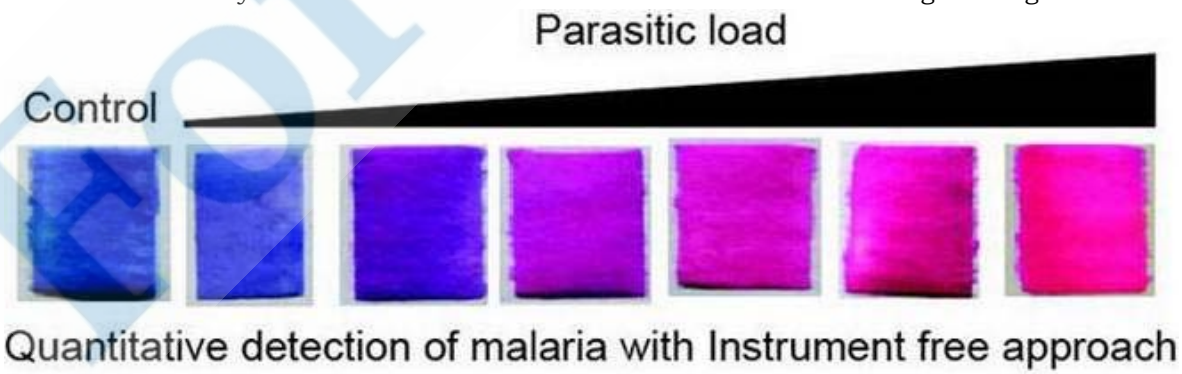
**Explanation:** The first-ever "World Food Safety Day" adopted by the Food and Agriculture Organization of the United Nations in collaboration with WHO, will be celebrated on 7th of June 2019 under the theme "Food Safety, Everyone's Business".
Source: ForumIAS factly

**Q.8)** Recently, which Indian Institute of technology (IIT) has developed a paper based test kit for malaria detection?
a) Indian Institute of technology (IIT) – Guwahati
b) Indian Institute of technology (IIT) – Madras
c) Indian Institute of technology (IIT) – Bombay
d) Indian Institute of technology (IIT) – Kanpur

**ANS: A**

**Explanation:** With over one million reported cases in 2017, malaria still continues to be a burden for India and most countries of south-east Asia.

- Now, a group of researchers from IIT Guwahati has developed a simple detection method that uses an instrument when in the lab or a piece of chromatographic paper when in the field.
- The kit can be used to detect Plasmodium parasite, which causes malaria and also specifically detect Plasmodium falciparum, a notorious species.
- Using an ordinary syringe fitted with a small magnet, magnetic beads and few chemicals inside, the researchers were able to specifically capture the antigen released by the parasites in the blood of malaria patients.
- When the captured antigens interact with specific substrates inside the syringe, the blue dye turns pink. The dye is then adsorbed over a modified chromatographic paper.
- The formation of pink colour on the paper is a direct indication of the presence of parasites in the blood serum.
- The intensity of the colour increases when the concentration of antigen is high.




Source: The Hindu

**Q.9)** Consider the following statements:
1. In scram-jet technology, combustion of fuel takes place in a chamber in the missile at supersonic speeds.

2. In ram jet system where the system collects the air it needs from the atmosphere during the flight at subsonic speeds and the propellants burn in the combustion chamber.

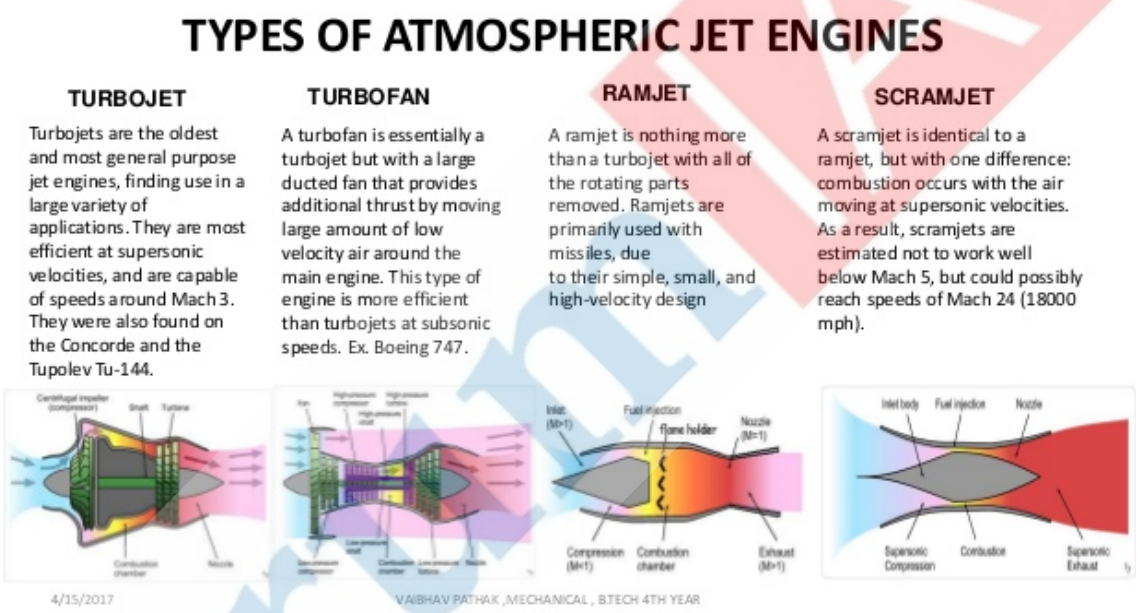
Which of the statements given above is/are correct?

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

**ANS: C**

**Explanation:** In scram-jet technology, combustion of fuel takes place in a chamber in the missile at supersonic speeds.

This is different from a ram jet system where the system collects the air it needs from the atmosphere during the flight at subsonic speeds and the propellants burn in the combustion chamber.




Source: ForumIAS factly

**Q.10)** The term "GW190412" is often seen in news is related to which of the following?

a) Detection of a merger of two unequal-mass black holes.
b) Bacterial strain that consumes complex aromatic compounds.
c) It is an asteroid which rotating very near to earth orbit.
d) A massive west Antarctica ice-sheet.

**ANS: A**

**Explanation:** For the first time since it started functioning, the gravitational wave observatories at LIGO scientific collaboration have detected a merger of two unequal-mass black holes.

- The event, dubbed GW190412, was detected nearly a year ago, and this is almost five years after the first ever detection of gravitational wave signals by these powerful detectors.
- Subsequent analysis of the signal coming from the violent merger showed that it involved two black holes of unequal masses coalescing, one of which was some 30

times the mass of the Sun and the other which had a mass nearly 8 times the solar mass.

- The actual merger took place at a distance of 2.5 billion light years away.

Source: The Hindu