

ForumIAS

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## Prelims Marathon

27 Dec to 2 Jan, 2021

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*HISTORY  
ECONOMICS  
POLITY  
SCIENCE AND TECHNOLOGY  
GEOGRAPHY AND ENVIRONMENT*

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## General Science

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**Q.1)** Consider the following statements regarding the Aerosols:

1. Their scattering of sunlight can reduce visibility (haze) and redden sunrises and sunsets.
2. Its concentrations in the atmosphere rise and fall with climate.

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:** Aerosols are minute particles suspended in the atmosphere. When these particles are sufficiently large, we notice their presence as they scatter and absorb sunlight.

- Their scattering of sunlight can reduce visibility (haze) and redden sunrises and sunsets. Aerosols interact both directly and indirectly with the Earth's radiation budget and climate.
- As a direct effect, the aerosols scatter sunlight directly back into space.
- As an indirect effect, aerosols in the lower atmosphere can modify the size of cloud particles, changing how the clouds reflect and absorb sunlight, thereby affecting the Earth's energy budget
- Aerosols come from both natural and human sources—and sometimes both at once. Dust, for example, is scoured from deserts, the dried-out edges of rivers, dry lakebeds, and more.
- Its concentrations in the atmosphere rise and fall with climate; in cold, dry, periods in the planet's history like the last ice age, more dust filled the atmosphere than during warmer stretches of Earth's history.

Source: NCERT

**Q.2)** Consider the following statements regarding the nucleotide of DNA:

1. It is an organic molecule that is the building block of DNA and RNA.
2. It is made up of phosphate group and a nitrogenous base with no carbon sugar.

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: A**

**Explanation:** A nucleotide is an organic molecule that is the building block of DNA and RNA.

- They also have functions related to cell signaling, metabolism, and enzyme reactions.
- A nucleotide is made up of three parts: a phosphate group, a 5-carbon sugar, and a nitrogenous base.
- The four nitrogenous bases in DNA are adenine, cytosine, guanine, and thymine.
- RNA contains uracil, instead of thymine.
- A nucleotide within a chain makes up the genetic material of all known living things.

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- They also serve a number of functions outside of genetic information storage, as messengers and energy moving molecules.

Source: NCERT

**Q.3)** Hydro-dynamic trapping, Solubility trapping and Mineral trapping is related to which of the following?

- a) Carbon sequestration
- b) Coal mining
- c) Off shore drilling
- d) Mineral exploration measurements

**ANS: A**

**Explanation:** In recent years, fundamental research has focused increasingly on the short and long term effects of CO<sub>2</sub> injection into reservoirs to assess the feasibility of CO<sub>2</sub> storage on a commercial scale.

- Sequestration processes involve different trapping mechanisms according to the hydrodynamic, physical and chemical conditions in the formation.
- It is common to divide these mechanisms into four different categories: hydrodynamic trapping, residual trapping, solubility trapping, and mineral trapping.

Source: Indian Express

**Q.4)** Consider the following statements regarding the composite materials:

1. It is better than traditional materials is because they improve the properties of their base materials and are applicable in many situations.
2. They are used in the development of Agni missile and Light Combat Aircraft - Tejas.

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 composite material is a combination of two materials with different physical and chemical properties.

- When they are combined they create a material which is specialized to do a certain job, for instance to become stronger, lighter or resistant to electricity.
- They can also improve strength and stiffness.
- The reason for their use over traditional materials is because they improve the properties of their base materials and are applicable in many situations.
- Use of composite materials in indigenously developed aircraft (Tejas), missiles (Agni) and in defense and civilian sectors is poised for big growth, where Indian companies are set to get into manufacturing mode.

Source: The Hindu

**Q.5)** Consider the following statements regarding the Neutrino:

1. The neutrino is a tiny elementary particle which is not part of the atom.
2. Neutrino has a very tiny mass and with no electrical charge.

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:** Proton, neutron, and electron are tiny particles that make up atoms.

- The neutrino is also a tiny elementary particle, but it is not part of the atom. Such particles are also found to exist in nature.
- Neutrino has a very tiny mass and no charge. It interacts very weakly with other matter particles.
- So weakly that every second trillions of neutrinos fall on us and pass through our bodies unnoticed.
- Neutrinos come from the sun (solar neutrinos) and other stars, cosmic rays that come from beyond the solar system, and from the Big Bang from which our Universe originated.
- They can also be produced in the lab.

Source: The Hindu

**Q.6)** The “Founder effect” is related to which of the following?

- a) Genetic drift
- b) Glacial lakes
- c) Geographical discoveries
- d) Chemical bonding

**ANS: A**

**Explanation:** Genetic drift can have major effects when a population is sharply reduced in size by a natural disaster (bottleneck effect) or when a small group splits off from the main population to found a colony (founder effect).

- The founder effect is another extreme example of drift, one that occurs when a small group of individuals breaks off from a larger population to establish a colony.
- The new colony is isolated from the original population, and the founding individuals may not represent the full genetic diversity of the original population.
- That is, alleles in the founding population may be present at different frequencies than in the original population, and some alleles may be missing altogether.
- The founder effect is similar in concept to the bottleneck effect, but it occurs via a different mechanism (colonization rather than catastrophe).
- Genetic studies done on the people of the Lakshwadeep archipelago by a team, led by K. Thangaraj at CSIR-Centre for Cellular and Molecular Biology (CCMB), for the first time have shown that a majority of human ancestry in Lakshadweep is largely derived from South Asia with minor influences from East and West Eurasia.
- And, there was no evidence of early human migration through the Lakshadweep islands.
- “We found a strong founder effect for both paternal and maternal lineages — a sign that the island population had limited genetic mixing”, said by scientists.

Source: The Hindu

**Q.7)** Which year is designated as the International Year of the Periodic Table of the Chemical Elements?

- a) 2018
- b) 2019
- c) 2020
- d) 2021

**ANS: B**

**Explanation:** The United Nations announced 2019 as the International Year of the Periodic Table of the Chemical Elements to highlight its first publication in 1869.

- The periodic table as we know it today was first designed by the Russian scientist Dmitri Ivanovich Mendeleev.
- This year marks the 150th anniversary of the first publication of the periodic table by Mendeleev.
- Since its creation, the periodic table has been at the centre of a lot of vivid debates and is now considered as “one of the most important and influential achievements in modern science reflecting the essence not only of chemistry, but also of physics, biology and other disciplines.”
- Mendeleev’s genius lies in the acknowledgement that at the time, not all the elements were known yet, so he left gaps in the table for undiscovered elements.
- At that time, only 63 elements had been identified. Still the properties of five other elements (the gaps brilliantly added to complete the table) could already been determined using the table.

Source: NCERT and Indian Express

**Q.8)** Recently Scientists discovered the world’s largest known subterranean fish in a cave in which of the following state?

- a) Andhra Pradesh
- b) Kerala
- c) Meghalaya
- d) Tripura

**ANS: C**

**Explanation:** Scientists have discovered the world’s largest known subterranean fish in a cave in Meghalaya.

- It is nearly five times the mean length (8.5 cm) for all known subterranean fish to date.
- It is closely related to a surface-dwelling fish known as the golden mahseer.
- The cavefish lack pigmentation and their eyes are poorly developed or even non-existent.

Source: The Hindu

**Q.9)** The maximum residue limit (MRL) is sometimes seen in news is related to which of the following?

- a) Pesticides level
- b) Pollution level
- c) Water toxicity
- d) Crude exploration

**ANS: A**

**Explanation:** The traces pesticides leave in treated products or those left by veterinary drugs in animals are called "residues".

- The traces pesticides leave in treated products or those left by veterinary drugs in animals are called "residues".
- A study of fruits and vegetables grown in the Nilgiris has found that some of the produce might be harbouring high levels of pesticide, beyond what is considered advisable. This was mainly true of potato and carrot.

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- While the Food Safety and Standards Authority of India (FSSAI) prescribes a maximum residual level (MRL) for some of the organophosphate pesticides used, it does not prescribe it for some other pesticides used in the cultivation of fruit and vegetables.

Source: NCERT

**Q.10)** The terms “Rani Rashmoni, Rani Abbakka, Rani Avanti Bai, Rani Durgavati and Rani Gaidinliu” often seen in news is related to which of the following?

- a) Deep sea research vessels
- b) Patrolling vessels
- c) Corvettes
- d) Diesel submarines

**ANS: B**

**Explanation:** Rani Rashmoni is a fast patrol vessel, indigenously built by Hindustan Shipyard.

- It is built under the Fast Patrol Vessel (FPV) project of Indian Coast Guard.
- Under the first phase of the project, 5 FPV's has been built.
- The first four such ships are ICGS Rani Abbakka, ICGS Rani Avanti Bai, ICGS Rani Durgavati and ICGS Rani Gaidinliu.

Source: The Hindu



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## Science

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**Q.1)** Which of the following is/are examples of van der Waals materials?

1. Tellurium
2. Native Bismuth
3. Selenium

Select the correct answer using the codes given below:

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

**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.
- Other examples of natural elemental van der Waals materials, although much less abundant than graphite, are native bismuth, antimony, selenium, and tellurium.

Source: The Hindu and Nature publications

**Q.2)** The term "Quadrantids" often seen in news is related to which of the following?

- a) Meteor showers
- b) Asteroid belt
- c) Saturn Satellites
- 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 “Ingenuity of NASA” often seen in news is related to which of the following?

- a) Venus mission
- b) Mars’s mission
- c) Jupiter mission
- d) Moon mission

**ANS: B**

**Explanation:** NASA is hoping to make history early on Monday when the Ingenuity Mars Helicopter attempts the first powered, controlled flight on another planet.

- The space agency had originally planned the flight for April 11 but postponed it over a software issue that was identified during a planned high-speed test of the aircraft's rotors.
- The issue has since been resolved, and the 1.8 kilograms drone could achieve its feat by around 7.30 GMT.

Source: The Hindu

**Q.4)** The “Skai” sometimes seen in news is related to which of the following?

- a) Solar powered flight
- b) Oxygen 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)** Neanderthal Fossil is often seen in news is mostly found in which of the following continent?

- a) North America
- b) South America
- c) Australia
- d) Europe

**ANS: D**

**Explanation:** Neanderthal fossils from a cave in Belgium believed to belong to the last survivors of their species ever discovered in Europe are thousands of years older than once thought, a new study said.

- Previous radiocarbon dating of the remains from the Spy Cave yielded ages as recent as approximately 24,000 years ago, but the new testing pushes the clock back to between 44,200 to 40,600 years ago.



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- The research appeared in the Proceedings of the National Academy of Sciences and was carried out by a team from Belgium, Britain and Germany.

Source: The Hindu

**Q.6)** The term “Dickinsonia” is often seen in news is related to which of the following?

- a) Humanoid (robot) Artist
- b) Earliest known living animal
- c) Artificial Intelligence (AI) based calculator
- d) Space travelling robot

**ANS: B**

**Explanation:** Researchers have discovered three fossils of the earliest known living animal — the 550-million-year-old ‘Dickinsonia’ — on the roof of the Bhimbetka Rock Shelters, about 40 km from Bhopal.

- One can identify the fossils from the white leaf-like patches with a central vertebra (central midrib) and connecting veins.
- While one fossil is 17 inches long, the other two are much smaller.
- The new discoveries, published in a journal, Gondwana Research, can be seen right at the beginning of the ‘Auditorium Cave’, the first of such caves at Bhimbetka, a UNESCO heritage site, located about 3.5 metres above the ground.

Source: The Hindu

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

- a) Philippines
- b) Indonesia
- c) Myanmar
- 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)** Recently, a mars space probe named “Hope” sent pictures of mars planet was launched by which of the following country?

- a) Malaysia
- b) Japan
- c) United Arab Emirates
- d) South Africa

**ANS: C**

**Explanation:** The UAE's "Hope" probe sent back its first image of Mars, the national space agency said on Sunday, days after the spacecraft successfully entered the Red Planet's orbit.

- The picture "captured the largest volcano in the solar system, Olympus Mons, emerging into the early morning sunlight".
- The image was taken from an altitude of 24,700 kilometres (15,300 miles) above the Martian surface on Wednesday, a day after the probe entered Mars' orbit.

Source: The Hindu

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

- a) Russia
- b) Australia
- c) Britain
- 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

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## Science

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**Q.1)** The Joint Enterprise Defense Infrastructure, or JEDI, project was associated with which of the following country?

- a) China
- b) France
- c) USA
- d) Britain

**ANS: C**

**Explanation:** In October 2019, the U.S. Defense Department (DoD) awarded a controversial contract to Microsoft.

- As part of the deal, the Windows-maker would set up large cloud-computing systems for the Pentagon.
- The Joint Enterprise Defense Infrastructure, or JEDI, project was worth about \$10 billion to Microsoft over a decade.
- The deal was a huge setback for another top bidder - - Amazon Inc - - which disputed the award saying that the Pentagon unfairly evaluated its cloud service and Microsoft's proposals.
- It also noted that the former U.S. president Donald Trump's criticism of Amazon and its founder Jeff Bezos had influenced Pentagon's decision.
- Trump had earlier criticised Bezos for coverage of his administration in the Washington Post, which is owned by Bezos.
- The award was fraught with conflict-of-interest allegations and legal challenges for the Pentagon and Microsoft.
- Some Pentagon officials raised concerns over contracting with just one single-source vendor for a military unit.
- In January, the Pentagon said in a statement that "regardless of the JEDI Cloud litigation outcome, the Department [DoD] continues to have an urgent, unmet requirement for enterprise-wide, commercial cloud service."

Source: The Hindu

**Q.2)** Consider the following statements regarding the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES):

1. It is an independent intergovernmental body.
2. It is not a United Nations body.

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 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is an independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.

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- It was established in Panama City, on 21 April 2012 by 94 Governments. It is not a United Nations body.
- However, at the request of the IPBES Plenary and with the authorization of the UNEP Governing Council in 2013, the United Nations Environment Programme (UNEP) provides secretariat services to IPBES.

Source: <https://ipbes.net/about>

**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

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

1. Buruli Ulcer
2. Dengue fever
3. AIDS

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:** 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
- Chromoblastomycosis
- 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
- Yaws

Source: WHO

**Q.6)** The term “Apophis” is often seen in news is related to which of the following?

- a) Asteroid
- b) Invasive species
- c) Micro plastic
- d) Traditional farming method

**ANS: A**

**Explanation:** NASA has given Earth the all clear for the next century from a particularly menacing asteroid.



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- The space agency announced this week that new telescope observations have ruled out any chance of Apophis smacking Earth in 2068.
- That's the same 1,100-foot (340-meter) space rock that was supposed to come frighteningly close in 2029 and again in 2036.
- NASA ruled out any chance of a strike during those two close approaches a while ago. But a potential 2068 collision still loomed.
- First detected in 2004, Apophis is now officially off NASA's asteroid "risk list."

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 can slow down the spread of diseases by eliminating its means of transmission.
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 exists as a crystalline, colorless solid under normal conditions.
2. It is used in the manufacture of dyes and in insect repellants.

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  $C_6H_5COOH$ .

- It consists of a carboxyl group attached to a benzene ring. Therefore, benzoic acid is said to be an aromatic carboxylic acid.

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- 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  $C_6H_5COOH$ .
- 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  $C_6H_5COOH$  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.
- $C_6H_5COOH$  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  $C_6H_5$
- 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.

Source: The Hindu

**Q.10)** The term "Saggitarius \*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.

Source: The Hindu

## Science

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

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

Select the correct answer using the code given below:

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

**ANS: B**

**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

**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 varieties
- d) Zero budget farming

**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 "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, allergens, 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 correct?

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

**ANS: C**

**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.

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- 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: 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) Telangana
- c) Odisha
- 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 efficacies.”
- “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: Agrahari

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## *Science & Technology*

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**Q.1)** The Nuclear Fuel Complex is often seen in news is located at?

- a) Mahendragiri
- b) Bangalore
- c) Hyderabad
- d) Ahmedabad

**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: Agraphari

**Q.2)** “Vitrification technology” is often seen in news is associated with which of the following?

- a) Nuclear Waste
- b) Solar Power generation
- c) Hydro power generation
- d) Plant varieties specification

**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.

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- 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) Acid rain measurement index
- d) Ocean acidification measurement

**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: The Hindu

**Q.4)** “JUICE Mission” is going to launch by which of the following Space Agency?

- a) NASA
- b) ISRO
- c) JAXA
- 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. It is India’s indigenously developed ballistic missile produced under project Devil.
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: B**

**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: The Hindu

**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) Andro – humanoid robot

**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 subsonic missile.
- b) It is the land-variant of India's K-15 missile.
- c) Its operational range is 700 to 1900 km.
- d) It is indigenously developed by DRDO.

**ANS: A**

**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 after Earth Summit.
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

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## Science & Technology

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**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 Helium
- b) Liquid Hydrogen and Liquid Oxygen
- c) Liquid Oxygen and Liquid Helium
- 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)** “Variants of Concern and Variants of interest” is often seen in news is associated with which of the following?

- a) Invasive species
- b) Space objects
- c) Micro plastics
- d) COVID – 19

**ANS: D**

**Explanation:** What began as a pneumonia outbreak in Wuhan, China, in December 2019, has assumed global proportions and claimed countless lives within a span of two years.

- At the outset, the virus spread through droplets of saliva, cough particles or nasal discharge from an infected person.
- Within the passage of a year, December 2020 saw the emergence of changing COVID-19 variants. These changes in variations allow the virus to be more contagious than before.
- The changes in the variants occur when there is a mutation of the genes of the virus. However, these mutations are only natural.
- M.D Robert Bollinger told the Johns Hopkins University’s Medical Organisation, that “All RNA viruses mutate over time. For example, flu viruses change often...”
- MD Stuart Ray told the Hopkins Medical Organisation that “Geographic separation tends to result in genetically distant variants.”

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- In light of such developments, the new mutations are bound to be several and distinct from one another. (New Variants of Coronavirus: What You Should Know | Johns Hopkins Medicine)
- The World Health Organisation has classified each emerging variant as either a Variant of Concern (VOC) or a Variant of Interest (VOI).
- The Alpha, Beta, Gamma and Delta variants fall under Variants of Concern.
- Whereas the Eta, Iota, Kappa and Lambda fall under Variants of Interest.

Source: The Hindu

**Q.3)** “Arackar licanantay” is recently seen in news is related to which of the following?

- a) Moon crest
- b) Volcano on mars
- c) Titanosaur
- d) Polar invasive species

**ANS: C**

**Explanation:** Scientists studying Chile's parched Atacama desert, the world's driest, have discovered the remains of a previously unknown species of dinosaur that millions of years ago lived among lush greenery in what is now a moonscape of rock and sand.

- A team led by Chilean geologist Carlos Arévalo unearthed the remains of Arackar licanantay, which means "Atacama bones" in the Kunza language, 75 kilometers south of the desert city of Copiapó.
- The so-called titanosaur had a small head and long neck and tail, as well as an unusually flat back compared with others like it.
- Recent paleontological studies suggest Arackar lived amid flowering plants, ferns and palm trees during the Cretaceous period 66-80 million years ago.
- Parts of the Atacama today, by contrast, have gone without rain for one hundred years and support little plant or animal life.
- The discovery of a titanosaur on the west side of South America's Andes Mountains is rare, though several species have been found in Argentina and Brazil, further east.
- Arackar also appears smaller in size compared with some other titanosaurs.
- The Argentinosaurus, discovered on the east side of the Andes in neighbouring Argentina, was more than four times as long, scientists say.

Source: The Hindu

**Q.4)** Which of the following is/are mission/missions related to Venus 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: A**

**Explanation:** Mars Missions by NASA:

- Mariner
- Mars Resonance Orbiter
- Phoenix

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- MAVEN
- In-Sights Lander
- Curiosity Rover

Magellan mission is related to Planet Venus.

Source: NASA

**Q.5)** Consider the following statements regarding “Indian Desert”:

1. The Indian Desert lies towards the western margin of Aravali Hills.
2. It is the ninth largest desert in the world.
3. It spreads over the states of Gujarat, Rajasthan, Haryana and Punjab.

Which of the statements given above is/are correct?

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

**ANS: B**

**Explanation:** The Indian Desert lies towards the western margin of Aravali Hills.

- It is also called Thar Desert. It is the ninth largest desert in the world.
- It spreads over the states of Gujarat and Rajasthan. This region has semi-arid and arid weather conditions. It receives less than 150 mm of rainfall per year.
- The vegetation cover is low with thorny bushes. Luni is the main river in this area.
- All other streams appear only at the time of rainfall otherwise they disappear into the sand.

Source: NCERT

**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 correct?

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

**ANS: B**

**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

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**Q.7)** Recently which state police has adopted 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) Kerala
- c) Tamil Nadu
- d) Haryana

**ANS: D**

**Explanation:** Haryana Police has adopted 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 "Green Bonds":

1. The proceeds from green bonds are ear-marked to finance green projects.
2. India's First Green Bond was issued by SEBI in 2015.

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: A**

**Explanation:** Green bonds are debt instruments issued by financial, non-financial or public entities where the proceeds are 'ear-marked' for use towards financing 'green' projects.

- India's First Green Bond was issued by Yes Bank Ltd in 2015.
- In 2016, India became second country (after China) to provide national level guidelines for Green bonds, issued by SEBI.
- According to the 2019-20 Economic Survey, India has the second largest green bond market among emerging economies after China.
- India has issued \$10.2 billion of green bonds in the first half of 2019.
- India's first listed Green Bond on 'India INX' issued by Indian Railway Finance Corporation.

Source: The Hindu

**Q.10)** "Selective Catalytic Reduction" is often seen in news is related to which of the following?

- a) Thermal power stations
- b) Bharat Stage - VI norms
- c) Nuclear power plants
- d) Stubble burning

**ANS: B**

**Explanation:** Diesel Particulate Filter (DPF) and Selective Catalytic Reduction (SCR) are being introduced with the roll-out of BS VI norms, which were not a part of BS IV.

- Real Driving Emission (RDE) will be introduced in India for the first time with the implementation of Bharat Stage VI emission norms.
- It will measure a vehicle's emission in real-time conditions against laboratory conditions.
- Onboard Diagnostics (OD) has been made mandatory for all vehicles which will give the vehicle owner or repair technician access to the status of the various vehicle sub-systems.

Source: MOEFCC

## Space & IT

**Q.1)** “Air Independent Propulsion (AIP) system” is often seen in news is related to which of the following?

- a) Aircraft Carrier
- b) Light Combat Aircraft
- c) Frigates
- d) Submarines

**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 “Vyommित्रa” is recently in news is related to which of the following?

- a) Half-humanoid robot
- b) Satellite radar system
- c) Space education portal
- d) AI driven car

**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.

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- 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 Mercury.
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 PSLV.

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:** 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)** The term "Qubits" is often seen in news is related to which of the following?

- a) Super computers
- b) Meteors
- c) Quantum computers
- d) Asteroids

**ANS: C**

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

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- 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.
- 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  $-273^{\circ}\text{C}$  ( $-459^{\circ}\text{F}$ ) 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 low 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) 1 and 3 only
- d) 1, 2 and 3

**ANS: C**

**Explanation:** Polycrack technology is world's first patented heterogeneous catalytic process which converts multiple feed stocks into hydrocarbon liquid fuels, gas, carbon and water.

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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) Hydrogen based fuel



**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