



Sleepy Classes IAS
Awakening Toppers

Pre-Mix

(Science & Technology)

Compilation

(September to December 2022)

Questions of The Day

1. In which of the following areas can satellite technology be used?

1. Mobile phone operations
2. Banking operations
3. Controlling the power grids
4. Determine chlorophyll content in the vegetation
5. Greenhouse gas emissions from rice paddies
6. Land surface temperatures

Select the correct answer using the code given below:

- A. 1, 2 and 5 only
- B. 2, 3, 5 and 6 only
- C. 1, 2, 3 and 6 only
- D. 1, 2, 3, 4, 5 and 6

2. Consider the following statements with reference to the Gaganyaan Mission of India:

1. The manned spacecraft will be placed in a low earth orbit of 300-400 km above Earth's surface.
2. ISRO will collaborate with Russia for the selection of astronauts.
3. It would make India 4th country to have sent crew to space if successful.

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

3. Consider the following statements with reference to the Indian satellites/Missions:

1. X-ray Polarimeter Satellite (XPoSat) is a planned space observatory to study polarisation of cosmic X-rays.
2. Data Relay Satellite Systems helps in tracking and communicating with other satellites.
3. Trishna mission is being planned for accurate mapping of land surface temperature.

Select the correct answer using the code given below.

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

4. Consider the following International space missions:

Mission	Purpose
1. Tianwen-1	: Investigation of Martian surface
2. DART	: Changing the course of an asteroid
3. Dawn	: Land first female astronaut on moon
4. Artemis	: Characterize the conditions and processes that shaped our solar system.

Which of the pairs given above is/are correct?

- A. 1 and 2 only
- B. 2 and 4 only
- C. 1, 2 and 3 only
- D. 2, 3 and 4 only

5. Consider the following statements regarding the Indian National Space Promotion and Authorization Centre (IN-SPACE):

1. It acts as a single window nodal agency for enabling and regulating space activities and usage of ISRO facilities by private entities.

2. Its decisions are binding on ISRO.
3. It is a statutory body.

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 2 only
- D. 1, 2 and 3

Answers & Explanations

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- D. 1, 2, 3, 4, 5 and 6

Answer: - D

Explanation:

- Option 1, 2 and 3 are areas where GPS technology is used. Global Positioning System (GPS) is a satellite based global navigation system developed by the USA. It provides accurate location and time information anywhere on the Earth.
- Banking operations require precise local and international timing to schedule

money transfers, this is provided by atomic clocks onboard the GPS satellites.

- Cell towers use it to route your phone calls, ATMs and cash registers use it for your transactions, electrical grids use it to send power to your house, and stock exchanges use it to regulate the trades that go into your stock portfolio or investment fund.
- Options 4, 5 and 6 are areas where Remote sensing technology is used. Remote sensing data provides essential information that helps in monitoring various applications such as image fusion, change detection and land cover classification.
- Remote sensing is a key technique used to obtain information related to the earth's resources and environment.
- Cartosat-1 & 2, Resourcesat-1 & 2, Oceansat-1 & 2, Risat-1, Megha-Tropiques, SARAL, Scatsat and INSAT series are some of the Indian Remote Sensing Satellites (IRS).
- With the development of remote sensing from space, satellite data offers the possibility for measuring land surface temperature over the entire globe with sufficiently high temporal resolution and with complete spatially averaged rather than point values.
- It is also possible to measure chlorophyll content in the vegetation of a specific location as chlorophyll will reflect more light in the green and near infrared spectrum compared to other wavelengths.
- Remote sensing from satellites can also deliver information on green house gas(GHGs) soil emissions by estimating tropospheric, near-surface CO₂ and CH₄ concentrations based on the measurement of the intensity of the reflected sunlight in small wavelength bands in the visible and short-wavelength IR portion of the spectrum.

- So, greenhouse gas emissions from rice paddies of a specific location can also be estimated by satellite image/remote sensing data.

2. Consider the following statements with reference to the Gaganyaan Mission of India:

1. The manned spacecraft will be placed in a low earth orbit of 300-400 km above Earth's surface.
2. ISRO will collaborate with Russia for the selection of astronauts.
3. It would make India 4th country to have sent crew to space if successful.

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

Answer: - D

Explanation

- **Statement 1 is correct:** India's first manned space flight 'Gaganyaan' is expected to send three persons into the space for seven days. The spacecraft will be placed in a **Low Earth Orbit (LEO) of 300-400 km** above Earth's surface. ISRO's heavy lift launcher, **GSLV Mk III** will be used as a launch vehicle for the Gaganyaan mission.
- It will consist of a service module and a crew module, collectively known as the Orbital Module.
- **Statement 2 is correct:** Russia will help with the selection of astronauts, while France will help with its expertise in space medicine.
- **Statement 3 is correct:** The mission will make India the fourth nation in the world to launch a Human Spaceflight Mission. The US, Russia and China are the only

three countries to have sent crews to space.

3. Consider the following statements with reference to the Indian satellites/Missions:

1. X-ray Polarimeter Satellite (XPoSat) is a planned space observatory to study polarisation of cosmic X-rays.
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Select the correct answer using the code given below.

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answer: - D

Explanation

- **Statement 1 is correct: X-ray Polarimeter Satellite (XPoSat):** It is a ISRO planned space observatory to study polarisation of cosmic X-rays. It is planned to be launched in the second quarter of 2022. The telescope is being developed by the Indian Space Research Organisation (ISRO) and the Raman Research Institute.
- **Statement 2 is correct:** India plans to ring in its own era of space-to-space tracking and communication of its space assets this year by putting up a new satellite series called the Indian Data Relay Satellite System.
- IDRSS satellites of the 2,000 kg class would be launched on the GSLV launcher to geostationary orbits around 36,000 km away
- The U.S. is putting up its third-generation advanced fleet of TDRS (Tracking & Data

Relay Satellites), Russia has its Satellite Data Relay Network and Europe is building its own European Data Relay System. China is into its second generation Tianlian II series.

- **Statement 3 is correct: Trishna Mission:** It stands for Thermal infrared Imaging Satellite for High-resolution Natural resource Assessment. It is a joint mission of ISRO and CNES, the French space agency.
- It is meant for accurate mapping of land surface temperature. It is scheduled for a 2024 launch.

4. Consider the following International space missions:

Mission	Purpose
1. Tianwen-1	: Investigation of Martian surface
2. DART	: Changing the course of an asteroid
3. Dawn	: Land first female astronaut on moon
4. Artemis	: Characterize the conditions and processes that shaped our solar system.

Which of the pairs given above is/are correct?

- A. 1 and 2 only
- B. 2 and 4 only
- C. 1, 2 and 3 only
- D. 2, 3 and 4 only

Answer: - A

- **Pair 1 is correct:** China's Tianwen-1 aims to study Martian surface and internal structure, search for indications of current and past presence of water, and characterization of the atmosphere of Mars.
- **Pair 2 is correct:** Double Asteroid Redirection Test (DART) is a National Aeronautics and Space Administration (NASA) mission. The main aim of the mission is to test the newly developed

technology that **would allow a spacecraft to crash into an asteroid and change its course.**

- **Pair 3 is incorrect:** Dawn is a NASA mission to the two most massive bodies in the main asteroid belt – Vesta and Ceres between Mars and Jupiter. It aims to characterize the conditions and processes that shaped our solar system.
- **Pair 4 is incorrect:** Artemis I moon mission is a NASA mission to **land the first female astronaut and the first astronaut of colour on the Moon's South Pole** by 2024. With this mission, NASA aims to contribute to scientific discovery and economic benefits and inspire a new generation of explorers.

5. Consider the following statements regarding the Indian National Space Promotion and Authorization Centre (IN-SPACE):

- It acts as a single window nodal agency for enabling and regulating space activities and usage of ISRO facilities by private entities.
- Its decisions are binding on ISRO.
- It is a statutory body.

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. **1 and 2 only**
- D. 1, 2 and 3

Answer: - C

- **Statement 1 and 2 are correct.** The Union Government has created the Indian National Space Promotion and Authorization Centre (IN-SPACE) to provide a level playing field for private companies to use Indian space infrastructure.
- IN-SPACE will hand-hold, promote and guide the private industries in space

activities through encouraging policies and a friendly regulatory environment. It is set up to not only to oversee the space activity of the private sector, but also **to handhold and share ISRO facilities.**

- **It acts as a single window nodal agency for enabling and regulating space activities and usage of ISRO facilities by private entities. The decision of the body is binding on ISRO as well.**
- **Statement 3 is incorrect.** It has been created through executive decision under the Department of Space and it functions autonomously to ISRO.

Additional Information

- IN-SPACe is to be established as a single window nodal agency, with its own cadre, which will permit and oversee the following activities of NGPEs-

- Space activities including building of launch vehicles and satellites and providing space based services as per the definition of space activities.
- Sharing of space infrastructure and premises under the control of ISRO with due considerations to on-going activities.
- Establishment of temporary facilities within premises under ISRO control based on safety norms and feasibility assessment
- Establishment of new space infrastructure and facilities, by NGPEs, in pursuance of space activities based on safety norms and other statutory guidelines and necessary clearances.
- Initiation of launch campaign and launch, based on readiness of launch vehicle and spacecraft systems, ground and user segment.

Questions for Today

1. Consider the following statements regarding Devasthal Optical Telescope:

1. Devasthal Optical Telescope is the largest telescope in India for study of celestial objects at optical wavelengths.
2. It is being maintained and operated by Indian Space Research Organisation (ISRO).
3. The recent study from the telescope observation has shown that atmospheric pressure on surface of Pluto is more than 80,000 times less than Earth.

Which of the statements given above is/are correct?

- A. 1 and 3 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

2. Wright Mons Mountain is associated with which of the following celestial bodies?

- A. Neptune
- B. Venus
- C. Pluto
- D. Uranus

3. Consider the following statements with reference to ExoMars 2022 Mission:

1. It is a three stage mission
2. ESA and NASA are the ExoMars collaborators
3. The primary aim of the mission is to check if there has ever been life on Mars

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. 3 only
- D. 1 and 2 only

4. Consider the following pairs of missions sent on Venus and the associated countries:

Missions	Countries
1. Mariner	Russia
2. Venera	US
3. Akatsuki	Japan

Select the correct code:

- A. 1 and 2 only
- B. 3 only
- C. 1 and 3 only
- D. 2 only

5. Which of the following is/are the advantages of 'Satellite Internet'?

1. Global coverage at any location on earth
2. Low latency
3. Compatible with Virtual Private Network
4. Instant Installation and Deployment
5. Reliability

Select the correct answer using the codes given below:

- A. 1, 2, 3 and 4 only
- B. 1, 4 and 5 only
- C. 1, 2 and 5 only
- D. 1, 2, 3, 4 and 5

Answers with Explanations

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2. It is being maintained and operated by Indian Space Research Organisation (ISRO).
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Which of the statements given above is/are correct?

- A. 1 and 3 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. 1, 2 and 3

Answer : A

Explanation

- **Statement 1 is correct:** The 3.6m **Devasthal Optical Telescope** is a custom-built instrument of great complexity. This telescope has the **distinction of being largest telescope in India for study of celestial objects at optical wavelengths.**
- It is a national facility installed at Devasthal in the district of Nainital, India.
- **Statement 2 is incorrect:** It was commissioned in the year 2016 and is being maintained and operated by Aryabhata Research Institute of Observational Sciences (ARIES).
- **Statement 3 is correct:** According to a study based on observation from Devasthal Optical Telescope, Pluto's

atmospheric pressure on its surface is 80,000 times less than that on Earth.

- The observing time on 3.6m Devasthal Optical Telescope is apportioned as follows: 60% open time on competitive basis to any astronomer working in an Indian Institution; 33% guaranteed time for astronomers from ARIES and 7% guaranteed time for Belgian astronomers subject to the scientific merit of the proposals. About 10% of the available science time, will be reserved as Director's Discretionary Time for allocation by the Director, ARIES.

Additional Information

- According to a study based on observation from Devasthal Optical Telescope, it has been confirmed that the Pluto suffers intense seasonal episodes because of large depression on Pluto, known as Sputnik Planitia. Pluto's poles remain, for decades, in permanent sunlight or darkness over its 248-year long orbital period leading to strong effects on its Nitrogen (N_2) atmosphere that is mainly controlled by vapour pressure equilibrium with the surface N_2 ice. Moreover, as Pluto is now moving away from the Galactic plane as seen from Earth, stellar occultations by the dwarf planet are becoming increasingly rare, making this event a decisive one.

Reference link

- <https://dst.gov.in/atmospheric-pressure-surface-pluto-more-80000-times-less-earth-study-based-observation-devasthal#:~:text=It%20was%20found%20to%20be,the%20seasonal%20peak%20of%20Pluto.>

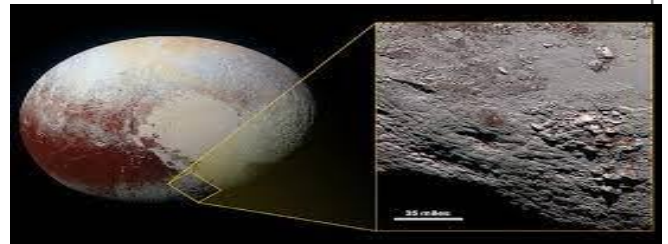
2. Wright Mons Mountain is associated with which of the following celestial bodies?

- A. Neptune
- B. Venus
- C. **Pluto**
- D. Uranus

What is Wright Mons?

- A mountainous feature named Wright Mons was found on Pluto, which rises 4-5km above its surroundings. It is about 150km across its base and has a **central depression** (a hole) 40-50km wide, with a floor at least as low as the surrounding terrain.
- Wright Mons, was informally named by the New Horizons team in honour of **the Wright brothers**.
- Scientists claim that Wright Mons is a volcano, and **cite the lack of impact craters** as evidence that it is not likely to be older than 1-2 billion years. An **impact crater** is formed when an object like an asteroid or meteorite crashes into the surface of a larger solid object like a planet or a moon.
- Its volume exceeds 20 thousand cubic kilometres. Although considerably less than the volume of Mars's biggest volcanoes, this is **similar to the total volume of Hawaii's Mauna Loa**, and much greater than the volume of its above sea-level portion.
- The slopes of Wright Mons and much of its surroundings are seen to be crowded with **hummocks** up to 1km high and mostly 6-12km across.
- Scientists conclude that these hummocks are **made primarily of water-ice, rather than nitrogen- or methane-ice** that covers some other young regions on Pluto. They argue that this is consistent with the material strength necessary to form and preserve these domes, but they do recognise small patches of much weaker nitrogen-ice, mainly in the central depression.

- The hummocks were likely created by some sort of ice volcanism, known by the technical term "**cryovolcanism**" - erupting icy water rather than molten rock.
- Pluto's bulk density shows that it must have rock in its interior, but its outer regions are a mixture of ices (water, methane, nitrogen and probably ammonia and carbon monoxide, too, all of which are less than a third as dense as rock) in the same way that the crust of the Earth and other rocky planets is a mixture of several silicate minerals.
- Many other areas of Pluto have been around long enough to accumulate large numbers of impact craters - no recent icy lava flows have covered them.



3. Consider the following statements with reference to ExoMars 2022 Mission:

1. It is a three stage mission
2. ESA and NASA are the ExoMars collaborators
3. The primary aim of the mission is to check if there has ever been life on Mars

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. **3 only**
- D. 1 and 2 only

Explanation

Statement 1 is incorrect: It is a two-stage mission:

- **First Part:** Its first mission launched atop a Proton-M rocket in 2016 and consisted of the European Trace Gas Orbiter and test lander called Schiaparelli. The orbiter was successful while the test lander failed during its descent to Mars.
- **Second Part:** It comprises a rover and surface platform: This second part of the mission was originally planned for July 2020. But it was postponed until this September 2022 due to technical issues.
- **Statement 2 is incorrect:** ESA and National Aeronautics and Space Administration (NASA) were the original ExoMars collaborators, but NASA dropped out in 2012 due to budgeting problems. Russia took NASA's place in the project in 2013.
- **Statement 3 is correct:** The primary aim of the mission is to check if there has ever been life on Mars and also understand the history of water on the planet. The European rover will drill to the sub-surface of Mars to collect samples from about 2 m of depth. The main goal is to land ESA's rover at a site which has high-potential for finding well-preserved organic material, particularly from the history of the planet.

4. Consider the following pairs of missions sent on Venus and the associated countries:

Missions	Countries
1. Mariner	Russia
2. Venera	US
3. Akatsuki	Japan

Select the correct code:

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- B. **3 only**
- C. 1 and 3 only
- D. 2 only

Answer : B

Explanation

- US- Mariner series 1962-1974, Pioneer Venus 1 and Pioneer Venus 2 in 1978, Magellan in 1989.
- Russia- Venera series of space crafts 1967-1983, Vegas 1 and 2 in 1985.
- Japan- Akatsuki in 2015
- Europe- Venus Express in 2005.

5. Which of the following is/are the advantages of 'Satellite Internet'?

- Global coverage at any location on earth
- Low latency
- Compatible with Virtual Private Network
- Instant Installation and Deployment
- Reliability

Select the correct answer using the codes given below:

- A. 1, 2, 3 and 4 only
- B. 1, 4 and 5 only
- C. 1, 2 and 5 only
- D. 1, 2, 3, 4 and 5

Explanation

- Jio Platforms has launched a joint venture (JV) with European satellite-based broadband service company SES to enter the satellite internet space.
- **Satellite Internet** is the technology that beams the internet down from a satellite that's orbiting the earth. Jio, Bharti Airtel OneWeb and Starlink want to send thousands of these satellites to orbit.

- Jio will use geostationary (GEO) and medium earth orbit (MEO) satellites, while Starlink and OneWeb use low earth orbit (LEO) satellites.

Advantages of Satellite internet:

- **Option 1 is correct. Global Coverage:** Satellite links give coverage at any location on earth. A single satellite in the geostationary orbit can cover distances as large as whole oceans or continents. This wide area coverage makes internet access quick and easy despite all kinds of geographical obstacles.
- **Option 4 is correct. Instant Installation and Deployment:** The satellite antennas can be instantly deployed and installed within a matter of a few hours. For mobile and transportable solutions, you can set-up and connect to the Internet in less than 10 minutes which makes it instant.
- **Option 5 is correct . Reliability:** Compared to terrestrial network services like cable or DSL, there is much less opportunity for network outages. With terrestrial services, network outages can occur at any point along the infrastructure whereas a complete satellite network can work independently of terrestrial infrastructure and maintain connectivity as long as the equipment is powered.

Disadvantages of Satellite internet:

- **Option 2 is incorrect.** Latency is the amount of time it takes information from your computer to reach its destination. In the case of satellite internet, to send data to space, to Internet Service Provider and back again which causes it to have high latency or a high ping rate.
- **Option 3 is incorrect.** Virtual Private Network are not compatible with

satellite internet. VPNs demand high bandwidth for both uploads and downloads; they require low latency, high bandwidth setup which is the complete opposite of what we get with satellite internet.



Sleepy Classes
Awakening Toppers

Pre-Mix

(Science & Technology)

01st October, 2022

Questions for Today

1. Consider the following pairs:

<i>Vitamin</i>		<i>Deficiency disease</i>
1. Vitamin C	:	Scurvy
2. Vitamin D	:	Rickets
3. Vitamin E	:	Night blindness

Which of the pairs given above is/ are correctly matched?

- A. 1 and 2 only
- B. 3 only
- C. 1, 2 and 3
- D. None

2. Which of the following is/are found in animal cells?

- 1. Cell Wall
- 2. Cilium
- 3. Ribosomes

Select the correct answer using the code given below:

- A. 1 and 2 only
- B. 3 only
- C. 2 and 3 only
- D. 1, 2 and 3

3. H1N1 virus is sometimes mentioned in the news with reference to which one of the following diseases?

- A. AIDS
- B. Bird flu
- C. Dengue
- D. Swine flu

4. Which of the following pairs are correctly matched?

Microorganisms	Applications
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1. Rhizobium	Bio fertilizer
2. Lactobacillus	Increase human longevity
3. Yeasts	Biofuel industry

Select the correct answer using the code given below:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

5. Consider the following pairs:

Commonly used/consumed materials	Unwanted or controversial chemicals likely to produce found in them
1. Lipstick	Lead
2. Soft Drinks	Brominated vegetable oils
3. Chinese fast food	Monosodium glutamate

Which of the pairs given above is/are correctly matched?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answers with Explanations

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1. Consider the following pairs:

<i>Vitamin</i>		<i>Deficiency disease</i>
1. Vitamin C	:	Scurvy

2. Vitamin D : Rickets
3. Vitamin E : Night blindness

Which of the pairs given above is/ are correctly matched?

- A. 1 and 2 only
B. 3 only
C. 1, 2 and 3
D. None

Ans : A

Explanation

- Vitamins are substances that our bodies need to develop and function normally like vitamins A, C, D, E, and K, choline, and vitamin B. They are generally regarded as **organic compounds** required in the diet in **small amounts** to perform **specific biological functions** for normal maintenance of optimum growth and health of the organism.
- They shore up bones, heal wounds, and bolster your immune system. They convert food into energy and repair cellular damage.
- Night blindness is caused by Vitamin A deficiency.
- Vitamin E deficiency can cause nerve and muscle damage, vision problems

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

and a weakened immune system.

Vitamin	Chemical Name	Deficiency Diseases
Fat soluble Vitamins		
A	Retinol, Retinal, Retinoic acid	Night-blindness and keratomalacia
D	Ergocalciferol (D ₂), Cholecalciferol (D ₃)	Rickets and Osteomalacia
E	Tocopherol	Mild hemolytic anemia in newborn infants
K	Phylloquinone (K ₁), Menaquinones (K ₂)	Bleeding diathesis
Water soluble vitamins		
B ₁	Thiamine	Beriberi
B ₂	Riboflavin	Ariboflavinosis
B ₃	Niacin, Niacinamide	Pellagra
B ₅	Pantothenic acid	Paresthesia
B ₆	Pyridoxine, Pyridoxamine, Pyridoxal	Anemia peripheral neuropathy
B ₇	Biotin	Dermatitis
B ₉	Folic acid, Folinic acid	Neural tube defects
B ₁₂	Cyanocobalamin	Megaloblastic anemia
C	Ascorbic acid	Scurvy

2. Which of the following is/are found in animal cells?

1. Cell Wall
2. Cilium
3. Ribosomes

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B. 3 only
C. 2 and 3 only
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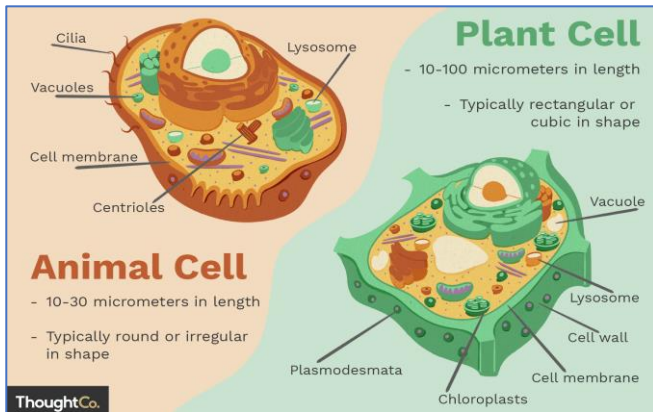
Ans : C

Explanation

- Plant cells have a cell wall**, as well as a cell membrane. In plants, the cell wall surrounds the cell membrane. This gives the plant cell its unique rectangular shape. **Animal cells simply have a cell membrane, but no cell wall.**

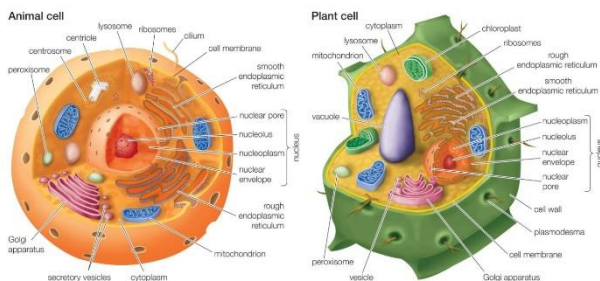
Ribosomes are present in both plant and animal cells.

Cilium is present only in animal cells.



Additional Information

- Both animal and plant cells have mitochondria, but only plant cells have chloroplasts. Plants don't get their sugar from eating food, so they need to make sugar from sunlight. This process (photosynthesis) takes place in the chloroplast. Once the sugar is made, it is then broken down by the mitochondria to make energy for the cell. Because animals get sugar



from the food they eat, they do not need chloroplasts: just mitochondria.

- Both plant and animal cells have vacuoles. A plant cell contains a large, singular vacuole that is used for storage and maintaining the shape of the cell. In contrast, animal cells have many, smaller vacuoles.
- Plant cells have a cell wall, as well as a cell membrane. In plants, the cell wall surrounds the cell membrane. This gives the plant cell its unique

rectangular shape. Animal cells simply have a cell membrane, but no cell wall.

3. H1N1 virus is sometimes mentioned in the news with reference to which one of the following diseases?

- AIDS
- Bird flu
- Dengue
- Swine flu

Ans : D

Explanation

- H1N1 is a type of **Influenza A virus**. In June 2009, the World Health Organization (WHO) declared the new strain of swine origin H1N1 as pandemic. This strain is often called as Swine flu.
- It is called as Swine flu because in the past, the people who caught it had direct contact with pigs.
- Acquired immunodeficiency syndrome (AIDS) is caused by the human immunodeficiency virus (HIV).
- HIV is transmitted through unsafe sexual acts if the other person is also infected with the virus. Some of the infectious agents, such as HIV, hepatitis B, and syphilis, can also be passed on from an infected mother to a newborn baby and can also be transmitted via blood transfusions.
- HIV infection may also be transmitted through contaminated blood products, syringes, and needles used for injection, etc.
- Zika, dengue, chikungunya, and yellow fever are all mosquito-borne diseases transmitted to humans by the *Aedes aegypti* mosquito.
- Bird flu is caused by a viral strain H5N1.

<https://indianexpress.com/article/explained/10-years-of-h1n1-influenza-outbreaks-in-india-infection-trends-in-the-states-5945927/>

4. Which of the following pairs are correctly matched?

Microorganisms	Applications
1. Rhizobium	Bio fertilizer
2. Lactobacillus	Increase human longevity
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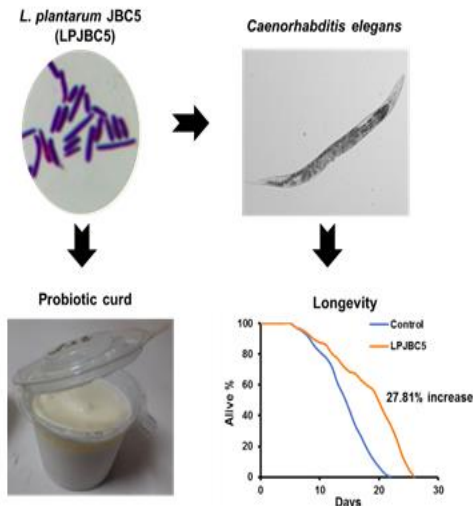
Ans : D

Explanation

- Microorganisms are classified into four major groups. These groups are bacteria, fungi, protozoa and some algae.
- **Pair 1 is correct:** Rhizobia are of enormous agricultural and economic values because they provide the major source of nitrogen input in agricultural soils. The application of rhizobia as biofertilizer ensures success in crop productivity and reduces the need for artificial fertilizers that are expensive and cause environmental problems.

Pair 2 is correct:

- Next-generation probiotic bacterium *Lactobacillus Plantarum* JBC5 identified by Indian scientists.
- Scientists searched for healthy bacteria to promote healthy living in fermented dairy products following proposal of Nobel laureate Dr. Elie Metchnikoff.
- Yogurt developed using the probiotic bacterium can promote healthy aging in elderly population & improve longevity.
- **Curd contains several microorganisms.** Of these, the bacterium, *Lactobacillus* promotes the formation of curd. It multiplies in milk and converts it into curd. Bacteria are also involved in the making of cheese, pickles and many other food items. An important ingredient of rava (sooji) idlis and bhaturas is curd.
- **Pair 3 is correct: Yeasts have a wide range of applications mainly in food industry (wine making, brewing, distilled spirits production, and baking) and in biomass production (single-cell protein [SCP]).** More recently, yeast has also been used in the biofuel industry and for the production of heterologous compounds
- Microorganisms are used for the large scale production of alcohol, wine and acetic acid (vinegar). Yeast is used for commercial production of alcohol and wine. For this purpose yeast is grown on natural sugars present in grains like barley, wheat, rice, crushed fruit juices, etc.



5. Consider the following pairs:

Commonly used/consumed materials	Unwanted or controversial chemicals likely to produce found in them
1. Lipstick	Lead
2. Soft Drinks	Brominated vegetable oils
3. Chinese fast food	Monosodium glutamate

Which of the pairs given above is/are correctly matched?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answer : D

Explanation

- **Pair 1 is correctly matched.** Lead is a common impurity found in cosmetic lip products, such as lipsticks, and other cosmetics, such as eye shadows, blushes, compact powders, shampoos, and body lotions.

- **Pair 2 is correctly matched.** Brominated vegetable oil is a food additive sometimes used to keep citrus flavouring from separating out in some sodas and soft drinks. It's banned as a food additive in Europe and Japan.
- **Pair 3 is correctly matched.** MSG, is a glutamate, or salt of glutamic acid, a "non-essential" amino acid. It is a neurotransmitter - transporting messages from one nerve cell to another. Because it is said to enhance flavours, some scientists believe it "excites nerve endings" and exhibits "neuro-excitatory properties", that is the ability to stimulate neurons. It is commonly used in Chinese fast food.



Sleepy Classes IAS
Awakening Toppers

Pre-Mix

(Science & Technology)

8th October 2022

Questions

1. Which of the following telescopes were used by Indian astronomers from the Aryabhata Research Institute of Observational Sciences (ARIES) while determining the reasons behind intense star formation in some dwarf galaxies:

1. Devasthal Fast Optical Telescope (DFOT)
2. Giant Metrewave Radio Telescope (GMRT)
3. James Webb Telescope
4. Himalayan Chandra Telescope (HCT)

Which of the options given above is/are correct?

- A. 1, 3 and 4 only
- B. 2 and 4 only
- C. 1 and 2 only
- D. 1, 2, 3 and 4

2. In which of the following areas the microgravity research would be done under Gaganyaan Mission

1. Space medicine & Bio-astronautics.
2. Human-machine interface studies.
3. In-situ manufacturing for space.

Which of the options given above is/are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 only
- D. 1, 2 and 3

3. Consider the following statements with reference to the Geotail:

1. The region exists as a result of the interactions between the Sun and Earth.
2. The region enables better conditions for Chandrayaan 2 to observe Moon scientifically.

Select the correct code:

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

4. Consider the following statements with reference to the AzadiSAT:

1. AzadiSAT was developed by Space Kidz India.
2. Small Satellite Launch Vehicle (SSLV) was used to launch AzadiSAT.
3. It is the success of ISRO's push for Science, Technology, Engineering, and Mathematics (STEM) amongst school girls of India.

Which of the statements given above is/are correctly matched?

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 only
- D. 1, 2 and 3

5. Which of the following are the beneficial uses of bacteria?

1. Fermentation of rice idlis
2. Production of antibiotics

3. Increasing soil fertility
4. Vaccine development

Select the correct answer using the code given below.

- A. 1 and 3 only
- B. 2, 3 and 4 only
- C. 2 and 4 only
- D. 1, 2, 3 and 4

Answers with Explanations

Click [here](#) to watch the following topics on YouTube

1. Which of the following telescopes were used by Indian astronomers from the Aryabhata Research Institute of Observational Sciences (ARIES) while determining the reasons behind intense star formation in some dwarf galaxies:

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Which of the options given above is/are correct?

- A. 1, 3 and 4 only
- B. 2 and 4 only
- C. 1 and 2 only
- D. 1, 2, 3 and 4

Answer: - C

Explanation:

- Recently, astronomers from the **Aryabhata Research Institute of Observational Sciences (ARIES)** have found out the **reasons behind intense star formation in some dwarf galaxies**.
- ARIES is an autonomous institute of Department of Science & Technology (DST).
- Amidst the billions of galaxies in the universe, a large number are tiny ones - 100

times less massive than the Milky-way galaxy. Most of these are called **dwarf galaxies and form stars at a much slower rate** than the massive ones.

- **Dwarf galaxies** are the most abundant type of galaxy in the universe but are difficult to detect due to their **low luminosity, low mass and small size**.
- **However**, some dwarf galaxies have been **seen forming new stars at a mass-normalized rate** i.e. 10-100 times more than that of the Milky-way galaxy.
- The star-formation activities do not last longer than a few tens of million-years, a period which is much shorter than the age of these galaxies - typically a few billion years.
- **Reasons Found Out by the Aries Astronomers:**

•Disturbed Hydrogen Distribution:

- Star formation at a high rate requires very high density of Hydrogen in the galaxies. Multiple nuclei and high concentration of ionized hydrogen have been found in the central region of such galaxies.
- Hydrogen in these dwarf galaxies is found to be irregular and sometimes not moving in well-defined orbits i.e. non-symmetric distribution of hydrogen.

•Galaxy-Galaxy Collision:

- Some Hydrogen around these galaxies is also detected in forms of isolated clouds, plumes, and tails as if some other galaxy recently has collided or brushed away with these galaxies, and gas is scattered as debris around the galaxies.

Telescopes Used for the Study:

Scientists used the 1.3-meter Devasthal Fast Optical Telescope (DFOT) near Nainital (Uttarakhand) and the Giant Metrewave Radio Telescope (GMRT) in Maharashtra.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1648135>

2. In which of the following areas the microgravity research would be done under Gaganyaan Mission:

1. Space medicine.
2. Human-machine interface studies.
3. In-situ manufacturing for space.

Which of the options given above is/are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 only
- D. 1, 2 and 3

Answer: - D

Explanation

- Gaganyaan is the first project taken up by ISRO for demonstrating the human space flight capability.
- The Gaganyaan programme envisages undertaking the demonstration of human spaceflight to LEO (Low Earth Orbit) with a crew of three astronauts to 400 km LEO.
- This task necessitates three major components, namely Human Rated Launch Vehicle, Crew Escape System and Orbital Module with human presence.
- Apart from this the Ground Control station is planned for the entire mission duration during ascent, on-orbit and descant phase of the mission. As per the mandate of Gaganyaan, two unmanned missions will be undertaken prior to the manned mission.
- The main objective of Gaganyaan Programme is to achieve autonomy in access to space providing both tangible and intangible benefits to the development of the national with maximal industry/academia participation and collaboration.
- Scientific experiments to advance the knowledge of the solar system are planned to be conducted. This project will also

accelerate the scientific & technological development in the country to foster intellectual capa

- One of the important objectives of Gaganyaan, is to enhance the capability of cutting edge scientific research in the country through human in loop micro-gravity experiments. The Announcement of Opportunities have already been floated for first two unmanned Gaganyaan flights micro gravity experiments for each flight are already shortlisted.
- **Some of the areas for microgravity research includes:**
 - Space medicine & Bio-astronautics,
 - Advanced life support system,
 - Human-machine interface (HMI) and human factor (HF) studies,
 - Habitability and environment studies,
 - Diet and nutrition,
 - Human adaptation and rehabilitative studies,
 - Physiological and psychological studies,
 - Space hazards to life studies,
 - In-situ manufacturing & resource utilisation for space,
 - Advanced Materials,
 - Energy harness and storage etc.

3. Consider the following statements with reference to the Geotail:

1. The region exists as a result of the interactions between the Sun and Earth.
2. The region enables better conditions for Chandrayaan 2 to observe Moon scientifically.

Select the correct code:

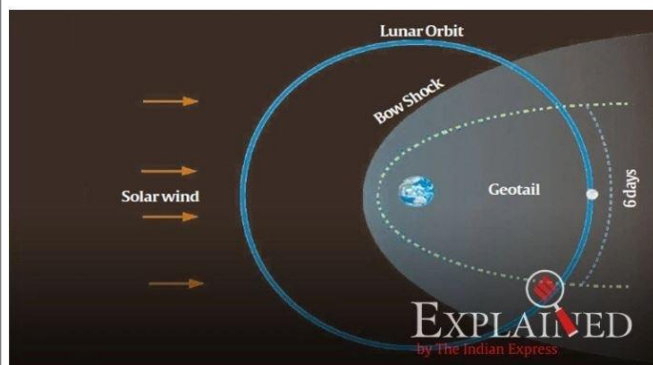
- A. 1 only

- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

Answer: - C

Explanation:

- **Geotail** is a region around the earth **that exists as a result of the interactions between the Sun and Earth.**
- The Sun emits the solar wind, which is a continuous stream of charged particles. These particles are embedded in the extended magnetic field of the Sun. Since the Earth has a magnetic field, it obstructs the solar wind plasma. This interaction results in the formation of a magnetic envelope around Earth.
- On the Earth side facing the Sun, the envelope is compressed into a region that is approximately three to four times the Earth's radius.
- On the opposite side, the envelope is stretched into a long tail, which extends beyond the orbit of the Moon called the **Geotail**.



- Once every 29 days, the Moon traverses the Geotail for about six days.
- The geotail region is comparatively free of Solar charged particles and hence allows better observation conditions to observe the moon when it is in the geotail region. The geotail is a region in space that allows the best observations.

4. Consider the following statements with reference to the AzadiSAT:

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3. It is the success of ISRO's push for Science, Technology, Engineering, and Mathematics (STEM) amongst school girls of India.

Which of the statements given above is/are correctly matched?

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 only
- D. 1, 2 and 3

Answer: - D

Explanation

- Indian Space Research Organisation (ISRO) is set to launch its smallest commercial rocket 'Small Satellite Launch Vehicle (SSLV)' carrying 'AzaadiSAT'. It will be launched to unfurl the Tricolour in space, from Satish Dhawan Space Centre in Sriharikota.
- It will encourage scientific temper and create opportunities for young girls to opt for 'space research' as their career.

About AzaadiSAT:

- AzaadiSAT comprises of 75 payloads.
- These payloads have been built by 750 young girl students from 75 rural government schools of India. [under the guidance of SpaceKidz India]
- It is the result of ISRO pushing for girls to go for "Science, Technology, Engineering, and Mathematics (STEM)".
- It is an 8-kilogram CubeSat. Each of the 75 payloads are weighing about 50 grams.
- AzadiSAT also comprise of a solid-state PIN diode-based radiation counter, that will measure the ionising radiation in its orbit, as well as a long-range transponder.

- ISRO will use ground system developed by Space Kidz India, to establish telemetry and communication with AzadiSAT in orbit.
- Space Kidz India is an organization creating 'young scientists for the country and spreading awareness among children for a borderless world.'

5. Which of the following are the beneficial uses of bacteria?

1. Fermentation of rice idlis
2. Production of antibiotics
3. Increasing soil fertility
4. Vaccine development

Select the correct answer using the code given below.

- A. 1 and 3 only
- B. 2, 3 and 4 only
- C. 2 and 4 only
- D. 1, 2, 3 and 4

Answer: - D

Explanation

Option 1 is correct.

- Bacteria and yeast are helpful for fermentation of rice idlis and dosa batter.
- Sugar is converted into alcohol by yeast. This process of conversion of sugar into alcohol is known as fermentation. Louis Pasteur discovered fermentation in 1857.
- The dough, which is used for making foods such as dosa and idli is fermented by bacteria. The puffed-up appearance of dough is due to the production of CO₂ gas which is released by the microbes.
- Similarly the dough, which is used for making bread, is fermented using baker's yeast (*Saccharomyces cerevisiae*).

Option 2 is correct.

Many medicines are sourced from microorganisms such as bacteria and fungi.

- Such medicines called, antibiotics, kill or stop the growth of the disease-causing microorganisms.
- These days a number of antibiotics are being produced from bacteria and fungi. Streptomycin, tetracycline and erythromycin are some of the commonly known antibiotics which are made from fungi and bacteria.
- The antibiotics are manufactured by growing specific microorganisms and are used to cure a variety of diseases.

Option 3 is correct.

- **Bacteria act as biofertilizer, thus, they can be used for increasing the fertility of soils** as some bacteria are able to fix nitrogen from the atmosphere to enrich soil with nitrogen and increase its fertility. These microbes are commonly called biological nitrogen fixers.

Option 4 is correct.

- Several vaccines have been developed from either killed or attenuated (living but multiplying at low rates) bacteria. For example, tuberculosis vaccine, whooping cough vaccine, plague vaccine, DTP (Diphtheria, Tetanus, Pertussis) vaccine, pneumonia vaccine are all prepared with the help of bacteria.

Other benefits of micro-organisms -

1. **Formation of curd** - Curd contains several microorganisms. Of these, the bacterium, *Lactobacillus* promotes the formation of curd. It multiplies in milk and converts it into curd. Bacteria are also involved in the making of cheese, pickles and many other food items.
2. **The microorganisms like aerobic and anaerobic bacteria are used in sewage treatment plants.** They breakdown the

organic matter, thereby reducing the organic content of the sewage along with the Biological Oxygen Demand of the treated sewage water. The treated sewage water then becomes fit to be released to the natural water bodies.

3. **Cleaning of environment** - In nature, microorganisms decompose dead organic waste of plants and animals converting them into simple substances. These substances are again used by other plants and animals. Thus, microorganisms can be used to degrade the harmful and smelly substances and thereby clean up the environment.
-



Sleepy Classes
Awakening Toppers

Pre-Mix

(Science & Technology)

15th October, 2022

Questions for Today

1. Consider the following statements regarding Plant based meats:

1. It refers to meat grown in a lab from a small sample of cells taken from herbivore animals.
2. Plant-based meats usually have lower amounts of total saturated fat than traditional animal-based meat

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. None of the above

2. At present, scientists can determine the arrangement or relative positions of genes or DNA sequences on a chromosome. How does this knowledge benefit us?

1. It is possible to know the pedigree of livestock.
2. It is possible to understand the causes of all human diseases.
3. It is possible to develop disease-resistant animal breeds.

Which of the statements given above is/are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 and 3 only
- D. 1, 2 and 3

3. Consider the following statements in context to Stem cells:

- 1) Stem cells are special human cells that have the capability to develop into wide-ranging types of cells in the human body
- 2) Adult stem cells can transform into all kinds of cells in the human body

- 3) Stem-cell transplant can help to cure HIV

Select the correct answer code:

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

4. Recently various terms like 'Merge', 'Surge', 'Purge' seen in news, related to :

- A. Banking sector
- B. Blockchain technology
- C. 5 G technology
- D. Nanotechnology

5. Recombinant DNA technology (Genetic Engineering) allows genes to be transferred

1. across different species of plants
2. from animals to plants
3. from microorganisms to higher organisms

Select the correct answer using the codes given below.

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answers with Explanations

Click [here](#) to watch the following topics on YouTube

1. Consider the following statements regarding Plant based meats:

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2. Plant-based meats usually have lower amounts of total saturated fat than traditional animal-based meat

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. None of the above

Answer : B

Explanation

Plant based Meat

Recently Agricultural and Processed Food Products Export Authority (APEDA) has facilitated the **export of the first consignment of plant-based meat products under the Vegan food category** from Gujarat to the United States of America (USA).

What Is Plant-Based Meat?

- Plant-based meat is pretty straightforward: it is **meat made out of plants**.
- Plant-based meats come in many different textures and flavors, all **without animals being slaughtered** to produce them. Some of them are created to **feel and taste like animal-based meat** so that they provide a realistic substitute, while other brands don't try to precisely mimic animal flesh.

What Is Plant-Based Meat Made Of?

- Each plant-based meat product is made differently. Many contain **legumes, grains, and vegetable protein**. The most common ingredients are **peas, soybeans, lentils, quinoa, potato starch, mung beans, mushrooms, coconut oil, and seitan**, though these are just a few of the many possibilities.

Plant-Based Meat Versus Meat from Animals

- **Plant-based** meats usually have **lower amounts of total saturated fat** than animal-based meat, and **zero**

cholesterol, both of which increase your risk of chronic diseases, including type 2 diabetes. In addition, processed **animal-based meat** can also **increase the risk** of stomach and bowel cancers.

- **Plant-based meats contain fiber**, which animal meats do not, **reducing the risk of developing breast, colon, and other digestive-related cancers** while boasting comparable amounts of protein and calories.

What is the difference between Plant-based and cultured meat?

- Plant-based meats are made of plant-derived ingredients but are designed to **look and taste like real meat**.
- **Cultured meat**, on the other hand, is a fairly new concept that refers to meat grown in a lab from a **small sample of cells taken from an animal**.
- The procedure requires the extraction of stem cells from a donor animal, which then proliferate to produce animal tissue structures.

2. At present, scientists can determine the arrangement or relative positions of genes or DNA sequences on a chromosome. How does this knowledge benefit us?

1. It is possible to know the pedigree of livestock.
2. It is possible to understand the causes of all human diseases.
3. It is possible to develop disease-resistant animal breeds.

Which of the statements given above is/are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answer : C

Explanation

- DNA sequencing is a laboratory technique used to determine the exact sequence of bases (A, C, G, and T) in a DNA molecule. The DNA base sequence carries the information a cell needs to assemble protein and RNA molecules. DNA sequence information is important to scientists investigating the functions of genes. The technology of DNA sequencing was made faster and less expensive as a part of the Human Genome Project.
- DNA sequencing is an important tool for determining the thousands of nucleotide variations associated with specific genetic diseases.
- Individual genetic profiling is already being used routinely to prescribe therapies for patients with HIV, breast cancer, lymphoblastic leukemia and colon cancer and in the future will be used to tailor treatments for cardiovascular disease, cancer, asthma, Alzheimer's disease and depression.
- DNA sequencing also underpins pharmacogenomics
 - This is a relatively new field that is leading the way to more personalized medicine.
 - Pharmacogenomics looks at how a person's individual genome variations affect their response to a drug.
- It is not yet possible to understand the causes of all human diseases.

Beyond medicine, DNA sequencing is now used for-

- Genetic testing for paternity and other family relationships.
- It also helps identify crime suspects and victims involved in catastrophes

- The technique is also vital to detecting bacteria and other organisms that may pollute the air, water, soil and food.
- In addition, the method is important to the study of the evolution of different population groups and their migratory patterns as well as determining pedigree for seed or livestock. Hence, statement 1 is correct
- It is possible to develop disease-resistant animal breeds.

3. Consider the following statements in context to Stem cells:

- 1) Stem cells are special human cells that have the capability to develop into wide-ranging types of cells in the human body
- 2) Adult stem cells can transform into all kinds of cells in the human body
- 3) Stem-cell transplant can help to cure HIV

Select the correct answer code:

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

Answer : C

Explanation

THE HINDU

First woman reported cured of HIV after stem cell transplant

REUTERS
CHICAGO

A U.S. patient with leukemia has become the first woman and the third person to date to be cured of HIV after receiving a stem cell transplant from a donor who was naturally resistant to the virus that causes AIDS.

The case of a middle-aged woman of mixed race, presented at the Conference on Retroviruses and Opportunistic Infections in Denver, is also the first involving umbilical cord blood.

Since receiving the cord blood to treat her acute myeloid leukemia - a cancer that starts in blood-forming cells in the bone marrow - the woman has been in remission and free of the virus for 14 months.

"This is now the third report of a cure in this setting, and the first in a woman living with HIV," Sharon Lewin, President-Elect of the International AIDS Society, said.

The case is part of a larger U.S.-backed study led by Dr. Yvonne Bryson of the University of California Los Angeles (UCLA), and Dr. Deborah Persaud of Johns Hopkins University in Baltimore.

more. It aims to follow 25 people with HIV who undergo a transplant with stem cells taken from umbilical cord blood for the treatment of cancer.

Patients in the trial first undergo chemotherapy to kill off the cancerous immune cells. Doctors then transplant stem cells from individuals with a specific genetic mutation in which they lack receptors used by the virus to infect cells.

Scientists believe these individuals then develop an immune system resistant to HIV.

First woman reported cured of HIV after stem cell transplant

- A **U.S. patient with leukemia has become the first woman and the third person to date to be cured of HIV** after receiving a stem cell transplant from a donor who was naturally resistant to the virus that causes AIDS.

About

- The case of a **middle-aged woman of mixed race**, presented at the Conference on Retroviruses and Opportunistic Infections in Denver, is also the **first involving umbilical cord blood**.
- Since receiving the cord blood to treat her acute myeloid leukemia - a cancer that starts in blood-forming cells in the bone marrow - **the woman has been in remission and free of the virus for 14 months**.
- This is now the **third report of a cure in this setting**, and the **first in a woman living with HIV**
- A **U.S. patient with leukemia has become the first woman and the third person to date to be cured of HIV** after receiving a stem cell transplant from a donor who was naturally resistant to the virus that causes AIDS.

About

- The case of a **middle-aged woman of mixed race**, presented at the Conference on Retroviruses and Opportunistic Infections in Denver, is also the **first involving umbilical cord blood**.
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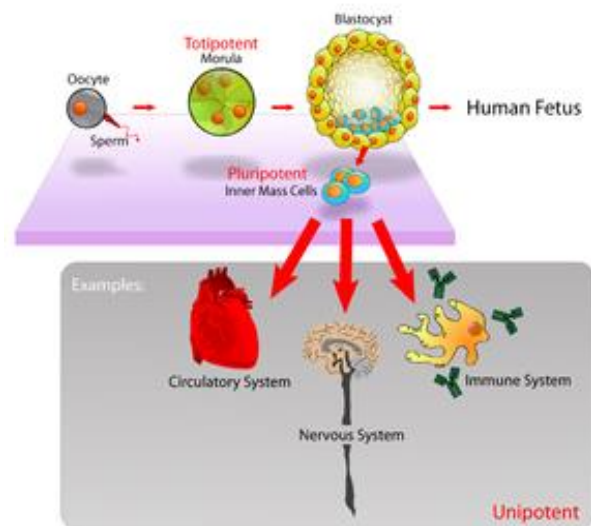
- This is now the **third report of a cure in this setting**, and the **first in a woman living with HIV**
- Patients in the trial **first undergo chemotherapy to kill off the cancerous immune cells**.
- Doctors then **transplant stem cells from individuals with a specific genetic mutation in which they lack receptors used by the virus to infect cells**.
- Scientists believe these individuals then **develop an immune system resistant to HIV**.

Stem cells

- Special human cells that have the capability to develop into wide-ranging types of cells in the human body, from muscle cells to brain cells, are called stem cells.

Embryonic Stem cells

- These are the Stem cells that **exist only during the earliest stage of**



development.

Adult Stem Cells

- Adult stem cells are present in all humans in small numbers
- These cells are capable of **giving rise only to a few types of cells that**

develop into a specific tissue or organ. They are therefore known as **multipotent** stem cells. Adult stem cells are sometimes referred to as somatic stem cells.

Induced pluripotent stem cells (iPSCs)

- are **adult cells that have been genetically converted to an embryonic stem cell-like state**.
- Human iPSCs can differentiate and become multiple different fetal cell types.
- iPSCs are valuable aids in the study of disease development and drug treatment, and they may have future uses in transplantation medicine.
- Further research is ongoing regarding the development and use of these cells.

4. Recently various terms like 'Merge', 'Surge', 'Purge' seen in news, related to :

- A. Banking sector
- B. **Blockchain technology**
- C. 5 G technology
- D. Nanotechnology

Answer : B

Explanation

Ethereum Merge

- Ethereum, the world's second most valuable cryptocurrency, has **completed a significant software overhaul** which promises to ramp up security of the cryptocurrency while **claiming to cut down on its carbon footprint, nearly entirely**.

The Merge

- The revamp, known as 'The Merge,' will cast aside the need for crypto miners and gigantic mining farms, who had **previously driven the blockchain under a mechanism called 'proof-of-work' (PoW)**.

Instead, it has now shifted to a 'proof-of-stake' (PoS) mechanism that assigns 'validators' randomly to approve transactions and earn a small reward.

- The move to PoS will **reduce ethereum's energy consumption** by nearly 99.95 per cent, according to the Ethereum Foundation, a non-profit organisation dedicated to supporting the cryptocurrency and its related technologies.

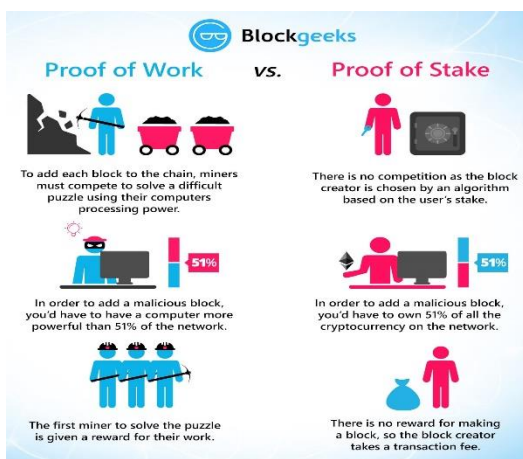
What has exactly changed?

- Ethereum is a **decentralised cryptocurrency**, meaning that it does not have institutions like banks approving the transactions that happen on its network – the approvals were **earlier happening under the PoW consensus mechanism** which was essentially done by miners.
- **Miners would compete to solve complex mathematical puzzles** using a massive infrastructure of cutting edge computer hardware, and the first one to solve the puzzle would be chosen as the **validator**.
- This method was almost entirely dependent on crypto farms, which are massive warehouses lined with rows of computers which would solve the puzzles.
- There was, however, **one big problem** – these mining farms were **energy guzzlers**, leading to one of the biggest criticisms of the crypto industry that they sometimes consumed more electricity than entire countries, and were therefore a **big concern in terms of environmental sustainability**.
- Enter 'The Merge' and the **shift to the PoS consensus mechanism**. Ethereum is still a decentralised platform, but under the new concept, it would **not need miners and mining farms to authenticate transactions anymore**.

- Instead, a validator will be **randomly assigned using an algorithm** from a **pool of people who 'stake' their coins**, which essentially means **pledging at least 32 Ethereum tokens on the network**. This would entirely eliminate the need for miners on the Ethereum network.

Why is the 'Merge' important?

- The Merge dramatically **increases the security of Ethereum**. An attacker needs **51% of the blockchain's value to [take control]**.
- With **Proof of Work**, you need on the order of **\$5 billion**, which allows you to buy enough computers and transformers, connect all of them to the grid, and then carry out an attack.
- With **Proof of Stake**, we will have **about \$20 billion** in economic security today – and this is a number I expect will grow dramatically.”
- Apart from that, it is also being seen as an **environmentally conscious** move as Ethereum is expected to now consume 99 per cent or so less energy.
- Given that some of the most popular applications of cryptocurrencies such as **non-fungible tokens (NFTs)** and decentralised finance (DeFi) are based on the Ethereum network, the overhaul could have far-reaching



in the future.

What's next for Ethereum?

Surge

- This refers to the addition of Ethereum sharding, which promises to process transactions on the network much faster than now.
- Sharding basically means **dividing transactions across several different chains** in a way that will **decrease fees and speed up transactions**. “By the end, ethereum will be able to process 100,000 transactions per second

Verge

- Called “Verkle trees” and “stateless clients,” which will allow **users on the network to become validators without having to store extensive amounts of data on their machines**.

Purge

- Involve purging old network history.
- The purge: trying to actually **cut down the amount of space you have to have on your hard**

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	drive , trying to simplify the Ethereum protocol over time and not requiring nodes to store history
Splurge	<ul style="list-style-type: none"> It aims at making sure that the network continues to run smoothly and that the updates to the protocol in the previous sections do not cause any issues.

5. Recombinant DNA technology (Genetic Engineering) allows genes to be transferred

1. across different species of plants
2. from animals to plants
3. from microorganisms to higher organisms

Select the correct answer using the codes given below.

- 1 only
- 2 and 3 only
- 1 and 3 only
- 1, 2 and 3

Answer : D

Explanation

- Genetic engineering (or recombinant DNA technology) allows selected individual gene sequences to be transferred from an organism into another and also between non-related species.
- The organisms derived from genetic engineering are termed genetically modified organisms (GMOs). A transgenic food is defined as a food that is derived from or contains GMOs.



Sleepy Classes
Awakening Toppers

Pre-Mix

(Science & Technology)

24th October, 2022

Questions for Today

1. Recently term 'Varroa destructor' seen in news, related to:

- a) Aircraft carrier
- b) Submarine
- c) Insect disease
- d) Blackhole merger

2. Which of the following diseases is/are transmitted by Aedes species of mosquitoes?

1. Dengue fever
2. Chikungunya
3. Zika fever
4. Yellow Fever

Select the correct answer using the codes given below.

- A. 1,2 and 3 only
- B. 2,3 and 4 only
- C. 1,3 and 4 only
- D. All of the above

3. Consider the following pairs:

- | | |
|-------------------------|-------------------------------|
| 1) Fairbank' disease | : Sleeping sickness |
| 2) Mange disease | : Bone disorder |
| 3) Ramsay Hunt Syndrome | : Facial palsy |
| 4) Alzheimer's disease | : Neuro-degenerative diseases |

How many pairs given above are correctly matched ?

- a) Only one pair
- b) Only two pairs
- c) Only three pairs
- d) All four pairs

4. It is the second deadliest parasitic disease in the world transmitted through the bites

of infected female phlebotomine sandflies . The disease is:

- A. Diabetes
- B. Kala Azar
- C. Malaria
- D. Lassa fever

5. Consider the following statements regarding Lassa fever

Seen in news recently:

1. It was first discovered in 1969 in United Kingdom
2. It is transmitted from person to person by mosquito bites
3. Sexual transmission of the disease is possible.

How many statements given above are correct?

- A. Only one statement
- B. Only two statements
- C. All three statements
- D. None of the above

Answers with Explanations

Click [here](#) to watch the following topics on YouTube

1. Recently term 'Varroa destructor' seen in news, related to:

- a) Aircraft carrier
- b) Submarine
- c) Insect disease
- d) Blackhole merger

Answer : C

Explanation

Why Australia has killed millions of bees to save its honey industry

Varroa mite

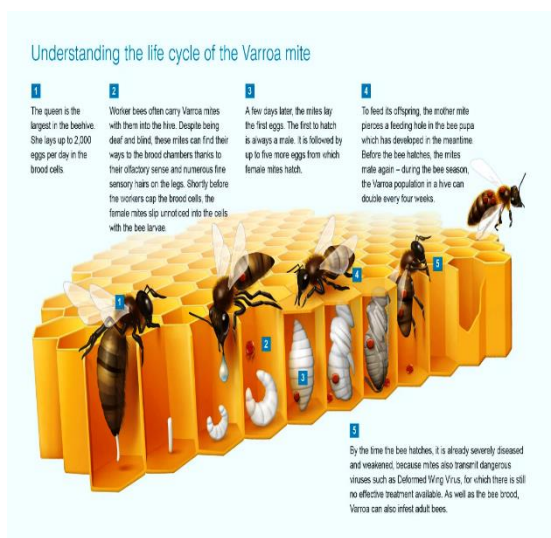
- The Varroa mite, or Varroa destructor, is a parasitic insect that attacks and

feeds on honeybees. Reddish-brown in colour, the tiny pests are known to kill entire colonies of honeybees

- They often **travel from bee to bee** and also via beekeeping equipment, such as combs that have been extracted.
- Although Varroa mites **can feed and live on adult honey bees**, they **mainly feed and reproduce on larvae and pupae** in the developing brood, causing malformation and weakening of honey bees as well as transmitting numerous viruses.
- Over time, as **the mite population increases in bee colonies**, the symptoms grow more severe.
- Generally, heavy infestations lead to **crippled bees, impaired flight performance, lower rate of return to the colony after foraging and reduced lifespan**, Bee Aware states.

Why do bees matter?

- According to a report , the latest lockdown could **adversely impact the growth of several crops** – including **almonds, macadamia nuts and blueberries** – that are dependent on



hives for pollination.

2. Which of the following diseases is/are transmitted by Aedes species of mosquitoes?

1. Dengue fever

2. Chikungunya
3. Zika fever
4. Yellow Fever

Select the correct answer using the codes given below.

- A. 1,2 and 3 only
- B. 2,3 and 4 only
- C. 1,3 and 4 only
- D. All of the above

Answer : D

Explanation

Aedes Chikungunya	Aedes Zika virus	Aedes Dengue
Culex West Nile virus	Anopheles Malaria	Aedes Yellow fever

3. Consider the following pairs:

- 1) Fairbank' disease : Sleeping sickness
- 2) Mange disease : Bone disorder
- 3) Ramsay Hunt Syndrome : Facial palsy
- 4) Alzheimer's disease : Neuro-degenerative diseases

How many pairs given above are correctly matched ?

- a) Only one pair
- b) **Only two pairs**
- c) Only three pairs
- d) All four pairs

Answer : B

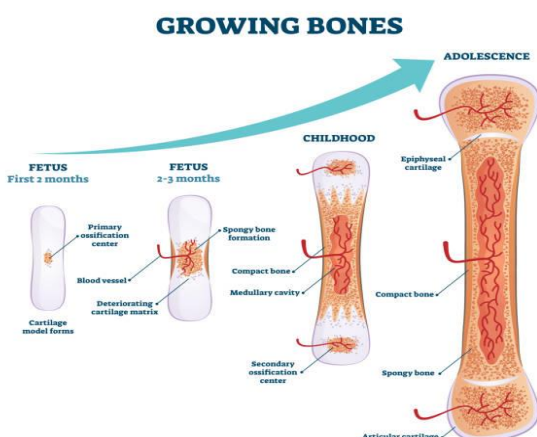
Explanation

Mange Disease

- As a result of It is caused by the parasite mite **Sarcoptes scabiei**, which is also responsible for **human scabies**, and is the most severe form of mange.
- **Transmission** The disease is spread **between animals through direct contact as well as through materials that have come into contact** with affected creatures.
- **Sarcoptic mange can also be contracted by humans from dogs, but the mites that cause it are unable to complete their life cycle on human skin.** As a result, humans may have **minor skin irritation** as a result of the problem, but the irritation is temporary.
- **Treatment:** The treatment of mange entails the administration of oral medications as well as the use of topical medications.

Fairbank's Disease

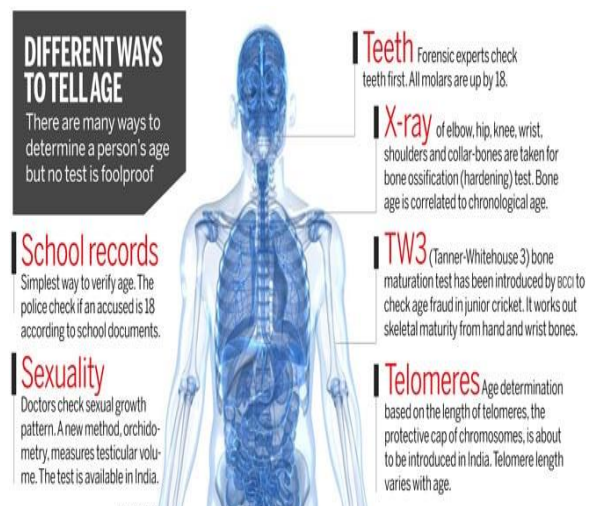
- This disease also known as Multiple Epiphyseal Dysplasia (MED).
- It is a **rare genetic disorder** that affects the growing ends of bones.
- **Bones usually elongate by a process that involves the depositing of cartilage at the ends of the bones, called ossification.**
- This **cartilage then mineralizes and hardens to become bone. In MED, this process is defective**
- Symptoms are joint pain in the hips and knees, early-onset arthritis, a waddling walk, and mild short stature as adults.



- Most people are diagnosed during childhood, but mild cases may not be diagnosed until adulthood.
- MED patient usually requires management of pain and orthopedic procedures.

Bone Ossification Test

- It is a method of determining the **age of a person on the basis of an examination of his or her bone framework**, which is performed using X-rays or CT scans.
 - In order to determine the age of the defendant, a test must be performed in order to evaluate the criminal liability, as the law treats people differently depending on their age.
 - The **Supreme Court** has ruled that the test cannot be considered infallible and hence **cannot be utilised as the only basis for determining the age** of an accused who claims to be a juvenile.



Ramsay Hunt Syndrome

- Recently, Pop sensation Justin Bieber revealed that a viral disease has temporarily paralysed one side of his face.

- Bieber said he has **developed a rare condition called the Ramsay Hunt Syndrome**

Ramsay Hunt Syndrome

- Ramsay Hunt Syndrome is neurological disease in which a virus – **Varicella Zoster** – causes **inflammation of the nerves** involved in facial movements.
- When the **nerves get inflamed, they lose their ability to function, leading to temporary facial palsy or paralysis**. What it means is that facial muscles in the infected person **cannot receive necessary signals to function properly**.
- There are **12 cranial nerves in the body**. Ramsay Hunt Syndrome is the viral infection impacting the **7th cranial nerve that is involved in facial movements**. The inflammation caused by the Varicella Zoster Virus makes the nerve ineffective,

Symptoms

- The symptoms include **painful, red rash and blisters in and around the ear, and facial paralysis** on the same side. Patients also report **hearing loss** in the ear that has been impacted apart from Tinnitus or ringing sounds. Inability to close the eye causes dryness.
- There is hearing loss, vertigo or spinning sensation. It causes **weakness of one side of the face and causes difficulty in closing one eye and eating as food falls off from the affected side**. There is drooping of the face

What is the virus that causes Ramsay Hunt Syndrome?

- The Varicella Zoster Virus (VZV) is the same virus that **causes chickenpox and shingles**.

- The virus can stay **dormant in a person's body and can reawaken to attack the nerves**.
- According to doctors, **VZV can get reactivated due to weakening of the immune system**.
- **Stress is also considered a trigger**, according to some studies, as it depresses the immune system. Some reports also suggest that T-cell dysfunction caused by coronavirus infection can reactivate VZV

How is Ramsay Hunt Syndrome treated?

- It is treated using **anti-viral drugs, steroids and physiotherapy**. Steroids and anti-viral drugs are the cornerstone of the treatment
- **Facial exercises** are very important. Patients need to protect their eyes. When one eye doesn't close, there is a chance of developing corneal aberration. Patients must use tear drops and use eye protection.
- They should wear glasses when they go out, and tape the eye that has been impacted when they sleep at night

Is Ramsay Hunt Syndrome contagious?

- The disease is **not contagious but can lead to chickenpox in those not vaccinated** for the disease. Till the blister scabs fall off, the patients are advised to avoid contact with those with low immunity and the ones who have not had chickenpox, or are not vaccinated against it.

Do patients recover fully from Ramsay Hunt Syndrome?

- The disease is **reversible**. Patients get cured within 15 days to three months of starting the treatment.

Can new drugs slow down Alzheimer's?

Recently researchers have discovered a drug named **Lecanemab** that **reduces**

cognitive decline in patients with early Alzheimer's, making it one of the first neuroprotective treatments for the disease.

- **At present**, the treatment for Alzheimer's is mainly symptomatic. There are a few pills that improve memory in early stages but they do not help in the other facets of Alzheimer's.

Dementia

- Dementia is an **umbrella term** for a **group** of disorders that lead to **impaired memory, decision-making and social skills** – Alzheimer's is one of the most common types of dementia.
- The **Dementia in India report 2020** estimates that there are **5.3 million people over the age of 60 years living** with dementia in India, with the prevalence projected to increase to 14 million by 2050.

What do the findings tell us about the theories on what causes Alzheimer's disease?

- Not only have several therapies for Alzheimer's and other dementia – a group of **neuro-degenerative diseases** – **failed** to achieve result over the years, scientists still **do not agree on what causes the disease** – **pathological clumping of amyloid protein**, autoimmunity, or high levels of iron in the brain are among several proposed hypothesis.
- The researchers have claimed that the success of Lecanemab – drug that **selectively binds and neutralises toxic beta amyloid aggregates** – proves the amyloid hypothesis.
- This theory posits that **abnormal accumulation of the beta amyloid in the brain is one of the main causes of Alzheimer's disease**

Alzheimer's Disease?

- Alzheimer's disease is the most common type of dementia.
- It is a progressive disease **beginning with mild memory loss and possibly leading to loss of the ability to carry on a conversation and respond to the environment.**
- Alzheimer's disease involves parts of the brain that **control thought, memory, and language.**
- It can seriously **affect a person's ability to carry out daily activities.**

What are the warning signs of Alzheimer's disease?

- Alzheimer's disease is **not a normal part of aging**. Memory problems are typically one of the first warning signs of Alzheimer's disease and related dementias.

In addition to memory problems, someone with symptoms of Alzheimer's disease may experience one or more of the following:

- **Memory loss that disrupts daily life**, such as getting lost in a familiar place or repeating questions.
- Trouble handling money and paying bills.
- Difficulty completing familiar tasks at home, at work or at leisure.
- Decreased or poor judgment.
- Misplacing things and being unable to retrace steps to find them.
- Changes in mood, personality, or behavior.

4. It is the second deadliest parasitic disease in the world transmitted through the bites of infected female phlebotomine sandflies . The disease is:

- A. Diabetes
- B. **Kala Azar**
- C. Malaria
- D. Lassa fever

Answer : B

Explanation

HEALTHCARE

Kala azar

- For the first time in eight years, Jharkhand reported a death due to Kala azar in the state.

About Kala azar

- Kala azar, which also known as **visceral leishmaniasis**. There are three types of leishmaniasis:
- **Visceral leishmaniasis**, which affects multiple organs and is the most serious form
- **Cutaneous leishmaniasis**, which causes skin sores and is the most common form.
- **Mucocutaneous leishmaniasis**, which causes skin and mucosal lesions.
- It is the **second largest parasitic killer in the world after malaria**.
- It is also one of the most dangerous neglected tropical diseases (NTDs).
- It is **caused by a parasite called Leishmania**, which is transmitted through the **bite of female phlebotomine sandflies**.
- It attacks the immune system, and is almost always fatal if not treated.
- Symptoms may include fever, weight loss and swelling of the spleen or liver

Transmission

- Leishmania parasites are transmitted through the **bites of infected female phlebotomine sandflies**, which feed on blood to produce eggs

Affects

- The disease affects some of the **poorest people on earth**, and is associated with **malnutrition, population displacement, poor**

housing, a weak immune system and lack of financial resources.

- Leishmaniasis is linked to **environmental changes such as deforestation, building of dams, irrigation schemes, and urbanization**
- The National Health Policy, 2002 had set the **goal of kala-azar elimination by the year 2010** which was revised to **2015**. This deadline was later extended twice to 2017, and then to **2020**.

National Vector Borne Disease Control Programmed

- NVBDCP is the central nodal agency for prevention and **control of six vector borne diseases i.e. Malaria, Dengue, Lymphatic Filariasis, Kala-azar, Japanese Encephalitis and Chikungunya in India.**
- It works under the **Ministry of Health and Family Welfare** & is subsumed under **National Health Mission (NHM)**.

5. Consider the following statements regarding Lassa fever

Seen in news recently:

1. It was first discovered in 1969 in United Kingdom
2. It is transmitted from person to person by mosquito bites
3. Sexual transmission of the disease is possible.

How many statements given above are correct?

- A. **Only one statement**
- B. **Only two statements**
- C. **All three statements**
- D. **None of the above**

Answer : A

Explanation

Lassa fever

One of the three persons diagnosed with **Lassa fever in the UK has died on February 11**. The cases have been linked to travel to west African countries

Lassa fever

- The Lassa fever-causing virus is found in **West Africa** and was first discovered in 1969 in Lassa, Nigeria,
- The fever is spread **by rats** and is primarily found in countries in **West Africa including Sierra Leone, Liberia, Guinea, and Nigeria** where it is **endemic**.

Transmission

- A person can become **infected if they come in contact with household items** of food that is contaminated with the **urine or feces of an infected rat**.
- It can also be spread, **though rarely, if a person comes in contact with a sick person's infected bodily fluids** or through mucous membranes such as the eyes, nose or the mouth.
- **Person-to-person** transmission is more common in healthcare settings.

Symptoms

- Symptoms typically appear 1-3 weeks after exposure.
- **Mild symptoms** include **slight fever, fatigue, weakness** and headache and more serious symptoms include **bleeding, difficulty breathing, vomiting**, facial swelling, pain in the chest, back, and abdomen and shock.
- **Death** can occur from two weeks of the onset of symptoms, usually as a result of **multi-organ failure**.

Treatment

- Avoiding contact with rats not only in places where the disease is endemic, **but also maintaining hygiene in other areas to prevent rats from entering the house**, keeping food in

rat-proof containers and laying down rat traps

- Researchers have been able to develop a **treatment for the viral disease that includes Ribavirin**, an antiviral drug which has shown to be most effective when given early in the course of the illness.



Sleepy Classes
Awakening Toppers

Pre-Mix

(Science & Technology)

05th November, 2022

Questions for Today

1. Consider the following statements:

1. Unlike a Cryogenic engine, a Semi Cryogenic engine uses Refined kerosene instead of liquid oxygen.
2. A semi cryogenic engine is more environment friendly and cost effective as compared to a cryogenic engine.
3. As per ISRO, Next-Gen Launch Vehicle will feature semi-cryogenic propulsion for the booster stages

Which of the statements given above /are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 and 3 only
- D. 2 and 3 only

2. Consider the following statements:

The Mangalyaan launched by ISRO

1. It made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt
2. Recently the Mangalyaan craft ran out of fuel due to back-to-back eclipses
3. The battery of the Mangalyaan was not designed to handle an eclipse.

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 2 only
- D. 1, 2 and 3

3 Consider the following statements:

1. UV-A and UV-B rays from the Sun are transmitted through our atmosphere and almost all UV-C is filtered by the ozone layer.

2. UV-A rays can only reach the outer layer of our skin or epidermis and can cause sunburns and are also associated with skin cancer.
3. UV-B rays can penetrate the middle layer of your skin or the dermis and can cause aging of skin cells and indirect damage to cells' DNA

Select the correct answer code:

- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

4. Consider the following matches:

- | | |
|--------------------|-------------------------|
| 1. Vyom Mitra | Half-humanoid astronaut |
| 2. Daksh robot | Bomb Disposal |
| 3. kamikaze drones | Manual Scavenging |

Select the correct answer code:

- A. 1 only
- B. 1 and 2 only
- C. 3 only
- D. 1 and 3 only

5 India has become the fourth country in the world to have its independent regional navigation satellite system recognised by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS) ,it means:

- A. All merchant vessels are authorised to use it anywhere in indo-pacific ocean
- B. All merchant vessels and small fishing vessel also authorised to use it
- C. Only merchant vessels are authorized to use it
- D. Only military vessel can use it.

Answers with Explanations

Click [here](#) to watch the following topics on YouTube

1. Consider the following statements:

1. Unlike a Cryogenic engine, a Semi Cryogenic engine uses Refined kerosene instead of liquid oxygen.
2. A semi cryogenic engine is more environment friendly and cost effective as compared to a cryogenic engine.
3. As per ISRO, Next-Gen Launch Vehicle will feature semi-cryogenic propulsion for the booster stages

Which of the statements given above /are correct?

- A. 1 and 2 only
- B. 2 only
- C. 1 and 3 only
- D. 2 and 3 only

Answer : D

Explanation

Semi-Cryogenic Propellant Tank

Context

Hindustan Aeronautics Ltd (HAL) delivered the heaviest semi-cryogenic propellant tank (SC120- LOX) to the Indian Space Research Organization (ISRO).

About

- The **semi cryo-liquid oxygen (LOX) tank** - the first developmental welded hardware - is a **part of the SC120 stage** intended for payload enhancement by replacing the L110 stage in the existing Mk-III launch vehicle.

- A **cryogenic engine/cryogenic stage** is the last stage of space launch vehicles which makes use of Cryogenics.
- **Cryogenics** is the study of the production and behaviour of materials at extremely low temperatures (below -150 degree Centigrade) to lift and place heavier objects in space.
- A **cryogenic engine provides** more force with each kilogram of cryogenic propellant it uses compared to other propellants, such as solid and liquid propellant rocket engines and is more efficient.
- It uses **Liquid Oxygen (LOX) and Liquid Hydrogen (LH2)** as propellants which liquefy at -183 deg C and -253 deg C respectively.
- In a semi-cryogenic engine, the liquid hydrogen is replaced by civil aviation fuel, which is most mostly kerosene or even CNG.

Cryogenic Vs Semi cryogenic engine

- Unlike a Cryogenic engine, a **Semi Cryogenic engine uses Refined kerosene instead of liquid hydrogen.**
- The **liquid oxygen** is used as a **Oxidiser.**
- That's the advantage of using a Semi Cryogenic engine as it requires **Refined Kerosene which is lighter than liquid fuel** and can be stored in a **normal temperature.**
- **Kerosene combined with liquid oxygen** provide a **higher thrust to the rocket.**
- **Refined Kerosene occupies less space**, making it possible to **carry more propellant in a Semi Cryogenic engines** fuel compartment.
- A semi cryogenic engine is more powerful, environment friendly and cost effective as compared to a cryogenic engine.

Next-Gen Launch Vehicle (NGLV)

- The Indian Space Research Organisation (ISRO) is developing a Next-Gen Launch Vehicle (NGLV), which will one day replace operational systems like the Polar Satellite Launch Vehicle (PSLV), ISRO Chairman S. Somanath has said.

Next-Gen Launch Vehicle

- In NGLV, ISRO is understood to be looking at a **cost-efficient, three-stage, reusable heavy-lift vehicle** with a payload capability of 10 tonnes to **Geostationary Transfer Orbit**.
- NGLV will feature **semi-cryogenic propulsion** (refined kerosene as fuel with liquid oxygen (LOX) as oxidiser) for the booster stages which is cheaper and efficient.
- NGLV will feature a **simple, robust design that allows bulk manufacturing, modularity in systems, sub-systems and stages** and minimal turnaround time.
- Potential uses will be in the areas of **launching communication satellites, deep space missions, future human spaceflight and cargo missions**

2. Consider the following statements:

The Mangalyaan launched by ISRO

- It made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt
- Recently the Mangalyaan craft ran out of fuel due to back-to-back eclipses
- The battery of the Mangalyaan was not designed to handle an eclipse.

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 and 3 only
- C. 1 and 2 only

D. 1, 2 and 3

Answer : C

Explanation

Mangalyaan mission over (MOM)

The Indian Space Research Organisation confirmed that the **Mars Orbiter craft has lost communication** with ground station, it's non-recoverable and the Mangalyaan mission has attained end-of-life.

About

- MOM was launched on November 5, 2013, and after completing 300 days of interplanetary journey, it was inserted to the Martian orbit on September 24, 2014.
- Despite being designed for a **life-span of six months** as a technology demonstrator, the MOM has lived for about **eight years** in the Martian orbit with a gamut of significant scientific results on Mars as well as on the Solar corona, before losing communication with the ground station, as a result of a long eclipse in April 2022, the national space agency said
- According to experts and reports, the Mangalyaan craft ran out of fuel due to back-to-back eclipses, especially the one which continued for over seven hours.

Instruments

- For Atmospheric studies (Lyman-Alpha Photometer (**LAP**))
- Methane Sensor for Mars (**MSM**),
- Particle environment studies(Mars Exospheric Neutral Composition Analyser (**MENCA**),
- Surface imaging studies (Thermal Infrared Imaging Spectrometer (**TIS**),
- Mars Colour Camera (**MCC**)

Significance

- It is the most **cost-effective** interplanetary mission (only 450 crore) NASA spent 4000 crore of rupees on MAVEN.
- Space research is **not waste of time and money**. (For eg. 1999 Odisha cyclone killed >10000 people. But 2013 cyclone **Phailin** killed very few, because Indian satellite gave accurate weather prediction)
- No country has ever reached Mars on its **first attempt**
- As ISRO establishes **reputation**, gets more contracts from foreign countries and more foreign exchange
- It can be used as a tool to **exercise soft power** by sending space missions of third world countries and SAARC countries.
- Inspiration and catalyst for **innovation** in the country

Criticism

- Wastage of resources: Some critics say that Crores of rupee wasted-could be used to **remove hunger, malnutrition, improve sanitation**
- Orbit is **highly elliptical**
- The **closest approach** to Mars. That too, maybe for **30-40 min**
- This is a **costly "me-too" mission** and would merely be a duplication of

other Mars probes

- Its camera and other sensors are **not as capable for probe as MAVEN's and other MARS missions**.

3 Consider the following statements:

- UV-A and UV-B rays from the Sun are transmitted through our atmosphere and almost all UV-C is filtered by the ozone layer.
- UV-A rays can only reach the outer layer of our skin or epidermis and can cause sunburns and are also associated with skin cancer.
- UV-B rays can penetrate the middle layer of your skin or the dermis and can cause aging of skin cells and indirect damage to cells' DNA

Select the correct answer code:

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- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

Answer : A

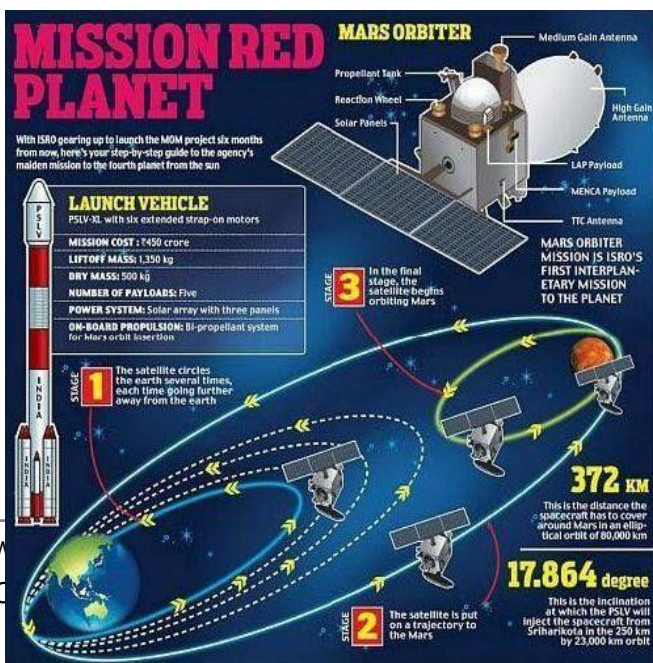
Explanation

UV-C technology

- Union Minister of State for Science and Technology has said that **Ultraviolet-C or UV-C Disinfection Technology will soon be installed in Parliament** for the "mitigation of airborne transmission of SARS-COV-2"

UV-C technology

- The UV-C air duct disinfection system was developed by **CSIR-CSIO** (Central Scientific Instruments Organisation)
- The system is designed to **fit into any existing air-ducts** and the virucidal dosages using UV-C intensity and residence time can be optimised according to the existing space.



- The **virus is deactivated** in any aerosol particles by the calibrated levels of UV-C light.
- It can be used in **auditoriums, malls, educational Institutions, AC buses, and in railways.**

What is UV?

- Ultraviolet (UV) is a type of light or radiation naturally emitted by the Sun. It covers a wavelength range of 100-400 nm.
- The human visible light ranges from 380-700 nm.
- UV is divided into three bands: **UV-C (100-280 nm), UV-B (280-315 nm) and UV-A (315-400 nm).**

UV-A/B/C

- **UV-A and UV-B rays from the Sun** are transmitted through our atmosphere and almost all **UV-C is filtered by the ozone layer.**
- **UV-A rays** can penetrate the middle layer of your skin or the dermis and can cause aging of skin cells and indirect damage to cells' DNA
- **UV-B rays** can only reach the outer layer of our skin or epidermis and can cause sunburns and are also associated with skin cancer.
- **UV-C radiation** from man-made sources has been known to cause **skin burns and eye injuries.**

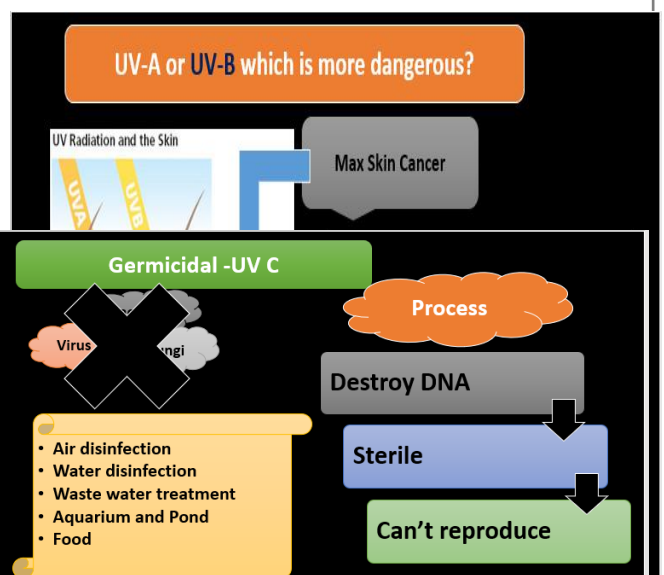
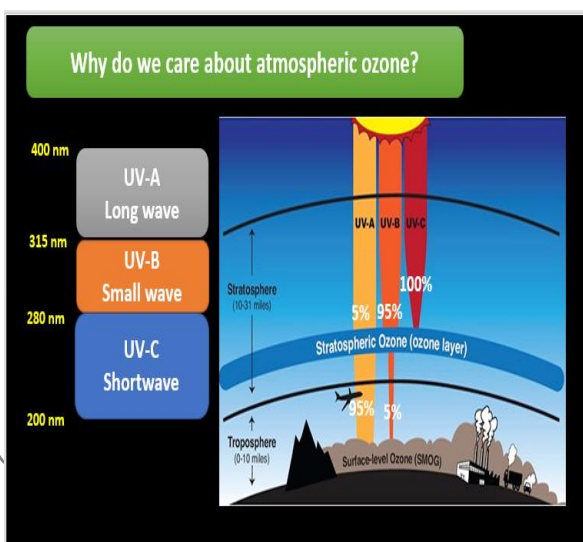
Can UV-C kill coronavirus ?

- **UV-C radiation** (wavelength around 254 nm) has been **used for decades to disinfect the air** in hospitals, laboratories, and also in water treatment.
- But these conventional germicidal treatments are done in unoccupied rooms as they can **cause health problems.**
- A **paper published in June 2020** in Scientific Reports noted that UV-C radiation can **destroy the outer protein coating of the SARS-Coronavirus.**

UV-A 400-315	UV-B 315-280	UV-C 280-200
<ul style="list-style-type: none"> • 95% of total UV reached earth. • Penetrate the second layer of <u>skin</u>. • Wrinkles and premature ageing. • Penetrate clouds and glass window • Use- Tanning bed 	<ul style="list-style-type: none"> • 5% of total reached earth. • Strong sunburn and strongly linked to skin cancer. • Can burn unprotected skin within 15 min 	<ul style="list-style-type: none"> • Does not reach the earth's surface • Normally not consider as risk factor for skin cancer. • Found in man made sources of UV-C radiation-mercury lamp , welding torches.

4. Consider the following matches:

- | | |
|----------------|-------------------------|
| 1. Vyom Mitra | Half-humanoid astronaut |
| 2. Daksh robot | Bomb Disposal |



3. kamikaze drones Scavenging

Manual

sowing terror in Ukrainian cities far from the frontlines of the war.

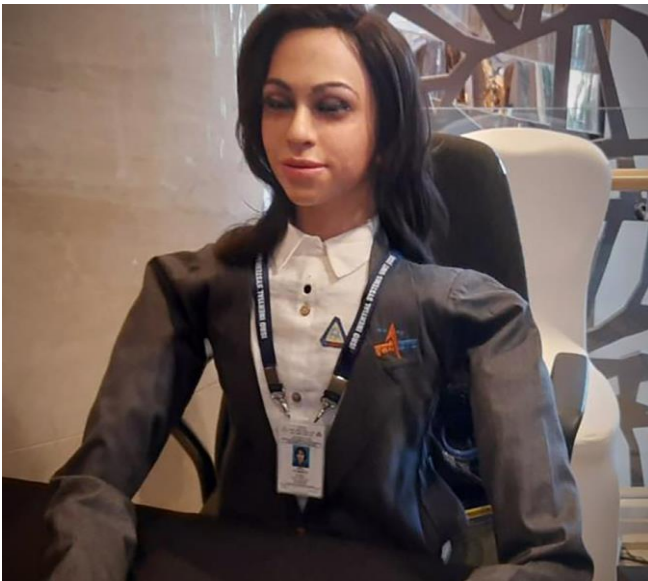
Select the correct answer code:

- A. 1 only
- B. 1 and 2 only**
- C. 3 only
- D. 1 and 3 only

Answer : B

Explanation

Robotics



Half Humanoid Robots

Eg-Vyom Mitra – By ISRO

- First 'woman' astronaut, named Vyom Mitra ride to space in the first test flight of the human space mission, Gaganyaan.
- Her body stops at the torso and has no legs

Robotics

Defence

- **Daksh-**
Bomb
disposal



kamikaze drones

Russia has launched a series of "kamikaze" drone attacks across Ukraine in recent weeks, striking civilian infrastructure and

What are kamikaze drones?



- Kamikaze drones, or **suicide drones**, are a type of aerial weapon system. They are known as a "**loitering munition**" because they are capable of circling for some time in an area identified as a potential target and only striking once an enemy asset is identified.
- These are small **unmanned aircraft packed with explosives** that can be flown directly at a tank or a group of troops that are destroyed when it hits the target and explodes. \
- The **name comes from the World War 2 era's** feared Japanese kamikaze pilots, who conducted suicide attacks by intentionally crashing their explosive filled aircraft into enemy targets.
- The **modern drone versions have the capability of surpassing traditional defences** to strike their targets and are

also cheaper than their larger counterparts.

- The small lethal drones are **difficult to detect on radar**, and through the use of facial recognition, can be programmed to hit targets without human intervention.

5 India has become the fourth country in the world to have its independent regional navigation satellite system recognised by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS), it means:

- All merchant vessels are authorised to use it anywhere in indo-pacific ocean
- All merchant vessels and small fishing vessel also authorised to use it
- Only merchant vessels are authorized to use it
- Only military vessel can use it

Answer : B

Explanation

The IMO has now accepted IRNSS as an alternative navigation module.

It was in use only on a pilot basis earlier but now **all merchant vessels are authorised to use it, even small fishing vessels.**

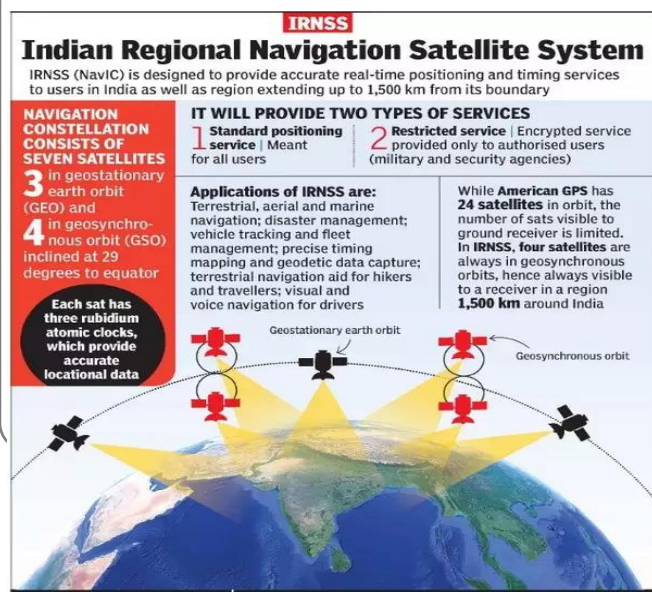
- There are at least 2,500 merchant vessels in Indian waters that will now be able to use the system.
- The IRNSS will be used to assist in the navigation of ships in ocean waters

within the area of approximately **1,500 km from the Indian boundary,**

ISRO to boost NavIC, widen user base of location system

Current Status

- Though available for use in mainland India as well as a range of 1,500 km around it, it isn't in wide regular use in India primarily because mobile phones haven't been made compatible to process its signals. The Indian government has been pressing manufacturers to add compatibility and has set a deadline of January 2023 but media reports suggest this is unlikely before 2025.



Pre-Mix – 5 MCQs for Prelims

Subject – Science & Technology

Date – 19th November 2022

1. Consider the following statements regarding 'Wolbachia Method' seen in news recently:

1. It is a novel method to reduce the spread of the dengue virus.
2. Wolbachia is a common bacteria that occur naturally in 60 per cent of insect species, but strangely not in Aedes aegypti mosquito.
3. Mosquitoes with Wolbachia are genetically modified.

Which of the statements given above /are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. All of the above.

2. Consider the following statements regarding 'Glyphosate' seen in news in recent times :

1. It is a herbicide used to kill weeds – undesirable plants that compete with crops for nutrients, water and sunlight.
2. In India, the only GM crop officially under commercial cultivation today is Bt cotton which can withstand the spray of glyphosate
3. This herbicide cannot be applied on normal cotton, as the chemical does not distinguish between the crops and weeds.

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

3 Consider the following statements:

1. Gene silencing is a method to reduce or suppress the expression of a gene.
2. Recently researchers at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have used the gene silencing technique to keep groundnuts free of aflatoxin contamination.
3. Aflatoxins are a family of toxins produced by certain bacteria that are found on agricultural crops.

Select the correct answer code:

- E. 1 and 2 only
- F. 2 only
- G. 1 and 3 only
- H. 2 and 3 only

4. Consider the following matches:

GM Crops	Gene technology
1. Bt cotton	Cry 1 Ab
2. HTBT Cotton	Barstar-Barnase
3. GM Mustard	Cp4-Epsps

Select the correct answer code:

- A. 1 and 2 only
- B. 1 only
- C. 1 and 3 only
- D. All of the above.

5. Recently CAR-T cell therapy seen in news for its role in :

- A. HIV treatment
- B. Cancer treatment
- C. COVID-19 Diagnosis
- D. Alzheimer treatment



Answers with Explanations

Click [here](#) to watch the following topics on YouTube

1. Consider the following statements regarding 'Wolbachia Method' seen in news recently:

1. It is a novel method to reduce the spread of the dengue virus
2. Wolbachia is a common bacteria that occur naturally in 60 per cent of insect species, but strangely not in Aedes aegypti mosquito
3. Mosquitoes with Wolbachia are genetically modified.

Which of the statements given above /are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. All of the above

Answer : B

Explanation

Wolbachia Method

- Wolbachia are **extremely common bacteria** that occur naturally in **60 per cent of insect species**, including some mosquitoes, fruit flies, moths, dragonflies and butterflies
- Wolbachia are **safe for humans and the environment**.
- **Aedes aegypti** mosquitoes **don't normally carry Wolbachia**, however many other mosquitoes do.
- when **Aedes aegypti** mosquitoes carry Wolbachia, the bacteria **compete with viruses** like dengue, Zika, chikungunya and yellow fever.
- This makes it **harder for viruses to reproduce inside the mosquitoes**.

And the mosquitoes are much less likely to spread viruses from person to person.

2. Consider the following statements regarding 'Glyphosate' seen in news in recent times :

1. It is a herbicide used to kill weeds — undesirable plants that compete with crops for nutrients, water and sunlight.
2. In India, the only GM crop officially under commercial cultivation today is Bt cotton which can withstand the spray of glyphosate
3. This herbicide cannot be applied on normal cotton, as the chemical does not distinguish between the crops and weeds.

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- A. 1 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. 1, 2 and 3

Answer : C

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3. Aflatoxins are a family of toxins produced by certain bacteria that are found on agricultural crops

Select the correct answer code:

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

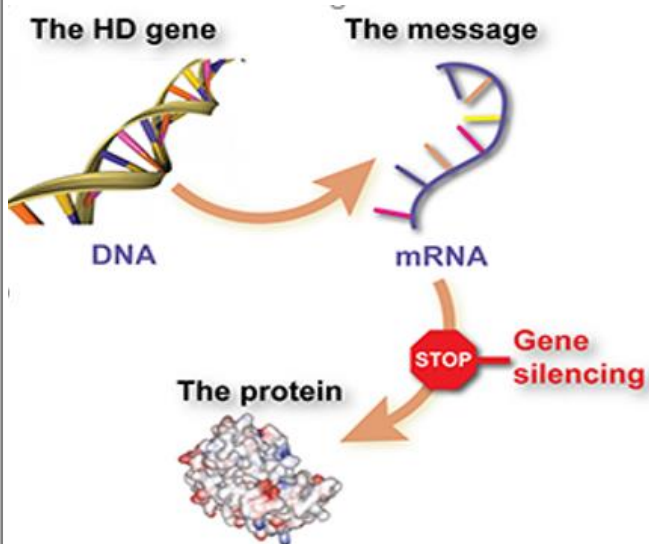
d) 2 and 3 only

Answer : A

Explanation

Gene Silencing

- Reduce or eliminate the production of a protein from its corresponding gene
- Researchers at the **International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)** in Hyderabad have used the **gene silencing technique** to keep groundnuts free of aflatoxin contamination
- **Aflatoxin** is a toxin produced by the fungi **Aspergillus flavus** and **Aspergillus parasiticus**.



4. Consider the following matches:

GM Crops

Gene technology

Biotechnology breakthrough can make groundnut immune to aflatoxin

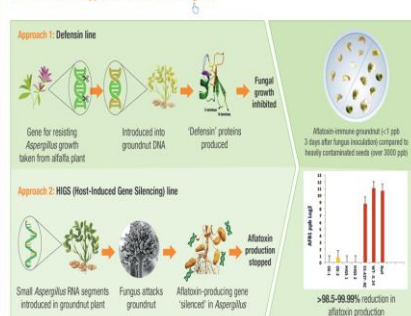
Global burden of aflatoxin
Up to 25% of liver cancer cases due to aflatoxin
5 billion people at risk worldwide
Stunting in children
Immune system dysfunction

The fungus Aspergillus spp. infects groundnut crop in farmer's field...

Through cracks in pods due to heat/drought/insects
...and throughout the value chain

Groundnut infected with Aspergillus
Livestock feed
Processed products
Aflatoxin-contaminated meat & milk (Aflatoxin is 20% of milk sample even after boiling)
Loss in trade (up to \$200 million/year)

A double-defence approach for aflatoxin mitigation



What's next?



- | | |
|----------------|-----------------|
| 1. Bt cotton | Cry 1 Ab |
| 2. HTBT Cotton | Barstar-Barnase |
| 3. GM Mustard | Cp4-Epsps |

Select the correct answer code:

- A. 1 and 2 only
B. **1 only**
C. 1 and 3 only
D. All of the above

Answer : B

Explanation

BT Cotton

- Bt cotton remains the **only GM crop allowed to be cultivated in the country**.
- Developed by **US giant Bayer-Monsanto**, it involves insertion of two genes viz '**Cry1Ab**' and '**Cry2Bc**' from the soil bacterium **Bacillus thuringiensis** into cotton seeds.
- This modification codes the plant to **produce protein toxic to Heliothis bollworm (pink bollworm)** thus making it resistant to their attack.
- The commercial release of this hybrid was sanctioned by the government in 2002.

Herbicide tolerant Bt (HtBt) cotton

- Addition of '**Cp4-Epsps**' gene from another soil bacterium, **Agrobacterium tumefaciens**
- by the **US giant Bayer Monsanto**.
- Not cleared by **GEAC**

GM Mustard

- **Barstar-Barnase system**
- Problem with mustard is that its **flowers contain both female and male reproductive organs**, making the plants largely self-pollinating.

- When the egg cells of one plant cannot be easily fertilised by the pollen grains from another, the scope for developing hybrids through crossing of parents from divergent genetic pools is restricted. This is where GM technology comes in. The Barnase gene alluded to earlier, codes for a protein that impairs pollen production. The plant into which it is incorporated, then becomes male-sterile, and capable of receiving pollen from another parent.

5 Recently CAR-T cell therapy seen in news for its role in :

- HIV treatment
- Cancer treatment**
- COVID-19 Diagnosis
- Alzheimer treatment

Answer : B

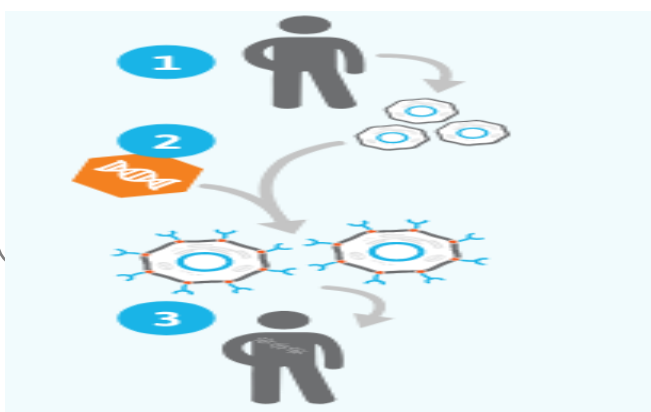
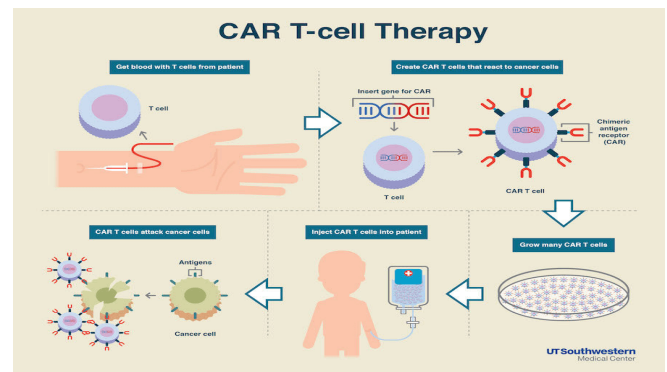
Explanation

CAR-T cell therapy

- CAR-T stands for chimeric antigen receptor (CAR) T-cell therapy.
 - It is a type of cell therapy that is used with gene-based therapies, but it is not a type of gene-based therapy by itself.
 - CAR-T cell therapy involves changing a person's own immune cells to recognize and fight cancer cells inside the body.
- T cells, a type of immune cell, are taken from a person's blood.
 - Then, in the laboratory, gene replacement therapy is used to **add a new gene to T cells**.

This new gene adds a **special receptor, called a chimeric antigen receptor (CAR)**, to T cells to make CAR-T cells. CAR-T cells are able to bind to and attack certain cancer cells.

- Large numbers of the CAR-T cells are made in the laboratory, and once a sufficient amount has been produced, the cells are put back into the body to fight certain cancers.
- US has recently approved the first gene therapy to fight childhood leukaemia
 - It is called as CAR-T cell therapies and the treatments are called **Yescarta and kymriah**.



Pre-Mix – 5 MCQs for Prelims

Subject – Science & Technology

Date – 03rd December 2022

1. Consider the following statements :

1. In Type 1 Diabetes body produces little or no insulin
2. In Type II Diabetes body produces insulin but unable to utilize it properly
3. As per recent studies artificial lights at night can decrease the risk of diabetes

Which of the statements given above /are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. All of the above

2. Recently concern over 5G technology and flight safety seen in news. Mark the most appropriate reason behind such concern:

- A. Lack of encryption early in the connection process
- B. More bandwidth will strain current security monitoring.
- C. High radiation impact on passenger
- D. Interference with flight operations

3 Consider the following statements regarding Dengue fever:

1. It is transmitted mainly by male mosquitoes of the species Aedes aegypti
2. Currently Aedes albopictus dominates lower Himalayas whereas Aedes aegypti is prevalent in the southern peninsula
3. It can be transmitted via blood products, organ donation and transfusions.

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

4. Consider the following matches:

Space Mission	Target
1. DART Mission	Mars
2. Aditya L1	Moon
3. Artemis 1	Sun

Select the correct answer code:

- A. Only one pair is correct
- B. Only two pairs are correct
- C. All three pairs are correct
- D. All pairs are incorrect

5. Which one of the following would you accept as the most appropriate definition of Artificial Intelligence?

- A. Artificial Intelligence is a field that aims to make humans more intelligent
- B. Artificial Intelligence is a field that aims to improve the security
- C. Artificial Intelligence is a field that aims to develop intelligent machines
- D. Artificial Intelligence is a field that aims to mine the data

Answers with Explanations

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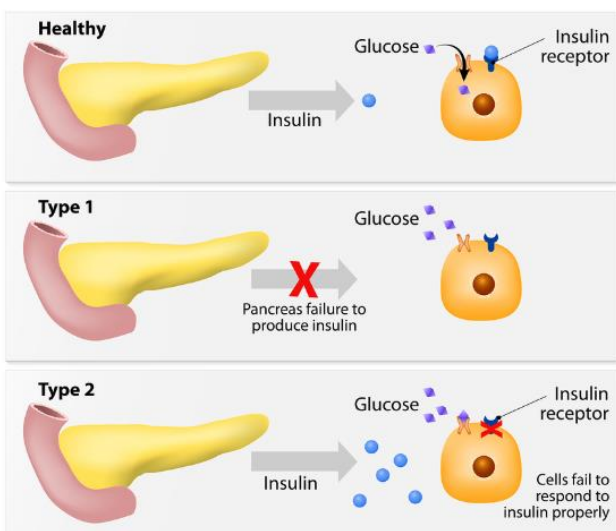
Answer : B

Explanation

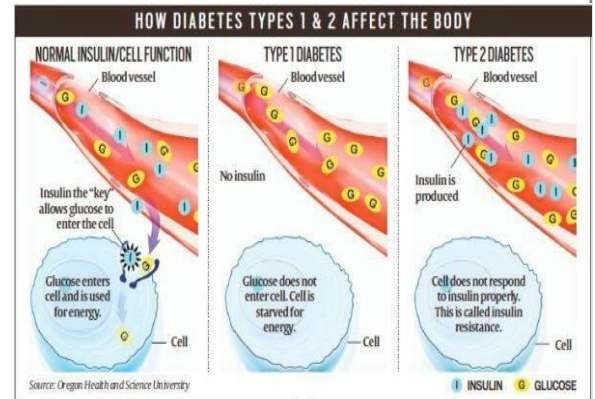
Can LED night lights at malls and food courts raise your risk of diabetes?

- Normally, our body clock reacts to the **diurnal rhythms**. So when it starts getting dark, our **melatonin production increases**, leading us to fall asleep and restoring and renewing our body when we do so.
- Once the sun rises over the horizon, the hypothalamus, which is connected to the pituitary gland, the master gland of our body, activates the **cortisol hormone to be released**, the 'wake up and go' stimulant hormone.
- **High cortisol also encourages quick sugar production** because it has fallen in the gap after your last meal. So basically, your sugar levels go up with your waking up hormones. That's why we get more physical and active in the early part of the day.

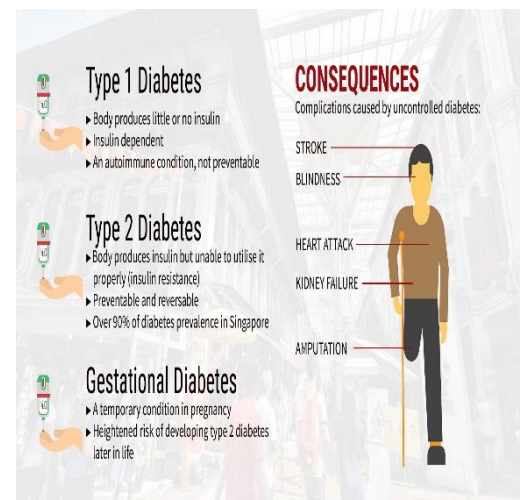
DIABETES MELLITUS



- Now, at night the body gets confused



as to whether to release or suppress melatonin,. Which means bright lights suppress melatonin while activating cortisol to keep us in a state of wakefulness and alertness. "Indirectly, this **produces insulin resistance** and counter regulatory hormones get activated, essentially causing body stress.



2.Recently concern over 5G technology and flight safety seen in news. Mark the most appropriate reason behind such concern:

- A. Lack of encryption early in the connection process
- B. More bandwidth will strain current security monitoring.
- C. High radiation impact on passenger
- D. Interference with flight operations

Answer : D

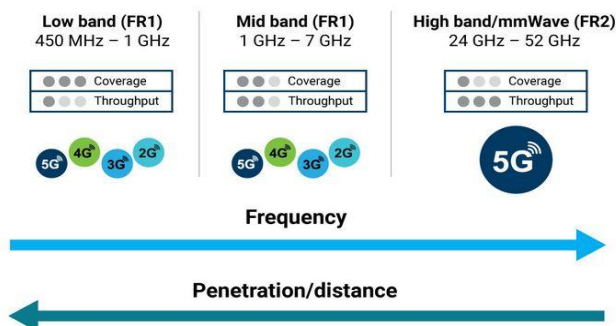
Explanation

What are the concerns around 5G interference with flight operations

the Indian Directorate General of Civil Aviation (DGCA) wrote to the telecom department flagging concerns over the likely interference of 5G C-Band spectrum with aircraft radio altimeters

The primary concern of the Directorate General of Civil Aviation (DGCA) emerges from the fact that these altimeters as well as a part of the 5G telecom services operate in the mid C-Band frequency range.

For telecom service providers, the C-Band presents a sweet spot for rolling out 5G services, ensuring coverage as well as high bandwidth, resulting in faster internet speeds. For aircraft operations, the use of altimeters in this band ensures highly precise measurements of the plane's altitude. 5G terrestrial signals typically operate at a very heavy power level compared to flight altimeters.



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3. It can be transmitted via blood products, organ donation and transfusions.

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

Answer : B

Explanation

Is it climate change that impacts trajectory of dengue in India?

According to recent study the ongoing spread of dengue has been attributed to a late withdrawal of monsoon

- Dengue transmission is closely associated with three key factors – rainfall, humidity and temperature – which dictate the geographies in which dengue spreads and the transmission rate.

Key Highlights

- In India, the number of months suitable for dengue transmission by *Aedes aegypti* mosquitoes has risen to 5.6 months each year.
- It accounts for a 1.69 per cent increase between 1951-1960 and 2012-2021
- Dengue spreads through the bite of two mosquitoes – *Aedes aegypti* and *Aedes albopictus*.
- Currently, *Aedes aegypti* is prevalent in the southern peninsula, eastern coastline, north-eastern states and the northern plains.
- *Aedes albopictus* dominates the eastern and western coastlines, north-eastern states and the lower Himalayas.
- The study projected “expansion of *Aedes aegypti* in the hot arid regions of the Thar Desert and *Aedes albopictus* in cold upper Himalayas as a result of future climatic changes



- **Temperature and humidity levels in Kashmir** are not conducive to the spread of dengue. Jammu had a similar story, but **rising temperatures have made it the hub for dengue in J&K**. Cases typically begin emerging post-monsoon in July-August, lasting till November-end, sometimes even December.
- The **duration of the outbreak depends on the rain and temperature**, where 30-32 degrees is favourable for dengue

Is it climate change that impacts trajectory of dengue in India?

Dengue

- Dengue virus is transmitted by **female mosquitoes** mainly of the species *Aedes aegypti* and, to a **lesser extent**, *Ae. albopictus*.
- These mosquitoes are also vectors of **chikungunya, yellow fever and Zika viruses**.
- Dengue is widespread throughout the tropics, with local variations in risk influenced by climate parameters as well as social and environmental factors.
- Dengue is caused by a **virus** of the Flaviviridae family and there are four distinct, **but closely related, serotypes of the virus that cause dengue (DENV-1, DENV-2, DENV-3 and DENV-4)**.

Transmission through mosquito bite

- The virus is transmitted to humans through the **bites of infected female mosquitoes, primarily the *Aedes aegypti* mosquito**. Other species within the *Aedes* genus can also act as vectors, but their contribution is secondary to *Aedes aegypti*.
- After feeding on an **DENV-infected person**, the virus replicates in the

mosquito midgut, before it disseminates to secondary tissues, including the salivary glands.

- **Once infectious, the mosquito is capable of transmitting virus for the rest of its life.**

Maternal transmission

- The primary mode of transmission of DENV between humans involves **mosquito vectors**.
- There is evidence however, of the **possibility of maternal transmission (from a pregnant mother to her baby)**.

Other transmission modes

- **Rare cases** of transmission via blood products, organ donation and transfusions have been recorded.

Symptoms

- Severe abdominal pain, persistent vomiting, fatigue, liver enlargement, rapid breathing, bleeding gums or nose, blood in vomit or stool etc

Treatment

- There is **no specific treatment for dengue fever**. Patients should rest, stay hydrated and seek medical advice.

Vaccination against dengue

- The first dengue vaccine, **Dengvaxia® (CYD-TDV)** developed by Sanofi Pasteur was licensed in December 2015 and has now been approved by regulatory authorities in ~20 countries.

4. Consider the following matches:

Space Mission	Target
1. DART Mission	Mars
2. Aditya L1	Moon
3. Artemis 1	Sun

Select the correct answer code:

- A. Only one pair is correct
- B. Only two pairs are correct
- C. All three pairs are correct
- D. All pairs are incorrect

Answer : D

Explanation

DART Mission

- The Double Asteroid Redirection Test (DART) mission is a trial of NASA's planetary defence plans. It's part of the Asteroid Impact and Deflection Assessment (AIDA) mission, a joint collaboration between ESA, NASA, the German Aerospace Center (DLR)

Aditya L1

- Aditya-L1 Mission is India's first solar mission planned by the Indian Space Research Organisation (ISRO).
- The objective of Aditya L1 mission is to study Sun's Corona, Chromosphere and Photosphere.

Artemis 1

- About the Mission Artemis I is the first in a series of increasingly complex missions of NASA that will enable human exploration to the Moon and Mars.

5. Which one of the following would you accept as the most appropriate definition of Artificial Intelligence?

- A. Artificial Intelligence is a field that aims to make humans more intelligent
- B. Artificial Intelligence is a field that aims to improve the security
- C. **Artificial Intelligence is a field that aims to develop intelligent machines**
- D. Artificial Intelligence is a field that aims to mine the data

Answer : C

Explanation

Artificial Intelligence is the development of intelligent systems that work and react in the same way that humans do. Intelligence is a process or a component of the ability to achieve goals in the world. People, animals, and a few machines all have different types and degrees of intelligence.

Pre-Mix – 5 MCQs for Prelims

Subject – Science & Technology

Date – 17th December 2022

1. Consider the following statements :

1. The amount of energy released in nuclear fusion is several times more than that released during nuclear fission.
2. Fuel derived from one tonne of natural uranium can produce more energy than energy generated from one tonne of black coal
3. On burning similar amount of fuel, brown coal generate more energy than black coal

Which of the statements given above /are correct?

- A. 1 only
- B. 1 and 2 only
- C. 2 and 3 only
- D. All of the above

2. Which among the following is/are gene editing technologies:

1. CRISPR Cas 9
2. TALEN
3. Meganucleases
4. SHANEL

Select the correct answer code:

- A. 1 and 2 only
- B. 1,2 and 3 only
- C. 1, 3 and 4 only
- D. All of the above

3 Consider the following statements regarding Black Fungus disease:

1. It mainly affects people who are on medication for health problems

2. It is Caused by a group of moulds known as mucormycetes present naturally in the environment.
3. It is categorized as Critical group fungus under Fungal Priority Pathogen List provided by WHO

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

4. Consider the following matches:

	Terms sometimes seen in news	Context/Topic
1	Chat GPT	Artificial Intelligence
2	SAOT technology	Particle Physics
3	Base editing	Nuclear Physics
4	CAR T cell therapy	Genetic engineering

Select the correct answer code:

- A. 1 and 2 only
- B. 2, 3 and 4 only
- C. 1, 3 and 4 only
- D. 1 and 4 only

5. Consider the following statements :

1. If a planet has an atmosphere and magnetic field, they probably have auroras.
2. Unlike earth, Jupiter and Saturn do not have strong magnetic field
3. Martian atmosphere create discrete auroras over the entire surface of the planet

4. Martian magnetic field is very strong due to molten iron at the interior of the planet

Select the correct answer code:

- A. 1 and 2 only
B. 1 and 3 only
C. 2,3 and 4 only
D. All of the above.

Answers with Explanations

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- Fuel derived from one tonne of natural uranium can produce more energy than energy generated from one tonne of black coal
- On burning similar amount of fuel, brown coal generate more energy than black coal

Which of the statements given above /are correct?

- A. 1 only
B. 1 and 2 only
C. 2 and 3 only
D. All of the above

Answer : B

Explanation

Nuclear Fission vs Nuclear Fusion	
A heavy nucleus breaks up to form two lighter nuclei.	Two nuclei combine to form a heavy nucleus.
It involves a chain reaction.	Chain reaction is not involved.
The heavy nucleus is bombarded with neutrons.	Light nuclei are heated to an extremely high temperature.
We have proper mechanisms to control fission reaction for generating electricity.	Proper mechanisms to control fusion reaction are yet to be developed.
Disposal of nuclear waste is a great environmental problem.	Disposal of nuclear waste is not involved.
Raw material is not easily available and is costly.	Raw material is comparatively cheap and easily available.

Both fusion and fission are nuclear reactions producing enormous amounts of energy. However, the amount of energy released in nuclear fusion is several times more than that released during nuclear fission.

Rank	Fuel source	Energy output per kilogram of fuel (megajoules)
1	Uranium	500 000
2	Crude oil	45
3	Natural gas	39*
4	Black coal	30
5	Firewood	16
6	Brown coal	9

Source : Aratura Resources NL, Submission no. 22, p. 4. * per cubic metre

2. Which among the following is/are gene editing technologies:

- CRISPR Cas 9
- TALEN
- Meganucleases
- SHANEL

Select the correct answer code:

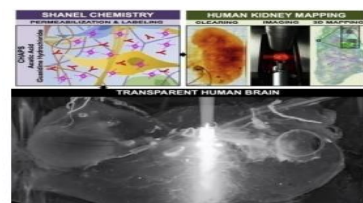
- A. 1 and 2 only
B. 1, 2 and 3 only
C. 1, 3 and 4 only
D. All of the above

Answer : B

Explanation

CRISPR Cas 9, TALEN and Meganucleases are gene editing technologies

SHANEL Technology makes Human Organs Transparent



Graphical abstract adapted from Cellular and Molecular Probing of Intact Human Organs published in Cell

For the first time, scientists at Helmholtz Zentrum München – German Research Center for Environmental Health – have come up with a technology called SHANEL (Small-micelle-mediated Human Organ Efficient clearing and Labeling) that makes human organs transparent helping in organ mapping and serve as templates for 3D bioprinting technologies. The technology can be used for developing artificial organs. According to the researchers, “SHANEL can develop into a key technology for mapping intact human organs in the near future. This would dramatically accelerate our understanding of organs such as the brain, their development and function in health and disease”. The study (DOI:https://doi.org/10.1016/j.cell.2020.01.020)

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Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

Answer : A

Explanation

Black Fungus

- This fungus causes a disease named as Mucormycosis or Black Fungus, previously called as zygomycosis or we can say that it is a serious but rare fungal infection caused by a group of molds called mucormycetes.
- It is Caused by a group of moulds known as mucormycetes present naturally in the environment.
- It mainly affects people who are on medication for health problems that reduces their ability to fight environmental pathogens.

list of fungal infections

- Recently WHO releases **first-ever list of fungal infections** that can be threat to public health

THREE CATEGORIES OF FUNGAL PATHOGENS

- The WHO FPPL is divided into **three categories -- critical, high and medium priority.**

- These fungal pathogens are ranked in each priority category **based on their impact on public health and/or emerging antifungal resistance risk.**

1. The **critical group** includes Candida auris, which is a highly drug-resistant fungi, Cryptococcus neoformans, Aspergillus fumigatus, and Candida albicans.
2. The **high priority group** includes a number of other fungi from the Candida family as well as others such as Mucorales, a group containing "**black fungus**", an infection which rose rapidly in seriously ill people, particularly in India, during Covid-19.
3. The **medium priority group** lists a number of other fungi, including Coccidioides spp and Cryptococcus gattii

4.Consider the following matches:

	Terms sometimes seen in news	Context/Topic
1	Chat GPT	Artificial Intelligence
2	SAOT technology	Particle Physics
3	Base editing	Nuclear Physics
4	CAR T cell therapy	Genetic engineering

Select the correct answer code:

- A. 1 and 2 only
- B. 2, 3 and 4 only
- C. 1, 3 and 4 only
- D. 1 and 4 only

Answer : D

Explanation

What is ChatGPT?

- GPT stands for **Generative Pre-trained Transformer 3** and this is a kind of **computer language model** that relies on deep learning techniques to produce human-like text based on inputs.

SAOT Technology

- FIFA has been using Artificial intelligence based semi-automated offside technology (SAOT), for the **first time**, at the **FIFA World Cup 2022 in Qatar**
- It helps to generate automated alerts about offsides to the match officials.** This replaces the manual effort taken in poring over replays for minutes on end.

CAR T cell therapy

- CAR-T therapy involves adding a gene to T-cells that causes them to seek out and destroy cancerous cells

Base editing

- Bases are the language of life. Just as letters in the alphabet spell out words that carry meaning, the billions of bases in our DNA spell out the instruction manual for our body.
- With advances in genetic technology, scientists have been able to zoom into a precise part of the genetic code to alter the molecular structure of just one base, effectively changing its genetic instructions.

5. Consider the following statements :

- If a planet has an atmosphere and magnetic field, they probably have auroras.
- Unlike earth, Jupiter and Saturn do not have strong magnetic field

- Martian atmosphere create discrete auroras over the entire surface of the planet
- Martian magnetic field is very strong due to molten iron at the interior of the planet

Select the correct answer code:

- 1 and 2 only
- 1 and 3 only**
- 2, 3 and 4 only
- All of the above

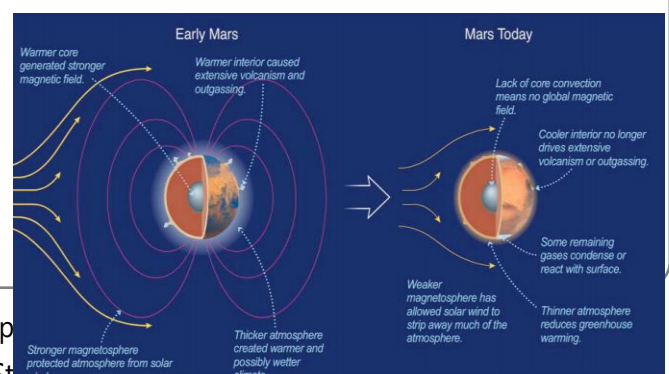
Answer : B

Explanation

Discrete auroras on Mars

Magnetic field on Mars and Aurora

- Martian magnetic field has largely died out due to molten iron at the **interior of the planet - which produces magnetism - has cooled.**
- However, the **Martian crust**, which hardened billions of years ago when the magnetic field still existed, **retains some magnetism.**
- Due to this **magnetism on Mars is unevenly distributed**, with fields strewn across the planet and differing in direction and strength.
- These disjointed fields channel the solar wind to different parts of the Martian atmosphere, **creating "discrete" auroras over the entire surface** of the planet as charged particles interact with atoms and molecules in the sky- as they do on Earth.



Do other Planets get auroras?

- If a planet has an atmosphere and magnetic field, they probably have auroras.
- The gas giants in our solar system (**Jupiter, Saturn, Uranus, and Neptune**) each have thick atmospheres and strong magnetic fields, and each has auroras – although these auroras are a little

different from Earth's, given they are formed under different conditions.

Pre-Mix – 5 MCQs for Prelims

Subject – Science & Technology

Date – 31st December 2022

1. Consider the following statements :

1. mRNA vaccines inject a fragment of the RNA sequence of a virus directly into the cells, which then stimulate an adaptive immune response
2. Unlike live-attenuated or viral-vectored vaccines, mRNA is more infectious and poses concern for DNA integration in body cells
3. As per recent studies mRNA vaccine has shown promising results against advanced melanoma, a kind of skin cancer.

Which of the statements given above /are correct?

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

2. Consider the following statements:

1. Cardiac arrest leads to the inability of the heart to pump blood to vital organs of the body
2. Heart attack is a condition which results due to loss of blood supply to a part of the heart muscle

Select the correct answer code:

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. None of the above.

3 Consider the following statements regarding Gelbots

Seen in news recently:

1. They are soft robots made out of gelatin
2. They are capable of moving without requiring an extra power source
3. They can be used to deliver targeted medicines in human body

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

4. Consider the following matches:

	Sometimes seen in news	Country
1	Hyabusa mission	China
2	SWOT Satellite	India

3	DART Mission	USA
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Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 only
- D. All of the above.

5. Consider the following statements :

- Essential amino acids are amino acids which are produced or synthesised by our bodies
- Non essential amino acids are Amino acids which cannot be synthesized or produced by the body and are required from food supplements
- There are 20 total amino acids common in all life forms and majority out of them are essential amino acids
- Protein sources derived from animal origin generally contain all the non essential amino acids and hence they are called complete proteins

Select the correct answer code:

- A. 1, 2 and 3 only
- B. 2, 3 and 4 only
- C. 3 and 4 only
- D. None of the above.

Answers with Explanations

Click [here](#) to watch the following topics on YouTube.

1. Consider the following statements :

- mRNA vaccines inject a fragment of the RNA sequence of a virus directly into the cells, which then stimulate an adaptive immune response
- Unlike live-attenuated or viral-vectored vaccines, mRNA is more infectious and poses concern for DNA integration in body cells

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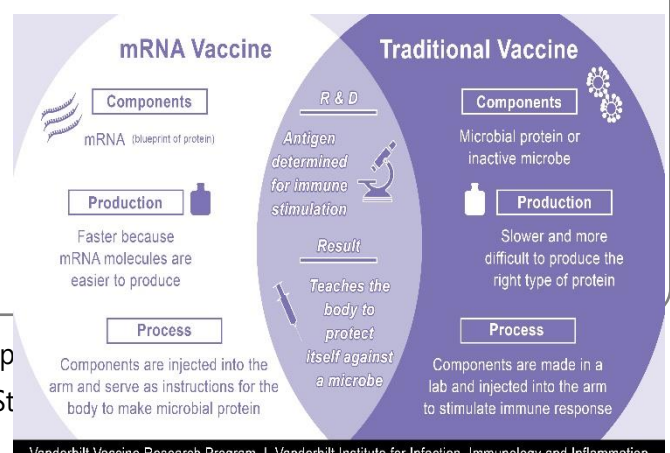
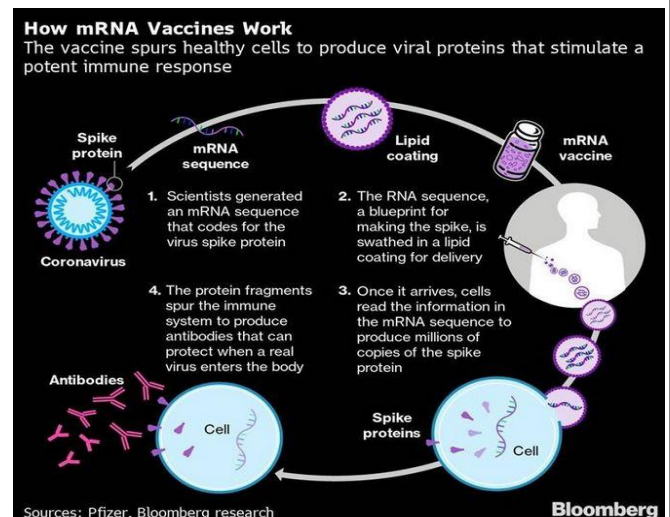
- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

Answer : C

Explanation

mRNA vaccine

- mRNA vaccines trick the body into producing some of the viral proteins itself.
- They work by using mRNA, or messenger RNA, which is the molecule that essentially puts DNA instructions into action.
- Inside a cell, mRNA is used as a template to build a protein.



mRNA vaccine advantages

- **Safety:** Unlike live-attenuated or viral-vectored vaccines, mRNA is non-infectious and poses no concern for DNA integration—mainly because it cannot enter the nucleus which contains DNA.
- **Efficacy:** mRNA is rapidly degraded in the body, and cells don't readily take up foreign mRNA. Recent technology has modified the mRNA molecule to make it more stable and packaged the molecules in fats (called lipids), increasing cell delivery efficiency.
- **Production:** mRNA can be quickly designed and scaled up, if necessary.

2. Consider the following statements:

1. Cardiac arrest leads to the inability of the heart to pump blood to vital organs of the body
2. Heart attack is a condition which results due to loss of blood supply to a part of the heart muscle

Select the correct answer code:

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. None of the above.

Answer : C

Explanation

Cardiac arrest

- **It** is a condition where the heart stops beating, and it must be revived immediately to prevent death of the individual.
- There are various reasons as to why the heart stops beating; one of the common causes is heart attack.
- Other causes can be irregular heartbeat (electrical dysfunction) due to problems in the heart muscle

or **problems** in the electrolyte balance in the body.

- Cardiac arrest leads to the inability of the heart to pump blood to vital organs of the body such as brain, the heart itself, kidneys, liver and gut, leading to death of the individual within minutes if not treated immediately.

Heart attack

- Heart attack is a condition which results due to loss of blood supply to a part of the heart muscle which could be a small or large part of the heart. It usually happens due to blockage in one or more of the arteries supplying the blood to the heart (coronary arteries). Heart attack may or may not lead to cardiac arrest.
- Patients with a heart attack present symptoms like chest pain, pain in the jaw or shoulder, breathing difficulty, palpitations and a sense of impending doom. In many instances, it can occur silently without any symptoms.

3 Consider the following statements regarding Gelbots

Seen in news recently:

1. They are soft robots made out of gelatin
2. They are capable of moving without requiring an extra power source
3. They can be used to deliver targeted medicines in human body

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above.

Answer : D

Explanation

Gelbots

Recently John Hopkins University scientists have built a soft robot named Gelbots.

- They are created by 3D printing made out of gelatin and capable of moving without requiring an extra power source because of the way their shape, dimensions and patterning of gel are designed.

Significance

- For moving on surfaces through the human body to deliver targeted medicines,
- To deploy as marine robots, patrolling and monitoring the ocean's surface and
- Trained to crawl in response to variations in human biomarkers and biochemical.

4. Consider the following matches:

	Sometimes seen in news	Country
1	Hyabusa mission	China
2	SWOT Satellite	India
3	DART Mission	USA

Select the correct answer code:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 only
- D. All of the above.

Answer : C

Explanation

NASA set to launch first global water survey satellite

Surface Water and Ocean Topography (SWOT)

- SWOT is an advanced radar satellite jointly developed and operated by

NASA and CNES, the French space agency in partnership with the Canadian Space Agency (CSA) and UK Space Agency (UKSA).

Objectives

- To make the first global survey of the Earth's surface water
- To observe the fine details of the ocean surface topography
- To measure how terrestrial surface water bodies change over time.

Features

- The satellite incorporates advanced microwave radar technology to collect high-definition measurements of oceans, lakes, reservoirs and rivers over 90% of the globe.

Hyabusa

- A sample of a space rock called Ryugu that returned to Earth almost two years ago may hold the answers to the origin of the planet, according to a new study.
- Samples of Ryugu were carried to Earth in 2020 by the Japanese space agency's asteroid sample-return mission, Hayabusa 2. The mission was launched in 2014.
- It was the first time several grams of asteroid samples were brought back to Earth.

Double Asteroid Redirection Test (DART spacecraft of NASA)

- It is a planned space probe that will demonstrate the kinetic effects of crashing an impactor spacecraft into an asteroid moon for planetary defense purposes.
- The mission is intended to test whether a spacecraft impact could successfully deflect an asteroid on a collision course with Earth.

5. Consider the following statements :



1. Essential amino acids are amino acids which are produced or synthesised by our bodies
2. Non essential amino acids are Amino acids which cannot be synthesized or produced by the body and are required from food supplements
3. There are 20 total amino acids common in all life forms and majority out of them are essential amino acids
4. Protein sources derived from animal origin generally contain all the non essential amino acids and hence they are called complete proteins

- There are 20 total amino acids common in all life forms and the nonessential amino acids out of these include arginine, alanine, aspartic acid, asparagine, cysteine, glutamine, glutamic acid, proline, glycine, serine and tyrosine. Without these amino acids, our body will find it hard to make up proteins it needs which are required for the repair, growth and maintenance of cells.
 - 11 of the 20 amino acids are non-essential
-

Select the correct answer code:

- A. 1, 2 and 3 only
- B. 2, 3 and 4 only
- C. 3 and 4 only
- D. None of the above.

Answer : D

Explanation

Essential Amino Acids:

- Amino acids which cannot be synthesized or produced by the body and are required from food supplements are called essential amino acids. There are 9 essential amino acids that include leucine, isoleucine, histidine, lysine, methionine, threonine, phenylalanine, tryptophan, and valine.
- 9 amino acids out of 20 are thought to be essential
- Protein sources derived from animal origin contain all the nine essential amino acids and hence they are called complete proteins.

Non-Essential Amino Acids:

- Amino acids which are produced or synthesised by our bodies and are not taken up as food supplements are called nonessential amino acids.