



**Sleepy Classes**  
Awakening Toppers

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**Pre-Mix**  
**(Science & Technology)**  
*Compilation*  
**January to April 2023**

**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Tech.****Date – 14<sup>th</sup> January 2023**

**1. Which among the following is/are part of big data's core characteristics ?**

1. Volume
2. Value
3. Veracity
4. Variety

**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. Graphene is a naturally occurring material often considered the hardest material in the world
2. There is no evidence of Graphene presence in extra terrestrial materials
3. Carbon nanotubes are cylindrical molecules that consist of rolled-up sheets of graphene

**Select the correct answer code:**

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

**3 Which among the following best describe iPS stem cells**

- A. Stem cells derived from embryonic stage
- B. Stem cells created through the introduction of embryonic genes
- C. Stem cells specifically used to treat neurological diseases
- D. Unipotent stem cell for arthritis treatment

**4 Consider the following statements regarding Agni class missiles**

1. Agni P (Prime) is the new generation advanced variant of the Agni class missiles
2. Agni P is an Indian intercontinental ballistic missile (ICBM) with a range of over 5,000 km.
3. Both Agni V and Agni P originate from Integrated Guided Missile Development Program (IGMDP)

**Select the correct answer code:**

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

**5. Consider the following matches :**

- |                  |                 |
|------------------|-----------------|
| 1. Project Netra | Missile tracker |
| 2. Tri Netra     | Detect debris   |
| 3. Sindhu Netra  | Satellite       |

**Select the correct answer code:**

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

**Answers with Explanations**

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

**Q1.) Which among the following is/are part of big data's core characteristics ?**

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2. Value
3. Veracity
4. Variety

**Which of the statements given above /are correct?**

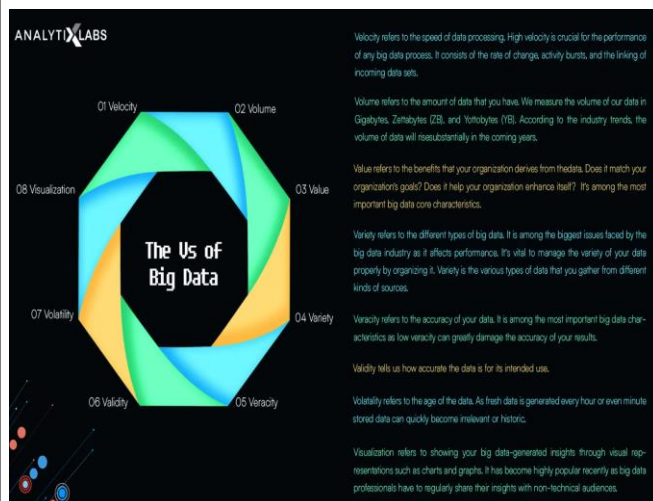
- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 and 3 only
- D. All of the above

**Answer : D**

### Explanation

#### Big data

- is a collection of data from many different sources
- Big Data allows companies and organizations to use large amounts of data effectively.
- It allows organizations to identify trends, patterns, and associations that would be quite challenging or nearly impossible to find with conventional data-processing solutions



### 2. Consider the following statements :

1. Graphene is a naturally occurring material often considered the hardest material in the world
2. There is no evidence of Graphene presence in extra terrestrial materials
3. Carbon nanotubes are cylindrical molecules that consist of rolled-up sheets of graphene

Select the correct answer code:

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- B. 1 and 3 only

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

**Answer : B**

### Explanation

#### Carbon nanotubes

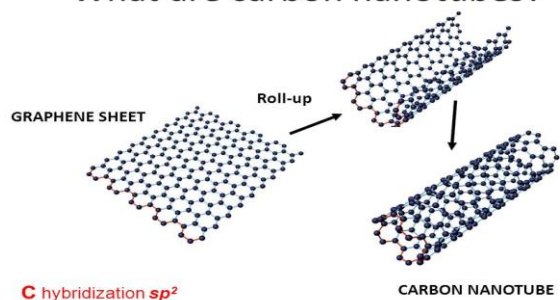
#### Graphene (Strongest material)

- Single layer of carbon atoms.
- It is harder than diamond yet more elastic than rubber
- Tougher than steel yet lighter than aluminium.
- Lowest resistivity substance known at room temperature.
- High thermal stability.
- High elasticity.
- High electrical conductivity.
- Electron mobility is high at room temperature.

### What are carbon nanotubes?

- are cylindrical molecules that consist of rolled-up sheets of single-layer carbon atoms (graphene)

#### What are carbon nanotubes?



### Q3.) Which among the following best describe iPS stem cells

- A. Stem cells derived from embryonic stage
- B. Stem cells created through the introduction of embryonic genes

- C. Stem cells specifically used to treat neurological diseases
- D. Unipotent stem cell for arthritis treatment

**Answer : B**

**Explanation**

**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.
- iPSCs are created through the introduction of **embryonic genes into a somatic cell** (a skin cell for example) that cause it to revert back to a "stem cell like" state.

**Q4.) Consider the following statements regarding Agni class missiles**

1. Agni P (Prime) is the new generation advanced variant of the Agni class missiles
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**Select the correct answer code:**

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

**Answer : B**

**Explanation**

**Integrated Guided Missile Development Programme (IGMDP)-DRDO**

IGMDP was started in 1983 (Dr APJ Abdul Kalam)

To attain self-sufficiency in the field of missile technology.

**Missiles**

- Prithvi Missile
- Akash
- Trishul
- Nag
- Agni (Later separated)

Missile	Type	Range
Agni I	MRBM	700-1000 Km
Agni II	IRBM	2000-2500
Agni III	IRBM	>2500
Agni IV	IRBM	>3500
Agni V	ICBM	>5000

**Agni-P missile**

A new-generation nuclear-capable ballistic missile, **Agni-P (Prime) was successfully test-fired** by the Defence Research and Development Organisation (DRDO)

**Agni-P**

**High accuracy**

- Many advanced technologies including composites, **propulsion systems, innovative guidance and control mechanisms** and state-of-the-art navigation systems have been introduced.
- The Agni-P missile **would further strengthen India's credible deterrence capabilities**

- There is a complete technology upgrade in every way.

## Shot in the arm

► Agni-P's range of 1,000–2,000 km is too short to reach targets in China's mainland, but can cover all of Pakistan's territory

► Being a canisterised missile, it can be transported easily and fired at very short notice

► It will replace the Prithvi, Agni-1 and Agni-2 missiles in India's arsenal that were built two decades ago with tech now considered obsolete

► It will enter service as a two-stage, solid propellant missile. Both stages will have composite rocket motors and guidance systems with electro-mechanical actuators

► Agni-P and Agni-5 originate from the Integrated Guided Missile Development Programme launched by then DRDO chief Dr APJ Abdul Kalam in the early 1980s

### 5 Consider the following matches :

- |                  |                 |
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| 1. Project Netra | Missile tracker |
| 2. Tri Netra     | Detect debris   |
| 3. Sindhu Netra  | Satellite       |

### 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

#### NETRA

- First indigenously built **Airborne Early Warning and Control System (AEW&CS)** developed by DRDO.
- This radar system is also mounted on Embraer aircraft (Brazil) which gives **240-degree coverage of airspace**.
- Helps to **detect and track aircraft, missiles, ships and vehicles**.

- The other countries which have developed AEW&C are **United States, Russia and Israel**.

#### Project Netra

- ISRO
- To detect debris and other hazards to Indian satellites.

#### Tri Netra

- Indian Railways
- Reduce train accidents by keeping a record of the track maintenance and will also provide better visibility during foggy days.

#### Sindhu Netra satellite (2021)

- Developed by the Defence Research and Development Organisation (DRDO)
- To **monitor activities of both military warships and merchant shipping** in the Indian Ocean Region (IOR).
- Also help in carrying out **surveillance** in specific areas such as the **South China Sea or near the Gulf of Aden and the African coast** including the **Ladakh region and the border areas with Pakistan**.
- In the first dedicated mission of its commercial arm NSIL (NewSpace India Limited), the ISRO successfully launched Brazil's earth observation satellite **Amazonia-1**
- Sindhu Netra' was part of the satellites launched.



**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Tech.****Date – 28<sup>th</sup> January 2023**

**1. Consider the following statements regarding Sand battery seen in news recently.**

1. It uses sand or sand-like materials as its storage medium
2. It store energy in a chemical form like other batteries and convert that into electrical energy when needed.
3. India became first country to install the world's first fully working "sand battery"

**Which of the statements given above /are correct?**

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

**2. Consider the following statements regarding Bone ossification test seen in news recently:**

1. It is a test that determines age of a person based on the degree of bone fusion
2. It help to provide accurate results as the process of ossification remains same irrespective of external factors
3. Effectiveness of the test increases with the age

**Select the correct answer code:**

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

**3 Recently terms Barnase, Barstar and Bar seen in news related to**

- A. Stem cells
- B. Low fat milk
- C. GM crops

D. Virus variants

**4. Which among the following best describe the term Local Bubble seen in news recently:**

- A. It is a cavity in the interstellar medium
- B. Lockdown restrictions to curb COVID 19 by china
- C. Tribal regions in forest area
- D. Region of the ocean with little oxygen

**5. Gluten-free diets have become increasingly popular in recent years for various reasons. Which among the following is correct in this context :**

1. Gluten is a family of storage fats which can lead to cardiovascular diseases
2. Gluten makes bread inelastic and decrease its moisture content
3. Most of the millets are gluten-free and are perfect substitutes for those suffering from Celiac Disease

**Select the correct answer code:**

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**Answers with Explanations**

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3. India became first country to install the world's first fully working "sand battery"

**Which of the statements given above /are correct?**

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

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

**Answer : A**

### Explanation

#### Sand battery

**Context:** A new battery technology by a Finland-based company that uses sand to store thermal energy may aid clean energy solutions. The innovation comes at a time when Europe is facing an unprecedented energy crisis.

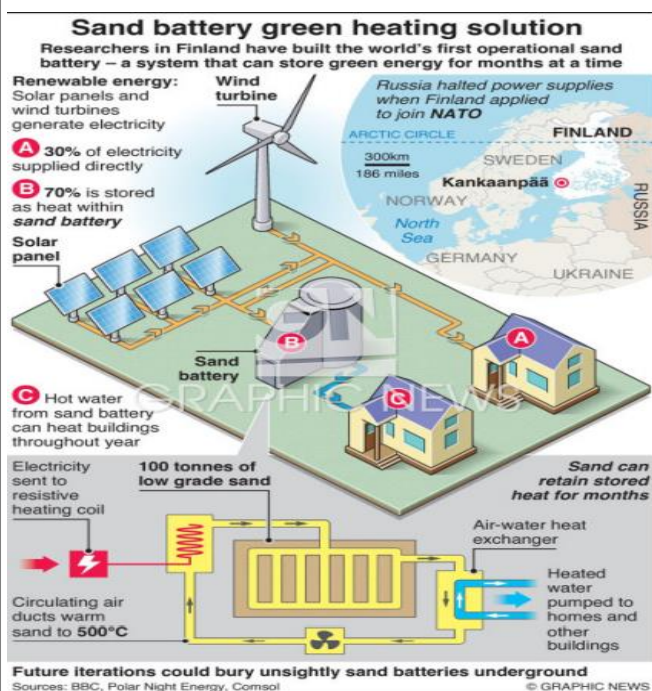
#### Background

- Russia – the supplier of **40 per cent of the European Union's natural gas supply** – has shut off its pipelines to a large extent. Countries in the Northern Hemisphere rely on a central heating system in winters, with natural gas as the most common heating fuel. This is unlike developing countries with a tropical climate.

#### Sand Battery

- A “sand battery” is a high temperature thermal energy storage that uses sand or sand-like materials as its storage medium. It stores energy in sand as heat.

#### How does the sand battery work?



- Just like conventional energy storage systems, when excess power is generated through renewable sources than is required, it is **directed towards the sand battery**.
- Instead of trying to move electrons from one electrode to the other or power pumps to send water to a higher reservoir, **a sand battery uses resistive heating to increase the temperature of the air**, which is then transferred to sand through a heat exchanger.
- With the melting temperature of the sand in **hundreds of degrees Celsius**, a tower of sand has a high potential to store energy. More importantly, sand store this energy for many months together, making it a viable long-term storage solution.

#### 2. Consider the following statements regarding Bone ossification test seen in news recently:

- It is a test that determines age of a person based on the degree of bone fusion
- It help to provide accurate results as the process of ossification remains same irrespective of external factors
- Effectiveness of the test increases with the age

#### Select the correct answer code:

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

**Answer : A**

### Explanation

#### What is the bone ossification test?

- The bone ossification test (hereinafter “ossification test”) is a test that determines age based on the “degree of fusion of bone” by taking the x-ray of a few bones. In simple words, the ossification test or osteogenesis is the process of the bone formation based on the fusion of joints between birth and the age of twenty five years in an individual.

## Problems associated with the test

- The major reason for ossification tests to not be a strong piece of evidence is because generally there is a variation of two years on both sides of the given possible age range. The process of ossification may also vary **based on factors like the nutrition, genetic peculiarities, injuries, geographical and climatic conditions, economic conditions, etc.**

## AGE OF THE EXAMINEE

- Bone ossification test also becomes difficult after the person whose age is to be determined crosses a certain age. Therefore, it cannot be used to determine the age of people after a lapse of time from the time of occurrence of the crime or if the accused raises the plea of minority after the passage of a long period of time – there is no restriction in raising the plea at a later stage – as the already inaccurate ossification test becomes even more inaccurate.

**WHAT IS A BONE OSSIFICATION TEST**

**OSSIFICATION**  
At birth, ends of bones are cartilaginous and middle part (bone shaft) is bony tissue. Cartilaginous portions become bone tissue as a person ages. This process—formation of new bone material (by cells called osteoblasts)—is called ossification.

**HOW THE TEST IS CONDUCTED**  
By X-ray analysis of mainly pelvic, shoulder, elbow, knee, ankle, thigh and wrist bones. This is supplemented by dental X-rays and a thorough physical examination, including analysis of secondary sexual characteristics. Age is declared after all tests are taken into consideration.

**FORENSIC UTILITY**  
Ossification of different bones occurs at different ages (see table); the process is complete only at the age of 25. Thus, a person's age (if 25) can be determined by an analysis of bones. The test is useful in determining if a person is minor or not. In criminal cases, it can help determine if a person has to be tried as a juvenile or an adult.

**LIMITATIONS**  
Age can be determined with a margin of error of two years. It means age cannot be exactly determined. Effectiveness of the test decreases with increase in age. It is easier to determine the age of a person who is 5-15 than 20-25.

**OSSIFICATION IN HUMANS**

AGE	EXTENT OF OSSIFICATION
5-14	Ossification in progress in various bones
17-20	Complete in hand and shoulder blade bones
18-23	Complete in leg and hip bones
23-25	Complete in breastbone, collarbone and vertebrae
25	Complete in almost all bones in body

**THE OSSIFICATION TEST CANNOT BE CONSIDERED CONCLUSIVE PROOF OF THE AGE OF THE PERSON WHO IS SUBJECTED TO IT AS IT INCLUDES A MARGIN OF ERROR**  
Justice Sachana Jadhav

## 3. Recently terms Barnase, Barstar and Bar seen in news related to

- Stem cells
- Low fat milk
- GM crops**
- Virus variants

**Answer : C**

**Explanation**

## GM mustard

- Recently, **GM mustard Dhara Mustard Hybrid (DMH-11)** was tested in the field and shown to be more productive.

## GM technology

- GM technology is a **disruptive technology capable of bringing any targeted change with in the crop variety** to overcome a problem that is difficult or impossible to achieve that are also safe to humans, animals and environment.
- Thus, the GM technology has **imminent potential for the much-needed revolution in Indian agriculture**.
- It is important to look at the current scenario particularly in relation to domestic production, requirement and import of edible oils in the country.

## 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.
- That plant, in turn, contains the Barstar gene, which blocks the action of the Barnase gene.
- The resultant F1 progeny is both high yielding and can also produce seed/grain, thanks to the Barstar gene in the second male-fertile line.





- Using this technology, the **Delhi University scientists bred DMH-11, a GM hybrid obtained from crossing an Indian mustard variety, Varuna ('Barnase' line), with Early Heera-2 ('Barstar').**
- DMH-11 has reported a roughly 30% yield advantage over the Varuna 'check' variety in the bio-safety research level field trials carried out between 2010-11 and 2014-15.

**4. Which among the following best describe the term Local Bubble seen in news recently:**

- A. It is a cavity in the interstellar medium
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**Answer : A**

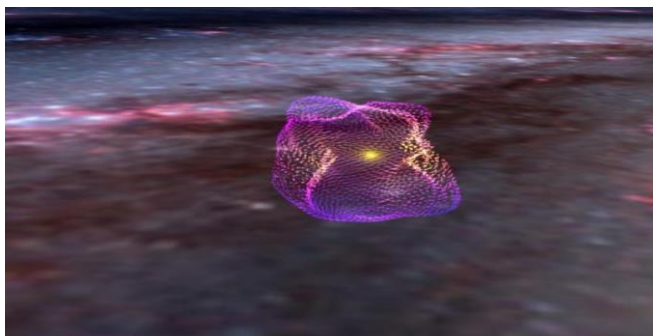
**Explanation**

**Local Bubble**

Recently Researchers from the Center for Astrophysics (CfA) | Harvard & Smithsonian have generated a 3D magnetic map of the cavity called Local Bubble

**Local Bubble**

- The Local Bubble is a 1,000-light-year-wide cavity or a superbubble. Other superbubbles also exist in the Milky Way, according to scientists.
- Space is full of these superbubbles that trigger the formation of new stars and planets and influence the overall shapes of galaxies



**5. Gluten-free diets have become increasingly popular in recent years for various reasons. Which among the following is correct in this context :**

1. Gluten is a family of storage fats which can lead to cardiovascular diseases
2. Gluten makes bread inelastic and decrease its moisture content
3. Most of the millets are gluten-free and are perfect substitutes for those suffering from Celiac Disease

**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**

**Gluten**

- Gluten is a family of proteins found in grains, including wheat, rye, spelt, and barley.
- Of the gluten-containing grains, wheat is by far the most common.
- Glutenin and gliadin are the two main proteins Trusted Source in gluten. Gliadin is responsible for most of Trusted Source the adverse health effects of gluten.
- When flour mixes with water, the gluten proteins form a sticky network that has a glue-like consistency.
- This glue-like property makes the dough elastic and gives bread the ability to rise during baking. It also provides a chewy, satisfying texture.
- Interestingly, the name gluten derives from this glue-like property of wet dough
- millets are gluten-free and are perfect substitutes for wheat if you want to



T.me/Sleepy Classes



**Sleepy Classes IAS**  
Awakening Toppers

give up gluten or are suffering from  
Celiac Disease.

**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Technology****Date – 06<sup>th</sup> February 2023****Questions from Crash Course**

**1. Recently NASA's audio of a black hole has gone viral. Which among the following is/are correct in this context ?**

1. Sound waves can easily move through space
2. Sound waves basically travel by vibrating the particles in a medium
3. Galaxy clusters can release a lot of gas, which can create a medium for sound waves to travel through.

**Which of the statements given above is/are correct?**

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

**2. The asteroid belt, with its many small rocky bodies, looks in some ways like the whole inner solar system. Why didn't the asteroid belt form into a planet, like the rest of the Solar System?**

1. There's not enough total mass in the belt to form a planet
2. The belt is too close to Jupiter

**Select the correct answer code:**

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

**Questions from Super current affairs**

**3. Consider the following statements regarding Millimeter wave seen in news recently:**

1. These are low-frequency radio waves that operate below the 1 GHz threshold
2. The waves are located in the wavelength range where microwaves and far infrared waves overlap
3. This band provide limited coverage with high speed internet

**Select the correct answer code:**

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

**4. Recently Ex-Pakistan President and Chief of Army Staff Pervez Musharraf died after suffering from amyloidosis. Which among the following is/are true in context to this disease.**

1. Amyloidosis is a rare disease that affects the heart, kidneys and liver.
2. A rare disease is defined as a health condition of low prevalence that affects a small number of people
3. According to the ICMR, a disease or disorder is defined rare in india if affect fewer than 1 in 2500 people

**Select the correct answer code:**

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

**UPSC Previous Year Question 2016**

**5. India is an important member of the 'International Thermonuclear Experimental Reactor'. If this experiment succeeds, what is the immediate advantage for India? (UPSC 2016)**

- A. It can use thorium in place of uranium for power generation
- B. It attain a global role in satellite-navigation

- C. It can drastically improve the efficiency of its fission reactors in power generation
- D. It can build fusion reactors for power generation

## Answers with Explanations

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### Questions from Crash Course

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3. Galaxy clusters can release a lot of gas, which can create a medium for sound waves to travel through.

Which of the statements given above is/are correct?

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

Answer : B

### Explanation

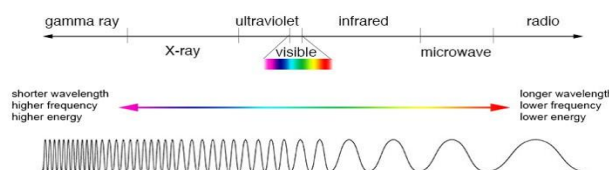
#### Sound waves

- Sound waves basically travel by vibrating the particles in a medium, i.e., molecules of air. These vibrations are passed on to consecutive particles in the medium, meaning that sound waves cannot travel without a medium. The reason we can't hear sound in the space is typically due to a lack of such a medium.
- We may argue that there are **clouds of gases in space that can act as mediums**, but gases are **not present uniformly**

throughout the space. Moreover, gases are typically less dense in space, which means there is too large of a gap between the particles, so vibrations cannot travel efficiently.

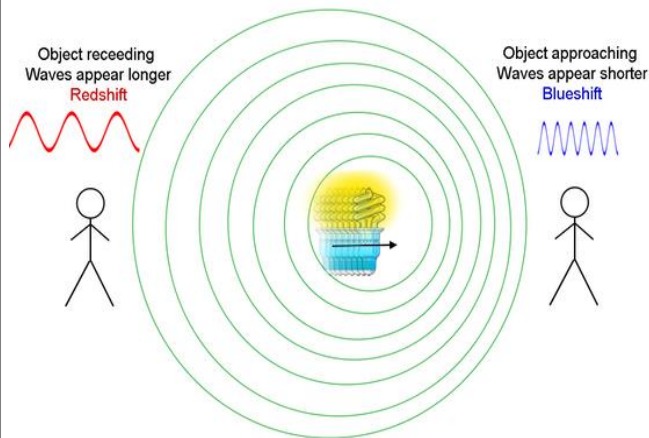
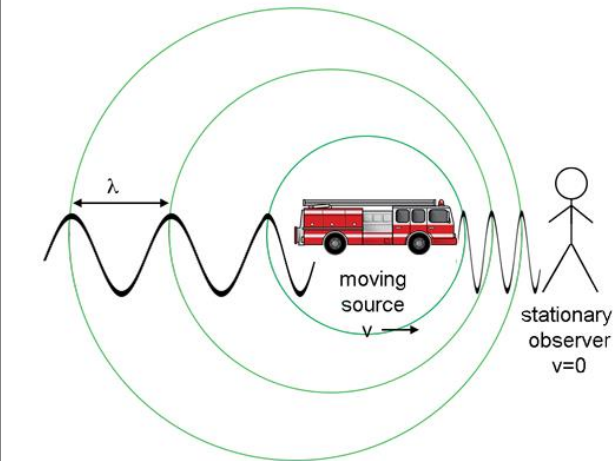
isn't space a vacuum? How can you 'hear' it?

- The idea that there is no sound in space is a **popular misconception**.
- Most of space is a vacuum that sound waves can't move through, but galaxy clusters can release a lot of gas, which envelops the many galaxies inside of them, creating a **medium for sound waves to travel through**.
- To create audio that is audible to humans, scientists do something known as **sonification**, which is the translation of this astronomical data into sound.



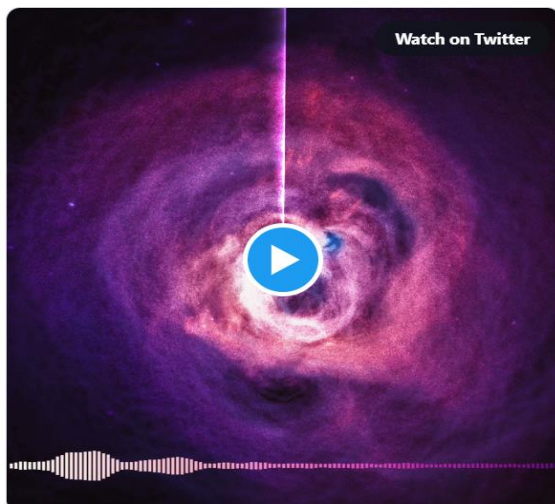
Color	Wavelength
violet	380–450 nm
blue	450–495 nm
green	495–570 nm
yellow	570–590 nm
orange	590–620 nm
red	620–750 nm





**NASA Exoplanets**   
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The misconception that there is no sound in space originates because most space is a ~vacuum, providing no way for sound waves to travel. A galaxy cluster has so much gas that we've picked up actual sound. Here it's amplified, and mixed with other data, to hear a black hole!



2. The asteroid belt, with its many small rocky bodies, looks in some ways like the whole inner solar system. Why didn't the asteroid belt form into a planet, like the rest of the Solar System?

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- D. None of the above.

Answer : C

Explanation

**Asteroid belt**

**Origin**

- **Early in the life** of the solar system, dust and rock circling the sun were pulled together by gravity into planets.
- But not all of the ingredients created new worlds.
- A region between **Mars and Jupiter** became the asteroid belt.

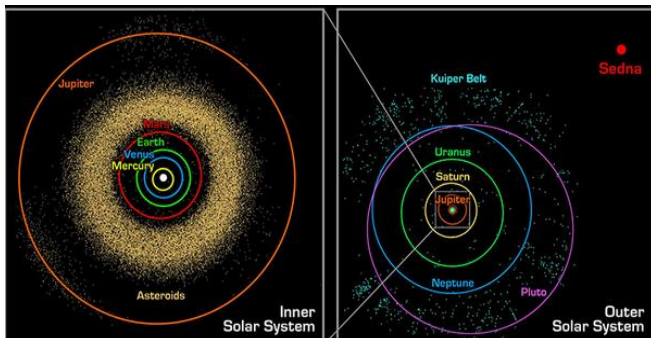
**Asteroid belt**

- An asteroid is a bit of rock.
- It can be thought of as what was "**left over**" **after the Sun and all the planets were formed**. Most of the asteroids in our solar system can be found orbiting the Sun between the orbits of Mars and Jupiter.
- This area is sometimes called the "asteroid belt"

**Whether the belt was made up of the remains of a destroyed planet, or a world that didn't quite get started**

- According to NASA, the total **mass of the belt is less than the moon**, far too small to weigh in as a planet.

- Instead, the **debris is shepherded by Jupiter**, which kept it from coalescing onto other growing planets



### Questions from Super current affairs

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- C. 3 only
- D. 2 and 3 only

**Answer : D**

### Explanation

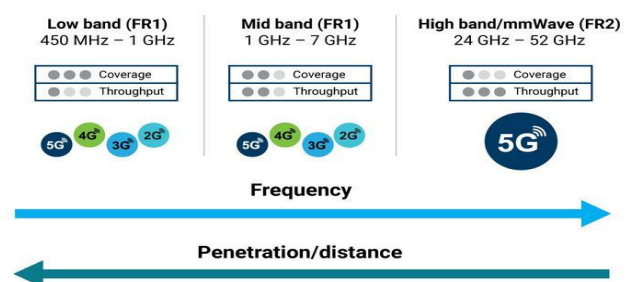
#### INTERNET

5G is the latest upgrade in the **long-term evolution (LTE)** mobile broadband networks.

#### Bands in 5G

- Low band spectrum:
- Mid-band spectrum:
- High-band spectrum:

Low band spectrum	<ul style="list-style-type: none"> <li>• Great promise in terms of <b>coverage and speed of internet</b></li> <li>• Maximum <b>speed is limited</b> to 100 Mbps</li> <li>• Main use-<b>commercial cell phones</b></li> </ul>
Mid-band spectrum	<ul style="list-style-type: none"> <li>• <b>Higher speeds</b> compared to the low band</li> <li>• <b>Limitations in terms of coverage area and penetration of signals</b></li> <li>• <b>Use-industries and specialized factory units for building captive networks</b></li> </ul>
High-band spectrum	<ul style="list-style-type: none"> <li>• <b>Highest speed of all the three bands</b></li> <li>• <b>Extremely limited coverage</b> and signal penetration strength.</li> <li>• Use-IoT</li> </ul>



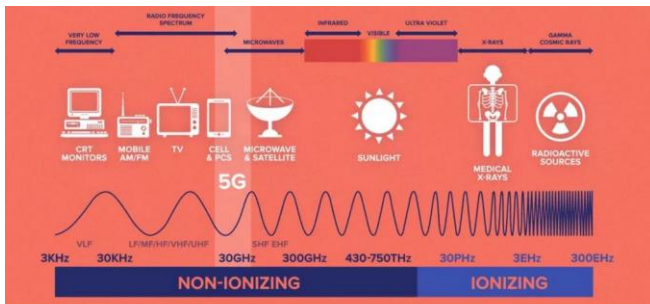
#### INTERNET

- Millimeter wave spectrum is the band of spectrum between 30 GHz and 300 GHz.
- Wedged between microwave and infrared waves, this spectrum can be

used for high-speed wireless communications

### Millimeter wave spectrum

- The 5G networks will operate in the millimeter wave spectrum (30-300 GHz) which have the advantage of sending large amounts of data at very high speeds because the frequency is so high, it experiences little interference from surrounding signals.



**4. Recently Ex-Pakistan President and Chief of Army Staff Pervez Musharraf died after suffering from amyloidosis. Which among the following is/are true in context to this disease.**

- Amyloidosis is a rare disease that affects the heart, kidneys and liver.
- A rare disease is defined as a health condition of low prevalence that affects a small number of people
- According to the ICMR, a disease or disorder is defined rare in india if affect fewer than 1 in 2500 people

**Select the correct answer code:**

- 1 and 2 only
- 1 and 3 only
- 3 only
- All of the above.

**Answer : D**

**Explanation**

**Pervez Musharraf Dies Of Amyloidosis**

- Amyloidosis is a rare disease that affects the heart, kidneys and liver. It occurs when a **protein called amyloid builds up in organs** and leads to impairment of their functioning. Such deposits can happen in the brain, kidneys, heart and spleen, and patients can experience it in one or several organs

### Rare disease

- Defined as a health condition of low prevalence that affects a small number of people when compared with other prevalent diseases in the general population
- While there is no universally accepted definition of rare diseases, countries typically arrive at their own descriptions, taking into consideration disease prevalence, its severity and the existence of alternative therapeutic options.
- In the **US**, for instance, a rare disease is defined as a condition that affects fewer than 200,000 people
- Prevalence of **1 or less, per 1000 population** is defined by the World Health Organization (**WHO**) as a rare disease
- According to the **ICMR**, a disease or disorder is defined rare in india if affect fewer than 1 in 2500 people
- According to the policy, rare diseases **include genetic diseases, rare cancers, infectious tropical diseases, and degenerative diseases**. As per the policy, out of all rare diseases in the world, less than five per cent have therapies available to treat them.
- In **India**, roughly **450 rare diseases** have been recorded from tertiary hospitals, of which the most common are Haemophilia, Thalassemia, Sickle-cell anemia, auto-

immune diseases, Gaucher's disease, and cystic fibrosis.

- The term "**orphan diseases**" is often used for these as less than five percent of rare diseases have treatment therapies available, most of which are prohibitively expensive.

### UPSC Previous Year Question 2016

**5. India is an important member of the 'International Thermonuclear Experimental Reactor'. If this experiment succeeds, what is the immediate advantage for India? (UPSC 2016)**

- A. It can use thorium in place of uranium for power generation
- B. It attain a global role in satellite-navigation
- C. It can drastically improve the efficiency of its fission reactors in power generation
- D. It can build fusion reactors for power generation**

**Answer : D**

### Explanation

**ITER (International Thermonuclear Experimental Reactor)**

- It is an **international nuclear fusion research and engineering megaproject**, which will be the world's largest magnetic confinement plasma physics experiment.
- It is a collaboration of **35 nations** launched in **1985**.
- It is located in **France**.
- It aims to build the world's largest tokamak to prove the feasibility of fusion as a large-scale and carbon-free source of energy.
- The ITER members include China, the European Union, **India**, Japan, South Korea, Russia and the United States.



**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Technology****Date – 15<sup>th</sup> February 2023**

**1. Consider the following statements regarding vaccine-derived poliovirus (VDPV) seen in news recently.**

1. It is primarily caused by Injectable inactivated polio vaccine.
2. Generally oral poliovirus vaccines contains a live, weakened form of poliovirus that replicates in the intestine to decrease cases related to vaccine-derived poliovirus (VDPV)
3. VDPVs can cause outbreaks in places where vaccine coverage is low.

**Which of the statements given above/are correct?**

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

**2. Consider the following statements regarding Lumpy skin disease seen in news recently:**

1. It is an infectious disease in cattle caused by bacteria
2. The disease is zoonotic, meaning it spread from animals to humans
3. It is not safe to consume milk from the infected animal.

**Which of the statements given above /are incorrect :**

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

**3. Recently Ramsay Hunt Syndrome seen in news related to**

- A. Decrease in bone density
- B. Inflammation of nerves
- C. Lungs infection
- D. Hypervitaminosis

**4. Consider the following statements in context to West Nile virus (WNV) and Malaria:**

1. Anopheles mosquito transmits malaria to humans, Culex mosquitoes transmit the West Nile virus.
2. Both diseases are caused by a parasite called plasmodium
3. Malaria has a specific line of treatment and can be cured but there is no specific treatment for West Nile virus

**Select the correct answer code:**

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

**5. Consider the following statements:**

1. Glucagon increases blood sugar levels, whereas insulin decreases blood sugar levels
2. Pancreas releases both Glucagon as well as insulin.
3. Body produces no or little insulin in type I Diabetes
4. In type II Diabetes body unable to utilize insulin properly

**Select the correct answer code:**

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

## Answers with Explanations

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

1. Consider the following statements regarding vaccine-derived poliovirus (VDPV) seen in news recently.

1. It is primarily caused by Injectable inactivated polio vaccine.
2. Generally oral poliovirus vaccines contains a live, weakened form of poliovirus that replicates in the intestine to decrease cases related to vaccine-derived poliovirus (VDPV)
3. VDPVs can cause outbreaks in places where vaccine coverage is low.

Which of the statements given above /are correct?

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

**Answer : C**

**Explanation**

**What is vaccine-derived polio?**

- Oral polio vaccine (OPV) contains an attenuated (weakened) vaccine-virus, activating an immune response in the body. When a child is immunized with OPV, the weakened vaccine-virus replicates in the intestine for a limited period, thereby developing immunity by building up antibodies. During this time, the vaccine-virus is also excreted. In areas of inadequate sanitation, this excreted vaccine-virus can spread in the immediate community (and this can offer protection to other children through 'passive' immunization), before eventually dying out
- On rare occasions, if a population is seriously under-immunized, an

excreted vaccine-virus can continue to circulate for an extended period of time. The longer it is allowed to survive, the more genetic changes it undergoes. In very rare instances, the vaccine-virus can genetically change into a form that can paralyse – this is what is known as a circulating vaccine-derived poliovirus (cVDPV).

- the problem is not with the vaccine itself, but low vaccination coverage. If a population is fully immunized, they will be protected against both vaccine-derived and wild polioviruses.

2. Consider the following statements regarding Lumpy skin disease seen in news recently:

1. It is an infectious disease in cattle caused by bacteria
2. The disease is zoonotic, meaning it spread from animals to humans
3. It is not safe to consume milk from the infected animal.

Which of the statements given above /are incorrect :

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

**Answer : D**

**Explanation**

**Lumpy skin disease**

- Some 1,229 cattle across five districts of Gujarat have been infected with Lumpy Skin Disease (LSD), an infectious viral disease, in the past one month.

**Lumpy skin disease**

- It is caused by infection of cattle or buffalo with the poxvirus Lumpy skin disease virus (LSDV).

- Historically, LSD has remained confined to Africa, where it was first discovered in 1929, and parts of West Asia.
- LSD was first reported in Asia and the Pacific region in 2019 in north west China, Bangladesh and India.

#### Symptoms:

- It appears as nodules of two to five-centimetre diameter all over the body, particularly around the head, neck, limbs, udder and genitals.
- The lumps gradually open up like large and deep wounds.

#### Transmission:

- The LSD virus easily spreads by blood-sucking insects like mosquitoes, flies and ticks and through saliva and contaminated water and food.

#### Treatment:

- There are no specific antiviral drugs available for the treatment of lumpy skin disease.
- Vaccines are the only cure to an LSD epidemic.



#### 3. Recently Ramsay Hunt Syndrome seen in news related to

- Decrease in bone density
- Inflammation of nerves**
- Lungs infection
- Hypervitaminosis

**Answer : B**

#### Explanation

#### 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 **7<sup>th</sup> cranial nerve that is involved in facial movements.** The inflammation caused by the Varicella Zoster Virus makes the nerve ineffective.

#### 4. Consider the following statements in context to West Nile virus (WNV) and Malaria:

- Anopheles mosquito transmits malaria to humans, Culex mosquitoes transmit the West Nile virus.
- Both diseases are caused by a parasite called plasmodium
- Malaria has a specific line of treatment and can be cured but there is no specific treatment for West Nile virus

#### Select the correct answer code:

- 1 only
- 1 and 2 only
- 1 and 3 only**
- 2 and 3 only

**Answer : C**

**Explanation**

**West Nile virus Vs malaria?**

- The similarities are that they are **both mosquito-borne diseases** and **sometimes, both can be potentially life-threatening**.
- However, **malaria** is caused by a parasite called **plasmodium**, and the **West Nile virus** is a single-stranded **RNA virus** that causes West Nile fever.
- Also, while the **female Anopheles mosquito transmits malaria to humans**, **Culex mosquitoes transmit the West Nile virus**.
- Additionally, **malaria** presents symptoms like fever with chills and, an immediately throbbing **headache** with chances of complications being high. But the **symptoms of West Nile virus do not always immediately become evident**.
- Treatment wise, **malaria has a specific line of treatment and can be cured**. There is **no specific treatment for West Nile virus** because it is a viral disease. As reported, many people do not even realise they have been infected.

**5. Consider the following statements:**

1. Glucagon increases blood sugar levels, whereas insulin decreases blood sugar levels
2. Pancreas releases both Glucagon as well as insulin.
3. Body produces no or little insulin in type I Diabetes
4. In type II Diabetes body unable to utilize insulin properly

**Select the correct answer code:**

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

C. 1, 3 and 4 only

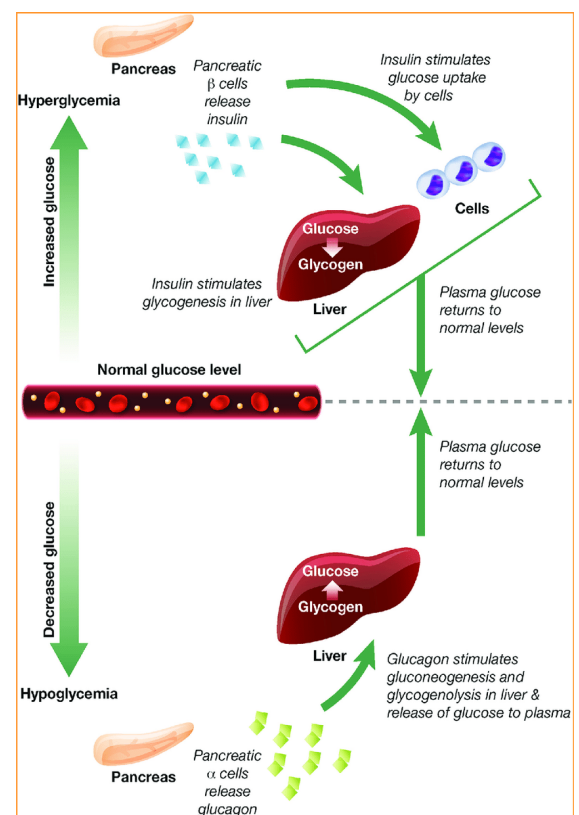
D. All of the above.

**Answer : D**

**Explanation**

**Diabetes**

- Recently **Indian Council of Medical Research (ICMR)** released guidelines for the diagnosis, treatment, and management for **type-1 diabetes**.
- This is the **first time the ICMR has issued guidelines** specifically for type 1 diabetes, which is rarer than type 2 – **only 2% of all hospital cases of diabetes in the country are type 1** – but which is being diagnosed more frequently in recent years.
- It gives **detailed guidelines on managing** the disease in different conditions such as when one is pregnant or when one is travelling.

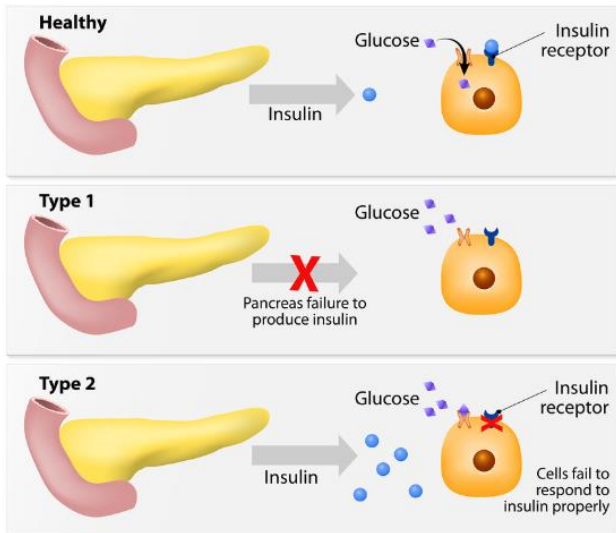






- The guidelines provide details on **diet and exercise, insulin monitoring, and prevention and treatment of complications** such as retinopathy, kidney disease, and nerve disease.

## DIABETES MELLITUS



## Diabetes: Type 1 vs. Type 2

Diabetes is on the climb - but there is a difference between Type 1 and Type 2. Do you know it?

### Type 1 Diabetes

Your body is no longer able to produce insulin

Usually develops during childhood, but can develop at any age

Family history

- Bedwetting  
- Frequent urination  
- Increased appetite & thirst  
- Mood changes, irritability  
- Tiredness and weakness  
- Unexplained weight loss

No known prevention methods

Insulin injections

### Type 2 Diabetes

Your body still produces insulin, but it doesn't make enough of it or it doesn't use it efficiently

Can develop at any age but is most common in adults over 45

- Overweight and/or inactive  
- Family history  
- High blood pressure

- Increased appetite & thirst  
- Dark patches on armpits/neck  
- Frequent urination  
- Blurry vision  
- Tiredness & weakness  
- Unexplained weight loss

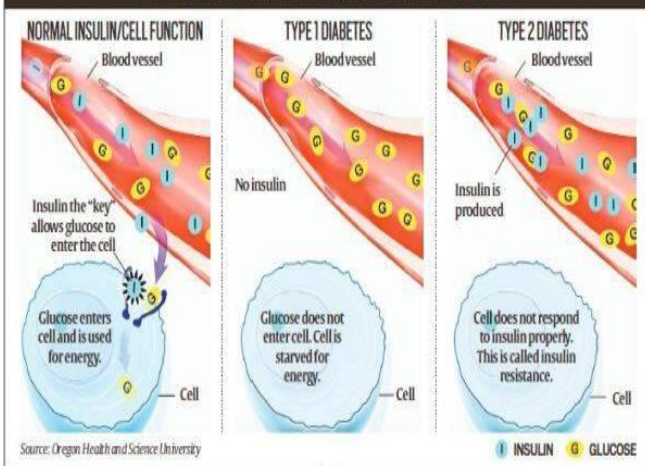
Healthy lifestyle

Healthy living, possible insulin support



Visit [blog.ohiohealth.com](http://blog.ohiohealth.com) for ways to stay healthy!

### HOW DIABETES TYPES 1 & 2 AFFECT THE BODY



- A similar guidebook for **type 2 diabetes** already exists.

**Pre-Mix - 5 MCQs for Prelims****Subject - Science & Technology****Date - 18<sup>th</sup> February 2023**

**1. Consider the following statements regarding Air Independent Propulsion (AIP) seen in news recently.**

1. It is a marine propulsion technology that allows non-nuclear submarines to operate without much access to atmospheric oxygen.
2. Fuel cell based AIP converts Hydrogen and Oxygen into electricity, with water and heat released as by-products.
3. A fuel cell is a device that generates electricity through the electrolysis chemical reaction

**Which of the statements given above /are correct?**

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

**2. Recently Ministry of Civil Aviation has launched an airspace map of India for drone operation. Which among the following statement/s is/are correct in this context.**

1. It shows red, yellow and green zones across the country.
2. In yellow zone drones can be operated only after a permission from the Central Government.
3. Red zone is the 'no-drone zone' within which drones can't be operated in any condition

**Which of the statements given above /are correct :**

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

D. 1 and 3 only

**3. Consider the following statements regarding critical information infrastructure (CII):**

1. It is defined under Information Technology Act of 2000
2. The government has the power to declare any data, database, IT network or communications infrastructure as CII
3. IT resources of ICICI Bank, HDFC Bank are declared as critical information infrastructure

**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

**4 Recently India reported few 100 cases of the Tomato Flu. It is caused by:**

- A. Virus
- B. Bacteria
- C. Fungi
- D. Parasite

**5. Consider the following statements in context to Dark matter:**

1. Dark matter is made up of particles that do not have a charge
2. They possess mass like normal matter and hence interact through electromagnetic interactions
3. More than 50% of the universe's content is Dark matter

**Select the correct answer code:**

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

D. 2 and 3 only

## Answers with Explanations

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

1. Consider the following statements regarding Air Independent Propulsion (AIP) seen in news recently.

1. It is a marine propulsion technology that allows non-nuclear submarines to operate without much access to atmospheric oxygen.
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3. A fuel cell is a device that generates electricity through the electrolysis chemical reaction

Which of the statements given above /are correct?

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

Answer : A

Explanation

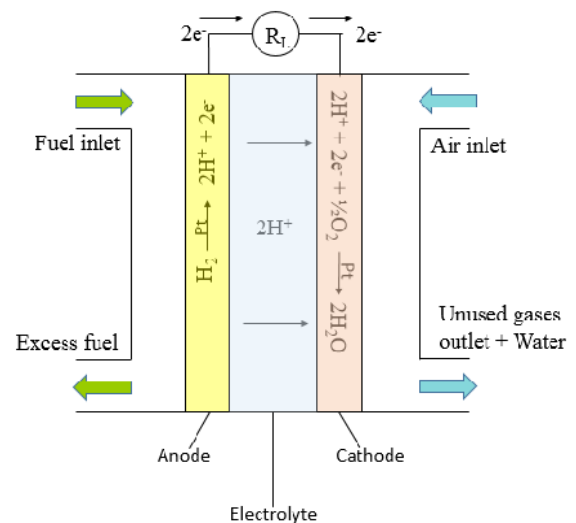
**Air Independent Propulsion (AIP)**

- Technology which allows a non-nuclear submarine to operate without the need to access atmospheric oxygen

**Air Independent Propulsion (AIP)**

**Fuel cell AIP**

- An electrolytic fuel cell releases energy by combining hydrogen and oxygen, with only water as the waste product.
- The cells are highly efficient, and **do not have moving parts**, thus ensuring that the submarine has a low acoustic signature.



**Basics**

**Electrolysis**

- When each water molecule **splits into its components**: two parts hydrogen and one part oxygen. That process is called **electrolysis**.

**Fuel cell (Reverse electrolysis)**

- What takes place inside a fuel cell is electrolysis in reverse: **Combine hydrogen and oxygen, and you get water and electricity**

**Air Independent Propulsion (AIP)**

- Fuel cell technology-based AIP generates power through the **reverse electrolysis of oxygen and hydrogen**. In this process, the two elements chemically combine, thereby generating electricity to charge the submarine's batteries. This process **does not need air, but requires storage of highly inflammable hydrogen on board**

**DRDO's AIP**

**Innovative Phosphoric Acid Fuel Cell technology**

- This process is more tolerant of fuel impurities, **offers longer life and**

**efficiency**, and is much safer, since it **does not require hazardous Hydrogen** to be stored on board.

**2. Recently Ministry of Civil Aviation has launched an airspace map of India for drone operation. Which among the following statement/s is/are correct in this context.**

1. It shows red, yellow and green zones across the country.
2. In yellow zone drones can be operated only after a permission from the Central Government.
3. Red zone is the 'no-drone zone' within which drones can't be operated in any condition

**Which of the statements given above /are correct :**

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

**Answer : A**

**Explanation**

### **TOP 10 FEATURES OF THE DRONE AIRSPACE MAPS**

1. The drone airspace map is an interactive map of India that demarcates the **yellow and red zones** across the country.
2. Green zone is the airspace **upto 400 feet** that has not been designated as a red or yellow zone; and **upto 200 feet** above the area located between 8-12 km from the perimeter of an operational airport.
3. In green zones, **no permission** whatsoever is required for operating drones with an all-up weight upto **500 kg**.
4. Yellow zone is the airspace **above 400 feet** in a designated green zone; **above**

**200 feet** in the area located between 8-12 km from the perimeter of an operational airport and **above ground** in the area located between 5-8 km from the perimeter of an operational airport.

5. Drone operations in yellow zone require permission from the concerned **air traffic control authority** – AAI, IAF, Navy, HAL etc. as the case may be.
6. Yellow zone has been reduced from **45 km earlier** to 12 km from the airport perimeter.
7. Red zone is the '**no-drone zone**' within which drones can be operated only after a permission from the **Central Government**.
8. The airspace map may be modified by **authorised entities** from time to time.
9. Anyone planning to operate a drone should **mandatorily** check the latest airspace map for any changes in zone boundaries.
10. The drone airspace map is **freely available** on the digital sky platform to all without any login requirements.

**3. Consider the following statements regarding critical information infrastructure (CII):**

1. It is defined under Information Technology Act of 2000
2. The government has the power to declare any data, database, IT network or communications infrastructure as CII
3. IT resources of ICICI Bank, HDFC Bank are declared as critical information infrastructure

**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

**Answer : D**

### Explanation

#### Critical information infrastructure

- The Union Ministry of Electronics and IT (MeitY) has declared IT resources of ICICI Bank, HDFC Bank and UPI managing entity NPCI as 'critical information infrastructure'.

#### What is critical information infrastructure?

- The Information Technology Act of 2000 defines "Critical Information Infrastructure" as a "computer resource, the incapacitation or destruction of which shall have debilitating impact on national security, economy, public health or safety".
- The government, under the Act, has the power to declare any data, database, IT network or communications infrastructure as CII to protect that digital asset.

**4. Recently India reported few 100 cases of the Tomato Flu. It is caused by:**

- A. Virus
- B. Bacteria
- C. Fungi
- D. Parasite

**Answer : A**

### Explanation

#### Tomato Flu

- Identified first in Kerala, Tomato Flu is caused by a virus and shows symptoms similar to those of Covid-19 but is **not related to SARS COV-2**.

- This disease was **first identified in Kerala's Kollam district**.
- Instead of being a viral infection, Tomato Flu **might be an after-effect of Dengue fever or Chikungunya in children**
- Till now, there **are no specific drugs** for this disease, and it is being treated with different combinations of medication for chikungunya and dengue.

**5. Consider the following statements in context to Dark matter:**

- Dark matter is made up of particles that do not have a charge
- They possess mass like normal matter and hence interact through electromagnetic interactions
- More than 50% of the universe's content is Dark matter

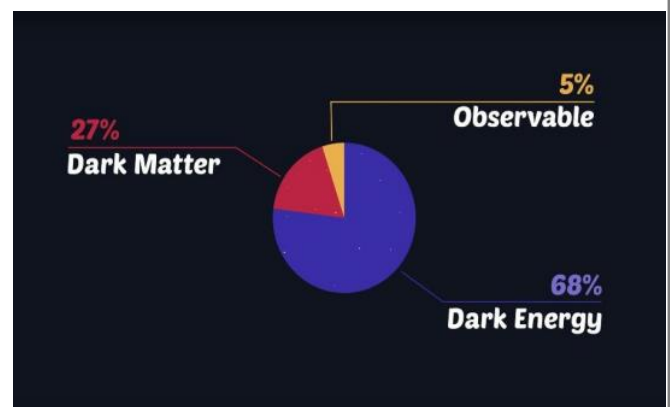
**Select the correct answer code:**

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

**Answer : A**

### Explanation

**What is dark matter ?**



- All interactions in the universe are a result of four fundamental forces acting on particles — strong nuclear force,



weak nuclear force, electromagnetic force and gravitation.

- Dark matter is made up of particles that **do not have a charge** – which means they do not interact through electromagnetic interactions. So, these are particles that are “dark”, namely because they do not emit light, which is an electromagnetic phenomenon, and “**matter**” because they possess mass like normal matter and hence interact through gravity.

## Pre-Mix – 5 MCQs for Prelims

### Subject – Science & Tech.

Date – 04<sup>th</sup> March 2023

1. Recently National Centre for Polar and Ocean Research (NCPOR) and the Goa University (GU) have synthesized gold nanoparticles (GNPs). Consider the following statements in this context:

1. These GNPs were synthesized by using fungi through eco-friendly way.
2. These GNPs can be used as a composite therapeutic agent.
3. The GNPs displayed anti-bacterial properties.

Which of the statements given above /are correct?

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

2. Recently the body of Nobel Peace Prize winner Desmond Tutu underwent aquamation, a green alternative to traditional cremation methods. Which among the following statement/s is/are correct in this context.

1. It is an alkaline hydrolysis process in which body is immersed in a mixture of water and a strong alkali.
2. The process leaves behind DNA, bone fragments and a neutral liquid called effluent.

Which of the statements given above /are correct :

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

3. With the current state of development, Synthetic biology can do which of the following?

1. Generation of polio virus from scratch

2. Microorganisms modification for bioremediation
3. Synthesis of bacterial genome
4. Rice modified to produce beta-carotene

Which of the statements given above /are correct:

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

4. Which among the following is/are correct in context to the Hubble space and James web telescope:

1. The JWST will be able to see right through and into massive clouds of dust that are opaque to earlier generation visible-light observatories like the Hubble Telescope.
2. Webb is equipped with cameras and other instruments sensitive to infrared or “heat” radiation.
3. The James Webb Space Telescope will not be in orbit around the Earth, like the Hubble Space Telescope is.

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.

5. Which one of the following statements is not correct?

(UPSC 2019)

- A. Hepatitis B virus is transmitted much like HIV.
- B. Hepatitis B, unlike Hepatitis C, does not have a vaccine.
- C. Globally, the number of people infected with Hepatitis B and C viruses are several times more than those infected with HIV.

- D. Some of those infected with Hepatitis B and C viruses do not show the symptoms for many years.

## Answers with Explanations

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

1. Recently National Centre for Polar and Ocean Research (NCPOR) and the Goa University (GU) have synthesized gold nanoparticles (GNPs). Consider the following statements in this context:

1. These GNPs were synthesized by using fungi through eco-friendly way.
2. These GNPs can be used as a composite therapeutic agent.
3. The GNPs displayed anti-bacterial properties.

Which of the statements given above /are correct?

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

**Answer : B**

**Explanation**

**Gold nanoparticles (GNPs)**

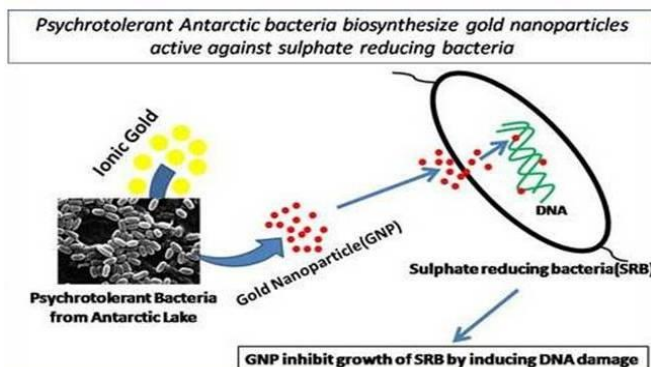
The National Centre for Polar and Ocean Research (NCPOR) and the Goa University (GU) have successfully synthesized gold nanoparticles (GNPs) using psychrotolerant Antarctic bacteria through a non-toxic, low-cost, and eco-friendly way.

- These GNPs can be used as a composite therapeutic agent clinical trials, especially in anti-cancer, anti-viral, anti-diabetic, and cholesterol-lowering drugs.

**Significance**

- The NCPOR-GU study revealed genotoxic effect of GNPs on a sulphate reducing bacteria (SRB).

- The GNPs displayed enough **anti-bacterial properties** by **inhibiting the growth of SRB and its sulphide production** by damaging the genetic information of the DNA of the bacterial cell.
- **Genotoxicity** describes the property of a chemical agent that is capable of **damaging the genetic information of DNA** and thus causing mutation of the cell, which can lead to cancer.



**Gold Nanoparticles**

- Gold nanoparticles are made up of metallic gold atoms to create a crystal structure of 1-100 nm.
- **Synthesis of gold nanoparticles**

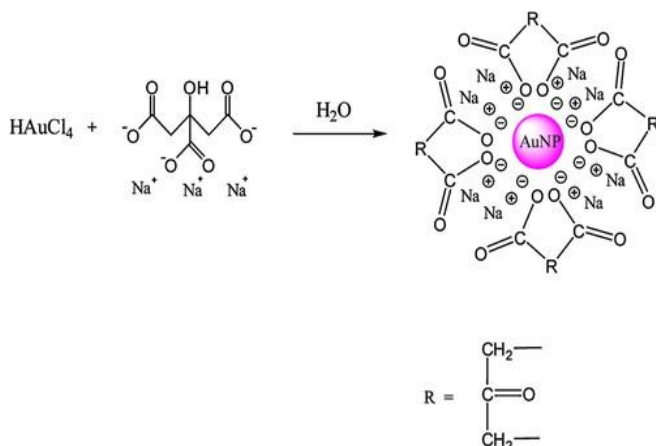
**Chemical method**

- Generally, the preparation of AuNPs by the chemical reduction method

**Electrochemical method**

**Biological method**

- Bacteria, algae, fungi or plants are used to reduce gold to its metallic state through various biological processes.



2. Recently the body of Nobel Peace Prize winner Desmond Tutu underwent aquamation, a green alternative to traditional cremation methods. Which among the following statement/s is/are correct in this context.

1. It is an alkaline hydrolysis process in which body is immersed in a mixture of water and a strong alkali.
2. The process leaves behind DNA, bone fragments and a neutral liquid called effluent.

Which of the statements given above /are correct :

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

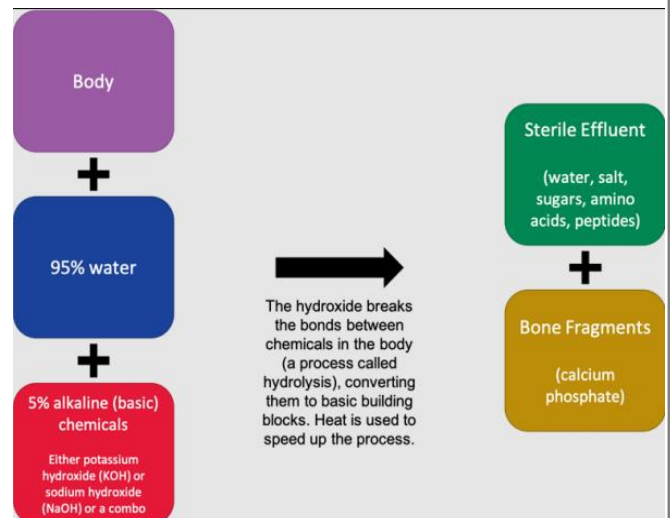
Answer : A

Explanation

What is aquamation?

- Aquamation, or alkaline hydrolysis, is a process in which the **body of the deceased is immersed for a few hours in a mixture of water and a strong alkali** in a pressurized metal cylinder and heated to around 150 degree centigrade.
- The process **leaves behind bone fragments** and a neutral liquid called effluent.
- The decomposition that occurs in alkaline hydrolysis is the **same as that which occurs during burial, just sped up dramatically by the chemicals.**
- The effluent is sterile, and contains salts, sugars, amino acids and peptides.

- There is **no tissue and no DNA left after** the process completes.



3. With the current state of development, Synthetic biology can do which of the following?

1. Generation of polio virus from scratch
2. Microorganisms modification for bioremediation
3. Synthesis of bacterial genome
4. Rice modified to produce beta-carotene

Which of the statements given above /are correct :

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

Answer : D

Explanation

Synthetic biology

- Synthetic biology or synbio is a broad and dynamic field of innovation encompassing the **design and construction of new biological parts that redesign existing natural biological systems** to address real-time and real-world problems.
- In 2002, scientists in the United States synthesized a viral genome for the first time. Viral genomes are much smaller compared to the genomes of most bacteria and microorganisms. **Scientists** showed that it



was possible to create the polio virus from scratch and brought attention to the risk that synthetic biology could be used to develop biological weapons

- The first synthetic bacterial genome was completed in 2008 with the **synthesis of the genome of *Mycoplasma genitalium***, a bacterium that can cause urinary and genital tract infections in humans.

**4. Which among the following is/are correct in context to the Hubble space and James web telescope:**

- The JWST will be able to see right through and into massive clouds of dust that are opaque to earlier generation visible-light observatories like the Hubble Telescope.
- Webb is equipped with cameras and other instruments sensitive to infrared or "heat" radiation.
- The James Webb Space Telescope will not be in orbit around the Earth, like the Hubble Space Telescope is.

**Which of the statements given above /are correct :**

- 1 and 2 only
- 2 and 3 only
- 1 and 3 only
- All of the above.

**Answer : D**

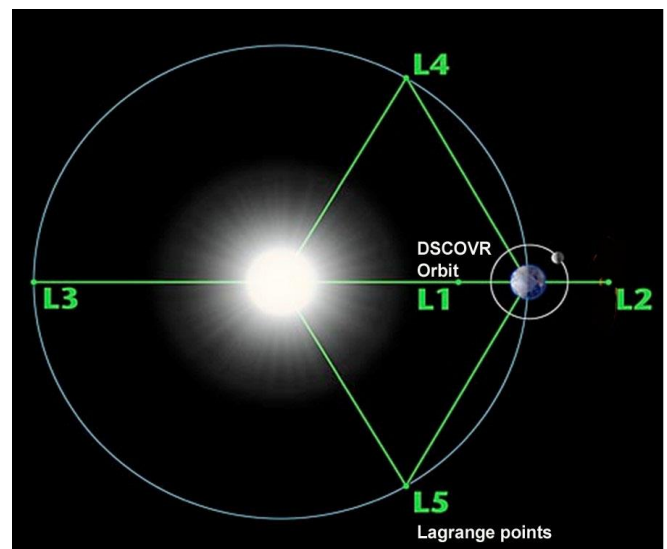
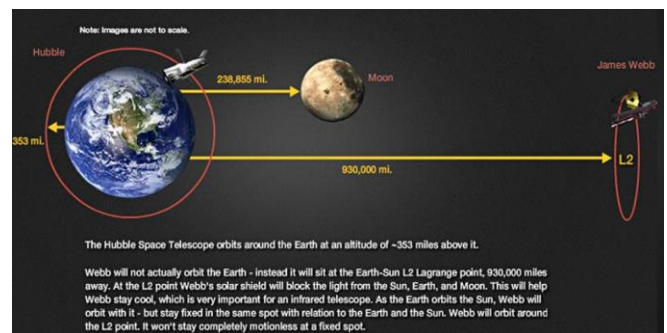
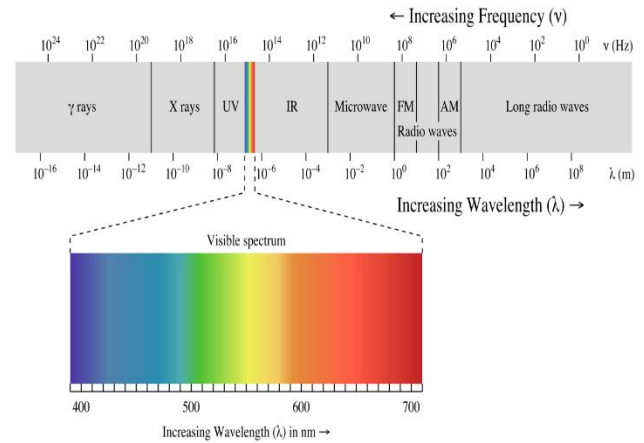
**Explanation**

**James Webb Space Telescope (JWST)**

**Hubble Vs James web telescope**

- The JWST will be able to see right through and into massive clouds of dust that are opaque to earlier generation visible-light observatories like the Hubble Telescope.
- Another difference is that the Webb is equipped with cameras and other instruments sensitive to infrared or "heat" radiation, and the Hubble is not.

- The expansion of the universe causes the light that would normally be in wavelengths that are visible to be shifted to longer infrared wavelengths, normally invisible to human eyes.



5. Which one of the following statements is not correct?

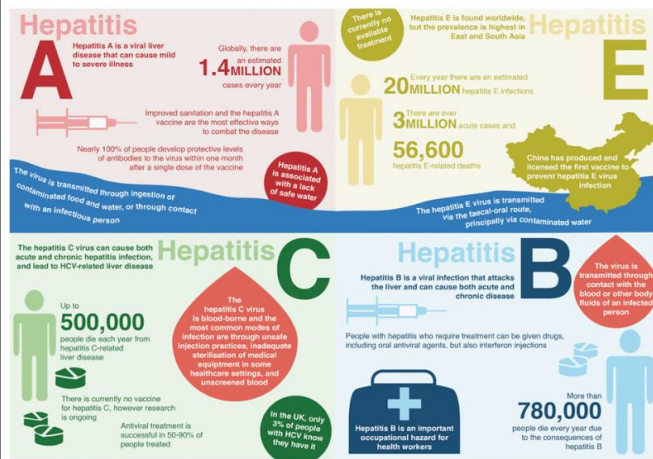
(UPSC 2019)

- A. Hepatitis B virus is transmitted much like HIV.
- B. Hepatitis B, unlike Hepatitis C, does not have a vaccine.
- C. Globally, the number of people infected with Hepatitis B and C viruses are several times more than those infected with HIV.
- D. Some of those infected with Hepatitis B and C viruses do not show the symptoms for many years.

**Answer : B**

**Explanation**

- Hepatitis B is a viral infection that attacks the liver and can cause both acute and chronic disease. The virus is transmitted through contact with the blood or other body fluids of an infected person. (HIV also gets transmitted via the exchange of a variety of body fluids from infected individuals, such as blood, breast milk, semen and vaginal secretions)



## Pre-Mix – 5 MCQs for Prelims

**Subject – Science & Tech.**

**Date – 11<sup>th</sup> March 2023**

**1. Which among the following is/are correct regarding Space Bricks seen in news recently:**

1. They are developed by NASA from Martian soil with the help of bacteria and urea.
2. Their can be used to construct building-like structures on Mars that could facilitate human settlement on the red planet.
3. Due to their high porosity and light weight, they are easy to use on other planets

**Select the correct answer code:**

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

**2. Consider the following statements in context of Gravitational waves:**

1. Every massive object that accelerates produces gravitational waves.
2. Humans, cars and airplanes also produces gravitational waves.
3. The most powerful gravitational waves are created when objects move at very high speeds.

**Select the correct answer using codes given below:**

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

**3. Consider the following statements:**

1. Unlike a Cryogenic engine, a Semi Cryogenic engine uses refined kerosene instead of liquid oxygen.
2. Refined Kerosene occupies less space, making it possible to carry more propellant

in a Semi Cryogenic engines fuel compartment

3. Semi-cryogenic engine requires refined kerosene, which is lighter and can be stored at a normal temperature.

**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

**4. Recently CCR 5 mutation seen in news, related to :**

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

**5. HIV/AIDS can be spread through:**

1. Blood transfusion
2. Insect Bite
3. Unprotected sex
4. Saliva
5. Pregnancy
6. Through food

**Which of the statements given above /is correct:**

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

## Answers with Explanations

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

**1. Which among the following is/are correct regarding Space Bricks seen in news recently:**

1. They are developed by NASA from Martian soil with the help of bacteria and urea.

2. They can be used to construct building-like structures on Mars that could facilitate human settlement on the red planet.
3. Due to their high porosity and light weight, they are easy to use on other planets

Select the correct answer code:

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

Answer : B

Explanation

Space Bricks

Context

- Researchers from ISRO and Indian Institute of Science (IISc) have developed a way to make bricks of complex shapes from Martian soil with the help of bacteria and urea.
- First slurry was made by mixing Martian soil with guar gum, a bacterium called *Sporosarcina pasteurii*, urea and nickel chloride ( $\text{NiCl}_2$ ).
- Bacteria convert the urea into crystals of calcium carbonate.
- These crystals, along with biopolymers secreted by microbes, act as cement holding soil particles together.
- In the past, the team had made bricks out of lunar soil using a similar method.

2. Consider the following statements in context of Gravitational waves:

1. Every massive object that accelerates produces gravitational waves.
2. Humans, cars and airplanes also produces gravitational waves.
3. The most powerful gravitational waves are created when objects move at very high speeds.

Select the correct answer using codes given below:

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

Answer : D

Explanation

Gravitational waves

- **Gravitational waves are 'ripples' in space-time** caused by some of the most violent and energetic processes in the Universe.
- Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity.
- Historically, scientists have relied almost exclusively on **electromagnetic (EM) radiation (visible light, X-rays, radio waves, microwaves, etc.)** to study the Universe. Some are trying to use subatomic particles, called neutrinos, as well. Each of these 'messengers' of information provides scientists with a different *but complementary* view of the Universe.
- **Gravitational waves, however, are completely unrelated to EM radiation.** They are as distinct from light as hearing is from vision.
- The gravitational waves that **LIGO detects** are caused by some of the most energetic events in the Universe—colliding black holes, merging neutron stars, exploding stars, and possibly even the birth of the Universe itself.

Sources and Types of Gravitational Waves

- Every massive object that accelerates produces gravitational waves. This includes **humans, cars, airplanes** etc., but the masses and accelerations of objects on Earth are far too small to make gravitational waves big enough to detect with our instruments. To find big enough gravitational waves, we have to look far outside of our own solar system.

The most powerful gravitational waves are created when objects move at very high speeds. Some examples of events that could cause a gravitational wave are:

- when a star explodes asymmetrically (called a **supernova**)
- when two big stars orbit each other
- when two **black holes** orbit each other and merge.

3. Consider the following statements:

1. Unlike a Cryogenic engine, a Semi Cryogenic engine uses refined kerosene instead of liquid oxygen.
2. Refined Kerosene occupies less space, making it possible to carry more propellant in a Semi Cryogenic engines fuel compartment
3. Semi-cryogenic engine requires refined kerosene, which is lighter and can be stored at a normal temperature.

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**

- **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.

**Semi-Cryogenic Propellant Tank**

- 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 (LH<sub>2</sub>)** 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.

4. Recently CCR 5 mutation seen in news, related to :

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

Answer : A

Explanation

**What is CCR5 mutation and how does it fight off HIV?**

- HIV (Human Immunodeficiency Virus) **mainly attacks the CD4 immune cells** in the human body, thereby reducing a person's ability to fight off secondary infections.



- The CCR5 receptors on the surface of the CD4 immune cells act as a doorway for the HIV virus.
- However, the **CCR5-delta 32 mutation** prevents these receptors used by the HIV virus from forming on the surface, effectively removing the doorway.
- **Only 1 per cent of the people in the world** carry two copies of the CCR5-delta 32 mutation – meaning they got it from both their parents – and another 20 per cent carry one copy of the mutation, mainly those of European descent. Those with the mutation hence are almost immune to the infection, although some cases have been reported.

#### 5. HIV/AIDS can be spread through:

1. Blood transfusion
2. Insect Bite
3. Unprotected sex
4. Saliva
5. Pregnancy
6. Through food

Which of the statements given above /is correct:

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

Answer : B

Explanation

How Is HIV/AIDS Transmitted?

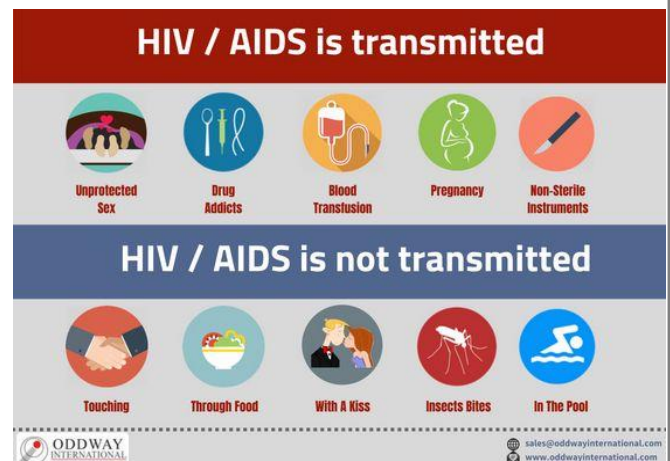
- **Sexual contact** - HIV is spread most commonly by sexual contact with an infected partner. The virus enters the body through the lining of the vagina, vulva, penis, rectum, or mouth during sexual activity.
- **Blood contamination** - HIV may also be spread through contact with infected blood. However, due to the screening of blood for evidence of HIV infection, the risk of

acquiring HIV from blood transfusions is extremely low.

- **Needles** - HIV is frequently spread by sharing needles, syringes, or drug use equipment with someone who is infected with the virus. Transmission from patient to healthcare worker, or vice-versa through accidental sticks with contaminated needles or other medical instruments, is rare.
- **Mother-infant** - HIV also can be spread to babies born to, or breastfed by, mothers infected with the virus.

HIV/AIDS cannot be spread through:

- Saliva
- Sweat
- Tears
- Casual contact, such as sharing food utensils, towels, and bedding
- Swimming pools
- Telephones
- Toilet seats
- Biting insects (such as mosquitoes)



**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Tech.****Date – 18<sup>th</sup> March 2023****1. Consider the following statements regarding deepfakes:**

1. The deep fakes are a compilation of artificial images and audio put together with machine-learning algorithms.
2. It use deep learning technology to generate text, images, audio and video scenes.
3. It can create people who do not exist and it can fake real people saying and doing things they did not say or do.

**Which of the statements given above is /are correct?**

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

**2. How do astronomers detect exoplanets?**

- A. By observing the visible light they reflect
- B. By detecting the gravitational pull they exert on their parent star
- C. By analyzing the sound waves they emit
- D. By measuring the temperature of their atmosphere

**3. With reference to the Mars Orbiter Mission sometimes mentioned in the news, consider the following statements:**

1. Mars Orbiter Mission was India's first interplanetary mission to study the Martian atmosphere.
2. The mission made India the second Asian country and the Six in the world to get to the planet
3. MOM was launched aboard a Geosynchronous Satellite Launch Vehicle

**Which of the statements given above is /are correct?**

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

**4. With reference to the Lumpy skin disease (LSD) sometimes mentioned in the news, consider the following statements**

1. Lumpy skin disease is a fungal disease of cattle and water buffalo caused by the Mucormycosis fungus.
2. It is spreads by blood-sucking insects like mosquitoes, flies and ticks
3. There is no vaccine available to cure to an LSD epidemic

**Which of the statements given above is /are correct?**

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

**5. Consider the following statements with reference to Tiangong Space Station:**

1. The Tiangong space station is a Chinese space station being built in low Earth orbit
2. China is the second country in history to have put both astronauts into space and to build a space station
3. Tiangong is smaller than the International Space Station

**Which of the statements given above is/are correct?**

- A. 1 and 2 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 deepfakes:

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2. It use deep learning technology to generate text, images, audio and video scenes.
3. It can create people who do not exist and it can fake real people saying and doing things they did not say or do.

Which of the statements given above is /are correct?

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

Answer : D

Explanation

**Deepfake technology**

The **Cyberspace Administration of China**, the country's cyberspace watchdog, is rolling out new regulations, to be effective from January 10, to **restrict the use of deep synthesis technology** and curb disinformation.

**Deep synthesis**

- It is defined as the use of technologies, including **deep learning and augmented reality**, to generate text, images, audio and video to create virtual scenes.
- One of the most notorious applications of the technology is **deepfakes**, where synthetic media is used to **swap the face or voice** of one person for another.
- Deepfakes are getting **harder to detect** with the advancement of technology. It is used to generate **celebrity porn videos**, produce



T.me/Sleepy Classes

**fake news, and commit financial fraud** among other wrongdoings.

- Under the guidelines of **China's new rules**, companies and platforms using the technology **must first receive consent from individuals before they edit their voice or image**.

**What is a deepfake?**

- Deepfakes are a **compilation of artificial images and audio** put together with machine-learning algorithms to **spread misinformation** and replace a real person's appearance, voice, or both with similar artificial likenesses or voices.
- It can **create people who do not exist** and it can fake real people saying and doing things they did not say or do.
- The **term deepfake originated in 2017**, when an anonymous Reddit user called himself "Deepfakes." This user manipulated Google's open-source, deep-learning technology to create and post pornographic videos. The videos were doctored with a technique known as **face-swapping**. The user "Deepfakes" replaced real faces with celebrity faces.

**What are other countries doing to combat deepfakes?**

- The **European Union** has an updated **Code of Practice** to stop the spread of disinformation through deepfakes.
- In July, last year, the **U.S.** introduced the **bipartisan Deepfake Task Force Act** to assist the Department of Homeland Security (DHS) to counter deepfake technology. The measure directs the DHS to conduct an annual study of deepfakes – assess the technology used, track its uses by foreign and domestic entities, and come up with available countermeasures to tackle the same.
- In **India**, however, there are **no legal rules against using deepfake technology**. However, specific laws can be addressed for

misusing the tech, which **include Copyright Violation, Defamation and cyber felonies**

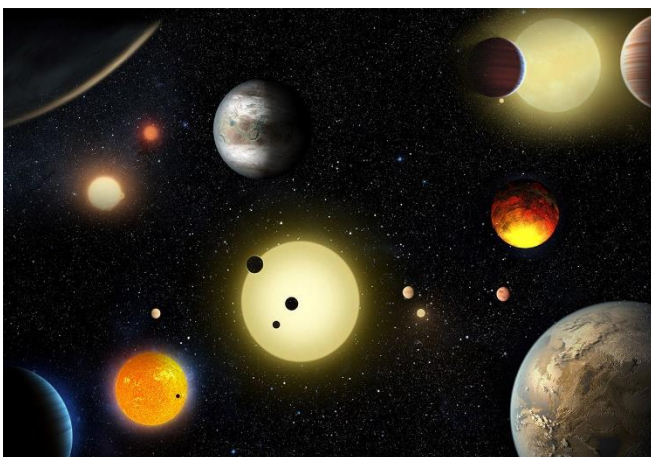
## 2. How do astronomers detect exoplanets?

- A. By observing the visible light they reflect
- B. By detecting the gravitational pull they exert on their parent star
- C. By analyzing the sound waves they emit
- D. By measuring the temperature of their atmosphere

**Answer : B**

### Explanation

- Astronomers primarily use the radial velocity method to detect exoplanets, which involves measuring the small wobbles in a star's motion caused by the gravitational pull of an orbiting planet. This method can also be used to determine an exoplanet's mass and distance from its parent star.
- Other methods, such as the transit method (detecting the small dip in a star's brightness as an exoplanet passes in front of it) and direct imaging (taking a picture of the exoplanet), can also be used to detect exoplanets, but they are generally less common and can be more challenging to perform.



3. With reference to the Mars Orbiter Mission sometimes mentioned in the news, consider the following statements:

- Mars Orbiter Mission was India's first interplanetary mission to study the Martian atmosphere.
- The mission made India the second Asian country and the Six in the world to get to the planet
- MOM was launched aboard a Geosynchronous Satellite Launch Vehicle

**Which of the statements given above is /are correct?**

- A. 1 and 3 only
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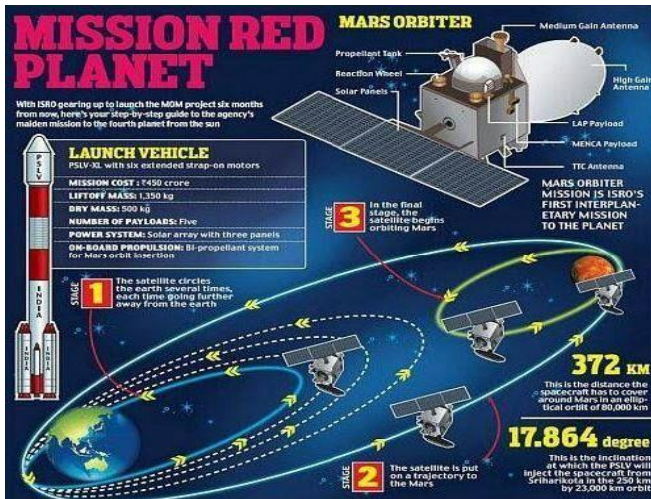
**Answer : B**

### Explanation

The Mars Orbiter Mission (MOM) or Mangalyaan is a space probe launched by the Indian Space Research Organization in 2013.

- Statement 1 is correct:** Mangalyaan was India's first interplanetary mission. India's Mangalyaan mission is aimed at studying the Martian atmosphere. The indigenously-built space probe has been in Martian orbit since 2014.
- Statement 2 is not correct:** The mission made India the **first Asian country and the fourth in the world after Roscosmos, NASA, and the European Space Agency**, to get to the planet. • Its objective is to explore Martian surface features, mineralogy, morphology and atmosphere using indigenous scientific instruments. A crucial objective of MOM was to develop technologies required for planning, designing, management and operations of an interplanetary mission.
- Statement 3 is not correct:** MOM was launched aboard PSLV C-25 (an XL version of the PSLV). ISRO spent \$75 million to launch the mission, making it the least-expensive Mars mission to date.





4. With reference to the Lumpy skin disease (LSD) sometimes mentioned in the news, consider the following statements

1. Lumpy skin disease is a fungal disease of cattle and water buffalo caused by the Mucormycosis fungus.
2. It is spreads by blood-sucking insects like mosquitoes, flies and ticks
3. There is no vaccine available to cure to an LSD epidemic

Which of the statements given above is /are correct?

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

**Answer : B**

**Explanation**

**Lumpy skin disease**

- Some 1,229 cattle across five districts of **Gujarat** have been infected with Lumpy Skin Disease (LSD), an infectious viral disease, in the past one month

**Lumpy skin disease**

- It is caused by infection of cattle or buffalo with the **poxvirus Lumpy skin disease virus (LSDV)**.

- Historically, LSD has remained confined to **Africa**, where it was first **discovered in 1929**, and parts of West Asia.
- LSD was **first reported in Asia and the Pacific region** in 2019 in north west China, Bangladesh and India.

**Symptoms:**

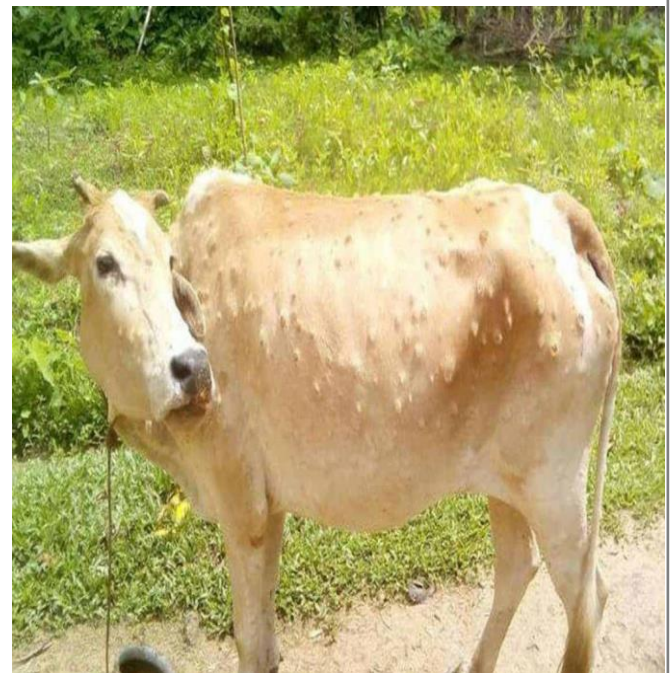
- It appears as **nodules of two to five-centimetre diameter** all over the body, particularly around the head, neck, limbs, udder and genitals.
- The lumps gradually open up like large and deep wounds.

**Transmission:**

- The LSD virus easily spreads by **blood-sucking insects like mosquitoes, flies and ticks** and through saliva and contaminated water and food.

**Treatment:**

- There are **no specific antiviral drugs** available for the treatment of lumpy skin disease.
- Vaccines are the only cure to an LSD epidemic.



5. Consider the following statements with reference to Tiangong Space Station:

1. The Tiangong space station is a Chinese space station being built in low Earth orbit
2. China is the second country in history to have put both astronauts into space and to build a space station
3. Tiangong is smaller than the International Space Station

Which of the statements given above is/are correct?

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

**Answer : C**

**Explanation**

**Tiangong space station**

China selects mystery astronauts for 2023 missions to Tiangong space station

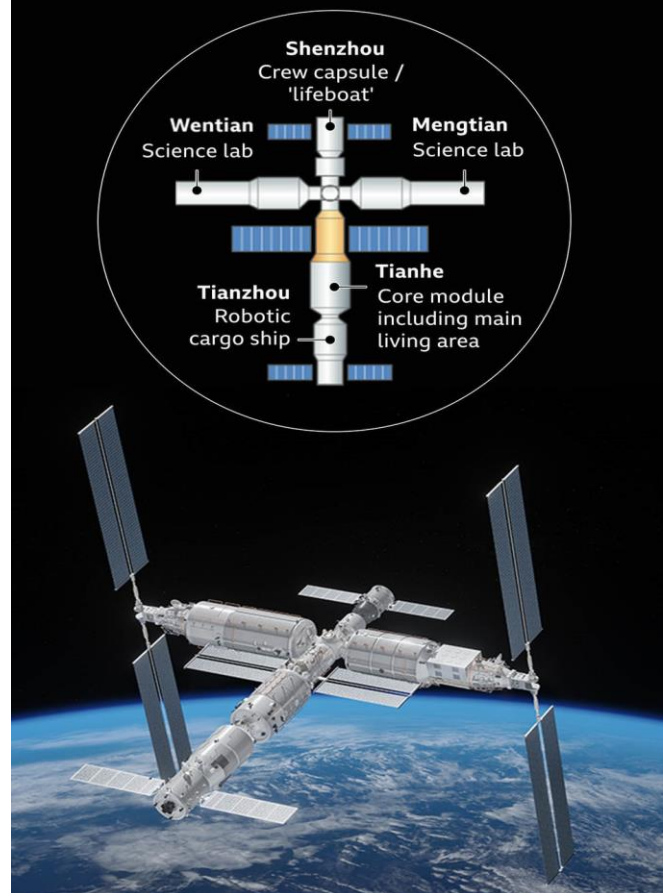
**About**

- China will later this year send two crews to the now fully operational Tiangong to spend six months in orbit conducting science experiments and keeping the space station maintained.
- Two three-person crews have been selected for the **Shenzhou 16 mission, due to launch in May, and the following Shenzhou 17 mission, launching six months later.** The missions will lift off atop Long March 2F rockets from Jiuquan in the Gobi Desert
- Tiangong, which means "**Heavenly Palace,**" will consist of **Tianhe** the main habitat for astronauts, and two modules dedicated to hosting experiments, **Mengtian and Wentian**

- Tiangong will be much smaller than the International Space Station (ISS)
- Tiangong will also be **lighter than the ISS**, which weighs about 400 tons (450 metric tons)
- China is **only the third country** in history to have put both astronauts into space and to build a space station, after the Russia and the US.

#### China's space station

How it will look when fully assembled



	International Space Station	Chinese Space Station	Mir
Maximum Length	109 m	37 m	31 m
Mass	420 metric tons	60 - 70 metric tons	130 metric tons
Lifespan	26 yrs if deorbited in 2024	>10 yrs	15 yrs
Crew Size	6, or 9 short-term	3, or 6 short-term	3, or 6 short-term
Initial Launch Date	1998	2021	1986

ChinaPower CSIS | 2021-2022

## Pre-Mix – 5 MCQs for Prelims

### Subject – Science & Technology

Date – 25<sup>th</sup> March 2023

#### 1. Consider the following statements :

1. Viruses are particles that infect or enter our cells and then use the cell's genetic machinery to make copies of themselves and subsequently spread to surrounding uninfected cells.
2. Cancer cells often have impaired antiviral defenses that make them susceptible to infection
3. Oncolytic viruses infect, replicate, in natural cells and causes cancer in body.

Which of the statements given above is /are correct?

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

#### 2. Recently term 'blood batteries' seen in news, related to

- A. Lead acid battery
- B. Bone marrow
- C. Lithium ion battery
- D. Spleen

#### 3. Which among the following causes avian influenza "bird flu" in human

1. H5N1
2. H1N1
3. H3N2
4. H9N2

Which of the statements given above is /are correct?

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

D. 3 and 4 only

#### 4. With reference to the Nairobi flies sometimes mentioned in the news, consider the following statements

1. They are Kenyan flies which releases a potent acidic substance that causes skin burns.
2. These flies do not bite .
3. Generally the use of bright light is recommended to repel these flies.

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

#### 5. Consider the following matches:

	Vitamin	Disease
1	A	Night blindness
2	B	Rickets
3	C	Beri Beri
4	D	Scurvy

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

### Answers with Explanations

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

#### 1. Consider the following statements :



1. Viruses are particles that infect or enter our cells and then use the cell's genetic machinery to make copies of themselves and subsequently spread to surrounding uninfected cells.
2. Cancer cells often have impaired antiviral defenses that make them susceptible to infection
3. Oncolytic viruses infect, replicate, in natural cells and causes cancer in body.

Which of the statements given above is /are correct?

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

**Answer : B**

**Explanation**

**Few min 23 July**

- Recently researchers have made significant **improvements to a next-generation cancer therapy that kills tumour cells** while leaving healthy tissues intact.
- The treatment uses **genetically engineered or naturally occurring microbes – oncolytic viruses** – that replicate in cancer cells and overwhelm them.
- The therapy also **strengthens the cancer patient's immune system** against the tumour.
- However, this also means that, at times, the oncolytic viruses come up against the body's natural defence system.
- At the University of Houston's Centre for Nuclear Receptors and Cell Signaling, researchers used gene editing to cancel out such an immune response, enabling the **anti-cancer microbes** to work with all their might.

- Along with the breakthrough, last month, in **anti-rectal cancer treatment**, advances in the use of oncolytic viruses offer hope that cancerous tumours can be eliminated without the use of surgery or debilitating chemotherapy.

### Previous issue

- Sometimes those **natural killers limit the oncolytic viruses**, and so despite the exciting development in the OV field in recent years, **there is room for improvement to tackle some limitations**, including the relatively weak therapeutic activity and lack of means for effective systemic delivery.

### Novel approach

- A region of the gene is deleted which shows to activate the signaling pathway that enables the virus to replicate in normal cells.
- It consists of a new oncolytic virus called **FusOn-H2**, based on the **Herpes simplex 2 virus, (HSV-2)**, commonly known as genital herpes.
- Arming FusOn-H2 with a chimeric NK engager that can engage the infiltrated natural killer cells with tumour cells can significantly enhance the effectiveness of this virotherapy

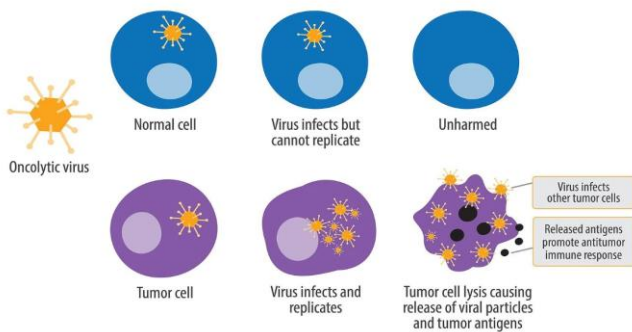
### Oncolytic Viruses as Cancer Treatment

- Oncolytic viruses infect, replicate, and eventually lyse cancer cells. This is the primary mechanism by which these viruses kill tumor cells. A secondary mechanism has also been proposed, whereby **antigens released by dying tumor cells stimulate an antitumor immune response**.
- The mechanism behind viral-induced immune modulation is an active area of research. Clinical studies have so far shown that oncolytic viral therapy can enhance the number of tumor-infiltrating lymphocytes, as seen in a trial for late-stage melanoma patients.

## Selectivity of Oncolytic Viruses

- An important feature of oncolytic viruses is selectivity – being **able to target tumor cells while sparing healthy, normal cells**. Replication-selective oncolytic viruses are engineered with **deletions of genes which are necessary for normal cell survival**, but dispensable in tumor cells.

### Antitumor Mechanisms of an Oncolytic Virus



Click [Here](#) for A Few Minutes Series

2. Recently term 'blood batteries' seen in news, related to

- Lead acid battery
- Bone marrow
- Lithium ion battery
- Spleen

Answer : C

### Explanation

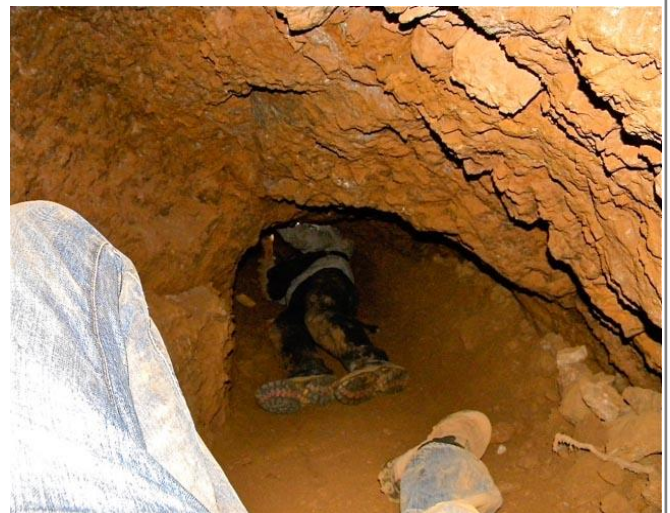
Green energy is touted as one of the best solutions. We are **replacing coal with hydroelectric power, fossil fuels with solar energy, petrol and diesel cars with electric vehicles (EV)**.

**EVs are being pitched as cleaner, greener and sustainable. But are they?**

- Under the shiny exteriors of an electric vehicle lies a shocking story of **blood batteries, extreme poverty and child labour**.
- Electric cars **use batteries**. You know that. But do you know that **lithium and cobalt**

are rare metals that make up these batteries.

- The **cobalt in the battery keeps it stable** and allows it to operate safely. It is a bluish-gray metal. It is found in the earth's crust or what we call crustal rocks.
- In addition to its use in **jet turbine generators, tool materials, pigments and smartphone batteries**, cobalt is also used in lithium-ion batteries. Cobalt is used in **about half of electric cars**, which is about four to 30 kilograms per battery.
- It is **found all over the world** in countries such as in **Australia, Canada, China, Cuba, South Africa, the United States and the Philippines**. But **70 per cent of the total supply comes from one country, the Democratic Republic of the Congo (DRC)**.
- DRC is the second-largest country in Africa**, with a gross domestic product of \$49 billion. It is synonymous with conflict, poverty and corruption.
- The **world's largest cobalt deposit is beneath the red earth of the DRC**. Some 92 million people live in the DRC and two million rely on cobalt production. They are called *Négociants*.





## Cobalt mining

Cobalt is mined in two ways in the DRC:

- **Industrial** (large-scale mining) and **artisanal** (small-scale mining). So what is the difference between the two?
- There are **no labour laws or safety protocols governing artisanal mines** in the DRC, where 20-30 per cent of the country's cobalt is mined. These mines **employ some 200,000 miners**, according to Transport & Environment, a European clean transport campaign group.
- At least **40,000 of them are children**, some as young as six years old, according to the Wilson Centre, a US non-partisan policy forum.
- These children flirt with death daily. They **enter vertical tunnels that are too narrow for adults to enter**. The children in the mine dig for cobalt under inhumane conditions in a furnace-like environment.
- Although they **sometimes use shovels, they typically dig with their bare hands**. They are **not provided with masks, gloves, work clothes** and may only be provided with 20 minutes of oxygen at a time. Yet, these young children dig for hours.
- Upon digging the rock, they crush it, wash it and then take their finds to the market in order to sell them. How much do these children make? Sometimes as little as a dollar.
- Cobalt is a multibillion-dollar industry estimated to be worth \$17.39 billion by 2027, according to Statista, a German company specialising in market and company data. But this **money never reaches a child who is spotting and extracting the metal**. In the poverty-stricken DRC, even a dollar is worth risking one's life for. Many die trying to make this money.
- In the DRC, at least **80 artisanal miners died between 2014 and 2015**, according to

UN-run radio station Radio Okapi. In **2019, an accident killed 43 miners**.

- Many suffer permanent **lung damage, skin infections and other life-changing injuries**.
- According to the **World Bank**, the demand for **cobalt will increase by 585 per cent by 2050**. The Congolese people wish to ride this wave and escape poverty. For them, sending their children to the mines is not a choice but rather a necessity.
- Many of these children end up working as artisanal miners or as informal workers. Although they are not employed by any company, several companies queue up to purchase their fines.

## China and the DRC

- The vast majority of **companies dealing in blood batteries are Chinese**.
- By far, **the largest producer of refined cobalt is China**, with 66 per cent, followed by **Finland** (10 per cent), according to *Mining.com*. In the last 15 years, Chinese companies have bought out North American and European companies mining in the DRC, according to the *New York Times*. As of last year, Chinese companies owned 15 of the 19 industrial mines in the DRC.
- China has promised the DRC billions of dollars in investment in the form of infrastructure, schools, and roads in exchange for Congolese cobalt. This is yet another example of how stories involving China never end well.
- In today's world, **China is leaking blood cobalt into the supply chain for electric vehicles**. Chinese companies are purchasing cobalt from children in an effort to encourage them to engage in the trade in blood batteries.
- In China's large-scale industry, **workers are abused, discriminated against, beaten and forced to work without contracts** and

adequate rations. If a worker dies, the Chinese keep the corpse hidden and bribe the family to keep quiet.

**It is your electric vehicle that is killing people even before it reaches the road. Did you sign up for this?**

- The world's largest automakers are complicit in these crimes, including **Tesla, Volvo, Renault, Mercedes-Benz and Volkswagen**, who all source cobalt from Chinese mines in the DRC.
- While they **may claim to have a zero-tolerance policy on child labour**, they are also aware that there is no way to map their entire supply chains.
- EVs thus **run on dirty energy, on blood batteries** and this is not a climate solution. This is **human rights abuse** and the two cannot co-exist. A climate solution should not be at the expense of human life. Long story short, electric vehicles have a long way to go before they can claim to be clean.

Click [Here](#) for Few Minutes Link.

**3. Which among the following causes avian influenza "bird flu" in human**

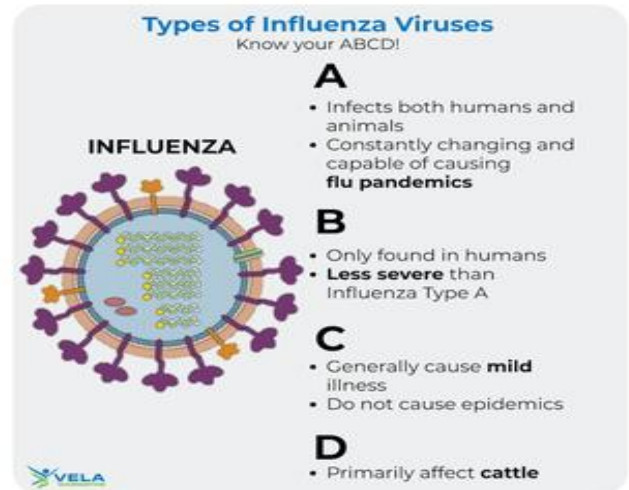
1. H5N1
2. H1N1
3. H3N2
4. H9N2

**Which of the statements given above is /are correct?**

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

**Answer : B**

## Explanation



## Influenza viruses

Influenza type A viruses are classified into subtypes according to the combinations of **different virus surface proteins, hemagglutinin (HA) and neuraminidase (NA)**

- For example, a virus that has an HA 7 protein and NA 9 protein is designated as subtype H7N9.
- **Human infections are primarily acquired through direct contact with infected animals or contaminated environments.**

## Influenza A viruses

- can be classified as
- **Avian influenza** (H5N1, H9N2 etc.)
- **Swine influenza** (H1N1 and H3N2), or other types of animal influenza viruses
- The most effective way to prevent the disease is **vaccination**
- **Humans can be infected with avian, swine and other zoonotic influenza viruses, such as avian influenza virus subtypes A(H5N1), A(H7N9), and A(H9N2) and swine influenza virus subtypes A(H1N1), A(H1N2) and A(H3N2).**

## G4 Virus(Strain of H1N1)

- It is **recently emerged** , infecting Chinese pigs
- G4 strain has the capability of **binding to human-type receptors** (like, the SARS-CoV-2 virus binds to ACE2 receptors in humans)

## Bird flu (avian influenza)

- Can spread from **one bird to other birds and animals**.
- Migratory birds have been assumed to be largely responsible for long-distance transmission of the virus into India.
- It also spreads through local movement of residential birds and poultry

Click [Here](#) for Few Minutes Series Link.

### 4. With reference to the Nairobi flies sometimes mentioned in the news, consider the following statements

1. They are Kenyan flies which releases a potent acidic substance that causes skin burns.
2. These flies do not bite .
3. Generally the use of bright light is recommended to repel these flies.

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 : A**

### Explanation

- Around **100 students of an engineering college in East Sikkim** have reported skin infections after coming in contact with Nairobi flies,
- The population of Nairobi flies, a species of insect **native to East Africa**, is growing at a

fast pace on campus of the **Sikkim Manipal Institute of Technology (SMIT)**

- The college administration said infected students had been given **medication and were recovering**. One student who was recently infected had to undergo surgery in his hand.

## Nairobi flies



- also called **Kenyan flies or dragon bugs**, are small, beetle-like insects that belong to two species, *Paederus eximius* and *Paederus sabaeus*.
- They are **orange and black in colour**, and thrive in areas with **high rainfall**, as has been witnessed in Sikkim in the past few weeks.
- Like most insects, the beetles are attracted by **bright light**.

## How are humans affected by them?



- Usually, the **insects attack pests that consume crops** and are beneficial for humans — but at times, they come in contact with humans directly and cause harm.
- Health officials say these **flies do not bite**, but if disturbed while sitting on anyone's skin, they release a potent **acidic substance that causes burns**.



- This substance is called **pederin**, and can cause **irritation if it comes in contact with the skin**, leading to lesions or unusual marks or colouring on the skin.
- The skin begins to heal in a week or two, but some secondary infections can occur, especially if the victim scratches the irritated skin.

### Have there been outbreaks of the disease?

- Major outbreaks have **happened in Kenya** and other parts of eastern Africa.
- In 1998, unusually heavy rain caused a large number of insects to come into the region, reported the Associated Press.
- Outside Africa**, outbreaks have happened in **India, Japan, Israel, and Paraguay in the past**.

### What is the way to protect oneself against Nairobi flies?

- Sleeping under **mosquito nets** can help. If a fly lands on a person, it should be **gently brushed off, and should not be disturbed or touched** to reduce the chances of it releasing pederin.
- The area where the flies sits should be **washed with soap and water**.
- If they are squelched and end up leaving toxic fluids on the skin, care should be taken that unwashed hands do not touch any other part of the body, particularly the eyes.

Click [Here](#) for Few Minutes Series Link.

5. Consider the following matches:

	Vitamin	Disease
1	A	Night blindness
2	B	Rickets
3	C	Beri Beri

4	D	Scurvy
---	---	--------

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 : A**

**Explanation**

Vitamin	Deficiency Disease	Source
A (Retinol)	Night blindness, Xerophthalmia	Green leafy vegetables, ripe yellow fruits, guava, milk, liver, nuts, tomatoes, oranges, carrots, broccoli, watermelon etc.

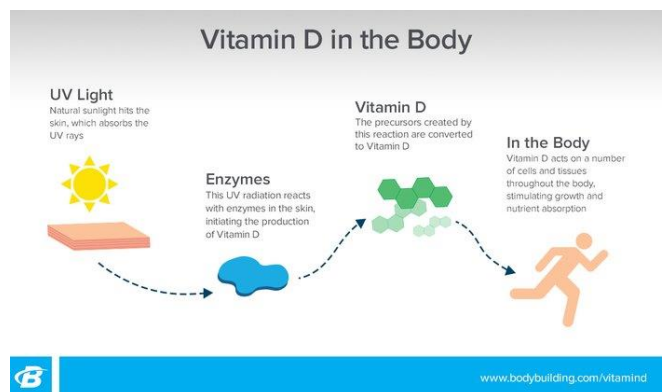
Vitamin	Deficiency Disease	Source
B1 (Thiamine)	Beriberi	Fresh fruits, potatoes, sweet potatoes, peas, corn, cashew nuts, wheat, milk, black beans, dates etc.



B2 (Riboflavin)	Slow growth, sore eyes , Cracking of tongue	Banana, dates, mushroom s, grapes, mangoes, peas, pumpkin, Green vegetable etc.
B3 (Niacin)	Pellagra	Meat, Tomato, fish, eggs, milk products, cereals, mushroom , guava etc.
B5 (pantothenic acid)	Impaired muscle coordination, fatigue	Broccoli , whole-grain cereals, mushroom s, Nuts etc
B6 (pyridoxine)	Anaemia, skin disease	Beef liver, Tuna, chickpeas, cereals etc
B7 (Biotin)	hair loss, or alopecia	whole eggs, Meat , Yeast
B11 (Folic acid)	Anaemia	Green varieties, whole grain products, bread, meat and dairy

B12(cyanocobalam in)	Anaemia	meat, fish, and dairy products
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Vitamin	Deficiency Disease	Source
C (Ascorbic acid)	Scurvy, Gum bleeding	Red pepper, orange, lemon, tomato, Kiwi fruit



Vitamin	Deficiency Disease	Source
D (Calciferol)	Rickets and Osteomalacia	Fish, egg, liver, beef, cod,



		chicken breast etc.
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Click [Here](#) for Few Minutes Link.

## Pre-Mix – 5 MCQs for Prelims

### Subject – Science & Technology

**Date – 01<sup>st</sup> April 2023**

#### FROM OUR CRASH COURSE

**1. What is a 'Dark sky reserve' recently seen in the news?**

- A. Reserves of dark matter present in the solar system
- B. It is land with distinguished nocturnal environment and starry nights that has been developed responsibly to prevent light pollution.
- C. It is the phenomenon of dark skies during winter months in the Arctic region
- D. It is the constant present of cloudy atmosphere which makes solar power generation impossible

#### FROM OUR TEST SERIES

**2. Consider the following with reference to satellite launch vehicles developed by Indian space research organization (ISRO)**

- 1. The most commonly used launch vehicle is the polar satellite launch vehicle (PSLV).
- 2. GSLV Mk-II is the heaviest launch vehicle developed by ISRO.
- 3. Launch Vehicle Mark-3 (LVM3) is the new reusable launch vehicle being developed by ISRO.

**Which of the statements given above is/are incorrect?**

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

#### FROM OUR TEST SERIES

**3. Consider the following statements:**

- 1. CRISPR-Cas9 replicates natural defense mechanisms in bacteria to fight virus attacks using a special protein called Cas9.
- 2. CRISPR-Cas9 technology behaves like a cut-and-paste mechanism on DNA strands that contain genetic information.

**Which of the statements given above is /are correct?**

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

#### FROM OUR CURRENT AFFAIRS COURSE

**4. Human settlement on Mars on a long-term basis poses several challenges . Which among the following is/are correct in this context.**

- 1. Blood capillaries in the body would burst open causing internal bleeding
- 2. Microgravity on mars will increases red blood cell count.
- 3. Developing foetus is likely to sit low in the mother's womb

**Select the correct answer using codes given below:**

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

#### FROM OUR CRASH COURSE

**5. In recent times, many companies are exploring Low earth orbit technology to provide satellite internet. Which among the following is/ are correct in this context:**

- 1. Low earth orbit Provide stronger signals and faster speeds than traditional fixed-satellite systems
- 2. In low earth orbit companies need to launch less number of satellite as compare to high earth orbit

3. Satellite's footprint in low earth orbit is greater than high earth orbit

Select the correct answer code:

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

## Answers with Explanations

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

### FROM OUR CRASH COURSE

1. What is a 'Dark sky reserve' recently seen in the news?

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- C. It is the phenomenon of dark skies during winter months in the Arctic region
- D. It is the constant present of cloudy atmosphere which makes solar power generation impossible

**Answer : B**

**Explanation**

**Dark Sky Reserve**

- By the end of 2022, India will establish the country's first Dark Sky Reserve in the cold desert regions of Ladakh

**What is a Dark Sky Reserve?**

- A Dark Sky Reserve is public or private land with a distinguished nocturnal environment and starry nights that has been developed responsibly to prevent light pollution.
- According to the International Dark Sky Association (IDSA) website, these reserves "consist of a core area meeting minimum

criteria for sky quality and natural darkness, and a peripheral area that supports dark sky preservation in the core."

- These reserves, it said, are formed through a "partnership of multiple land managers who have recognized the value of the natural nighttime environment through regulations and long-term planning".

**How does a site become a 'Dark Sky Reserve'?**

- Individuals or groups can nominate a site for certification to the International Dark Sky Association (IDSA). There are five designated categories, namely International Dark Sky parks, communities, reserves, sanctuaries and Urban Night Sky Places.
- The certification process is similar to that of a site being awarded the UNESCO World Heritage Site tag or getting recognised as a Biosphere Reserve.
- Between 2001 and January 2022, there have been 195 sites recognised as International Dark Sky Places globally, the IDSA said.

**Criteria**

- The IDSA considers a piece of land suitable for dark sky place only if it is either publicly or privately owned; is accessible to the public partially or entirely during the year; the land is legally protected for scientific, natural, educational, cultural, heritage and/or public enjoyment purposes; the core area of the land provides an exceptional dark sky resource relative to the communities and cities that surround it and the land offers prescribed night sky brightness either for a reserve, park or sanctuary.
- India is still in the process of filing its nomination to IDSA.

**Who is developing India's first Dark Sky Reserve?**

- The Ladakh Union Territory administration is leading the efforts in establishing the country's first Dark Sky Reserve.

- To be situated at a height of 4,500 metres above sea level, the Hanle Dark Sky Reserve (HDSR) will come up within the Changthang Wildlife Sanctuary.

**FROM OUR TEST SERIES**

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**Which of the statements given above is/are incorrect?**

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

**Answer : B**

**Explanation**

**Explanation:**

- India currently has three operational launch vehicles – the Polar Satellite Launch Vehicle or PSLV, of which there are multiple versions; the Geosynchronous Satellite Launch Vehicle or GSLV Mk-II; and the Launch Vehicle Mark-3 or LVM3. The PSLV has been the most commonly used, having carried as many as 53 successful missions since 1993. Only two flights of PSLV have failed. Hence, statement **1 is correct**.
- The GSLV-MkII rocket has been used in 14 missions, of which four have ended in failures, most recently in August last year. The LVM3 has flown five times, including the Chandrayaan 2 mission, and has never disappointed. In addition, ISRO has been working on a reusable launch vehicle (RLV).

Unlike other rockets, the RLV would not end up in space as waste. Instead, it can be brought back and refurbished for use multiple times. Hence, statement **3 is incorrect**.

- The heaviest rocket of the Indian Space Research Organisation - LVM3-M2/OneWeb India-1 blasted off from this spaceport to place 36 broadband communication satellites into the Low Earth Orbit (LEO) for a UK-based customer. Hence, statement **2 is incorrect**.
- New Space India Limited (NSIL), a central public sector enterprise under the Department of Space, had earlier signed two launch service contracts with the London-headquartered Network Access Associated Limited (OneWeb) for launching OneWeb LEO satellites on board ISRO's LVM3.

**FROM OUR TEST SERIES**

**3. Consider the following statements:**

1. CRISPR-Cas9 replicates natural defense mechanisms in bacteria to fight virus attacks using a special protein called Cas9.
2. CRISPR-Cas9 technology behaves like a cut-and-paste mechanism on DNA strands that contain genetic information.

**Which of the statements given above is /are correct?**

- A. 1 only
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- C. 1 and 2 only
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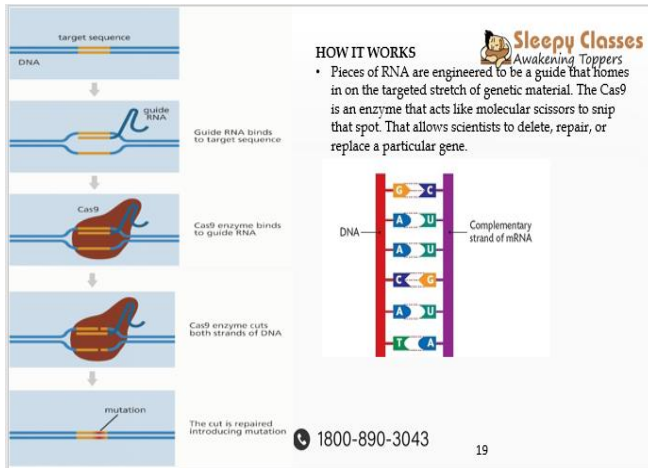
**Answer : C**

**Explanation**

In the 10 years since the CRISPR technology has been developed, it has begun to deliver on its unlimited potential which will help in improving the quality of human life. CRISPR is short for Clustered Regularly Interspaced Short Palindromic Repeats.



- Statement 1 is correct: It is a powerful gene editing technology that replicates natural defence mechanisms in bacteria to fight virus attacks using a special protein called Cas9.
- Statement 2 is correct: CRISPR-Cas9 technology behaves like a cut-and-paste mechanism on DNA strands that contain genetic information.



### FROM OUR CURRENT AFFAIRS COURSE

4. Human settlement on Mars on a long-term basis poses several challenges . Which among the following is/are correct in this context.

1. Blood capillaries in the body would burst open causing internal bleeding
2. Microgravity on mars will increases red blood cell count.
3. Developing foetus is likely to sit low in the mother's womb

Select the correct answer using codes given below:

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

Answer : A

Explanation

Sustaining Life on Mars

Lack of oxygen

- Since the atmosphere does not contain oxygen, **breathing becomes impossible**, without the aid of oxygen cylinders
- Due to the low atmospheric pressure, **blood capillaries in the body would burst** open causing internal bleeding

### Absence of magnetic field

- In the **absence of a magnetic field**, humans on Mars would be exposed to high levels of **harmful ionizing radiations**.
- Continuous exposure to high levels of radiation leads to many health problems like **cataract, cancer, gene mutations, and more**.

### Gravity

- **Microgravity** of space leads to **loss of bone density and muscle mass** resulting in osteopenia and fractures.
- Another problem is that while on Earth the human heart has to pump against gravity, in space, it does not have to do that. So it **weakens with time leading to cardiac problems, low red blood cells, immunodeficiency, etc**.
- Microgravity in space also **affects eyeball movement** and brain affecting a person's sense of balance and body orientation.
- The severity of these problems at the reduced gravity of Mars is not known.
- On Earth, the **entire developing foetus - its bone, muscle, circulation system** - all work against gravity. In the low gravity of Mars, the developing **foetus is likely to sit high up in the mother's womb**, pressing on the lungs and making it difficult for her to breathe.

### Soil

- Martian soil, called regolith, is known to contain high levels of chemicals such as **sulphates and perchlorates**. Plants incorporating these chemicals are known to be **harmful to humans if consumed**.



FROM OUR CRASH COURSE

5. In recent times, many companies are exploring Low earth orbit technology to provide satellite internet. Which among the following is/ are correct in this context:

1. Low earth orbit Provide stronger signals and faster speeds than traditional fixed-satellite systems
2. In low earth orbit companies need to launch less number of satellite as compare to high earth orbit
3. Satellite's footprint in low earth orbit is greater than high earth orbit

Select the correct answer code:

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

**Answer : A**

**Explanation**

**Satellite Internet**

- Following the successful launch of 36 satellites on May 28, OneWeb's Low Earth Orbit (LEO) constellation reached 218 in-orbit satellites
- The company only has one more launch to complete before it obtains the capacity to enable its '**Five to 50' service** of offering internet connectivity to all regions north of 50 degrees latitude.

**What is OneWeb?**

- OneWeb is a global communications company that aims to deliver **broadband satellite Internet** around the world through its fleet of LEO satellites

Low Earth Orbit technology	
Distance	Around 500km-2000km from earth
Advantages	<ul style="list-style-type: none"> <li>• Provide <b>stronger signals and faster speeds</b> than traditional fixed-satellite systems</li> <li>• <b>Signals travel faster through space than through fibre-optic cables</b></li> </ul>
Issues	<ul style="list-style-type: none"> <li>• Satellites travel at a speed of 27,000 kph and complete a full circuit of the planet in <b>90-120 minutes</b></li> <li>• Individual satellites can only make direct contact with a land transmitter for a <b>short period of time</b> thus requiring massive LEO satellite fleets</li> <li>• Huge <b>capital investment</b></li> </ul>

**Pre-Mix – 5 MCQs for Prelims****Subject – Science & Technology****Date – 06<sup>th</sup> April 2023****FROM OUR CRASH COURSE QUIZ**

**1. Consider the following statements with reference to Uranium Enrichment:**

1. Natural uranium is only 0.7% U-235, the fissionable isotope.
2. Centrifugal separators are used in uranium enrichment.
3. The enriched uranium fuel used in fission reactors cannot be used to make a bomb.

**Which of the above is/are correct?**

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

**2. Arrange the following components of the universe in an increasing order of their share in universe?**

1. Stars and comets
2. Dark energy
3. Dark matter

**Select the correct option from below:**

- A. 2>3>1
- B. 1>2>3
- C. 3>2>1
- D. 2>1>3

**3. Pluto is not referred to as a planet. Which of the following criteria of planet, Pluto does not satisfy?**

- A. It orbits around a fully-fledged star.
- B. It has cleared the neighborhood objects around its orbit.

- C. It has enough gravity to pull itself into a spherical shape.
- D. Both A and B

**4. Which of the following is not an advantage of CRISPR technology ?**

- A. Inexpensive
- B. Cancer treatment
- C. Pest resistant crops
- D. Off target effects

**5. Consider the following statements:**

1. In somatic gene therapy effects are transferred to next generation.
2. In Germline therapy effects will not be transferred to next generation.

**Which of the above is/are correct?**

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

**Answers with Explanations**

**Click here to watch the following topics on YouTube.**

**FROM OUR CRASH COURSE QUIZ**

**1. Consider the following statements with reference to Uranium Enrichment:**

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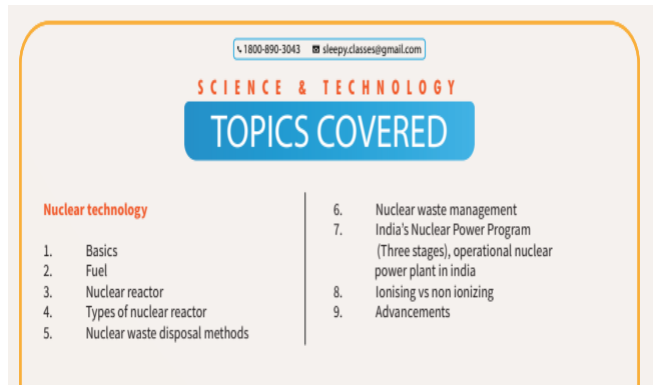
**Which of the above is/are correct?**

- 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:** Natural uranium is only 0.7% U-235, the fissionable isotope.
- **Statement 2 is correct:** Centrifugal separators are used in uranium enrichment.
- **Statement 3 is correct:** The enriched uranium fuel used in fission reactors cannot be used to make a bomb.

**2. Arrange the following components of the universe in an increasing order of their share in universe?**

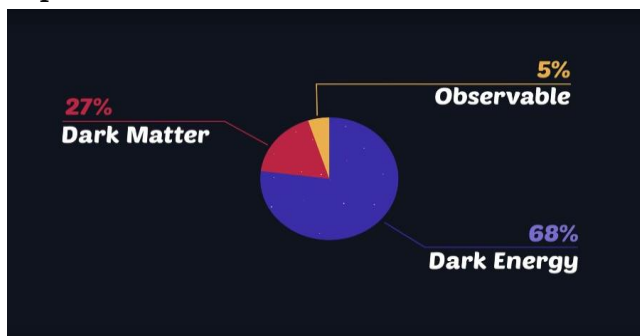
1. Stars and comets
2. Dark energy
3. Dark matter

**Select the correct option from below:**

- A. 2>3>1
- B. 1>2>3
- C. 3>2>1
- D. 2>1>3

**Answer : A**

**Explanation**



Dark energy constitutes 68% of the universe, dark matter constitutes 27% of the universe and stars, comets, planets, blackholes constitute 5% of the universe.

**3. Pluto is not referred to as a planet. Which of the following criteria of planet, Pluto does not satisfy?**

- A. It orbits around a fully-fledged star.
- B. It has cleared the neighborhood objects around its orbit.
- C. It has enough gravity to pull itself into a spherical shape.
- D. Both A and B

**Answer : B**

**Explanation**

**International Astronomical Union (IAU)**, a group of experts, is the authorized body to define the criteria for any object to be designated as a planet.

In 2006, IAU defines three criteria to classify any object as a planet.

- 1) It needs to be in orbit around any fully-fledged star.
- 2) It needs to have enough gravity to pull itself into a spherical shape.
- 3) It has cleared the neighborhood around its orbit.

Pluto has not satisfied third criteria (It has cleared the neighborhood around its orbit). Therefore, Pluto is not referred to as a planet anymore.

**4. Which of the following is not an advantage of CRISPER technology ?**

- A. Inexpensive
- B. Cancer treatment
- C. Pest resistant crops
- D. Off target effects

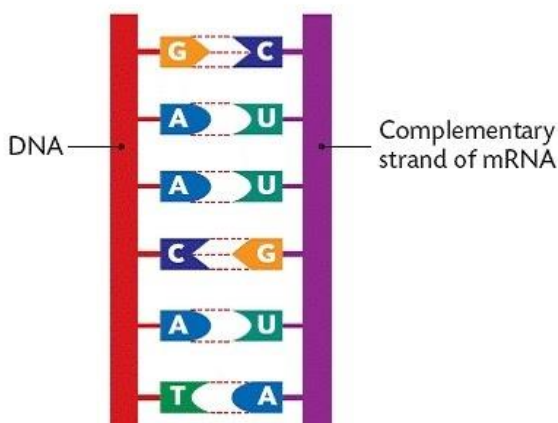
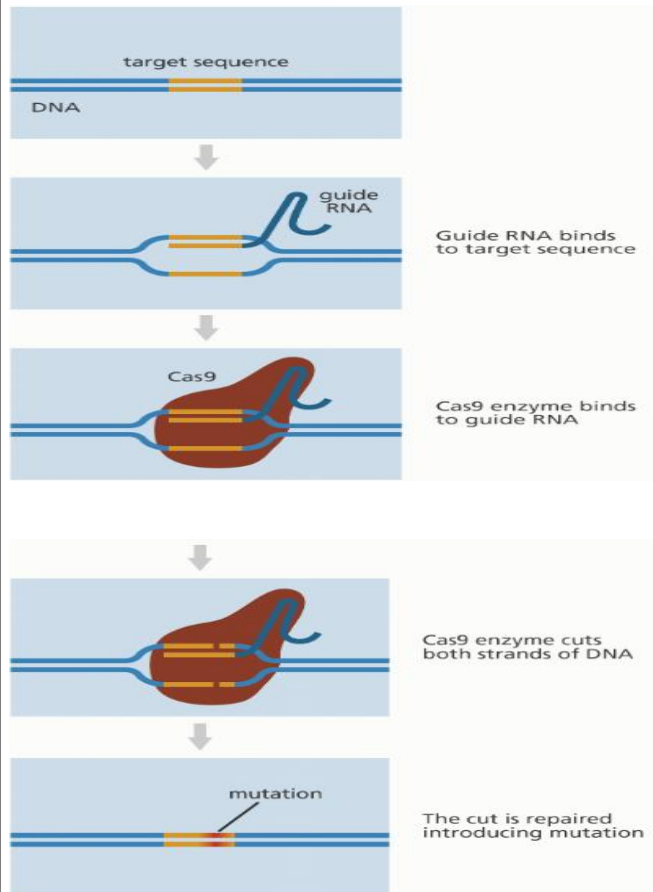
**Answer : D**

**Explanation**

## CRISPER Technology

### HOW IT WORKS

- Pieces of RNA are engineered to be a guide that homes in on the targeted stretch of genetic material. The Cas9 is an enzyme that acts like molecular scissors to snip that spot. That allows scientists to delete, repair, or replace a particular gene.



### Advantages of crisper technology

- Curing Genetics Disease

- Inexpensive
- Cancer Treatments
- Pest Resilient Crops
- Simple to Amend Target
- Drug Research

### 5. Consider the following statements:

- In somatic gene therapy effects are transferred to next generation.
- In Germline therapy effects will not be transferred to next generation.

### Which of the above is/are correct?

- 1 only
- 2 only
- Both 1 and 2
- Neither 1 nor 2

Answer : D

### Explanation

Somatic therapy	Gene	Germline therapy	Gene
<ul style="list-style-type: none"> <li>Somatic Gene therapy refers to the alteration of the genome of somatic cells by transferring therapeutic genes.</li> </ul>		<ul style="list-style-type: none"> <li>Germline Gene therapy refers to the alterations of the genome of the germ cell by introducing therapeutic genes</li> </ul>	
<ul style="list-style-type: none"> <li>Alterations done by somatic gene therapy are non-reproducible. Hence, do not pass to the</li> </ul>		<ul style="list-style-type: none"> <li>Alterations done by germline gene therapy are reproducible. Hence, pass into the next generation.</li> </ul>	



next generation.	
<ul style="list-style-type: none"> <li>Techniques used in somatic gene therapy are relatively simple. Hence, can be performed under in vitro conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Techniques are very complex since it involves fetal samples.</li> </ul>

## Pre-Mix – 5 MCQs for Prelims

### Subject – Science & Technology

Date – 11<sup>th</sup> April 2023

#### 1. Consider the following matches:

1. 1G      TDMA
2. 2G      CDMA
3. 3G      WCDMA
4. 4G      FDMA

#### Select the correct answer code:

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

#### 2. Consider the following statements

1. Plants take carbon dioxide as well as oxygen for their growth.
2. Single celled animal can live without oxygen whereas multicellular can not.

#### 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 matches in context to Drones categories:

1. Nano      Less than 250 grams
2. Small      250 grams to 2 Kg
3. Medium      2 Kg to 25 Kg

#### Select the correct answer code:

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

#### 4. Consider the following matches :

1. Project Netra      Missile tracker
2. Tri Netra      Detect debris
3. Sindhu Netra      Satellite

#### Select the correct answer code:

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

#### 5. 'Yescarta and kymriah' recently seen in news, it is a treatment for :

- A. Cancer
- B. Tuberculosis
- C. Malaria
- D. AIDS

### Answers with Explanations

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

#### 1. Consider the following matches :

1. 1G      TDMA
2. 2G      CDMA
3. 3G      WCDMA
4. 4G      FDMA

#### Select the correct answer code:

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

**Answer : C**

#### Explanation

##### Evolution of Telecommunication

- Frequency Division Multiple Access (FDMA)-1G
- Time Division Multiple Access (TDMA)-2G
- Code Division Multiple Access (CDMA)-2.5 G

### WCDMA -3G

- ☐ LTE
- ☐ 4G
- ☐ 5G

### 2. Consider the following statements

1. Plants take carbon dioxide as well as oxygen for their growth.
2. Single celled animal can live without oxygen whereas multicellular can not.

### Select the correct answer code:

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

**Answer : A**

### Explanation

#### *Henneguya Salminicola* — Unique Non-oxygen Breathing Animal

Researchers at Tel Aviv University (TAU) have discovered a new non-oxygen breathing animal called *Henneguya salminicola*, a parasite, a member of the jellyfish family. *Henneguya salminicola* is tiny, less than a 10-celled parasite. The discovery (<https://doi.org/10.1073/pnas.1909907117>) published in *Proceedings of the National Academy of Sciences* says that “the discovery confirms that adaptation to an anaerobic environment is not unique to single-celled eukaryotes, but has also evolved in a multicellular, parasitic animal. Hence, *H. salminicola* provides an opportunity for understanding the evolutionary transition from an aerobic to an exclusive anaerobic metabolism”.

### 3. Consider the following matches in context to Drones categories:

1. Nano                      Less than 250 grams
2. Small                    250 grams to 2 Kg
3. Medium                2 Kg to 25 Kg

### Select the correct answer code:

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

**Answer : A**

### Explanation

Definition and Classification of Drones		
<b>Drone</b>	An unmanned aircraft system ("UAS"), that can operate autonomously or can be <b>operated remotely without a pilot on board</b>	
<b>Classification</b>	<b>Nano drone</b>	Less than or equal to 250 grams;
	<b>Micro drone</b>	Greater than 250 grams and less than or equal to 2 kilograms
	<b>Small drone</b>	Greater than 2 kilograms and less than or equal to 25 kilograms
	<b>Medium drone</b>	Greater than 25 kilograms and less than or equal to 150 kilograms
	<b>Large drone</b>	Greater than 150 kilograms
<b>If larger than 500 kg</b>	Provisions of the Aircraft Rules, 1937 shall apply instead of the Drone Rules	

### 4. Consider the following matches :

1. Project Netra                      Missile tracker
2. Tri Netra                            Detect debris
3. Sindhu Netra                      Satellite

Select the correct answer code:

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

**Answer : C**

**Explanation**

## WARNING SYSTEM

### NETRA

- First indigenously built Airborne Early Warning and Control System (AEW&CS) developed by DRDO.
- This radar system is also mounted on Embraer aircraft(Brazil) which gives 240-degree coverage of airspace.
- Helps to detect and track aircraft, missiles, ships and vehicles.
- The other countries which have developed AEW&C are United States, Russia and Israel.

**Other with similar name**

### Project Netra

- ISRO
- To detect **debris** and other hazards to Indian satellites.

### Tri Netra

- Indian Railways
- Reduce train accidents by keeping a record of the track maintenance and will also provide **better visibility during foggy days**.

### Sindhu Netra satellite (2021)-PSLV

- Developed by the Defence Research and Development Organisation (**DRDO**)
- To **monitor activities of both military warships and merchant shipping** in the Indian Ocean Region (IOR).

- Also help in carrying out **surveillance** in specific areas such as the **South China Sea or near the Gulf of Aden and the African coast** including the **Ladakh region and the border areas with Pakistan**.
- In the first dedicated mission of its commercial arm NSIL (NewSpace India Limited), the ISRO successfully launched Brazil's earth observation satellite **Amazonia-1**
- Sindhu Netra' was part of the satellites launched.

**5. 'Yescarta and kymriah' recently seen in news, it is a treatment for :**

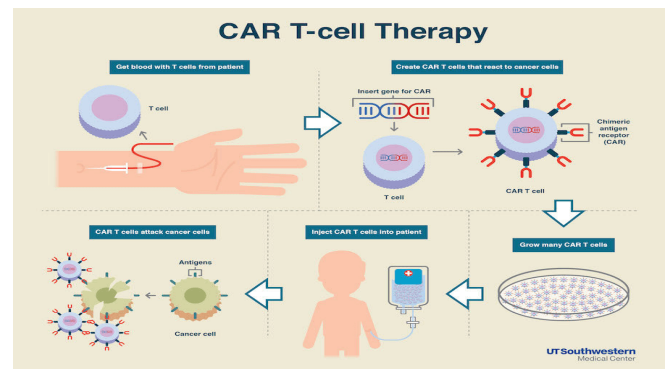
- A. Cancer
- B. Tuberculosis
- C. Malaria
- D. AIDS

**Answer : A**

**Explanation**

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 & Tech.

Date – 18<sup>th</sup> April 2023

### 1. What is whole genome sequencing (WGS)?

- A. The process of sequencing only a small portion of an organism's genome
- B. The process of sequencing the entire genome of an organism
- C. The process of comparing the genomes of different organisms
- D. The process of editing the genome of an organism

### 2. With reference to the Lumpy skin disease (LSD) sometimes mentioned in the news, consider the following statements:

- 1. Lumpy skin disease is a fungal disease of cattle and water buffalo caused by the Mucormycosis fungus.
- 2. It is spread by mosquitoes, flies by direct contact among the cattle, and through contaminated food and water.
- 3. There is no treatment for the virus, so prevention by vaccination is the most effective means of control.

Which of the statements given above is /are correct?

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

### 3. What is a 'Dark sky reserve' recently seen in the news?

- A. Reserves of dark matter present in the solar system
- B. It is land with distinguished nocturnal environment and starry nights that has been developed responsibly to prevent light pollution.

- C. It is the phenomenon of dark skies during winter months in the Arctic region
- D. It is the constant presence of cloudy atmosphere which makes solar power generation impossible

### 4. H5N1 virus is sometimes mentioned in the news with reference to which one of the following diseases?

- A. Yellow fever
- B. Bird flu
- C. Dengue
- D. Chicken pox

### 5. Consider the following statements regarding DNA and RNA

- 1. A Nucleic acid containing deoxyribose is called deoxyribonucleic acid (DNA) while that which contains ribose is called ribonucleic acid (RNA).
- 2. Both DNA and RNA contain Adenine, Guanine, Thymine and Cytosine.

Which of the statements given above is/are correct?

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

## Answers with Explanations

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

### 1. What is whole genome sequencing (WGS)?

- A. The process of sequencing only a small portion of an organism's genome
- B. The process of sequencing the entire genome of an organism
- C. The process of comparing the genomes of different organisms

D. The process of editing the genome of an organism

**Answer: B**

**Explanation**

**What is Whole Genome Sequencing?**

- All organisms have a unique genetic code, or genome, that is composed of nucleotide bases- Adenine (A), Thymine (T), Cytosine (C) and Guanine (G).
- The unique Deoxyribonucleic Acid (DNA) fingerprint, or pattern can be identified by knowing the sequence of the bases in an organism. Determining the order of bases is called sequencing.
- Whole genome sequencing is a laboratory procedure that determines the order of bases in the genome of an organism in one process.

**2. With reference to the Lumpy skin disease (LSD) sometimes mentioned in the news, consider the following statements:**

1. Lumpy skin disease is a fungal disease of cattle and water buffalo caused by the Mucormycosis fungus.
2. It is spread by mosquitoes, flies by direct contact among the cattle, and through contaminated food and water.
3. There is no treatment for the virus, so prevention by vaccination is the most effective means of control.

**Which of the statements given above is /are correct?**

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

**Answer: C**

**Explanation:**

- **Statement 1 is not correct:** Lumpy skin disease (LSD) is a viral disease of cattle and water buffalo caused by the poxvirus LSD virus.

- **Statement 2 is correct:** It is spread by mosquitoes, flies, lice, and wasps, by direct contact among the cattle, and through contaminated food and water.

- **Main symptoms** include Fever in animals, Depression, Characteristic skin nodules all over the body, Marked reduction in milk production, Abortion in pregnant animals, and Difficulty in eating, which sometimes leads to the animal's death.

- **Prevention:** Four tactics to control and prevent LSD are quarantine, vaccination, slaughter campaigns and management strategies. Insecticides can be sprayed to prevent mosquitoes, flies, and lice in animal habitats during the monsoon season.

- **Statement 3 is correct:** There is no treatment for the virus, so prevention by vaccination is the most effective means of control. Secondary infections in the skin may be treated with Non-Steroidal Anti-Inflammatories (NSAIDs) and also antibiotics when appropriate.

**3. What is a 'Dark sky reserve' recently seen in the news?**

- A. Reserves of dark matter present in the solar system
- B. It is land with distinguished nocturnal environment and starry nights that has been developed responsibly to prevent light pollution.
- C. It is the phenomenon of dark skies during winter months in the Arctic region

- D. It is the constant present of cloudy atmosphere which makes solar power generation impossible

**Answer: B**

### Dark Sky Reserve

- By the end of 2022, India will establish the **country's first Dark Sky Reserve in the cold desert regions of Ladakh**

### What is a Dark Sky Reserve?

- A Dark Sky Reserve is **public or private land** with a distinguished nocturnal environment and starry nights that has been developed **responsibly to prevent light pollution**.
- According to the **International Dark Sky Association (IDSA)** website, these reserves **"consist of a core area meeting minimum criteria for sky quality and natural darkness, and a peripheral area that supports dark sky preservation in the core."**
- These reserves, it said, are formed through a "partnership of multiple land managers who have recognized the value of the natural nighttime environment through regulations and long-term planning".

### How does a site become a 'Dark Sky Reserve'?

- Individuals or groups can nominate** a site for certification to the International Dark Sky Association (IDSA). There are five designated categories, namely **International Dark Sky parks, communities, reserves, sanctuaries and Urban Night Sky Places**.
- The certification process is **similar to that of a site being awarded the UNESCO World Heritage Site tag or getting recognised as a Biosphere Reserve**.

- Between 2001 and January 2022, there have been 195 sites recognised as International Dark Sky Places globally, the IDSA said.

### Criteria

- The IDSA considers a piece of land suitable for dark sky place only if it is either publicly or privately owned; is accessible to the public partially or entirely during the year;
- the land is legally protected for scientific, natural, educational, cultural, heritage and/or public enjoyment purposes; the core area of the land provides an exceptional dark sky resource relative to the communities and cities that surround it and the land offers prescribed night sky brightness either for a reserve, park or sanctuary.
- India is still in the process of filing its nomination to IDSA.

### Who is developing India's first Dark Sky Reserve?

- The **Ladakh Union Territory administration** is leading the efforts in establishing the country's first Dark Sky Reserve.
- To be situated at a height of 4,500 metres above sea level, the Hanle Dark Sky Reserve (HDSR) will come up within the Changthang Wildlife Sanctuary.

### 4. H5N1 virus is sometimes mentioned in the news with reference to which one of the following diseases?

- A. Yellow fever
- B. Bird flu
- C. Dengue
- D. Chicken pox

**Answer: B**

- Avian influenza known informally as avian flu or bird flu refers to "influenza caused by viruses adapted to birds". Most avian influenza viruses do not infect humans, however, some, such as A(H5N1) and A(H7N9), have caused serious infections in people.
- The Avian (H5N1) virus subtype, a highly pathogenic virus, first infected humans in 1997 during a poultry epidemic outbreak in Hong Kong SAR, China.

### 5. Consider the following statements regarding DNA and RNA

1. A Nucleic acid containing deoxyribose is called deoxyribonucleic acid (DNA) while that which contains ribose is called ribonucleic acid (RNA).
2. Both DNA and RNA contain Adenine, Guanine, Thymine and Cytosine.

Which of the statements given above is/are correct?

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

**Answer: A**

### DNA and RNA

- Nucleic acids are responsible for the transfer of characters from parents to off springs.

There are two types of nucleic acids - DNA and RNA.

- A nucleic acid containing deoxyribose is called deoxyribonucleic acid (DNA) while that which contains ribose is called ribonucleic acid (RNA).

- Both DNA and RNA contain Adenine, Guanine and Cytosine. The fourth base is Thymine in DNA and Uracil in RNA. Hence, statement 2 is incorrect.
- The structure of DNA is a double strand [helix] whereas RNA is a single strand molecule. Hydrogen bonds bind the nitrogenous bases of the two separate polynucleotide strands to make double-stranded DNA. The DNA backbone is resistant to cleavage, and both strands of the double-stranded structure store the same biological information. Biological information is replicated as the two strands are separated.
- Within cells, DNA is organized into long structures called chromosomes. During cell division these chromosomes are duplicated in the process of DNA replication, providing each cell its own complete set of chromosomes.
- Eukaryotic organisms (animals, plants, fungi, and protists) store most of their DNA inside the cell nucleus and some of their DNA in organelles, such as mitochondria or chloroplasts.
- In contrast, prokaryotes (bacteria and archaea) store their DNA only in the cytoplasm.



## Pre-Mix – 5 MCQs for Prelims

### Subject – International Relations

Date – 25<sup>th</sup> April 2023

1. Consider the following statements in context of Gravitational waves:

1. Every massive object that accelerates produces gravitational waves.
2. Humans, cars and airplanes also produces gravitational waves.
3. They electromagnetic radiations detected by LIGO observatory.

Select the correct answer using codes given below:

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

2. Consider the following statements in context to gluten

1. It makes the dough elastic and gives bread the ability to rise during baking
2. Gluten free diet can give huge boost to the performance of athletes

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 somatic gene editing therapy:

1. It involve modifying a patient's DNA to cure a disease caused by a genetic mutation
2. The edited gene is passed on to the future generation.
3. Defective blood cells can be treated by using this technique

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. Which among the following is/are types of biometric identifiers

1. DNA matching
2. walking gait
3. Typing patterns
4. Digital signatures

Select the correct answer code:

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

5. Which one of the following statements correctly describes the term "Flipping" with respect to StartUp Sector?

- A. It is a strategy which allows the founder to transfer ownership and make money to pay back investors.

- B. Process of transferring the entire ownership of an Indian company to an overseas entity.
- C. It is a short-term loan that helps a startup access money in between rounds of funding.
- D. None of the above

## Answers with Explanations

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

1. Consider the following statements in context of Gravitational waves:

1. Every massive object that accelerates produces gravitational waves.
2. Humans, cars and airplanes also produces gravitational waves.
3. They electromagnetic radiations detected by LIGO observatory.

Select the correct answer using codes given below:

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

**Answer: A**

### Gravitational waves

- **Gravitational waves are 'ripples' in space-time** caused by some of the most violent and energetic processes in the Universe.

- Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity.
- Historically, scientists have relied almost exclusively on electromagnetic (EM) radiation (visible light, X-rays, radio waves, microwaves, etc.) to study the Universe. Some are trying to use subatomic particles, called neutrinos, as well. Each of these 'messengers' of information provides scientists with a different *but complementary* view of the Universe.
- **Gravitational waves, however, are completely unrelated to EM radiation.** They are as distinct from light as hearing is from vision.
- The gravitational waves that **LIGO detects** are caused by some of the most energetic events in the Universe—colliding black holes, merging neutron stars, exploding stars, and possibly even the birth of the Universe itself.

### Sources and Types of Gravitational Waves

- Every massive object that accelerates produces gravitational waves. This includes **humans, cars, airplanes** etc., but the masses and accelerations of objects on Earth are far too small to make gravitational waves big enough to detect with our instruments. To find big enough gravitational waves, we have to look far outside of our own solar system.

**The most powerful gravitational waves are created when objects move at very high speeds. Some examples of events that could cause a gravitational wave are:**

- when a star explodes asymmetrically (called a **supernova**)
- when two big stars orbit each other
- when two **black holes** orbit each other and merge

26-4-2023	Wednesday	Environment
27-4-2023	Thursday	Environment
28-4-2023	Friday	Science and Tech
29-4-2023	Saturday	Science and Tech
30-4-2023	Sunday	Polity + Govt. Schemes + Social Issues
1-5-2023	Monday	Polity + Govt. Schemes + Social Issues
2-5-2023	Tuesday	Polity + Govt. Schemes + Social Issues
3-5-2023	Wednesday	Geography
4-5-2023	Thursday	Geography
5-5-2023	Friday	International Relations
6-5-2023	Saturday	History
7-5-2023	Sunday	History
8-5-2023	Monday	History
9-5-2023	Tuesday	Economy
10-5-2023	Wednesday	Economy

2. Consider the following statements in context to gluten

1. It makes the dough elastic and gives bread the ability to rise during baking
2. Gluten free diet can give huge boost to the performance of athletes

**Select the correct answer code:**

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

**Answer: A**

Gluten is a family of proteins found in grains, including wheat, rye, spelt, and barley.

**Of the gluten-containing grains, wheat is by far the most common.**

- The two main proteins in gluten are **glutenin and gliadin**.
- Gliadin is responsible for most of the adverse health effects of gluten
- When flour mixes with water, the gluten proteins form a sticky network that has a glue-like consistency.
- This glue-like property makes the **dough elastic and gives** bread the ability to rise during baking. It also provides a chewy, satisfying texture.

### Technology for Extraction of Gluten from Wheat Dough (ICAR)

- Bajra, maize, jowar (sorghum), ragi and other **millets contain comparable levels of protein and more vitamins, minerals, crude fibre and other nutrients than wheat. But they don't have any gluten proteins**, which results in poor dough quality.

**3. Consider the following statements regarding somatic gene editing therapy:**

1. It involve modifying a patient's DNA to cure a disease caused by a genetic mutation
2. The edited gene is passed on to the future generation.
3. Defective blood cells can be treated by using this technique

**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**

### **Somatic gene therapy**

- Somatic gene therapies involve modifying a patient's DNA to treat or cure a disease caused by a genetic mutation.
- In one clinical trial, for example, scientists take blood stem cells from a patient, use CRISPR techniques to correct the genetic mutation causing them to produce defective blood cells, then infuse the "corrected" cells back into the patient, where they produce healthy hemoglobin. The treatment changes the patient's blood cells, but not his or her sperm or eggs.

### **Germline human genome editing**

- Germline human genome editing, on the other hand, alters the genome of a human embryo at its earliest stages.
- This may affect every cell, which means it has an impact not only on the person who may result, but possibly on his or her descendants.
- There are, therefore, substantial restrictions on its use.

4. Which among the following is/are types of biometric identifiers

1. DNA matching
2. walking gait
3. Typing patterns
4. Digital signatures

**Select the correct answer code:**

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

**Answer: D**

### **Types of biometrics**

- The two main types of biometric identifiers are either physiological characteristics or behavioral characteristics.

**Physiological identifiers** relate to the composition of the user being authenticated and include the following:

- facial recognition
- fingerprints
- finger geometry (the size and position of fingers)
- iris recognition
- vein recognition
- retina scanning
- voice recognition
- DNA (deoxyribonucleic acid) matching
- digital signatures

### **Behavioral identifiers** include

- the unique ways in which individuals act, including recognition of typing patterns, walking gait and other gestures. Some of these behavioral identifiers can be used to provide continuous authentication instead of a single one-off authentication check.



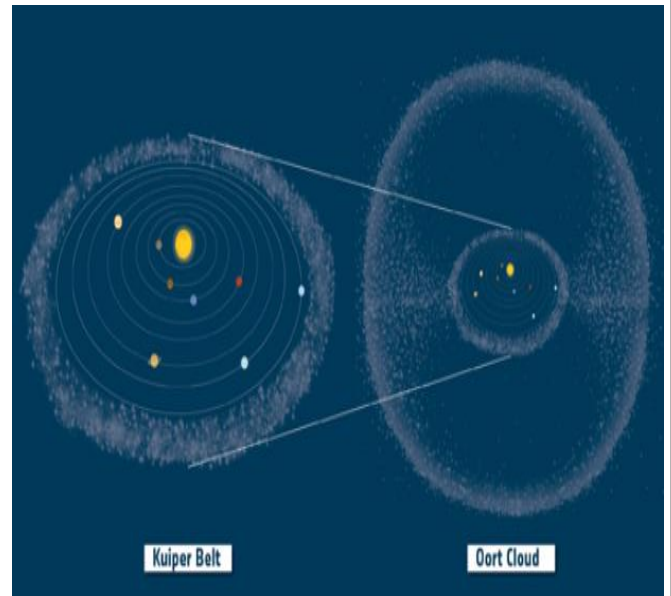
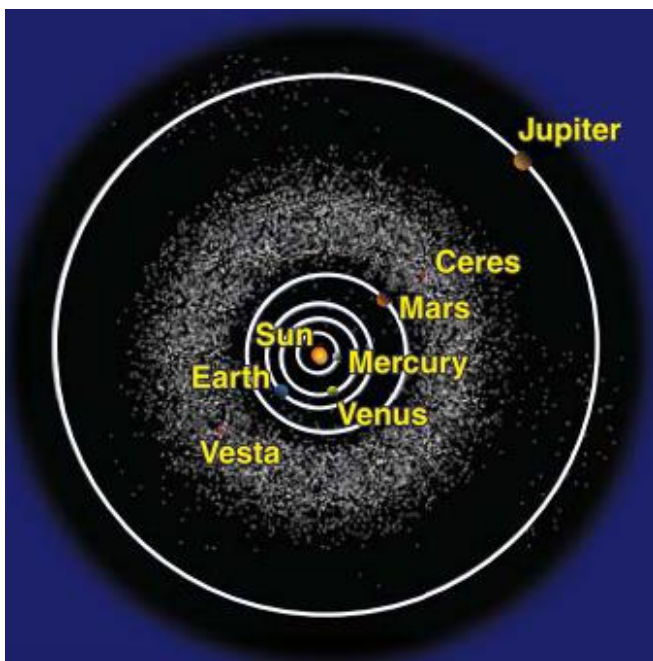
5. 'Cold & hot Classical objects' often seen in news, are:

- A. Asteroid belt object
- B. Kuiper belt objects
- C. Oort cloud part
- D. Part of Moon's orbit

**Answer: B**

### Kuiper Belt

- Region of the Solar System that exists **beyond the eight major planets**.
- It is similar to the asteroid belt, in that it contains many small bodies, all remnants from the Solar System's formation.
- But unlike the Asteroid Belt, it is **much larger -20 times** as wide and 20 to 200 times as massive.



### What is the Kuiper Belt?

- The **inner edge begins** at the orbit of Neptune, at **about 30 AU from the Sun**. (1 AU, or astronomical unit, is the distance from Earth to the Sun.)
- The **outer edge continues** outward to nearly **1,000 AU**, with some bodies on orbits that go even further beyond.
- There are bits of rock and ice, comets and dwarf planets in the Kuiper Belt.
- Besides Pluto and a bunch of comets, other interesting Kuiper Belt Objects are **Eris, Makemake and Haumea**.
- They are dwarf planets like **Pluto**.

### Reason for small Kuiper Belt Objects (KBO)

- Are all small because they **might have come together to form a planet** had Neptune not been there.
- Instead, **Neptune's gravity stirred up this region** of space so much that the small, icy objects there weren't able to coalesce into a large planet

## Cold & hot Classical objects

- There are two main groups of objects in the classical Kuiper Belt, referred to as "cold" and "hot." These terms **don't refer to temperature -- instead, they describe the orbits of the objects**, along with the amount of influence Neptune's gravity has had on them.

### Cold Classical KBO

- The cold classical KBOs have orbits that **never come very close to Neptune**, and thus they remain "cool" and unperturbed by the giant planet's gravity.

### Hot classical KBOs

- Have had interactions with Neptune in the past.
- These interactions pumped energy into their orbits, which stretched them into an **elliptical shape**, and tilted them slightly **out of the plane** of the planets.