

Pre-Mix – 5 MCQs for Prelims

Subject – Science & Tech

Date – 11th 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.

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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 (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:

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- 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 (LH2)** as propellants which liquefy at -183 deg C and -253 deg C respectively.
- In a semi-cryogenic engine, the liquid hydrogen is replaced by civil aviation fuel, which is most mostly kerosene or even CNG.

Cryogenic Vs Semi cryogenic engine

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

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:

- 1, 2 and 3 only
- 1, 3 and 5 only
- 2, 3, 4 and 5 only
- 1, 3, 5 and 6 only

Answer : B

Explanation

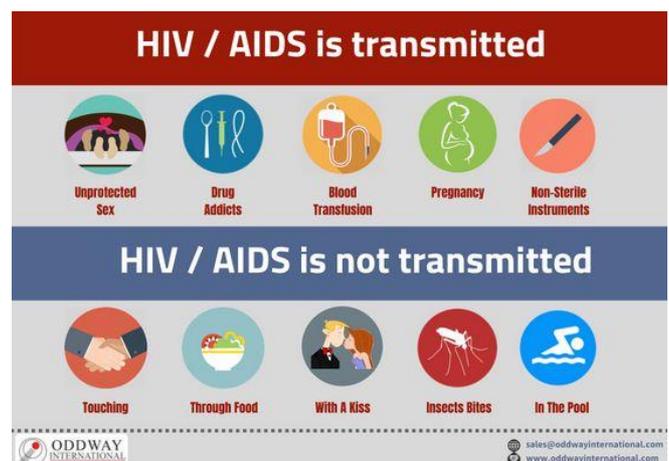
How Is HIV/AIDS Transmitted?

- **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)



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