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Daily MCQs: 15-05-2024

**1. Xenotransplantation recently seen in the news is related to which of the following?**

- A) It is the transplantation of living cells, tissues or organs from one species to another.
- B) It is a treatment for vector borne diseases transmitted primarily by Aedes Aegypti mosquitoes.
- C) It is a technique used in assisted reproductive technologies that involves manipulating genetic material.
- D) None of the above

**2. Consider the following pairs :**

**Important ports sometimes mentioned in the news**

- 1. Duqm : Oman
- 2. Changi : Myanmar
- 3. Chabahar : Iraq
- 4. Gwadar : Pakistan

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

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

**3. Consider the following statements about Virtual Private Network (VPN)**

- 1) A VPN is a private network that uses a public network to connect remote sites or users together.
- 2) VPNs mask the user's internet protocol (IP) address so their online actions are virtually untraceable.
- 3) VPN services provide greater privacy than an unsecured Wi-Fi hotspot.

**How many of the statements given above is/are correct?**

- A) Only one
- B) Only two
- C) All three
- D) None

**4. Consider the following statements about Auroras**

- 1. Auroras are primarily visible near the equator and are devoid of in the polar regions.
- 2. Auroras occur due to the collision of charged particles from the Sun with Earth's atmosphere.

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

- A) 1 only
- B) 2 only
- C) Both 1 and 2

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D) Neither 1 nor 2

### 5. Which of the following places in India have coral reefs?

- A) Lakshadweep, Andaman and Nicobar Islands, Gulf of Kachchh, Sundarbans
- B) Lakshadweep, Andaman and Nicobar Islands, Gulf of Kachchh, Malvan coast of Maharashtra
- C) Lakshadweep, Gulf of Mannar, Gulf of Kachchh, Sundarbans
- D) Lakshadweep, Andaman and Nicobar Islands, Malvan coast of Maharashtra, Sundarbans

### Solutions:

#### 1. Answer: A

#### Explanation:

- According to the US Food and Drug Administration (FDA), “**Xenotransplantation is any procedure that involves the transplantation, implantation or infusion into a human recipient of either**
  - (a) **live cells, tissues, or organs from a nonhuman animal source, or**
  - (b) **human body fluids, cells, tissues or organs that have had ex vivo contact with live nonhuman animal cells, tissues or organs.**”
- Essentially, it is the use of animal cells and organs to heal humans. It includes transplantation of animal organs (like a pig kidney), or use of a pig liver for temporary perfusion during acute liver failure.

#### Need for this procedure

- **Xenotransplantation involving the heart was first tried in humans in the 1980s.** The need for such a procedure was felt because of the **significant gap** between the **number of transplantations needed by patients and the availability of donor organs.**

#### How does xenotransplantation happen?

- In practice, the actual surgery may not be very different from a regular organ transplant. But, there are several crucial additional steps. The **animal organ has to undergo genetic modifications so that the human body does not reject it.**
  - The gene editing technology **CRISPR-Cas9** can be employed to remove certain pig genes that produce sugars with antibodies our immune systems react to and add certain human genes to improve the kidney’s compatibility with humans.
- After the operation, **constant monitoring** needs to be done to check the body’s response to the organ.

#### Why are pigs often used for xenotransplantation?

- Pig’s **anatomical and physiological parameters** are **similar to that of humans,**
- The **breeding** of pigs in farms is **widespread and cost-effective.**
- Many **varieties** of pig breeds are farmed, which provides an **opportunity** for the **size of the harvested organs** to be **matched with the specific needs** of the **human recipient.**

#### Earlier cases of Xenotransplantation

- Pig heart valves have been used for replacing damaged valves in humans for over 50 years now.

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- In January 2022, the **first xenotransplantation of a genetically-modified pig heart** was done. However, the patient passed away after two months due to a range of factors, including being tainted with a latent virus in the pig heart, which may have contributed to the dysfunction of the transplant.

### Complications in xenotransplantation

- It has to be ensured that the **body does not reject the organ**. One method of doing this is embedding the pig's thymus gland, responsible for educating the immune system, underneath the outer layer of the kidney. This helps keep away any new or delayed immune responses.
- The FDA also notes concerns of potential infection of recipients with both recognised and unrecognised **infectious agents** and the **possible subsequent transmission to their close contacts and into the general human population**.
- Another public health concern is the possibility of **cross-species infection** by **retroviruses**, which **may be latent and lead to disease years after infection**.

### 2. Answer: B

#### Explanation

1. Duqm : Oman
2. Changi : Singapore
3. Chabahar : Iran
4. Gwadar : Pakistan

### 3. Answer: C

#### Explanation

##### What is a VPN?

- A virtual private network **gives you online privacy and anonymity by creating a private network from a public Internet connection**. Hence **statement 1 is correct**.
- **VPNs mask your Internet protocol (IP) address so your online actions are virtually untraceable**. Hence **statement 2 is correct**.
- VPN services establish secure and encrypted connections, guaranteed to provide greater privacy than even a secured Wi-Fi hotspot.

##### Why do you need a VPN service?

- Surfing the web or transacting on an unsecured Wi-Fi network means you could be exposing your private information and browsing habits. That's why a virtual private network, better known as a VPN, should be a must for anyone concerned about their online security and privacy. Hence **statement 3 is correct**.

##### What does a VPN hide?

- browsing history
- IP address and location
- location for streaming
- web activity — to maintain internet freedom

##### How can a VPN help protect against identity theft?

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- Identity theft occurs when thieves steal your personal information and use it to commit crimes in your name — like taking over or opening new accounts, filing tax returns in your name, or renting or buying property. A VPN can help protect against identity theft by helping protect your data. It creates an encrypted tunnel for the data you send and receive that's out of reach of cyberthieves.
- If your smartphone's Wi-Fi is enabled at all times, your device could be vulnerable without you ever knowing it. Everyday activities like online shopping, banking and browsing can expose your information, making you vulnerable to cybercrime.
- A VPN can protect the information you share or access using your devices. That's especially important when using a public Wi-Fi network, where a cyberthief on the same network could capture your login credentials and the credit card number you type in when you shop online.

### 4. Answer: B

#### Explanation

- An aurora is a natural phenomenon which is characterized by a **display of a natural-coloured (green, red, yellow or white) light in the sky**.
- It is a light show which is caused when **electrically-charged particles from the sun collide with particles from gasses** such as oxygen and nitrogen present in the Earth's atmosphere. Hence **statement 2 is correct**.
- Aurora is sometimes referred to as '**polar light**'. It is predominantly seen in the regions of **high altitudes like the Arctic and Antarctic**. Hence **statement 1 is incorrect**.



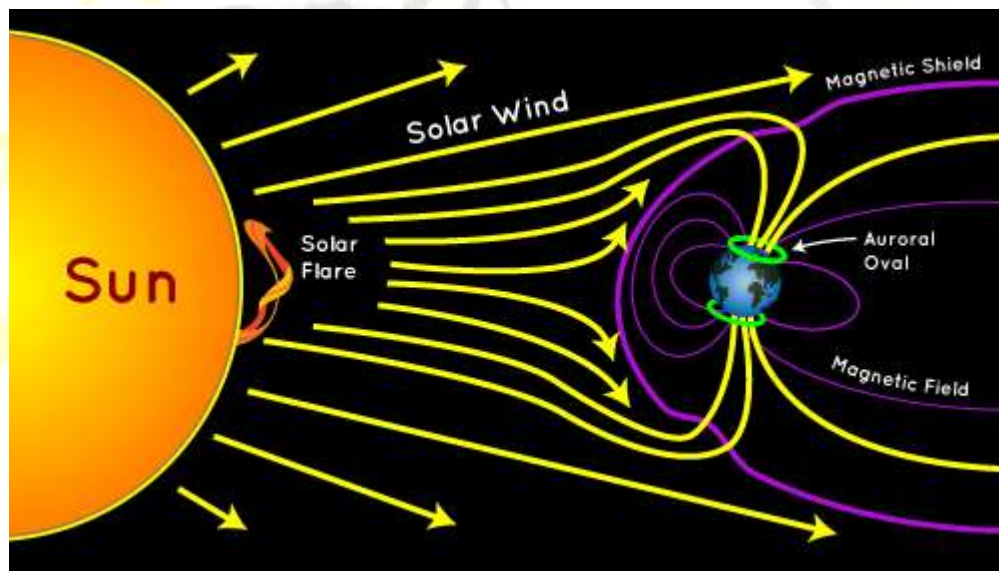
#### What causes an Aurora?

- An aurora is caused by the **streams of electrified particles** (which are emitted by the sun) **trapped in the magnetic field of the earth**.
- It is produced when this **magnetosphere is disturbed by the solar wind carrying the charged particles**.

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- Auroras are seen in latitudes of **around 70 degrees**. They generally **occur in a band** known as **'auroral zone'**.
- The auroral zone is **3 to 6 degrees wide** in latitude. It lies between **10 and 20 degrees from the geomagnetic poles**.
- This is visible quite clearly during the night. Auroras can sometimes be seen at latitudes below the actual auroral zone.
- Auroras can appear in various forms like **streamers, patches, arcs, scattered light, diffused light etc.**
- The brightest and the most distinctive of all forms of auroras are the ones which are curtain-like in the shape of an arc, extending in the east-west direction.
- This natural light effect is known as **'aurora borealis'** in northern altitudes, while the effect in the southern latitudes is known as **'aurora australis'**.
- Aurora borealis is also known as **'Northern lights'**. Similarly, aurora australis is also known as **'Southern lights'**.



5. Answer: B

### Explanation:

- Coral reefs are large underwater structures composed of the skeletons of colonial **marine invertebrates called coral**.
- The coral species that build reefs are known as **hermatypic, or "hard," corals** because they extract **calcium carbonate (CaCO<sub>3</sub>)** from seawater to create a hard, durable exoskeleton that protects their soft, sac-like bodies.
- Other species of corals that does not involve reef building are known as "soft" corals. These types of corals are flexible organisms often resembling plants and trees and include species such as sea fans and sea whips.



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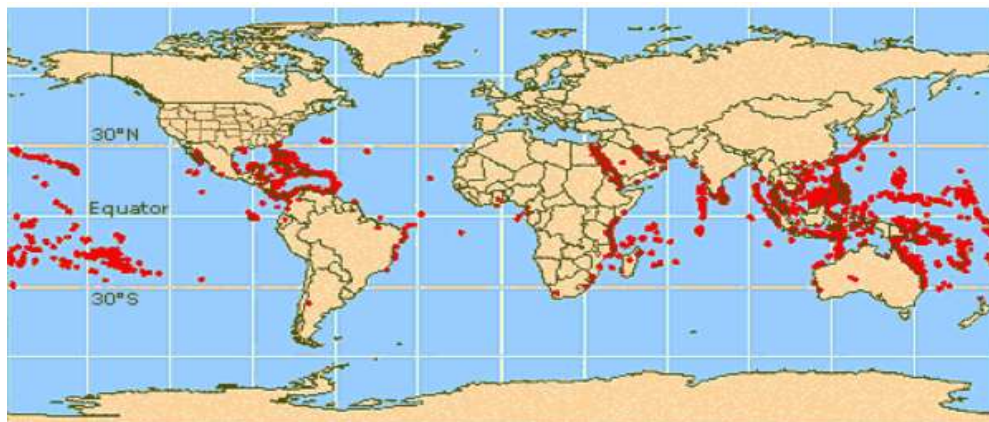
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### Symbiotic relationship

- Most reef-building corals contain photosynthetic algae called **zooxanthellae** which live in their tissues. The corals and algae have a **symbiotic relationship**.
- The coral provides the algae with a protected environment and compounds they need for photosynthesis. In return, the algae produce oxygen and help the coral to remove wastes. The presence of the zooxanthellae also provides coloured pigments to help protect the coral's white skeleton from sunlight.

### Significance of Coral reefs

- Coral reefs only occupy 0.1% of the area of the ocean but they support 25% of all marine species on the planet.
- Because of the diversity of life found in the habitats created by corals, reefs are often called the "**rainforests of the sea.**"
- The majority of reef building corals are found within tropical and subtropical waters. These typically occur between **30°N and 30°S of the equator**.
- The largest of these coral reef systems, the **Great Barrier Reef** in Australia, is more than 1,500 miles long (2,400 km).

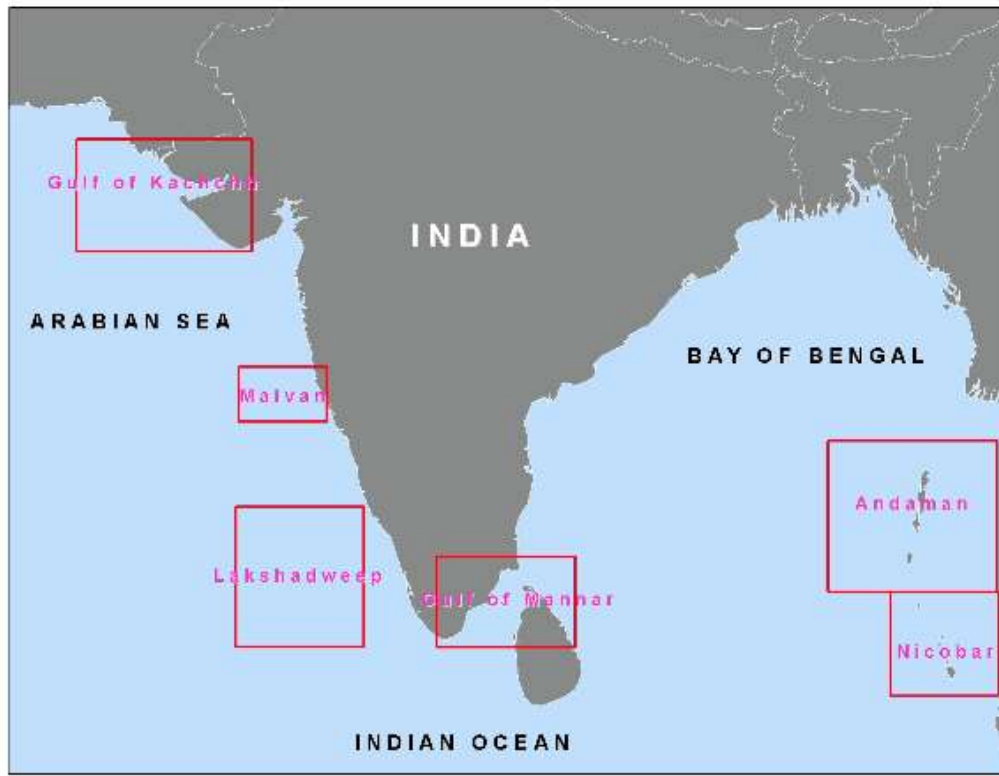


### Coral reefs in India

- Coral reefs are present in the areas of **Gulf of Kutch, Gulf of Mannar, Andaman & Nicobar, Lakshadweep Islands and Malvan coast of Maharashtra.**

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