



# 2025 Prelims Science & Technology Report Card

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for  
IAS Classes and Study Material**



**Total Questions = 8  
Hits = 4  
Missed = 4**

# PrepMate IAS

Q1. Consider the following types of vehicles:

1. Full battery electric vehicles
2. Hydrogen fuel cell vehicles
3. Fuel cell electric hybrid vehicles

How many of the above are considered as alternative powertrain vehicles?

- (a) Only one
- (b) Only two
- (c) All the three
- (d) None

**Correct Option: (c) All the three**

The **powertrain** refers to all the components that generate power and move a vehicle. Alternative powertrain vehicles are those that utilize propulsion systems other than the conventional internal combustion engine (ICE) that runs on gasoline or diesel.

Statement 1 is correct. Full battery electric vehicles are alternative powertrain vehicles.

Science & Technology Notes, Chapter 19 Transportation Technologies, Page 434

#### **Battery electric Vehicles (BeVs)**

Battery Electric vehicles, as the name indicates, use electricity from a battery to power

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an engine. The term Electric Vehicle is generally used to refer to a Battery Electric Vehicle.

The conventional vehicles use combustion of fossil fuels to generate the energy needed to power the engine. The combustion of fossil fuels releases pollutants and GHGs. Electric vehicles, on the other hand, are environment friendly as they are emission-free. Moreover, since electric vehicles do not generate emissions, there are no carbon deposits on their parts. Thus, unlike fossil fuel-based vehicles, electric vehicles do not require regular service, and hence, their maintenance cost is negligible.

Unlike, the internal combustion engine of conventional vehicles, electric vehicles have an electric motor. This electric motor drives the wheels of the vehicle. The vehicle consists of a battery pack that can be charged by plugging into a charging outlet. The battery powers the electric motor.

Statement 3 is also correct. Both Hydrogen fuel cell vehicles and Fuel cell electric hybrid vehicles are alternative powertrain vehicles.

Science & Technology Notes, Chapter 19 Transportation Technologies, Page 437

### **Hydrogen cars or Fuel cell electric cars**

Hydrogen cars are also known as fuel cell electric cars. These vehicles use hydrogen as fuel to generate electricity. The electricity is used to power the electric motor of the car. A major difference between electric vehicles and hydrogen cars is that while electric vehicles use electricity from an external power source (battery is charged by plugging into an outlet), hydrogen cars generate their own electricity. They are called fuel cell electric vehicles to differentiate them from the regular Battery Electric Vehicles (BEVs).

Hydrogen cars use fuel cell technology to generate electricity. The hydrogen fuel in the tank reacts with oxygen from the air. The reaction takes place inside a fuel cell. As a result of this chemical reaction, electric energy is produced along with heat and water. Hence, water vapour is emitted as a by-product. The electricity generated is used to power the electric motor in the vehicle. Alternatively, hydrogen cars can also be equipped with a battery (called Peak Power battery), which is charged by the electricity from the fuel cell. Compared to batteries in electric vehicles, peak power batteries are smaller and lighter.

### **Current Affairs**

Statements 2 and 3 are correct.

April 2024 Edition, Page 121

**How do hydrogen fuel cells work?**

A **hydrogen fuel cell** generates electricity by utilising the chemical energy contained in hydrogen. It releases only pure water, not discharging pollutants. Hydrogen is loaded into cells. The energy within the hydrogen is converted into electricity and heat, which is then used to power the vessel's propulsion mechanism. In the fuel cell, the hydrogen reacts with the oxygen in the air to produce electricity. Unlike batteries, hydrogen fuel cells do not require recharging. Provided uninterrupted supply of fuel and oxygen, these cells would work continuously.

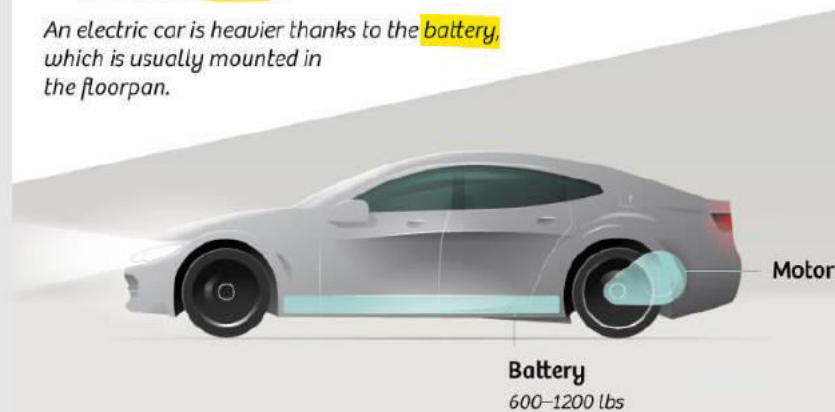
**Statement 1 is correct.**

**June 2025 Edition, Page 112**

Electric Vehicles (EVs) are celebrated for cutting greenhouse gas (GHG) emissions, helping fight climate change. But a new study warns of an overlooked environmental cost—pollution from tyre particles.

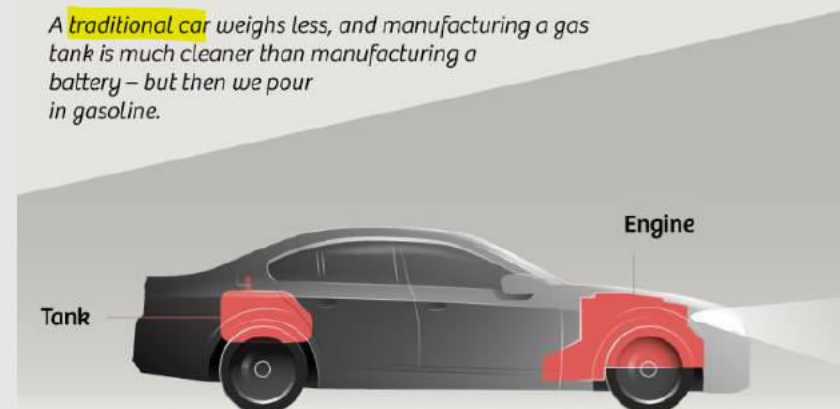
### ⚡ Electric car

*An electric car is heavier thanks to the battery, which is usually mounted in the floorpan.*



### 💧 Gasoline car

*A traditional car weighs less, and manufacturing a gas tank is much cleaner than manufacturing a battery – but then we pour in gasoline.*



Prelims 2025 Questions	PrepMate IAS Notes - Hits
<p>Q2. In the context of electric vehicle batteries, consider the following elements:</p> <ol style="list-style-type: none"> <li>1. Cobalt</li> <li>2. Graphite</li> <li>3. Lithium</li> <li>4. Nickel</li> </ol> <p>How many of the above usually make up battery cathodes?</p> <p>(a) Only one (b) Only two (c) Only three (d) All the four</p> <p><b>Correct Option: (c)</b></p>	

Prelims 2025 Questions	PrepMate IAS Notes - Hits
<p>Q3. Consider the following:</p> <ol style="list-style-type: none"> <li>1. Cigarette butts</li> <li>2. Eyeglass lenses</li> <li>3. Car tyres</li> </ol> <p>How many of them contain plastic?</p> <ol style="list-style-type: none"> <li>a. Only one</li> <li>b. Only two</li> <li>c. All the three</li> <li>d. None</li> </ol> <p><b>Correct Option: (c)</b></p>	

Prelims 2025 Questions	PrepMate IAS Notes - Hits
<p>Q4. Consider the following substances:</p> <ol style="list-style-type: none"><li>1. Ethanol</li><li>2. Nitroglycerine</li><li>3. Urea</li></ol> <p>Coal gasification technology can be used in the production of how many of them?</p> <ol style="list-style-type: none"><li>a. Only one</li><li>b. Only two</li><li>c. All the three</li><li>d. None</li></ol> <p><b>Correct Option: (b)</b></p>	



Prelims 2025 Questions	PrepMate IAS Notes - Hits
<p>5. What is the common characteristic of the chemical substances generally known as CL-20, HMX and LLM-105, which are sometimes talked about in media?</p> <p>a. These are alternatives to hydro-fluorocarbon refrigerants</p> <p>b. These are explosives in military weapons</p> <p>c. These are high-energy fuels for cruise missiles</p> <p>d. These are fuels for rocket propulsion</p> <p><b>Correct Option: (b)</b></p>	

Prelims 2025 Questions	PrepMate IAS Notes - Hits
<p>6. Consider the following statements:</p> <ol style="list-style-type: none"> <li>It is expected that Majorana 1 chip will enable quantum computing.</li> <li>Majorana 1 chip has been introduced by Amazon Web Services (AWS).</li> <li>Deep learning is a subset of machine learning.</li> </ol> <p>Which of the statements given above are correct?</p> <ol style="list-style-type: none"> <li>I and II only</li> <li>II and III only</li> <li>I and III only</li> <li>I, II and III</li> </ol>	<p><b>Correct Option: (c)</b> Statement 3 is covered in PrepMate Science &amp; Technology, Chapter 16 Artificial Intelligence</p> <p><b>Deep Learning:</b> Deep learning is an advanced type of machine learning. It can process a wide range of data sets and requires less data preprocessing by the humans. Data preprocessing refers to preparing and organizing raw data to make it suitable for a machine learning model.</p> <p>am's IAS 374 Contact - 75979-00000</p>

7. GPS-Aided Geo augmented navigation (GAGAN) uses a system of ground stations to provide necessary augmentation. Which of the following statements is/are correct in respect of GAGAN?

- I. It is designed to provide additional accuracy and integrity.
- II. It will allow more uniform and high-quality air traffic management.
- III. It will provide benefits only in aviation but not in other modes of transportation.

Select the correct answer using the code given below.

- a. I, II and III
- b. II and III only
- c. I only
- d. I and II only

**Correct Option: (d)**

Science & Technology, Page 133

and Airports Authority of India (AAI). It is developed to provide enhanced navigation signals to the civil aviation sector to minimise accidents. With the help of GAGAN, pilots are able to fly even in bad weather conditions. Before GAGAN, air traffic in India was dependent upon the GPS.

GAGAN system is also interoperable with other international Satellite-based Augmentation Systems (SBAS), and hence can provide seamless navigation across the regional boundaries. The Signal-In-Space (SIS) of GAGAN system is available through the satellites-GSAT-8, GSAT-10, and GSAT-15.

According to ISRO, GAGAN though primarily meant for aviation, will provide benefits beyond aviation to many other user segments such as intelligent transportation, maritime, highways, railways, surveying, geodesy, security agencies, telecom industry, personal users of position location applications, etc.

April 2024 Edition, Page 146

**What is the new proposed highway tolling system?**

The global navigation satellite system is a term used to refer to any satellite-based navigation system, including the United States' Global Positioning System (GPS). It uses a large constellation of satellites to provide more accurate location and navigation information to users globally as compared to the GPS alone.

An official of the Ministry of Road Transport and Highways explained that its implementation will involve an On-Board Unit (OBU), or a tracking device, fitted inside a vehicle whose location can be mapped using GAGAN, the Indian satellite navigation system with an approximate accuracy of 10 metres. The co-ordinates of the entire length of the country's national highways will have to be logged with the help of digital image processing, and software will be used to assign the toll rate on a particular highway, calculate the toll amount for a vehicle as per the distance travelled by it and then deduct it from a wallet linked to the OBU.

The Ministry official further explained that the aim of the technology is to provide users the benefit of paying toll only for the actual distance travelled on a highway, or pay-as-you-use. The government also hopes that it will eventually allow barrier-free movement.

8. With reference to india's defence, consider the following pairs:

Aircraft type: Description

1. Dornier 228 : Maritime patrol aircraft
2. IL-76 : Supersonic combat aircraft
3. C-17 Globe-master III : Military transport aircraft

How many of the pairs given above are correctly matched?

- a. Only one
- b. Only two
- c. All the three
- d. None

**Correct Option: (b)**

Pair 1 is correct:

News Juice Monthly, April 2024 Edition, Page 58

The Maldives defence ministry said the first team of Indian civilians had arrived, and would take charge of the operation of a helicopter in Addu, the country's southernmost atoll. The two countries had agreed on February 2 that India would pull out 80-odd military personnel stationed in the Maldives between March 10 and May 10.

The Indian Ministry of External Affairs had said that the two helicopters and a Dornier aircraft in the Maldives would be operated by "competent Indian technical personnel" who would replace the "present personnel".

Statement 2 is incorrect and 3 is correct.

**May 2025 News, Page 56**

The base houses PAF transport aircraft such as Lockheed C-130 Hercules, Ilyushin Il-78 refuellers, and trainers such as Karakoram-8. With the Pakistan Army's General Headquarters and the Strategic Plans Division — the operational arm of the country's nuclear command — in the vicinity, the base lies at the heart of the Pakistani military establishment.

PAF Base Chaklala was renamed PAF Base Nur Khan in 2012, in honour of Air Marshal Nur Khan, the base's first Pakistani commander in 1947 who went on to lead the Pakistan Air Force from 1965 to 1969.

Science & Technology, Page 180

### **Important Transportation and Training Aircrafts and Helicopters**

These aircrafts are not only used during wars for assistance purposes but also during the humanitarian, civilian, training, search, and rescue operations.

**Ilyushin (IL)-78:** Ilyushin-78 is manufactured by Russia. It is fitted with a mid-air refueling system (MARS). It has the ability to refuel three fighter jets at a time. It is presently in service.

**C-17 Globemaster:** C-17 Globemaster was inducted into the IAF in 2013. It is jointly manufactured by the U.S. companies Boeing and McDonnell Douglas. The aircraft is primarily meant for rapid airlifting and transporting troops, cargo, equipment and warfare materials, tanks, etc.