

**DAILY
CURRENT
AFFAIRS
ANALYSIS**



LAKSHYA ACADEMY®

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1 - Gamma Ray Bursts:

GS III

Science and Technology

- **Important information:**

- Lightning monitors in India detected a powerful energy burst that struck Earth in a historic event.
- It is currently thought that an extraterrestrial source that originated outside of the Solar System is responsible for this huge blast.
- An powerful Gamma-Ray Burst (GRB) from a distant exploding star caused a severe disturbance in Earth's ionosphere.
- We call this cosmic event GRB 221009A.
- The burst was one of the strongest known GRBs, coming from a galaxy that was about two billion light-years away.

- **Importance:**

- This finding is important because it shows that cosmic events that take place billions of light-years away from Earth can nevertheless have real-world consequences.
- Like a significant solar flare, the disturbance affected the lowest levels of Earth's ionosphere.
- Very low frequency radio signals were impacted by the bottom-side ionosphere's increased ionisation, which changed how they bounced throughout the ionosphere.
- Such a GRB within our own galaxy might have catastrophic consequences, possibly causing damage to the ozone layer and permitting dangerous UV radiation to reach Earth's surface.
- There have been theories regarding this situation as a potential reason for previous Earthly mass extinctions.

- **How do gamma-ray bursts occur?**

- The strongest and most intense explosions in the known cosmos are called gamma-ray bursts (GRBs).
- Some of the most violent occurrences in the cosmos, such as the formation of black holes and collisions between neutron stars, produce these brief bursts of intense light.
- GRBs, which can last anywhere from a few milliseconds to several minutes, can have a luminosity equivalent to a million trillion suns, hundreds of times that of an average supernova.
- As a result, during an eruption, a GRB briefly shines brighter than any other source of electromagnetic radiation in the visible cosmos.

- The Vela 4A satellite, one of several X-ray, gamma, and neutron-detecting spacecraft intended to track any nuclear testing by the Soviet Union or other countries, made the first observation of a GRB in 1967.
- **Why do gamma-ray bursts occur?**
- The duration of a gamma-ray burst determines its cause.
- The merger of a neutron star and a black hole or the merging of two neutron stars results in GRBs that last less than two seconds.
- Hour-long longer GRBs are produced when a big star crashes and forms a black hole.
- **What is the power of Gamma-Ray Bursts?**
- A gamma-ray burst can release as much energy in a few of seconds as the sun will in its nine billion years.
- *Source → The Hindu*

2 - *Cyrtodactylus Vairengtensis*:

GS III

Environmental Conservation related issues

- **Important information:**
- The town in Mizoram where the new species was discovered is titled "*Cyrtodactylus vairengtensis*," however "Vairengte bent-toed gecko" is the common name that has been proposed for it.
- With the introduction of this new species, there are now 22 native geckos in northeast India in addition to the six that are native to Mizoram.
- Of the 335 species of gecko recognised worldwide, 42 are found in India.
- This new species may be distinguished from other members of the *Cyrtodactylus* family by its large number of femoral pores.
- The International Union for Conservation of Nature (IUCN) should classify it as "data deficient," according to the researchers' recommendation.
- *Source → The Hindu*

3 - How Do Electric Batteries Operate:

GS III

Science and Technology

- **Trial conducted by Luigi Galvani:**
 - The underlying change in the arrangement of electrons in atom-to-atom bonds drives all chemical processes.
 - In 1780, Luigi Galvani carried out an experiment.
 - Galvani made a simultaneous touch to the leg of a frog with two plates made of different metals.
 - Although the limb had contracted, he was unable to determine why.
- **Alessandro Volta:**
 - Alessandro Volta's voltaic pile, constructed in 1800, was the following significant pre-industrial breakthrough in this area.
 - This cell was made up of alternating plates made of copper and zinc that were spaced apart by paper sheets dipped in salt water.
 - Volta discovered that this configuration could provide a constant current for a while.
- **Daniel John:**
 - John Daniel, a British chemist, enhanced Volta's design.
 - He put an earthen pot with a zinc electrode submerged in sulfuric acid inside a copper pot that had been filled with copper sulphate.
 - An even longer electric current might be produced with this more advanced setup.
- **Michael Farley:**
 - Michael Faraday identified the components of these cells (such as the anode, cathode, and electrolyte) and figured out why they operated in the manner that they did in the beginning of the 1800s.
- **An electric battery: what is it?**
 - Redox processes are used by voltaic, also known as galvanic, cells to generate an electric current.
 - There are two half-cells in the cell.

- A metal electrode submerged in an electrolyte of that metal (for example, a zinc electrode in zinc sulphate and a copper electrode in copper sulphate) makes up each half-cell.
- A salt bridge—a substance that transmits ions while staying electrically neutral—connects the two tubs of electrolyte, and a wire connects the two metal electrodes.
- Two electrons are released into the electrode of the zinc half-cell when zinc ions (Zn^{2+}) from the electrode dissolve in the zinc sulphate.

- **The opposite occurs in the copper half-cell:**

- After depositing onto the electrode, copper ions (Cu^{2+}) from the copper sulphate now need two electrons.
- Thus, two electrons are transferred from the zinc electrode to the copper electrode via the wire that connects the electrodes.
- Similar to this, Zn^{2+} and sulphate (SO_4^{2-}) ions can interact and exchange electrons thanks to the salt bridge that joins the two electrolytes.
- An external circuit attached to the wire carrying electrons from the zinc to the copper electrodes can pull electron flow for a variety of uses.

- **An assortment of these cells makes up a battery.**

- **About batteries:**

- The redox reaction, the anode, and the cathode.
- The electrode that receives electrons and is positively charged—copper in the example above—is known as the cathode.
- The negatively charged electrode that "supplies" electrons is known as the anode.
- Electrons are released in an oxidation reaction and consumed in a reduction reaction.
- Accordingly, copper decreases at the cathode while zinc oxidises at the anode.
- This is the fundamental redox reaction of all electrochemical cells.

- **Voltage at the source and voltage at the terminal:**

- The source voltage, formerly known as the electromotive force, is the energy that the half-cells impart to the electrons.
- The electrons are driven from the anode to the cathode by the terminal voltage, which functions as a driving force.
- The source voltage and the terminal voltage are equal under perfect circumstances.
- The electrochemical potential of the cell increases with increasing source voltage.

- **Issues pertaining to these batteries:**

- **The corrosion process:**

- Corrosion is a well-known issue that reduces the efficiency of electrochemical cells.
- For instance, water droplets may form on the electrodes in humid environments.
- The water and gas can react to form carbonic acid, which can damage the electrode, if atmospheric carbon dioxide concentrations are high.
- **The corrosion caused by galvanic action:**
 - Another source is galvanic corrosion, in which the less reactive electrode of a cell erodes first and dissolves more quickly into the electrolyte over time due to its higher level of reactivity.
 - For instance, as a carbon-zinc battery is operated, zinc erodes more preferentially in non-rechargeable batteries.
- **Battery types:**
 - **These days, two batteries that frequently make the news are:**
 - the lithium-ion battery (Li-ion) and
 - Electric vehicles (EVs) employ fuel cell batteries.
 - **How a Li-ion battery operates:**
 - In 2019, the creators of the Li-ion battery were awarded the Nobel Prize in Chemistry.
 - This battery combines the features of an electrolytic and voltaic cell.
 - Chemical energy is transformed into electrical energy using a voltaic cell.
 - Chemical energy is produced from electrical energy using an electrolytic cell.
 - So, a battery that has both capabilities is rechargeable.
 - Graphite serves as the anode and lithium metal oxide serves as the cathode in a Li-ion polymer cell, which is utilised in smartphones.
 - A semisolid polymer gel serves as the electrolyte.
 - Utilising microporous polyethylene, the two half-cells are kept apart.
 - EVs can also be powered by these batteries.
 - **Fuel cells powered by hydrogen:**
 - Fuel cells are among the additional electric power sources found in automobiles.
 - A catalyst divides hydrogen into protons and electrons at the anode.
 - Protons travel through the electrolyte and electrons through an external circuit to reach the cathode.
 - Heat and water are produced at the cathode when the particles interact with atmospheric oxygen.
 - Such a cell is projected to play a major role in the hydrogen economy, functioning as long as hydrogen is available.

- *Source* → *The Hindu*

4 – Issue of Adultery in India:

GS II

Government Policies and Interventions

- **The Indian Adultery Law's Past:**

- A pre-constitutional law known as adultery law was passed in 1860.
- Women were viewed as chattel, or the "property" of their husbands, and had no autonomous rights at that period.
- Adultery was therefore considered a felony against the husband, for which he might bring charges against the perpetrator.
- Adultery was not listed as a crime in the initial draught of the Indian Penal Code (1837) created by the Law Commission of India, which was led by Lord Macaulay.
- The Second Law Commission expressed suspicions and suggested that it would be wrong to exclude the offence from the IPC; as a result, it was eventually added.

- **Position of the law regarding adultery:**

- Section 497 of the Indian Penal Code, in effect until 2018, characterised adultery as a crime punishable by up to five years in prison, a fine, or both.
- But women could not be punished under Section 497; only men could.
- A five-judge Supreme Court bench unanimously invalidated Section 497 of the IPC in *Joseph Shine v. Union of India* (2018), citing discriminatory intent.
- In addition, the court invalidated Section 198(2) of the CrPC to the extent that it relates to Section 497's definition of adultery.
- According to Section 198(2) of the Criminal Procedure Code, a court may only hear a matter if it is brought before it by a party who has been wronged, and in cases of adultery, only the spouse will be considered "aggrieved."
- The court ruled that adultery should not be prosecuted as a crime and could only be used as a legitimate reason for divorce.

- **What recommendations has the House Committee made?**

- In the BNS, 2023 report that the Committee approved, it was noted that adultery ought to be penalised equally for men and women, meaning that it should once again be a classified crime.
- Essentially, the paper argues that gender-neutralizing Section 497 would remedy the defect that led to its invalidation on the grounds of discrimination.

- **Why was it overturned?**
- **Discriminating in character:**
 - One of the reasons the court overturned Section 497 was its discriminatory character and its "manifest arbitrariness" in punishing only men for adultery.
- **Breach of essential rights:**
 - The Constitution's Articles 14, 15, and 21 were violated by Section 497:
 - **Article 14: Equality as a Human Right:**
 - Adultery was regarded as a breach of Article 14 because it was only punished against males and women.
 - The State is forbidden from discriminating on the basis of sex under Article 15(1).
 - In terms of the harmed party, the law exclusively took the husbands into account.
 - Protection of life and personal freedom is covered under Article 21.
 - This law violated women's essential dignity by treating them as their husbands' property.
 - **Women's autonomy:**
 - The court emphasised women's autonomy as a component of human dignity.
 - The husband does not have legal dominion over his wife and is not her master, the court ruled.
 - Any system that treats a woman in an indecent manner is inviting the Constitution's wrath.
- **Not a felony:**
 - Adultery also does not fall under the definition of a crime.
 - The absolute privacy of the marriage sphere would be greatly invaded if it were considered a crime.
 - It is preferable to not be used as a divorce reason.
 - Is it possible to overturn the Supreme Court's ruling in this case?
 - The supreme court's decision is national law.
 - Parliament cannot merely enact legislation that deviates from a high court decision.
 - It can, however, enact legislation that does away with the foundation of the court's ruling.
 - A law of this kind may be both prospective and retroactive.
- **Source → The Hindu**