Balancing faith, dignity and constitutional rights

Prelims: General Studies Paper - 1
Indian Polity and Governance - Constitution, Political System, Panchayati Raj, Public Policy, Rights Issues

Mains: General Studies - 2
Indian Constitution—historical underpinnings, evolution, features, amendments, significant provisions and basic structure

1. Background

- In **Indian Young Lawyers Association vs State of Kerala (2018),** a 5-judge Bench (4:1) allowed **women of all ages to enter the Sabarimala temple**.

- The verdict triggered **widespread protests**, with critics alleging **judicial interference** in religious customs.

- Nearly a decade later, the Supreme Court is hearing final arguments on **review petitions** challenging the ruling and its legal principles.

2. Key Constitutional Findings in 2018 Judgment

- The Court held that **Ayyappa devotees** are **not a separate religious denomination.**

- The **exclusion of women aged 10-50** violated women's **freedom of religion and equality.**

- Rule 3(b) of the **Kerala Hindu Places of Public Worship (Authorisation of Entry) Rules, 1965** was struck down as **unconstitutional.**

- It was also held to be **inconsistent with the parent law,** which guarantees **temple entry to all Hindus..**

- The dissent argued that courts should respect **essential religious practices** and **community autonomy.**

3. Doctrinal Challenge

- Courts have used the **"essential religious practices" test,** effectively deciding what counts as **core religious doctrine.**

- This approach relies on **limited evidence and weak procedure**, and fails when such practices harm individual dignity.

- By placing **judges in a theological role**, it risks **undermining constitutional secularism.**

4. Proposed Way Forward

- **Justice D.Y. Chandrachud** proposed an **anti-exclusion test** grounded in **constitutional values**, not theology.

- The test **respects religious autonomy** but intervenes when practices **exclude individuals** or **impair dignity** and access to basic goods.

- It shifts the focus from whether a **practice is essential to whether its effects violate equality and dignity.**

- This framework could **guide future cases** involving religious exclusion, including disputes within **Dawoodi Bohra and Parsi communities**.

5. Conclusion

- The review offers the Court a chance to **recalibrate India's religious freedom jurisprudence.**

- An anti-exclusion approach better balances **faith, dignity, and constitutional rights,** protecting belief **without legitimising discrimination**

Unpackaging the myth of safe bottled water in India

Prelims: General Studies Paper - 1
General issues on Environmental ecology, Biodiversity and Climate Change

Mains: General Studies - 3
Conservation, environmental pollution and degradation, environmental impact assessment

1. Background

- **Bottled wate**r has shifted from **occasional use to a daily necessity** in India due to declining trust in municipal water.

- While bottled water is **generally microbiologically safe**, new evidence highlights **chemical and microplastic contamination**, challenging the belief that it is inherently safer.

- Scientific attention has moved from **short-term pathogens to long-term public health** and environmental risks.

2. Key Risks Identified

Microplastics contamination:

- Studies in **Nagpur** found **72-212 microplastic particles per litre** across all bottled water brands.

- Samples from **Mumbai and coastal Andhra Pradesh** also showed contamination in every sample.

- **Local brands showed higher contamination**, indicating gaps in bottling and quality control.

- Microplastics can carry **toxic additives,** and smaller particles may **cross biological barriers**, while nanoplastics remain unregulated and undetected.

Chemical leaching from plastic bottles:

- Additives like **antimony, phthalates and plasticisers** can leach into water.

- **Heat, sunlight and long storage**, common in India, increase leaching.

- Current regulations assess chemicals individually and short term, i**gnoring cumulative long-term exposure.**

3. Regulatory and Environmental Gaps

- Bottled water is regulated by **Food Safety and Standards Authority of India (FSSAI)**, but standards **do not test for microplastics or long-term chemical exposure.**

- Removal of mandatory **Bureau of Indian Standards (BIS) certification** improved baseline quality but narrowed regulatory scope.

- State surveys (e.g., Karnataka) reveal **weak enforcemen**t and **substandard samples.**

- **Single-use bottles** add to India's plastic waste crisis, with degraded plastics re-entering water systems as microplastics, creating a **health-environment feedback loop**.

4. Way Forward

- **Reduce exposure:** avoid heat storage, use **point-of-use filtration**, and expand refill stations and public water dispensers.

- **Systemic reforms:** strengthen **municipal water systems**, ensure transparent water-quality disclosure, and expand affordable household filtration.

- **Regulatory update**: include routine testing for microplastics and plastic-derived chemicals in **FSSAI and BIS standards**.

- **Policy shift:** move from blind reliance on bottled water to **accountable, monitored public water systems.**

How are Indian firms training LLMs?

Prelims: General Studies Paper - 1
Economic and Social Development-Sustainable Development, Poverty, Inclusion, Demographics, Social Sector Initiatives, etc.

Mains: General Studies - 3
Achievements of Indians in science & technology; indigenization of technology and developing new technology.

1. Sarvam AI & Indigenous LLM Development

- **Sarvam AI**, a Bengaluru-based startup, launched two **Large Language Models (LLMs)**.

- Models are claimed to be **less power- and compute-intensive** than comparable systems.

- They show **improved performance in Indian languages**.

- The models were trained **"from scratch"** and are said to be **open source**

- It is **not available on platforms like Hugging Face**, making it **difficult for outside experts to scrutinise the claims the firm has made.**

- Available via an app called **Indus**.

2. Challenges in Training LLMs in India

- LLMs require large clusters of **Graphics Processing Units (GPUs)** and high **electricity costs**, running into **millions of dollars**.

- Most training data is collected from the Internet, where **English and European languages are more common** than Indian languages.

- **Indian languages are underrepresented**, creating two key challenges:

  - Poor performance in Indian languages.

  - They use **more text units and computing effort** to translate sentences into English (and translate the answers back) to improve performance.

- Limited **capital availability** makes large-scale AI training difficult for Indian startups.

- If there is **no clear business use**, it becomes **financially risky** to invest in it.

3. Government Support & IndiaAI Mission

- The **IndiaAI Mission** has **supported AI training in India** by setting up **over 36,000 GPUs** in data centres run by Indian companies like Yotta, and by allowing researchers and startups to use them at a **low cost**.

- Sarvam received access to **4,096 GPUs**.

- Government subsidy so far: approximately **₹100 crore**.

- Total infrastructure cost ("bill of materials"): **₹246 crore**.

- Objective:

  - Strengthen **AI self-reliance**.

  - Improve **Indian language capabilities**.

  - Develop domestic **AI talent and ecosystem**.

- Inspired partly by cost-efficient innovations like China's **DeepSeek R1 model**.

4. Mixture of Experts (MoE) Architecture & Future Plans

- Traditional LLMs use **all their internal components** while answering a query, which makes them **expensive to run**.

- Mixture of Experts (MoE) uses only a **small part of the model at a time**, which makes it

  - **Faster**

  - **More efficient**

  - **Consume a lower level of computing resources**

- Current focus: **accuracy, usefulness, efficiency, and alignment for Indian context**.

- Plans to scale up with **larger training runs** in future.

- **Mixture of Experts (MoE)** - Mixture of Experts (MoE) is a **machine learning method** where an AI model is **divided into smaller parts called experts.**

  - **Each expert handles a specific type of input**, and together they work to complete the task efficiently.

- **GPU** - A graphics processing unit is an **electronic circuit designed to speed computer graphics** and image processing on various devices

- **Open source software (OSS)** - Software whose **source code is publicly available**.

  - Anyone can **use, study, modify, and share it**, usually for free.

What are carbon capture and utilisation technologies?

Prelims: General Studies Paper - 1
Current events of national and international importance

Mains: General Studies - 3
Conservation, environmental pollution and degradation, environmental impact assessment.

1.What is Carbon Capture and Utilisation (CCU)?

- Carbon Capture and Utilisation (CCU) involves **capturing carbon dioxide (CO_2) from industrial sources or directly from the air and converting it into useful products** such as fuels, chemicals, and building materials.

- Unlike Carbon Capture and Storage, it **reuses the captured carbon instead of storing it** underground.

2. Why Does India Need CCU?

- India is the **third-largest CO_2 emitter, mainly from carbon-intensive industries** like power and cement.

- CCU **helps reduce emissions from such hard-to-abate industries** while creating new value chains.

- It **supports India's net-zero target for 2070** and promotes a circular, low-carbon economy.

3. India's Current Status on CCU

- The **Department of Science and Technology has prepared a Research and Development roadmap** for Carbon Capture and Utilisation.

- The **Ministry of Petroleum and Natural Gas has released** a **draft 2030 roadmap** for Carbon Capture, Utilisation and Storage (CCUS).

- Ambuja Cements and Indian Institute of Technology Bombay **are piloting CO_2 conversion into fuels and materials.**

- JK Cement and Organic Recycling Systems Limited (ORSL) are **developing CCU applications in construction materials and bio-chemicals.**

4. Global Developments

- **European Union (EU):** Supports CCU under the **EU Bioeconomy Strategy and Circular Economy Action Plan**.

- **Belgium**: Firms are converting captured CO_2 into carbon monoxide for industry.

- **United States:** Uses tax credits and funding to promote CCU.

- **United Arab Emirates:** Al Reyadah links CCU with green hydrogen for chemicals.

5. Key Risks and Challenges

- CCU technologies **are costly and energy-intensive.**

- It **struggles to compete with cheaper fossil-based products.**

- **India lacks proper CO_2 transport** and industrial infrastructure.

- **Lack of clear standards and weak market demand** create investor uncertainty.

6.Way Ahead

- India has **taken positive steps** through CCU roadmaps and pilot projects.

- **Effective implementation, lower costs, and better infrastructure** are essential for scaling.

- **Properly scaled CCU can support India's climate goals** and build a low-carbon economy.

KEYWORDS

Human Papillomavirus (HPV)

- HPV is a **group of more than 200 viruses**, and about **90% of infections clear naturally**.

- Persistent infection with high-risk HPV types, especially **HPV-16 and HPV-18**, causes **cervical cancer.**

- It is also linked to cancers of the **vulva, vagina, anus, penis, and oropharynx.**

- Globally, HPV caused around **6.9 lakh cancer cases in 2019**.

- **HPV vaccination is a proven preventive tool,** supported by screening and treatment of precancerous lesions.

- In India, **HPV-16 and HPV-18 account for over 80% of cervical cancer cases**, while screening coverage is very low.

- India is rolling out a **nationwide single-dose HPV vaccination programme** for 14-year-old girls, as recommended by the **World Health Organization.**

- Vaccination will be provided at **government health facilities** with trained staff and adverse event monitoring.

- Effective implementation can **significantly reduce cervical cancer burden** and improve women's health outcomes

Species in News

African elephants

- African elephants are **the largest land animals, with males weighing up to 6,000 kg** and standing 3-4 metres tall.

- There are two species: **Savanna Elephants (Loxodonta africana) and Forest Elephants (Loxodonta cyclotis).**

- They are **slightly larger than Asian Elephants and can be identified by their larger ears**. (Asian elephants have smaller, rounded ears)

- **Savanna elephants are larger** and widely distributed across sub-Saharan Africa.

- **Forest elephants are smaller, live in central and West African forests**, and face higher threats from poaching and habitat loss.

- IUCN Conservation Status:

  - African Forest Elephant: Critically Endangered

  - **African Savanna(or Bush) Elephant: Endangered**

Places In News

Ethiopia

- **Ethiopia** is a **landlocked country** located in the **Horn of Africa**.

- Its capital city, **Addis Ababa**, lies near the **geographical centre** of the country.

- It is one of the **world's oldest civilizations**, with its territorial boundaries changing over centuries.

- Ethiopia was among the **first independent nations to sign the United Nations Charter** and played an important role in supporting **African decolonisation** and promoting **Pan-African cooperation**.

- Ethiopia shares borders with **Eritrea (north)**, **Djibouti (northeast)**, **Somalia (east)**, **Kenya (south)**, and **South Sudan and Sudan (west)**.