

SCIENCE AND TECHNOLOGY

❖ **Piezoelectric effect**

➤ **CONTEXT:** For the first time, scientists have reported evidence of the piezoelectric effect in liquids. The effect has been known for 143 years and in this time has been observed only in solids. The new finding challenges the theory that describes this effect as well as opens the door to previously unanticipated applications in electronic and mechanical systems.

- The effect was found in pure 1-butyl-3-methyl imidazolium bis(trifluoromethyl-sulfonyl)imide and 1-hexyl-3-methyl imidazolium bis(trifluoromethylsulfonyl)imide – both ionic liquids (i.e. liquids made of ions instead of molecules) at room temperature.

➤ **What is the piezoelectric effect?**

- In the piezoelectric effect, a body develops an electric current when it is squeezed. Quartz is the most famous piezoelectric crystal: it is used in this capacity in analog wristwatches and clocks. Such crystals are also used in cigarette lighters, electric guitars, TV remote controls, audio transducers, and other instruments where converting mechanical stress to a current is useful.

- Scientists believe the piezoelectric effect was discovered in 1880, in quartz and according to them every report they are aware of has been for the piezoelectric effect in a solid material, whether it was a composite or a pure solid, the piezoelectric effect has not been seen in any liquid until now.

- Quartz is silicon dioxide (SiO₂). The quartz crystal consists of silicon and oxygen atoms at the four vertices of a three-sided pyramid; each oxygen atom is shared by two pyramids. These pyramids repeat themselves to form the crystal.

- The effective charge of each pyramid is located slightly away from the centre. When a mechanical stress is applied (i.e. when the crystal is squeezed) the position of the charge is pushed further from the centre, giving rise to a small voltage. This is the source of the effect.

➤ **Why the effect in liquids surprising?**

- The reason the piezoelectric effect has only been expected in solids thus far is that the body being squeezed needs to have an organised structure, like the pyramids of quartz. Liquids don't have such structure; instead, they take the shape of their container.

- Physicists explain the effect using a combination of Hooke's law (that the force required to squeeze an object is linearly (i.e. non-exponentially) proportional to the amount of squeezing) and the properties of dielectric materials. These are materials that don't conduct electricity but whose electrons are still mildly affected by an electric field.

- Hooke's law is not clear when the body isn't very compressible.

- The observation of the effect in ionic liquids appears on its face to be inconsistent with the current model. An implication of our findings is the existence of some manner of organisation in ionic liquids that is not seen in 'normal' liquids."

- Indeed, the discovery will have to be modelled in ionic liquids specifically. This is because, according to the paper, 'normal' and ionic liquids of the kind tested in the study respond very differently, at the molecular level, when an electric charge is "imposed" on them.

- Within the framework of the current understanding, the piezoelectric effect requires 'persistent' order within the material. Normal liquids and gases have not been shown to exhibit order that persists long enough to be observed and characterised.

➤ **What is the strength of the effect?**

- In their experiment researchers filled a container with each liquid, of a somewhat thick consistency, and compressed it using a piston. A wire inside the piston connected to an external circuit, with an indicator to show when a current flowed through it.

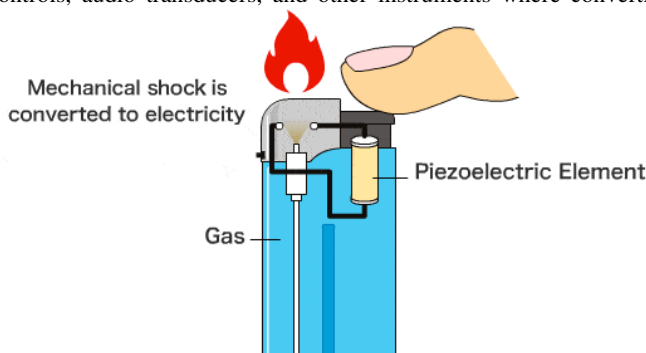
- According to the paper, the magnitude of the piezoelectric effect in the first liquid was 16 millivolt per newton (mV/N) and in the second, 17 mV/N, in both cases within a margin of 1 mV/N. Using these numbers, they calculated the piezoelectric constant (the strength of the effect in these materials) to be lower than that of quartz by a factor of 10, a relatively small difference.

➤ **What new applications are possible?**

- Researchers believe the most pressing matter is to develop a theoretical framework with predictive power to understand these experimental observations.

- According to the paper, "The discovery opens the door to applications that have previously not been accessible with solid-state materials, and [room-temperature ionic liquids] are more readily recyclable and in many instances pose fewer environmental issues than many currently used piezoelectric materials."

- The liquids also displayed the inverse piezoelectric effect: they became distorted when an electric charge was applied. this fact could be used to control how the liquids bent light passing through them by passing different currents through them. That is, using this simple control mechanism, vials of these liquids could be lenses with dynamic focusing abilities.



- Having a theory to explain the liquids' behaviour could reveal why these liquids behave the way they do, which could in turn reveal better ways to manipulate them, and develop newer applications.

SOCIETY

❖ **What does Muslim personal law say on inheritance?**

➤ **CONTEXT:** A Muslim couple from Kerala, advocate C. Shukkur and his wife Sheena, former Pro Vice-Chancellor of Mahatma Gandhi University, recently decided to get their marriage registered under the Special Marriage Act (SMA), almost 30 years after having solemnised their nikaah according to Islamic principles.

- Mr. Shukkur claimed to have got the marriage registered under SMA, so that principles of the secular Act could apply to matters of inheritance in his family, and enable his daughters to inherit the couple's property under the Indian Succession Act, 1925. The couple has three daughters and no sons.

➤ **What does Islamic law say?**

- This decision has put the spotlight on Islamic principles of inheritance. The Koran, through Surah Nisa clearly outlines the principles of inheritance for both direct and indirect heirs. Verse 7 states, "For men there is a share in what their parents and close relatives leave, and for women there is a share in what their parents and close relatives leave — whether it is little or much. These are obligatory shares."

- According to unanimously agreed rules on the division of property in Islam, a daughter gets half the share of the son. So if a son inherits a plot of 100 metres from the father, the daughter gets a plot of 50 metres or half the value of the 100-metre plot.

- On marriage, according to Islam, it is the man who is supposed to bear the family expenses, including residence, food, clothing and medicine besides maintenance of his wife, education of his children and looking after his parents. If the husband predeceases his wife, she gets a one-eighth share of his property, if the couple has children. Otherwise, she gets one-fourth. There is also a share for paternal uncles, aunts, etc, as long as they are blood relatives. Same for grandparents if they are alive. Each parent gets one-sixth if the son passes away before them, and leaves children behind.

- The problem, as in the case of the Kerala couple arises, when a couple has only a daughter or daughters. The daughters can inherit only two-thirds of father's property, as the holy book says, "If you leave only two or more females, their share is two-thirds of the estate." Beyond that, the shares are for the mother and for paternal blood relatives.

➤ **What are the various options?**

Within Islamic law, options are available to such a couple in case they want the property to remain within the family.

- The first option is to make a will or vasiyat under which a person can declare that upon his death, a particular heir shall inherit not more than one-third of the property. This is often done in case one of the children is not financially sound, or has special needs, or has served his or her parents more than other children. For instance, if two children stay abroad and one child stays back with parents to look after them in old age, such a provision may be used. Many Muslim families used this provision during the Partition when many families were divided. While some children crossed over to Pakistan, others remained here with their parents.

- Besides vasiyat, there is also the concept of virasat. Under virasat or inheritance, there is the option of hiba which allows unrestricted transfer of wealth or property to a person during the lifetime of the donor. In the case of the Kerala couple, hiba provisions could have been used to transfer all the property in the name of the daughters during the lifetime of the parents. This is like a gift deed.

- Importantly, while the Islamic division of property clauses for relatives comes into force once a person dies, a gift deed can be made during one's lifetime. The jury is out whether the Kerala couple's actions went against the tenets of Islam or arose from parents' anxiety to secure the future of their children.

PRELIMS

1. **SHRESHTA Scheme**

➤ **CONTEXT:** Minister of state for Social Justice and Empowerment Sushri Pratima Bhoumik in the Lok Sabha in a written reply today gave information about the Scheme for Residential Education for Students in High Schools in Targeted Area (SHRESHTA) and Support for Marginalised Individual for Livelihood and Enterprise (SMILE) scheme.

➤ **About**

- Under the SHRESHTA scheme (Earlier known as Grant-in-Aid to Voluntary and other Organizations working for Scheduled Castes), financial assistance is provided to NGOs for running projects related to education of students belonging to Scheduled Castes.

- The Scheme broadly covers 3 types of projects namely Residential Schools, Non Residential Schools and Hostels, both for Primary and Secondary Students.

- The scheme has been revised w.e.f 2022-23 as Scheme for Residential Education for Students in High Schools in Targeted Areas (SHRESHTA) and a new component under Mode-I has been added to the Scheme, under which every year a specified number of meritorious SC students in the country are selected for quality residential education in top-class residential High Schools through a nation-wide entrance test conducted by National Testing Agency (NTA).

- The SHRESHTA scheme provides scholarships that cover almost all of the educational expenses of meritorious students of Classes 9 and 11 from Scheduled Caste communities.

- Students are enrolled for the scheme through the entrance examination known as NETS.

- The National Entrance Test for SHRESHTA (NETS) is a national level test conducted by the National Testing Agency (NTA) in computer-based (CBT) mode. Candidates who qualify the SHRESHTA entrance exam are shortlisted for admission to CBSE affiliated schools.

- The scheme involves disbursement of scholarships directly to the schools giving admission to the shortlisted students, the CBSE said in a notification.
- The CBSE further informed that the scholarship covers school fee (including Tuition Fee etc.) and Hostel Fee (including Mess Charges etc.).
- The scheme is applicable only residential schools (independent) affiliated with the CBSE up to Class 12 Schools must be in operation for 5 years or more with 75 % pass percentage or more in Class 10 and 12 in the last 3 years.

➤ **SMILE Scheme**

- The Ministry of Social Justice & Empowerment has allocated 365 crore rupees for the scheme from 2021-22 to 2025-26.
- It is set to provide welfare and rehabilitation to the Transgender community and the people engaged in the act of begging.
- It includes two sub-schemes –‘Central Sector Scheme for Comprehensive Rehabilitation for Welfare of Transgender Persons’ : It includes various components.
- It provides Scholarships for Transgender Students studying in IX and till post-graduation to enable them to complete their education.
- It has provisions for Skill Development and Livelihood under the PM-DAKSH scheme.
- Through Composite Medical Health it provides a comprehensive package in convergence with PM-JAY supporting Gender-Reaffirmation surgeries through selected hospitals.
- The Housing facility in the form of ‘Garima Greh’ ensures food, clothing, recreational facilities, skill development opportunities, recreational activities and medical support etc. to the Transgender community and the people engaged in the act of begging.
- The Provision of Transgender Protection Cell in each state will monitor cases of offences and to ensure timely registration, investigation and prosecution of offences.
- The National Portal & Helpline will provide necessary information and solutions to the Transgender community and the people engaged in the act of begging when needed.
- ✓ ‘Central Sector Scheme for Comprehensive Rehabilitation of persons engaged in the act of Begging : It will focus on Survey and identification, Mobilisation, Rescue/ Shelter Home and Comprehensive resettlement.

➤ **Objectives and Need**

- The scheme keeps in mind the **social security** that is needed through multiple dimensions of identity, medical care, education, occupational opportunities and shelter.
- It aims to provide comprehensive welfare and rehabilitation measures to the Transgender community and the people engaged in the act of begging.
- This scheme with skill training and modern education will definitely enable transgender community to move forward with the mainstream and this will signify the vision of Prime Minister Narendra Modi of Sabka Sath Sabka Vikas.
- The scheme strengthens and expands the reach of the Rights that give the targeted group the necessary legal protection and a promise to a secured life.

2. **SVAMITVA Scheme**

➤ **CONTEXT:** The Central Sector Scheme “SVAMITVA” aims to provide the ‘Record of Rights’ to village household owners possessing houses in inhabited areas (Abadi) in villages. Under the scheme, land parcels in rural inhabited area of all the villages of the country are surveyed. It helps in determination of clear ownership of property. This information was given by the Union Minister of State for Panchayati Raj, Shri Kapil Moreshwar Patil in a written reply in Lok Sabha.

➤ **About**

- SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) Scheme was launched on April 24, 2020, which is also celebrated as National Panchayat Day. The Ministry of Panchayati Raj is the Nodal Ministry for this Scheme.
- The SVAMITVA Scheme is being implemented with the efforts of state Panchayati Raj Departments, State Revenue Departments, the Ministry of Panchayati Raj, and the Survey of India.
- This scheme would provide an integrated property validation solution for the rural areas of the country.
- Under the scheme, SVAMITVA Property Cards will be provided to the landowners by Government authorities. This card will help them present an official document to financial organizations in case of using their land as an asset for loans in the future.
- SVAMITVA Scheme will help the owners possess their houses in inhabited areas. They can use these areas as an asset for loans when required.
- Starting from 2020 to 2024, the mapping of areas using drones will be carried out in all villages.
- SVAMITVA Scheme is only applicable to 6 states currently- Maharashtra, Haryana, Karnataka, Madhya Pradesh, Uttar Pradesh, and Uttarakhand.
- For the pilot phase of the SVAMITVA Scheme, Rs.79.65 crores have been allotted. This scheme is funded by the Central Government of India.

➤ **Activities**

The major activities under the SVAMITVA Yojana are as follows:

- Continuous Operating Reference System (CORS) will be established under this SVAMITVA Scheme. CORS is a network that supports accurate ground-truthing, Geo-referencing, and demarcation of lands.

- With the help of a drone survey, the inhabited places in the Rural area would be mapped. This would help in generating high-resolution and accurate maps to grant ownership property rights. On the basis of the data, property cards will be issued to the household owners,
- Under the SVAMITVA Yojana, a Program management unit will be set up at the state and national levels.
- Awareness programs will be carried out to sensitize the rural population about the methodology of surveying and its benefit through SVAMITVA Scheme.
- Documentation of conducting regional and national workshops.

➤ **Objectives**

The main objectives of the SVAMITVA Scheme are given below.

- Property or land can be used as an asset to get financial benefits or loans, which will improve the financial stability of the people living in rural areas.
- Determination of the property tax would be easier through SVAMITVA Scheme.
- With the help of the SVAMITVA Scheme, accurate rural planning and land records can be created.
- With the use of GIS maps under the SVAMITVA Scheme, the Gram Panchayat Development Plan (GPDP) will get support as well.
- One of the major problems in rural areas is property-related disputes, but with the help of the SVAMITVA Scheme, these cases will be resolved easily.
- There are various government departments that would be largely benefitted from GIS Maps

3. National Mission on Natural Farming

➤ **CONTEXT: To motivate farmers to adopt chemical free farming and enhance the reach of natural farming, the Government has formulated National Mission on Natural Farming (NMNF) as a separate and independent scheme from 2023-24 by up scaling the Bhartiya Prakritik Krishi Paddati (BPKP) this information given by Agricultural Ministry in Lok Saba.**

➤ **About the Mission**

- In order to involve more farmers and enhance the reach of natural farming on a larger scale, the Government has formulated National Mission on Natural Farming (NMNF) by upscaling the Bharatiya Prakritik Krishi Paddhati (BPKP) to promote natural farming across the country.
- NMNF will cover 7.5 lakh hectare area by developing 15,000 clusters in the next four years with a total budget outlay of ₹1,584 crore (Centre's share).
- With NMNF, the government proposes to touch one crore farmers along the Ganga belt and in other rainfed parts of the country.
- Under NMNF, farmers will receive a financial assistance of ₹15,000 per hectare per year for three years for the creation of on-farm input production infrastructure. The operational guidelines state that incentives would be provided to farmers only when they commit to natural farming and have actually taken it up. If a farmer defaults or does not continue with natural farming, subsequent instalments shall not be disbursed.
- The BPKP, a sub-scheme under Paramparagat Krishi Vikas Yojana (PKVY), had provided financial assistance of ₹12,200 per hectare for three years for cluster formation, capacity building and continuous hand-holding. Additionally, an assistance of ₹8,800 per hectare for three years was allowed from PKVY funds for marketing, value addition and publicity of natural farming products.
- The NMNF guidelines say that farmers willing to implement natural farming on their field will be registered as cluster members — each cluster shall comprise 50 farmers or more with 50 hectare land. Also, each cluster can fall in one village or spread across 2-3 nearby villages under the same gram panchayat.

➤ **Master trainers**

- A web portal (naturalfarming.dac.gov.in) has been launched for the promotion of natural farming with information on the implementation framework, resources, implementation progress, farmer's registration, blog, and so on.
- The agriculture ministry is undertaking large-scale training of master trainers, 'champion' farmers and practising farmers in the techniques of natural farming through the National Institute of Agricultural Extension Management (MANAGE) and National Centre of Organic and Natural Farming (NCONF). Already 997 training programmes have been conducted, covering 56,952 gram pradhans, he added.
- the Centre intends to set up 15,000 Bhartiya Prakritik Kheti Bio-inputs Resources Centres (BRCs) to provide easy access to bio-resources like Jeevamrit, Ghana Jeevamrit and neemastra, wherein cow dung and urine, neem and bioculture play an important role.
 - ✓ At a recent meeting with Niti Aayog, representatives of cow shelters wanted their units to be designated as BRCs as they form the backbone of the value chain in the production and distribution of bio fertilisers.
- These bio-input resource centres would be set up alongside the proposed 15,000 model clusters of natural farming. These BRCs would create a national-level distribution network for micro-fertilisers and pesticides, with each BRC responsible for one cluster under NMNF.

ANSWER WRITING

Q. "The oceans are reservoirs of global biodiversity". In this context explain the meaning of Blue Economy and initiatives by the government to promote the development of blue economy. Also map out sustainability challenges of blue economy.

According to the World Bank, the blue economy is the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem." The oceans are reservoirs of global biodiversity,

critical regulators of the global weather and climate, and support the economic well-being of billions of people in coastal areas. Therefore, the term 'blue economy' includes not only ocean-dependent economic development but also inclusive social development and environmental and ecological security.

Initiatives taken by the government to promote the development of the blue economy:

- Sagarmala Project: The prime objective of the Sagarmala project is to promote port-led direct and indirect development and to provide infrastructure to transport goods to and from ports quickly, efficiently and cost-effectively.
- Pradhan Mantri Matsya Sampada Yojana (PMMSY): It aims to bring about the Blue Revolution through sustainable and responsible development of the fisheries sector in India.
- Sagar Manthan dashboard: It is a real-time performance monitoring dashboard for tracking vessels. The platform has all the integrated data related to the Ministry for Ports, Shipping and Waterways.
- Deep Ocean Mission: Also known as the Samudrayaan program, it aims to explore deep-sea resources in the exclusive economic zones (EEZ) and continental shelves as well as the development of technology for harnessing them. One of the primary aims of the mission is to explore and extract polymetallic nodules.
- Coastal Regulation Zone notification: India adopted the Coastal Regulation Zone notification to classify and better manage coastal regions and conserve ecologically sensitive coastal and marine areas, including ecosystems.
- India-Norway Task Force on Blue Economy: Through this, Norway and India are engaging in ways to ensure integrated ocean management at the government level.
- Draft Blue Economy policy: The framework envisages the optimal utilization of all sectors of the maritime domain, (living, non-living resources, tourism, ocean energy, etc.) for sustainable development of coastal areas.

Sustainability challenges concerning India's blue economy vision:

- Marine pollution: India is reeling under the marine debris crisis, which poses serious threats to its particularly rich marine biodiversity. According to UNEP, some 15,343 tonnes of waste dumped in the south Asian seas daily are generated from 60 major Indian cities.
- Over-extraction of marine resources: India's coastal waters suffer from overfishing, which can deplete fish stocks and cause the destruction of the marine environment. This can have a detrimental effect on the fishing industry and other areas of the blue economy.
- Climate change and extreme marine events: Rising water temperatures, acidification, and low oxygen levels can combine with natural ocean cycles to create extreme marine events. Marine heat waves, dead zones, and coral bleaching are a few examples of these events. Further, some fish species have already altered their geographic range in response to climate change.
- Unplanned urbanization: The growing population has led to unplanned urbanization in the coastal areas. This poses significant threats to the ocean, coastal and marine ecosystems, and biodiversity.
- Lack of coherent regional arrangement for governance: The absence of a regional governance agreement which covers Indian ocean region countries or ensures the protection of various species creates further challenges and regional conflict. For e.g.: The India-Sri Lanka fishing conflict.

Given the opportunities and challenges, India's G20 presidency can play an important role in promoting individual and collective actions to facilitate the transition towards a sustainable blue economy. The stewardship of oceans is an investment that will sustain future generations. Therefore, the spirit of 'One Earth, One Family, One Future' must unite the global community for the well-being of our ocean commons.

MCQs

1. Consider the statement in regard to the SVAMITVA scheme.
 1. The aim of this scheme is to update rural land records, providing a record of rights to village households and issue property cards.
 2. SVAMITVA is a central scheme of the Ministry of Panchayati Raj and Rural Development.
 3. This scheme to be implemented across the country in a phased manner over a period of six years (2020-2026).

Select the correct answer by using the code mentioned below.

- a) 1 only
- b) 2 only
- c) **1 and 2 only**
- d) 2 and 3 only

2. Which of the following statements is/are correct regarding the SMILE Scheme?
 1. The Ministry of Social Justice and Empowerment has formulated this scheme for Support for Marginalized Individuals.
 2. Focus of the scheme is on rehabilitation, provision of medical facilities only.
 3. "SMILE stands for Support for Marginalized Individuals for Livelihood and Enterprise".

Select the correct answer by using the codes given below.

- a) 1 only
- b) 2 only
- c) 1 and 2 only
- d) **1 and 3 only**

3. Which of the following statements about 'SHRESHTA' scheme is/are correct?
 1. This scheme is for residential education for students in high school in targeted areas.
 2. It provides for high quality education for meritorious but poor Scheduled Caste students.

Select the correct answer using the code given below.

- a) 1 only
- b) 2 only
- c) **Both 1 and 2**
- d) Neither 1 nor 2

4. With reference to organic farming in India, consider the following statements:

1. 'The National Programme for Organic Production' (NPOP) is operated under the guidelines and directions of the Union Ministry of Rural Development.
2. 'The Agricultural and Processed Food Products Export Development Authority' (APEDA) functions as the secretariat for the implementation of NPOP.

Which of the statements given above is/are correct?

- a) 1 only
- b) **2 only**
- c) Both 1 and 2
- d) Neither 1 nor 2

5. Consider the following statements about Status of Personal Law in India

1. Personal law subjects like marriage, divorce, inheritance come under State List
2. Hindu personal laws have been by and large secularized and modernized by statutory enactments (The Hindu Marriage Act, 1955).
3. Christians and Jews follow the same personal law in India

Which of the above statements is/are not correct?

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

6. In reference to piezoelectric effect, consider the following statements.

1. In the piezoelectric effect, a body develops an electric current when it is squeezed.
2. Quartz is used in analog wristwatches and clocks, cigarette lighters, electric guitars, TV remote controls.
3. Piezoelectric effect is observed in all three states- solid, liquid and gas.

Which of the above statements is/are correct?

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

7. With reference to high-altitude platform (HAP) consider the following

1. Like satellites they are reach much greater altitudes and revolve around the earth only with the help of gravity.
2. India has three high-altitude platform (HAP) in operation which are design and developed by National Aerospace Laboratories (NAL)

Which of the above statement/s is/are correct?

- a) 1 only
- b) 2 only
- c) Both 1 and 2
- d) **Neither 1 nor 2**

8. With reference to World Press Freedom Index, Consider the following statements:

1. The index neither ranks public policies and nor is it an indicator of the quality of journalism in any country or region.
2. The report is released every year by Sweden-based Varieties of Democracy (V-Dem).

Which of the statements given above is/are correct?

- a) **1 only**
- b) 2 only
- c) Both 1 and 2
- d) Neither 1 nor 2

9. With reference to Natural Farming, consider the following statements

1. Natural farming is synced with Sustainable Development Goal-1.
2. Participatory Guarantee System (PGS) certification is aimed at promoting Natural Farming.

Which of the above statement/s is/are correct?

- a) 1 only
- b) **2 only**
- c) Both 1 and 2
- d) Neither 1 nor 2

10. Central Bureau of Narcotics (CBN) functions under which of the following Ministry/Office?

- a) **Ministry of Finance**
- b) Ministry of Defence
- c) Ministry of Home Affairs
- d) Prime Minister's Office