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# CURRENT AFFAIRS

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## AMRIT TECHNOLOGY

*This article covers "Daily Current Affairs" and the topic details "AMRIT Technology". This topic has relevance in the Science and Technology section of the UPSC CSE exam.*

*GS 3: Science and Technology*

### Why in the news?

Recently, AMRIT Technology for water purification was showcased by Indian Institute of Technology (IIT) - Madras

### About AMRIT Technology:

AMRIT Technology, developed by the Indian Institute of Technology (IIT) - Madras, is a cutting-edge solution designed to address water quality issues by efficiently removing arsenic and metal ions from water.

### Key Features:

- **Nano-Scale Iron Oxy-Hydroxide:** The technology incorporates nano-scale iron oxy-hydroxide, which exhibits selective removal of arsenic as water passes through it.
- **Versatility:** AMRIT is versatile, catering to both domestic and community-level water purification needs.
- **Alignment with Jal Jeevan Mission:** The technology aligns with the overarching objectives of the Jal Jeevan Mission, contributing to the mission's goal of providing safe and potable tap water to rural households across India.

### Recognition and Recommendation:

- The 'Standing Committee' of the Department of Drinking Water and Sanitation has recommended AMRIT Technology for consideration in addressing water and sanitation challenges, highlighting its efficacy and potential impact.

### Jal Jeevan Mission (JJM): Transforming Rural Water Supply

The Jal Jeevan Mission (JJM), launched in August 2019 by the Government of India, aims to ensure the provision of safe and sufficient tap water to rural households. The mission is implemented collaboratively with states, where they assume responsibilities for planning, execution, and maintenance of water supply schemes.

### Progress Highlights:

- **Baseline Status (August 2019):**

- At the initiation of JJM, only 16.8% (approximately 3.23 Crore) of rural households had tap water connections.
- **Current Status (As of 07.12.2023):**
- A significant development is evident, with approximately 10.53 Crore additional rural households now equipped with tap water connections.
- Presently, out of the total 19.24 Crore rural households in India, around 71.51% (approximately 13.76 Crore households) have access to tap water supply within their homes.

### State Responsibilities:

- **State Control:**
- Drinking water falls under state jurisdiction, granting states the autonomy to select water technology for piped supply schemes, particularly in addressing water quality issues.
- **Government Support:**
- The central government provides crucial support to states by offering technical and financial assistance for the successful implementation of JJM.
- Collaborates with esteemed institutions such as Indian Institutes of Technology (IITs) to provide guidance on suitable technologies, especially those addressing water quality concerns.

### Understanding Arsenic: Properties, Uses, and Concerns

Arsenic, a naturally occurring chemical element denoted by the symbol 'As' and atomic number 33, is commonly found in the Earth's crust in various forms, both inorganic and organic compounds.

### Properties and Occurrence:

- **Physical Properties:**
- Arsenic appears as a gray, metallic-looking solid at room temperature with a metallic luster.
- It can manifest in different forms, including yellow, black, and gray, with the yellow form being the most unstable.
- **Chemical Properties:**
- Reacts with oxygen and water but does not dissolve in non-oxidizing acids.
- Forms diverse compounds, both organic and inorganic, exhibiting various chemical behaviors.
- **Occurrence:**
- Naturally found in soil, rocks, water, air, and living organisms.
- Commonly coexists with other elements such as sulfur, oxygen, and metals, especially in minerals.

### Uses and Applications:

- **Historical and Industrial Uses:**
- Historically employed in medicine, agriculture, and cosmetics.
- Once widely utilized in manufacturing processes, including wood preservatives, pesticides, herbicides, and certain metal alloys.
- **Current Applications:**
- Semiconductor Industry: Arsenic plays a crucial role in the production of semiconductors, gallium arsenide-based electronics, and solar cells.
- Pharmaceuticals: Arsenic compounds have been explored for medical treatments, particularly in some cancer treatments.

- Agriculture: Formerly used in pesticides and herbicides, but its application has been restricted due to its toxicity.

### **Health and Environmental Concerns:**

- **Toxicity:**
  - Highly toxic, elevated exposure can lead to severe health issues.
  - Inorganic arsenic compounds are particularly dangerous, associated with various health problems such as cancers (skin, lung, bladder), skin lesions, cardiovascular diseases, and developmental issues.
- **Environmental Impact:**
  - The contamination of water sources by arsenic poses a notable environmental threat.
  - Groundwater contamination with arsenic is a global issue, representing a major public health risk in specific regions.

### **Sources of Arsenic:**

Arsenic, occurring naturally in the Earth's crust, can infiltrate groundwater, particularly in regions with specific geological formations. Anthropogenic sources, including industrial activities like mining, smelting, and pesticide use, contribute to arsenic contamination.

### **Health Risks:**

Chronic exposure to arsenic in drinking water poses significant health risks, leading to skin lesions, and cancers of the skin, bladder, and lungs. Long-term ingestion can result in cardiovascular diseases, diabetes, and developmental issues in children.

### **Detection and Measurement:**

- **Testing Methods:**
  - Analytical techniques like atomic absorption spectroscopy (AAS) and inductively coupled plasma mass spectrometry (ICP-MS) are employed for measuring arsenic levels.
  - On-site screening of water for arsenic contamination can be conducted using field test kits.
- **Regulations:**
  - International standards, with the World Health Organization (WHO) guideline set at 10 µg/L, define safe arsenic levels in drinking water.
  - Regular monitoring and adherence to these standards are crucial for safeguarding public health.

### **Mitigation Strategies:**

- **Treatment Technologies:**
  - **Coagulation-Filtration:** Chemical addition to bind arsenic, followed by filtration to remove arsenic precipitates.
  - **Adsorption Methods:** Use of activated alumina, iron oxide, or activated carbon to absorb arsenic.
  - **Ion Exchange and Reverse Osmosis:** Techniques for arsenic removal through ion exchange or selective filtration.
- **Community Interventions:**

- Implementation of community-level water treatment systems with cost-effective technologies is crucial for affected regions.
- Public awareness campaigns about arsenic dangers and the significance of safe water sources are essential.

**Challenges:**

- **High-Cost Barriers:**
  - Advanced treatment technologies come with high costs, presenting barriers, particularly in low-resource regions.
- **Sustainable Access:**
  - Ensuring sustainable access to safe water sources and regular monitoring in arsenic-affected areas remains challenging.
- **Ongoing Research:**
  - Ongoing research focuses on developing low-cost, efficient arsenic removal technologies suitable for diverse settings.
- **Collaboration:**
  - Collaborative efforts involving scientific institutions, governments, and NGOs are crucial for implementing effective arsenic mitigation strategies.

**Q.1 Regarding the AMRIT Technology for water purification recently seen in the news, consider the following statements:**

1. It is especially designed to be used for filtering out non metal impurities
2. The technology incorporates nano-scale iron oxy-hydroxide to remove toxic material

**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

**ANSWER: B**

**Q.2 Assess the prospects of ensuring universal access to clean water in India. Discuss the impact of water quality on public health and the environment, and propose comprehensive strategies for sustainable water management in the country.**

**Rishabh**