Red Color of Mars

Source: TOI

The study, based on data from several space missions and ground-level observations, suggests that **Mars' red color is primarily due to Ferrihydrite—a water-formed iron oxide—rather than the previously assumed Hematite.**

- **Ferrihydrite forms in cool, water-rich conditions**, whereas **hematite forms in dry, warm conditions.**
  - It suggests that **Mars once had liquid water,** potentially supporting life. Additionally, **the study revealed hydrogen bound to iron-rich minerals**, further indicating past interactions with liquid water on Mars.

Mars: Mars is the **4th planet from the Sun** and the **second-smallest in the Solar System after Mercury.**

- About **half Earth's size**, it hosts **Olympus Mons** (**largest volcano)**, and has 2 moons (Phobos and Deimos)**.**
- Mars **completes a rotation every 24.6 hours**, making its day **nearly identical in length to Earth's (23.9 hours)**. Martian days are called **sols**.
  - A year on Mars lasts **669.6 sols,** which is the same as **687 Earth days**.
- Its axis is tilted at **25 degrees** relative to its orbit, similar to **Earth's axial tilt of 23.4 degrees**.
  - Mars experiences **seasons like Earth,** but they are l**onger in duration.**
- **Important Mars Missions:**
  - **NASA's Mars Mission, India's MOM, UAE's Hope**
  - **Tianwen-1: China's Mars Mission**

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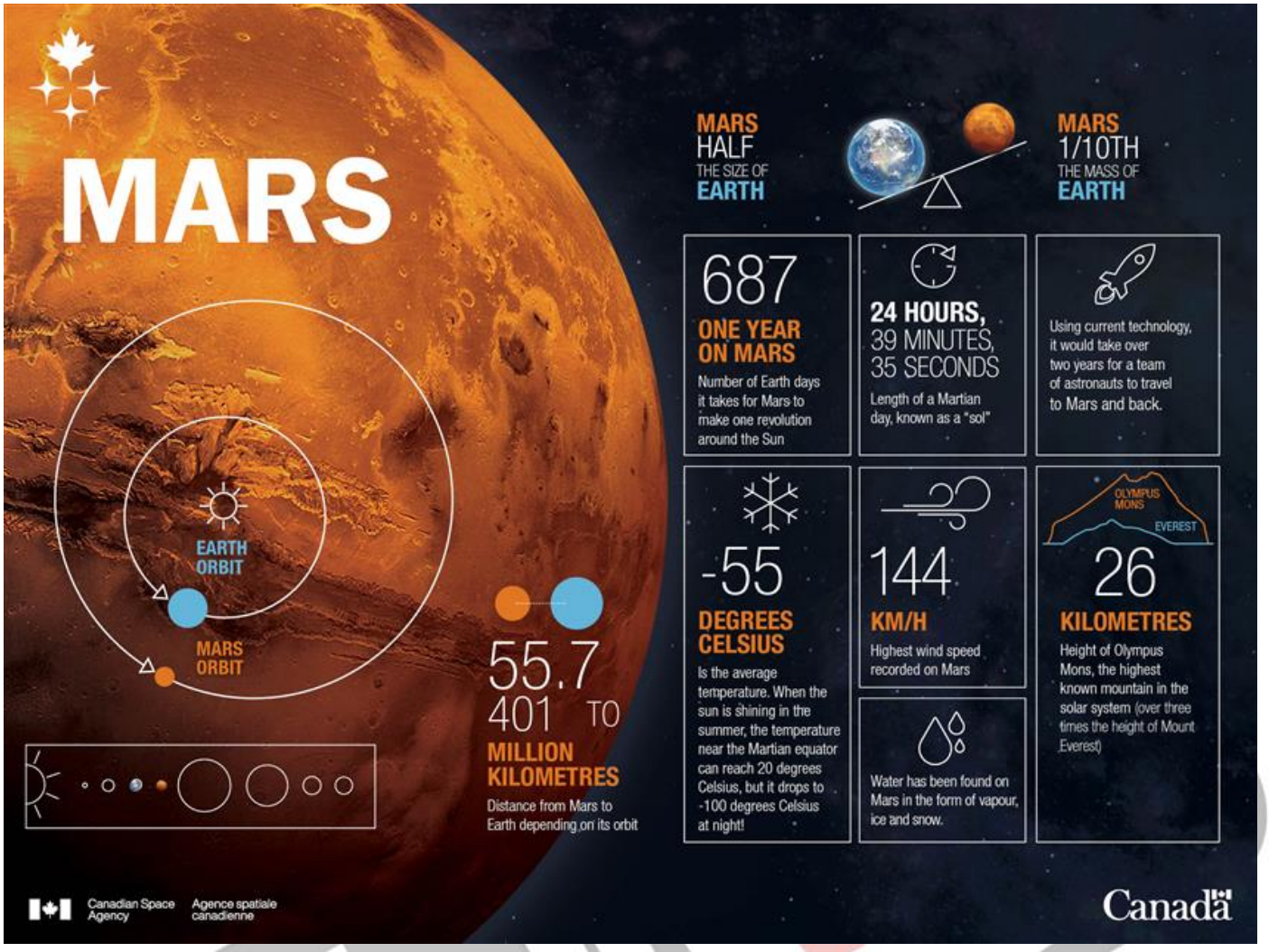


Read More: NASA's Mars Sample Return Program

Algal Blooms in River Thames

Source: DTE

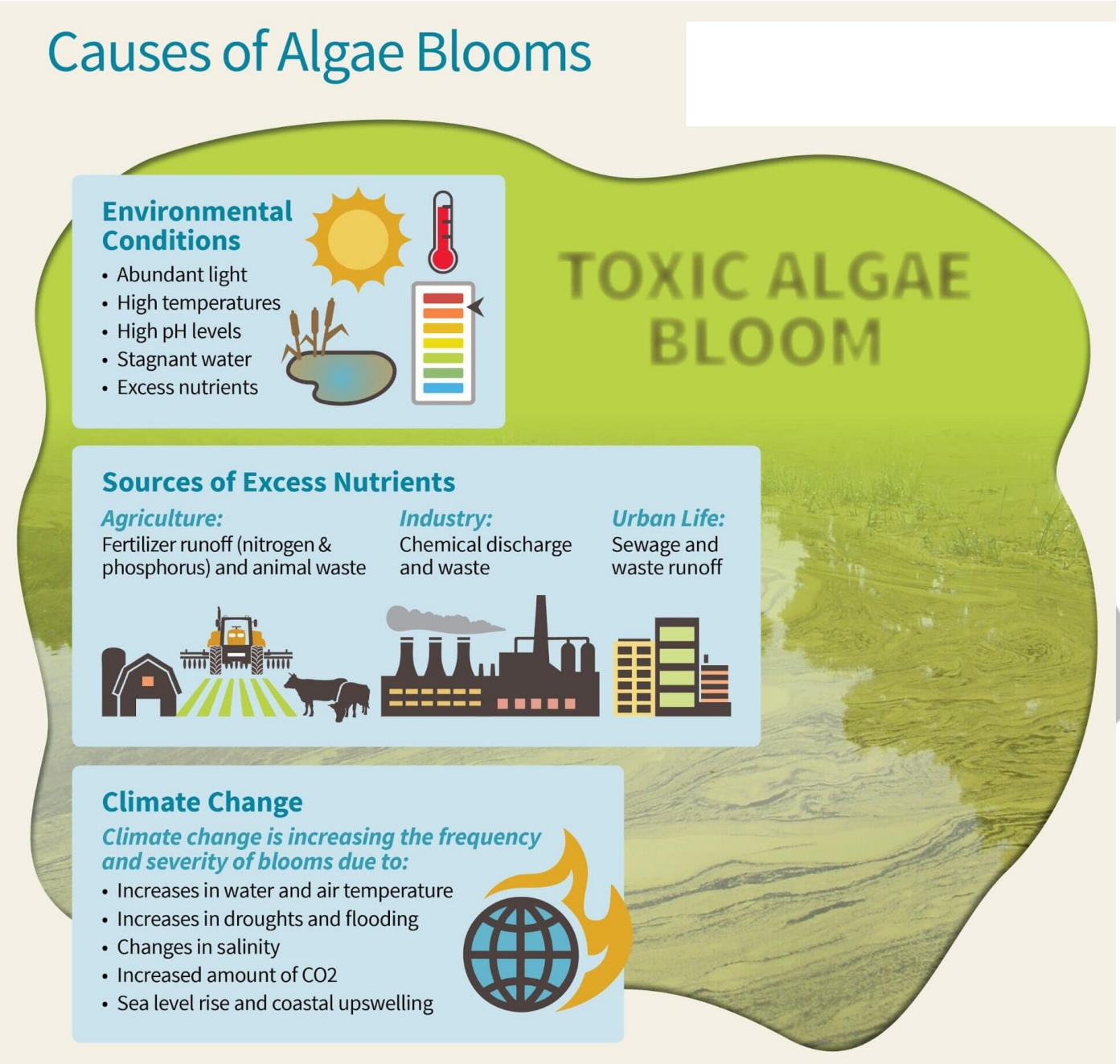
A study has revealed that **climate change** is increasing the risk of **algal blooms** in the **River Thames (England)** despite an **80% reduction in phosphorus loads** over four decades.

- An **algal bloom** is the **overgrowth of microscopic algae** or algae-like bacteria in **fresh, salt, or brackish waters.**

Key Findings:

- **Rising river temperature** is driving the growth of **spring diatom blooms** and **summer cyanobacterial (blue-green algae) blooms**, which **deplete oxygen**, harm aquatic life, and increase drinking water treatment costs.
    - **Algal blooms** also restrict **recreational activities** like fishing and swimming.
- Despite an **80% reduction** in **phosphorus** since 1985, its concentration remains **above safe limits**, sustaining **algal growth.**
    - **Excess nitrogen and phosphorus block sunlight** and deplete oxygen, threatening

marine ecosystems.



River Thames:

- It is **346 km** long **(Longest in England**, second longest in the UK after **River Severn)**.
- It originates from **Thames Head, Gloucestershire**, and drains into the **North Sea via the Thames Estuary**, with **Nore sandbank** at its mouth.
    - **London is on the bank of Thames**.
- It supplies **two-thirds of London's drinking water** and has been a **vital trade route**.

Read More: [Red Tide](), [Plankton Crash]()

State of Madras vs V.G. Row Case

For Prelims: [Supreme Court,]() [Fundamental Rights](), Restrictions on Fundamental Rights

For Mains: Restrictions on Fundamental Rights, Test of Reasonableness on Restriction of Rights

[Source: IE]()

Why in News?

The [Supreme Court's]() ruling in ***State of Madras vs V.G. Row, 1952,*** established the **test of reasonableness** for **laws restricting** [fundamental rights.]()

- It set a precedent for **judicial review,** ensuring that **restrictions on civil liberties must be fair, just, and not excessive**.

What is the State of Madras vs V.G. Row Case?

- **Background:** The case **challenged the Criminal Law Amendment Act, 1950,** which empowered the government **to restrict associations deemed prejudicial to public order**, under which the Madras government **banned the People's Education Society in 1950.**
  - V.G. Row, a member of the banned society, contended that the law violated **Article 19(1)(c) (Right to Form Associations)** and imposed an **unreasonable restriction under Article 19(4)**.
- **Supreme Court (SC) Ruling:**
  - In 1952, the **SC struck down the law as unconstitutional**, ruling that **excessive executive discretion in banning associations** was arbitrary and violated Article 19(1)(c).
  - It emphasized that restrictions must be **fair, just, and not excessive** in relation to their objective.
  - SC **laid out a framework** to **test reasonableness of restriction** based on factors like the **nature of the right infringed, purpose** and extent of the restriction, proportionality **to the issue addressed**, and prevailing socio-political conditions.
- **Significance:**
  - **Evolution of Constitutional Jurisprudence:** The **reasonableness test** became **foundational, evolving** into the **structured proportionality test** used today to evaluate state actions that limit fundamental rights.
  - **Impact on Modern Legal Frameworks:** Laws like the **Unlawful Activities (Prevention) Act (UAPA), Terrorist and Disruptive Activities (Prevention) Act (TADA),** and **Prevention of Terrorism Act (POTA)** have been scrutinized under this to ensure **they do not arbitrarily infringe on civil liberties.**

Note

- In ***Anuradha Bhasin v. Union of India, 2020***, the SC ruled that restrictions on **movement and communication must meet the test of proportionality**.
  - SC held that indefinite internet suspension **violates Article 19(1)(a) & 19(1)(g)** unless justified under **Article 19(2)** and must be **necessary, proportionate, and subject to judicial review**.
- **Article 19 of the Indian Constitution** guarantees **fundamental rights**, including **speech, assembly, and movement.**
  - **Article 19(2)** allows **reasonable restrictions** for specific purposes: **protecting sovereignty, state security, diplomatic relations, public order, morality, judiciary (contempt of court) etc**.

What are the Landmark Cases on Balancing Rights and Restrictions?

- ***Kesavananda Bharati v. State of Kerala, 1973*:** It established the **basic structure doctrine**.
- ***Maneka Gandhi v. Union of India, 1978*:** It expanded the scope of **Article 21**, requiring that **any restriction must be fair, just, and reasonable.**
- ***Shreya Singhal v. Union of India, 2015*: Struck down Section 66A of the IT Act** for being **vague and overbroad**.
- ***Justice K.S. Puttaswamy v. Union of India, 2017*.**

Read more: Fundamental Rights (Part-1), Fundamental Rights (Part-2)

Drishti Mains Question:

Q. How does the principle of ‘reasonable restrictions’ safeguard national interest while upholding

democratic freedoms?

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q1. 'Right to Privacy' is protected under which Article of the Constitution of India? (2021)

(a) Article 15
(b) Article 19
(c) Article 21
(d) Article 29

Ans: (c)

Q2. Right to Privacy is protected as an intrinsic part of Right to Life and Personal Liberty. Which of the following in the Constitution of India correctly and appropriately imply the above statement? (2018)

(a) Article 14 and the provisions under the 42nd Amendment to the Constitution.
(b) Article 17 and the Directive Principles of State Policy in Part IV.
(c) Article 21 and the freedoms guaranteed in Part III.
(d) Article 24 and the provisions under the 44th Amendment to the Constitution.

Ans: (c)

Mains

Q. Examine the scope of Fundamental Rights in the light of the latest judgement of the Supreme Court on Right to Privacy. (2017)

HeroRATS for Tuberculosis Elimination

Source: TH

Why in News?

A Tanzanian non-profit organization conducts research to **train African giant pouched rats, or HeroRATS,** to detect **Tuberculosis (TB)**.

- These rats show high accuracy, especially in resource-limited areas. This research could help speed up **TB detection in countries like India.**

What are the Key Findings of the Research on HeroRATS?

- **HeroRATS:** These rats have an exceptional sense of smell due to their sensitive **olfactory receptors**, allowing them to detect diseases like TB.
  - HeroRATS undergoes a **training** program, learning to detect TB in sputum samples (thick mucus from lungs). They can screen **100 samples in just 20 minutes**, compared to **3–4 days** for traditional methods.

        - Detected samples are then confirmed using ***Ziehl-Neelsen and fluorescent microscopy***.
- **Increased Detection Rates:** HeroRATS **doubled TB detection rates** in children compared to conventional testing.
    - The rats were **six times more effective** at detecting TB in patients with a low bacillary load compared to those with a higher concentration of bacteria.
    - They outperformed traditional microscopy, which often fails in such cases.

Note: Earlier, Magawa, a Tanzanian-born African giant pouched rat, was trained to detect landmines and alert handlers for their safe removal.

How can HeroRATS Help India's TB Elimination Efforts?

- **Potential Benefits for India:** HeroRATS provide fast, cost-effective TB screening, **especially for children and smear-negative cases,** aiding early diagnosis and reducing transmission, thereby contributing to lowering the **TB burden in India.**
    - Integrating rat-based TB detection into the **National Tuberculosis Elimination Programme (NTEP)** through a phased rollout, starting in high-TB burden states, can enhance case detection.
- **TB in India:** India has the **highest burden of TB** with **two deaths occurring every three minutes** from TB.
    - NTEP, implemented under the aegis of the **National Health Mission**, aims to make India **TB-free by 2025**, ahead of the global 2030 target.
    - TB incidence declined by **17.7% (237 to 195 per 100,000)** from 2015 to 2023, while TB deaths fell by **21.4% (28 to 22 per lakh).**

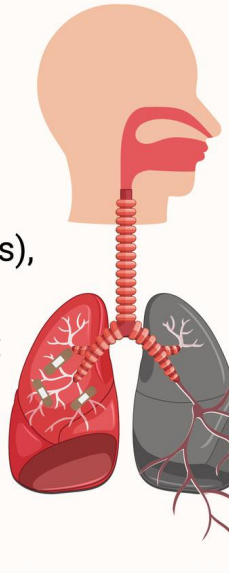
What are the Key Facts About Tuberculosis?

- **About:** TB is a bacterial infection ***(Mycobacterium tuberculosis)*** affecting the lungs, spreading through the air.
    - Preventable and curable with antibiotics. About 25% of the global population is infected, but only **5–10% develop symptoms.**
- **Risk Factors:** Weak immune system, diabetes, malnutrition, tobacco, and alcohol use.
- **Diagnosis:** WHO recommends rapid molecular tests (Xpert MTB/RIF Ultra). Traditional methods struggle with low bacterial loads, especially in children difficult due to their inability to produce sufficient sputum for testing.
- **Prevention:** The **Bacille Calmette-Guérin (BCG) vaccine** is given to infants to prevent TB.
- **Treatment:** Standard TB treatment lasts 4-6 months. Incomplete treatment leads to drug-resistant TB.
- **Multidrug-resistant TB (MDR-TB):** It is resistant to ***isoniazid and rifampicin*** (medicines used to treat TB), treatable with costlier alternatives.
- **Extensively Drug-Resistant TB:** It is more severe, with limited treatment options.
- **TB and Human Immunodeficiency Virus (HIV):** HIV patients are 16 times more vulnerable to TB, a leading cause of their deaths.

Tuberculosis

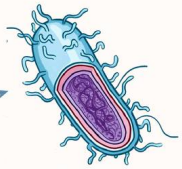
Drishti IAS

Tuberculosis (TB) is an infectious disease that affects the lungs.
Tuberculosis is preventable and curable.



Prevention

- Seek medical intervention if symptoms persist
- If at a higher risk (HIV patients), get tested for TB.
- Practice good cough hygiene: Wear a mask and avoid contact



Causes:

- *Mycobacterium tuberculosis*
- Coughing droplets
- Prolonged exposure from a patient

Symptoms of TB:

Chest pain
Weakness
Weight loss
Fever
Night sweats
Prolonged cough

Facts

- 1.6 million deaths in 2021 Worldwide
- 13th leading cause of death
- India aims to achieve the UN's TB-related SDGs by 2025, five years ahead of the global target to end the TB epidemic by 2030.

#Tuberculosis

Ni-kshay Programme

- Nikshay Mitra are individuals or groups who adopt one TB patient for their treatment for a period of 6 months
- Provision of free drugs and diagnostics
- Ni-kshay Poshan Yojana for nutritional support to TB patients

Macromatic Species Used for Disease Detection

- **Macromatic Species:** These species have a highly developed sense of smell, unlike microsmatic species with a reduced olfactory ability. Few macromatic species are:
  - **Dogs:** With 125–300 **million olfactory receptors** and a **special sensory organ called the Jacobson's organ,** they can detect diseases like **Parkinson's** and potentially lung cancer and diabetes.
  - **Ants:** A French study found **ants can detect cancer cells** within three days using chemical cues, offering a faster, cheaper alternative to traditional diagnostics.
  - **Honeybees:** Posses highly sensitive **olfactory antennal lobes,** can detect lung cancer, with 88% accuracy using synthetic biomarkers (artificial human breath that contains cancerous odours) in human breath.
- These highlight the growing field of **bio-detection**, where nature's instincts are harnessed for medical advancements.