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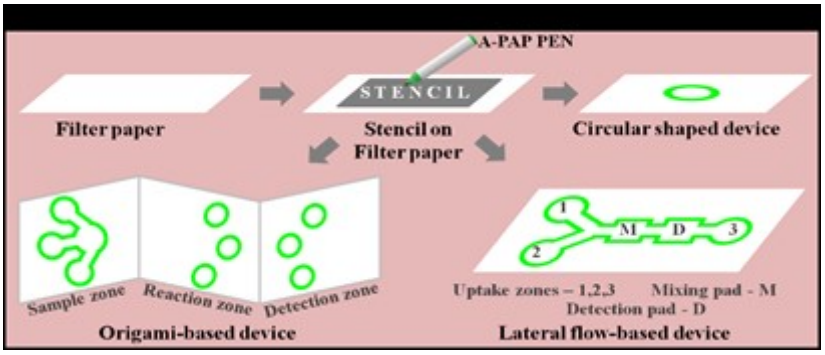
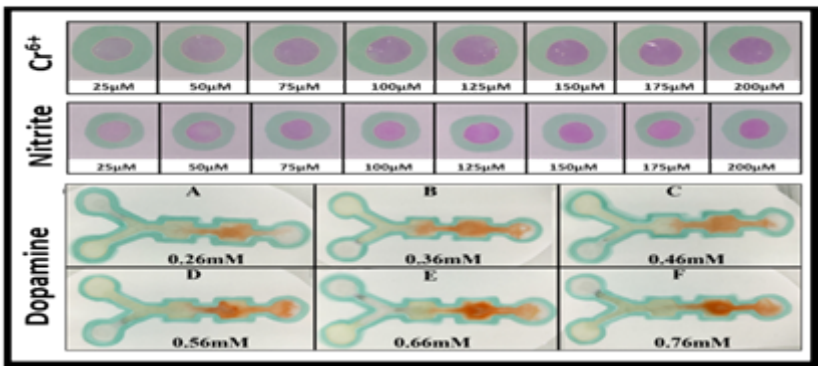
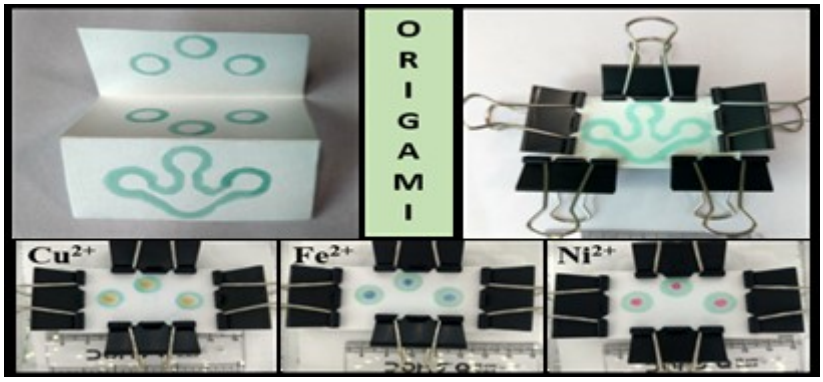
Advanced PAP (A-PAP) pen, paper based device sensing contaminants

Scientists have recently developed fabricating paper-based devices using an Advanced PAP (A-PAP) pen.

- An Advanced PAP (A-PAP) pen is a ***hydrophobic barrier pen*** used in laboratory applications to draw barriers on glass slides to confine the flow of reagents.
- A-PAP pen offers a practical alternative to conventional sensing methods that necessitate specialized equipment and expertise making it suitable for resource-limited settings.
- PAP pen that ***does not require any machinery or heating/drying*** steps and adopts a DIY approach.
- **Recent analysis** - Using the A-PAP pen, the fabrication of two-dimensional (2D) paper-based devices for chemical detection of heavy metal and nitrite can be done.
- The versatility of fabrication technique for biological sensing using 2D lateral flow paper-based devices for the detection of dopamine can be done.
- Furthermore, the technique is also validated for fabricating complex three-dimensional (3D) paper-based devices using a paper origami technique for heavy metals sensing.
- The omission of the heating/drying step thereby enabling the rapid fabrication in around 10 seconds with superior contact angle suitable for testing and sensing applications.
- **Benefits -** This technique provides a valuable tool for creating affordable, efficient, and accessible chemical and biological testing solutions.
- Its versatility extends to fabricating simple and complex devices like lateral-flow-based and 3D origami devices.







Paper-based devices

- It is also known as paper-based analytical devices (PADs) or microfluidic paper-based analytical devices (µPADs).
- They are made by patterning paper to create channels and barriers, and can be used with a variety of detection methods.
- These are analytical tools that use paper to perform a variety of tasks
- **Detection -** PADs can detect biological analytes associated with disease, such as glucose, or foodborne pathogens.
- **Monitoring -** PADs can monitor environmental, health, and food issues.
- **Diagnosis -** PADs can be used for clinical diagnosis.
- **Drug development -** PADs can be used in drug development.
- PADs are inexpensive, portable, and disposable.

Reference

PIB | Advanced PAP (A-PAP) pen

Venus Orbiter Mission (VOM)

The Union Cabinet chaired by the Prime Minister has recently approved the development of Venus Orbiter Mission (VOM).

- The Venus Orbiter Mission (VOM) is a planned mission to study the surface and atmosphere of Venus.
- **Agency -** Indian Space Research Organisation (ISRO).
- **Aim –** It aims for scientific exploration and for better understanding of Venusian

atmosphere, geology and generate large amount of science data probing into its thick atmosphere.
- The mission is expected to be accomplished during March 2028.
- By studying Venus, Indian scientists hope to unlock answers to key questions about planetary evolution, particularly Venus, despite its similarities to Earth, developed so differently.
- By studying Venus, scientists hope to uncover how planetary environments can evolve differently despite similar beginnings.

Venus

- Venus is the 2nd planet from the Sun Earth's closest planetary neighbor.
- **Size -** Venus is the sixth largest planet and is similar in size to Earth.
- Due to its similar size and composition, Venus is often referred to as Earth's "twin".
- **Temperature -** Venus is believed to have once harbored conditions suitable for life.
- However, the planet underwent a dramatic transformation, evolving into an extremely hostile environment with surface ***temperatures exceeding 450°C*** and an atmosphere filled with toxic gases.
- Venus's dense atmosphere creates an intense greenhouse effect, trapping heat and making it the ***hottest planet in the solar system.***
- NASA explained that its surface temperatures are so extreme that they can melt lead.
- Beneath the thick, perpetual clouds, the planet features volcanic landscapes and distorted mountain ranges.
- Distance from the Sun - Venus is said to orbit the Sun at an average distance of 67 million miles (108 million kilometres), or ***0.72 astronomical units (AU).***

  1 AU represents the distance between Earth and the Sun.

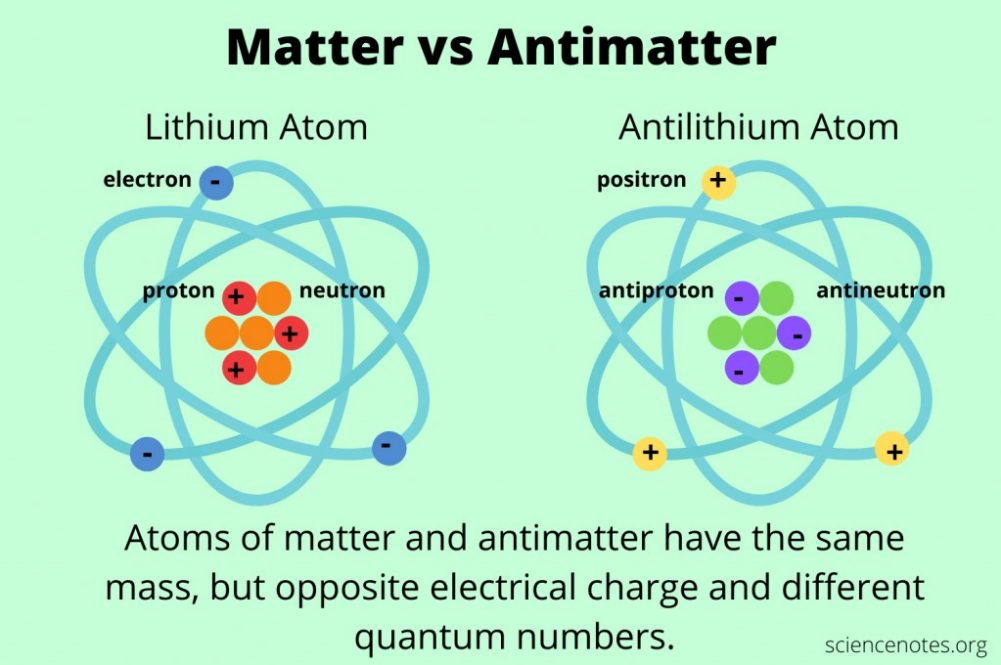
- At this range, sunlight takes about 6 minutes to reach Venus.
- **Moons-** Venus is one of only two planets in our solar system without a moon, but it does have a quasi-satellite called Zoozve.

References

1. PIB | Venus Orbiter Mission (VOM)
2. Economic Times | Venus Orbiter Mission

Antimatter

- Antimatter is the twin of almost all the subatomic particles that make up the universe.
- The matter in universe comes in many forms like solids, liquids, gasses, and plasmas.
- These forms of matter all consist of subatomic particles that give matter its mass and volume.



- These particles include protons and neutrons (also known as baryons), electrons and neutrinos (also known as leptons), and a variety of other particles in the Standard Model of Particle Physics.
- Protons and neutrons are themselves made up of particles known as quarks and gluons.
- But matter can have an opposite in the form of antimatter.
- All the subatomic particles in matter either ***have their own anti-twins*** (antiquarks, antiprotons, antineutrons, and antileptons such as antielectrons).
- These anti-particles can combine to form anti-atoms and, in principle, could even form anti-matter regions of the universe.
- Antimatter is made up of special particles that are like opposites to the ones in regular matter, having opposite electrical charges.
- In antimatter, there are antiparticles like ***positrons*** (positively charged electrons).
- When antimatter particles meet their matching matter particles, they cancel each other out, releasing a lot of energy.
- Antimatter is rare in the observable universe, but scientists find it in places with lots of energy, like cosmic rays and certain experiments in labs.
- British physicist ***Paul Dirac*** predicted antimatter in 1928 while trying to combine quantum mechanics, which describes subatomic particles, and Einstein's theory of relativity.
- Positrons were discovered by American California Institute of Technology physicist ***Carl Anderson.***
- Dirac and Anderson received the ***Nobel Prize in physics*** for their work on this discovery in 1933 and in 1936 respectively.
- Humans have created antimatter particles using ultra-high-speed collisions at huge particle accelerators such as the Large Hadron Collider, located outside Geneva and operated by CERN, European Organization for Nuclear Research.
- Several experiments at CERN create antihydrogen, the antimatter twin of the element hydrogen.
- The most complex antimatter element produced to date is antihelium, the counterpart

to helium.

References

1. Dept of Energy | Antimatter
2. Live Science | Anti matter

Bio-RIDE Scheme

The Union Cabinet approved the Biotechnology Research Innovation and Entrepreneurship Development (Bio-RIDE) scheme to support cutting-edge research and development in biotechnology.

- The 2 umbrella schemes of Department of Biotechnology (DBT)
  - Biotechnology Research and Development (R&D) and
  - Industrial and Entrepreneurship Development (I&ED) merged as one scheme- 'Biotechnology Research Innovation and Entrepreneurship Development (Bio-RIDE)'.
- It is merged with a new component, ***'Bio-manufacturing and Bio-foundry'.***
- **Aim -** To accelerate research, enhance product development, and bridge the gap between academic research and industrial applications.
- It is designed to foster innovation, promote bio-entrepreneurship, and strengthen India's position as a global leader in biomanufacturing and biotechnology.

- **Components of Bio-RIDE**
  - Biotechnology Research and Development (R&D).
  - Industrial & Entrepreneurship Development (I&ED).
  - Biomanufacturing and Bio foundry (a new component).
- **Nodal ministry-** The Department of Biotechnology (DBT) under the Ministry of Science and Technology.
- **Implementation –** During the 15th Finance Commission period (2021-2026).
- **Key Features**
  - **Promote Bio-Entrepreneurship-** Seed funding, incubation, and mentorship for startups.
  - **Advance Innovation-** Grants and incentives for cutting-edge research in areas like synthetic biology, biopharmaceuticals, bioenergy, and bioplastics.
  - **Facilitate Industry-Academia collaboration-** Strengthen partnerships between academic institutions, research organizations, and industry to commercialize biotech products.
  - **Encourage sustainable biomanufacturing-** Focus on environmentally sustainable practices aligned with India's green goals.
  - **Support researchers-** Extramural funding for researchers in biotechnology fields like agriculture, healthcare, and environmental sustainability.
  - **Nurture human resources-** Develop skilled manpower through holistic support and capacity building in biotechnology.

References

1. PIB | Bio-RIDE scheme
2. Business Standard | Bio-RIDE scheme

Spotted deer

Pench Tiger Reserve in Madhya Pradesh faces Habitat Strain recently due to Spotted Deer Overpopulation.

- The chital deer, also known as the spotted deer, chital deer, or axis deer, is a deer species native to the Indian subcontinent.
- **Scientific Name -** Axis axis.
- **Family -** Cervidae.
- **Size -** 35 inches tall and weighs about 187 pounds.
- **Distribution** - The major area of their distribution is Sri Lanka and India, though they are introduced to USA and Australia as well.
- **Habitat** - is found in large numbers in dense deciduous or semievergreen forests and open grasslands.
- **Appearance** - The deer's golden-rufus coloring is speckled with white spots, and it has a white underbelly.
- Its curved, three-pronged antlers extend nearly 3 feet and shed each year.
- **Diet –** They are herbivores, they feed upon tall grass and shrubs.
- **Breeding** - The spotted deer has a prolonged mating season, as the perpetually warm climate allows females to remain fertile and to give birth to fawns any time of year.
- It is a social animal, usually occurs in herds of 10 to 50 individuals.

- **Conservation status**
  - **IUCN** – Least concern.
  - Not listed in CITES.
  - **WPA, 1972** - Schedule III.

Reference

Deccan chronicle | Spotted Deer