MISSION X

Innovation in Learning

X TECH WEEKLY

SCIENCE & TECHNOLOGY CURRENT AFFAIRS

October 20 – 27, 2026

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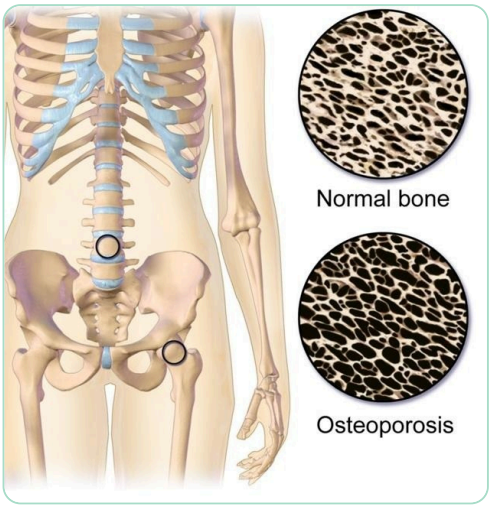
HEALTH

01

Osteoporosis: Piezo1 Protein as the Body's Exercise Sensor

NEWS IN BRIEF

- A study by HKUMed, led by Prof. Xu Aimin and published in Signal Transduction and Targeted Therapy, identified Piezo1 as an exercise sensor on bone marrow stem cells; the findings are back in the news.
- When Piezo1 is active, stem cells make more bone-forming cells and less fat in the bone marrow; in mice lacking it, bone density fell and fat accumulated.
- Researchers propose exercise-mimicking drugs that activate Piezo1 for frail patients, though safety is a concern.
- Osteoporosis makes bones brittle and raises fracture risk, a growing issue as India ages.



Normal bone vs osteoporotic bone

KEY CONCEPTS EXPLAINED

Osteoporosis	A silent bone disease of low bone density, often found only after a hip, spine or wrist fracture.
Piezo1	A mechanosensitive protein that detects physical force and pressure; Piezo channels were discovered by Ardem Patapoutian, who shared the 2021 Nobel Prize.
DEXA scan	Dual-energy X-ray absorptiometry, the standard test that measures bone mineral density to diagnose osteoporosis.

UNIQUE FACT

Exercise also sends a molecular signal through Piezo1 that steers stem cells toward bone instead of fat, hence the term 'exercise mimetics' for future drugs.

EXAM TRAP

Do not treat Piezo1 as a hormone or vitamin. It is a force-sensing membrane protein on stem cells, and the work so far is in mice and human cells, so no approved Piezo1 drug for osteoporosis exists yet.

PRELIMS MEMORY BANK

Piezo1: mechanosensor protein | Study by HKUMed, in mice | Active Piezo1: more bone, less fat | Idea: exercise mimetic drugs | Diagnosis: DEXA scan

01 HEALTH
Osteoporosis: Piezo1 Protein as the Body's Exercise Sensor

PRELIMS PRACTICE MCQ

Piezo1, recently in the news for its role in bone health, is

a a hormone secreted by the thyroid that raises bone density

b a force-sensing membrane protein on bone marrow stem cells

c a vitamin that helps the body absorb calcium

d an enzyme that breaks down bone tissue

ANSWER: (b)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Options (a) and (c) can be dropped because the news calls Piezo1 an exercise sensor, which points to detecting physical force and not to a hormone or vitamin. Option (d) fails because active Piezo1 led to more bone.

2 THROUGH FACTUAL KNOWLEDGE

Piezo1 is a mechanosensitive protein on bone marrow stem cells that senses physical force and steers them toward bone-forming cells, confirming option (b).

HEALTH

02

Shamonda-like Virus: New Midge-Borne Threat to European Cattle

NEWS IN BRIEF

- A Shamonda-like orthobunyavirus, new to continental Europe, was reported in dairy herds in France from mid-July 2026 and has since been found in Germany, Switzerland, Belgium, the Netherlands and Austria.
- Infected cattle show fever, diarrhoea and a sharp fall in milk yield, with some farms seeing temporary drops of nearly 50 percent; most animals recover in days.
- It is spread by Culicoides biting midges, so cases are expected to ease in winter and may return when midges reappear in spring.
- No vaccine exists, and authorities say there is no evidence of infection in humans or of risk through milk and dairy products.

KEY CONCEPTS EXPLAINED

Orthobunyavirus	A genus of RNA viruses in order Bunyavirales, many of which are spread by biting insects; the Simbu group includes Schmallenberg virus.
Culicoides midges	Tiny biting flies that act as vectors for diseases such as bluetongue and Schmallenberg virus in livestock.
Reassortant	A virus formed when segmented genomes of two related viruses mix, which may explain the new variant's origin.

UNIQUE FACT

Shamonda virus has long been known from Africa and Japan, but its first appearance in Europe in 2026 resembles the 2011 arrival of Schmallenberg virus, which later caused abortions and birth defects in livestock.

EXAM TRAP

Do not call it a zoonosis or a bacterial disease. It is a virus of animals spread by insect vectors, not by direct contact, and current evidence shows no human infection.

PRELIMS MEMORY BANK

Virus: Shamonda-like orthobunyavirus | Vector: Culicoides biting midges | Hosts: cattle, other ruminants | First in Europe: summer 2026 | No vaccine available yet

02 HEALTH
Shamonda-like Virus: New Midge-Borne Threat to European Cattle

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I Cases of the Shamonda-like virus in European cattle are expected to ease in winter and return in spring.

STATEMENT II The virus is spread by Culicoides biting midges.

STATEMENT III Midges are less active in cold weather and reappear when it warms.

Which one of the following is correct in respect of the above statements?

a **Both Statement II and Statement III are correct and both of them explain Statement I**

b Both Statement I and Statement II are correct and Statement I explains Statement II

c Only one of the Statements II and III is correct and that explains Statement I

d Neither Statement II nor Statement III is correct

ANSWER: (a)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Statement I describes a seasonal pattern, and an insect vector whose activity follows temperature is the natural reason for it, so Statements II and III fit together as the explanation.

2 THROUGH FACTUAL KNOWLEDGE

The virus is spread by Culicoides midges (Statement II), which decline in winter and return in spring (Statement III), explaining the expected pattern in Statement I, so option (a).

AGRICULTURE

03

Bud Rot Disease Threatens Coconut Palms in Tiptur

NEWS IN BRIEF

- Coconut growers in Tiptur taluk of Tumakuru district, Karnataka, are worried as more palms are hit by bud rot, reported in October 2026.
- The disease is caused by Phytophthora palmivora and destroys the growing tip, after which the palm cannot recover.
- Infection is worst in the humid monsoon and often shows up in scattered palms, mainly on flood-prone riverbanks; young palms are most vulnerable.
- Control rests on early detection: cutting out rotted tissue, applying Bordeaux paste, and spraying neighbouring palms before and during the wet season.

KEY CONCEPTS EXPLAINED

Phytophthora palmivora	A water mould, an oomycete rather than a true fungus, that causes rot in coconut, cocoa and other tropical crops.
Growing point (bud)	The single apical bud of a coconut palm; since the palm does not branch, damage to this point kills the whole tree.
Bordeaux mixture	A copper sulphate and lime preparation used as a protective fungicide against plant diseases.

UNIQUE FACT

A coconut palm has just one growing point, so unlike many crops it cannot regrow from a side shoot once bud rot reaches the bud, which is why early detection is critical.

EXAM TRAP

Do not confuse bud rot with the root wilt disease or the eriophyid mite problem of coconut. Bud rot is caused by Phytophthora palmivora, spreads in wet weather and rots the crown, and the pathogen is an oomycete, not a bacterium.

PRELIMS MEMORY BANK

Pathogen: Phytophthora palmivora | Location in news: Tiptur, Tumakuru | Spear leaf pales and droops | Worst in monsoon humidity | Control: Bordeaux paste

03 AGRICULTURE
Bud Rot Disease Threatens Coconut Palms in Tiptur

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I Bud rot of coconut is most severe in humid monsoon conditions.

STATEMENT II Young coconut palms are the most vulnerable to bud rot.

Which one of the following is correct in respect of the above statements?

a Both Statement I and Statement II are correct and Statement II explains Statement I

b Both Statement I and Statement II are correct but Statement II does not explain Statement I

c Statement I is correct but Statement II is not correct

d Statement I is not correct but Statement II is correct

ANSWER: (b)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Both statements read as separate facts. Weather explains when the disease peaks, while age of the palm explains which palms suffer, so one does not explain the other.

2 THROUGH FACTUAL KNOWLEDGE

Bud rot, caused by Phytophthora palmivora, is worst in humid monsoon weather and young palms are most vulnerable, but the second fact does not explain the first, confirming option (b).

CHEMISTRY

04

Diamondiyne: A New Diamond-Like Form of Carbon

NEWS IN BRIEF

- Physical chemist Karl Borjesson and colleagues at the University of Gothenburg reported a new three-dimensional carbon allotrope, diamondiyne, in Angewandte Chemie, covered on 19 October 2026.
- It is a carbo-mer of diamond: sp3 carbon centres are joined by chains of sp carbon forming diyne groups, giving a more open and porous network than diamond.
- It was grown as thin films at a liquid-liquid interface through a cascade reaction, at low pressure unlike diamond.
- The films are about 5 cm2 and tens of nanometres thick; larger crystals are planned.

KEY CONCEPTS EXPLAINED

Allotropes	Different structural forms of one element, such as diamond, graphite and graphene for carbon.
Hybridisation (sp and sp3)	sp carbons form triple bonds in a straight line, while sp3 carbons form four single bonds in a tetrahedron.
Carbo-mer	A structure made by inserting carbon-carbon triple bond units into every bond of a parent lattice.

UNIQUE FACT

Diamondiyne had been described only in theory for more than 30 years, and it forms at relatively low pressure, whereas natural and synthetic diamond need very high pressure and temperature.

EXAM TRAP

Do not call it a form of diamond or assume it is harder than diamond. It is a separate, more porous carbon allotrope, and its mechanical and electronic properties are still under investigation.

PRELIMS MEMORY BANK

New 3D carbon allotrope | Made at Univ. of Gothenburg | Mix of sp and sp3 carbon | Grown at liquid-liquid interface | Published in Angewandte Chemie

04 CHEMISTRY
Diamondiyne: A New Diamond-Like Form of Carbon

PRELIMS PRACTICE MCQ

With reference to carbon and its compounds, consider the following:

I Diamondiyne
II Graphite
III Silicon carbide
IV Fullerene

How many of the above are allotropes of carbon?

a Only one
b Only two
c Only three
d All the four

ANSWER: (c)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Silicon carbide contains silicon as well as carbon, so it cannot be a form of carbon alone. That rules out 'all the four' and leaves only three.

2 THROUGH FACTUAL KNOWLEDGE

Allotropes are different structural forms of the same element. Diamondiyne, graphite and fullerene are carbon allotropes, while silicon carbide is a compound, so option (c).

SPACE

05

Centaurus X-3: Indian Scientists Map Structure Around a Neutron Star

NEWS IN BRIEF

- Researchers at the Raman Research Institute, Bengaluru, led by Kinjal Roy, reported in October 2026 a structured accretion disk and a co-rotating accretion stream around the neutron star Centaurus X-3.
- The study also reports stable disk accretion along with a steady spin-up of the pulsar and a decay of its orbit.
- Centaurus X-3 is a high-mass X-ray binary about 24,000 light-years away, with a supergiant companion more than ten times the Sun's mass.
- It was the first X-ray pulsar discovered, first seen in 1967 and shown to pulse by the Uhuru satellite in 1971.



X-ray rings around Centaurus X-3 (Chandra)

KEY CONCEPTS EXPLAINED

Neutron star	The dense remnant of a massive star's collapse; a teaspoon of its matter would weigh about a billion tonnes.
Accretion disk	A rotating disk of gas pulled from a companion star onto a compact object, heating up and emitting X-rays.
High-mass X-ray binary	A system in which a neutron star or black hole feeds on a young massive companion star.

UNIQUE FACT

The pulsar spins once in about 4.84 seconds and orbits its companion in about 2.1 days, and it is an eclipsing system, so the companion periodically blocks its X-rays from Earth's view.

EXAM TRAP

Do not mistake it for a black hole system. Centaurus X-3 holds a highly magnetised neutron star, and its X-ray pulses come from gas funnelled onto the star's magnetic poles.

PRELIMS MEMORY BANK

Neutron star in a binary | First X-ray pulsar discovered | Study by RRI, Bengaluru | Spin period about 4.84 s | Accretion disk plus stream

05 SPACE
Centaurus X-3: Indian Scientists Map Structure Around a Neutron Star

PRELIMS PRACTICE MCQ

With reference to Centaurus X-3, consider the following statements:

1. It is a high-mass X-ray binary containing a neutron star.
2. It is a stellar-mass black hole with no companion star.
3. It is regarded as the first X-ray pulsar discovered.

Which of the statements given above is/are correct?

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1, 2 and 3

ANSWER: (c)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Statement 2 can be eliminated on logic alone: a system whose X-rays come from an accretion disk is fed by a companion star, so it cannot lack a companion.

2 THROUGH FACTUAL KNOWLEDGE

Centaurus X-3 is a high-mass X-ray binary with a neutron star (statement 1) and was the first X-ray pulsar found (statement 3), confirming option (c).

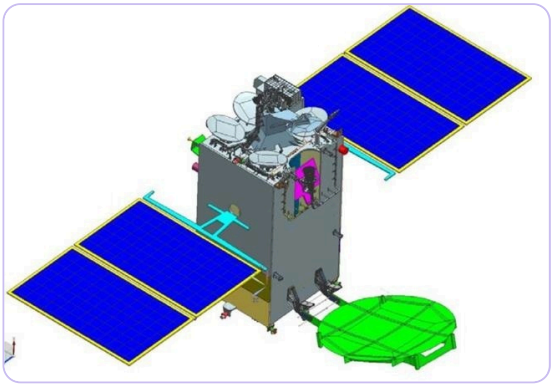
SPACE

06

GSAT-7B: Army's Dedicated Satellite Set for Mid-2028

NEWS IN BRIEF

- ISRO now expects to launch GSAT-7B by mid-2028, about six months later than the November 2027 target, after technical evaluations, reports of 19 to 21 October 2026 said.
- It will be the Indian Army's first dedicated communication satellite, designed under a Rs 2,963 crore contract signed with NewSpace India Limited in March 2023.
- The geostationary satellite is planned at about five tonnes, which would make it India's heaviest communication satellite so far.
- It will give secure beyond-line-of-sight links to forward troops and weapon systems; the Army now depends on the Air Force's GSAT-7A.



GSAT-7 series satellite (representative)

KEY CONCEPTS EXPLAINED

Geostationary orbit	A circular orbit about 36,000 km above the equator where a satellite matches Earth's rotation and appears fixed over one spot.
Beyond line-of-sight communication	Links that do not need a direct visible path between sender and receiver, enabled by relaying signals through satellites.
NSIL	NewSpace India Limited, ISRO's commercial arm, which builds and operates satellites on a demand-driven model.

UNIQUE FACT

Each armed service is getting its own satellite: GSAT-7 serves the Navy, GSAT-7A the Air Force, GSAT-7B the Army, and a Rs 2,563 crore GSAT-7C contract for the Air Force was signed on 15 October 2026.

EXAM TRAP

Do not link GSAT-7B with the Navy's Rukmini. The Navy's satellite is GSAT-7, while GSAT-7B is meant for the Army and is still awaiting launch in 2028.

PRELIMS MEMORY BANK

Army's first dedicated satellite | Launch due mid-2028 | Contract: Rs 2,963 crore, NSIL | About five tonnes, geostationary | Navy: GSAT-7, IAF: GSAT-7A

06 SPACE
GSAT-7B: Army's Dedicated Satellite Set for Mid-2028

PRELIMS PRACTICE MCQ

GSAT-7B, which is due for launch by mid-2028, is meant to serve as the dedicated communication satellite of the

a Indian Navy

b Indian Army

c Indian Air Force

d Indian Coast Guard

ANSWER: (b)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

The Navy already uses GSAT-7 and the Air Force uses GSAT-7A, so the satellite still awaiting launch points to the remaining service among the options, the Army.

2 THROUGH FACTUAL KNOWLEDGE

GSAT-7B is the Army's first dedicated communication satellite, built under a Rs 2,963 crore contract with NSIL, confirming option (b).

DEFENCE

07

Swavlamban 2026: Navy's Innovation and Indigenisation Seminar

NEWS IN BRIEF

- The fifth edition of Swavlamban, the Indian Navy's innovation and indigenisation seminar, is being held on 26 and 27 October 2026 at Manekshaw Centre, New Delhi.
- The Navy signed contracts worth over Rs 1,900 crore ahead of the event to boost indigenous naval technologies.
- Technologies in focus include quantum positioning systems, high-power microwave directed-energy systems, extra-large autonomous underwater vehicles and indigenous ramjet engines.
- Last year drew nearly 3,000 attendees, and over 100 stalls are expected this year, spanning maritime surveillance, counter-drone systems and AI.

KEY CONCEPTS EXPLAINED

Indigenisation	Replacing imported defence equipment with systems designed and made in India, to reduce import dependence.
Directed-energy weapon	A weapon such as a high-power microwave or laser that damages targets with focused energy instead of a physical projectile.
XLAUV	Extra-large autonomous underwater vehicle, an uncrewed submarine-like vessel for long missions such as surveillance and mine work.

UNIQUE FACT

Swavlamban means self-reliance, and the seminar brings together startups, MSMEs, academia, investors and the Navy to turn indigenous innovations into operational capability.

EXAM TRAP

Do not treat Swavlamban as a naval exercise with foreign navies. It is a domestic seminar and exhibition on innovation and indigenisation, and the 2026 edition is its fifth.

PRELIMS MEMORY BANK

Fifth edition, 26-27 Oct 2026 | Venue: Manekshaw Centre, Delhi | Contracts over Rs 1,900 crore | Theme: indigenous innovation | Organiser: Indian Navy

07 DEFENCE
Swavlamban 2026: Navy's Innovation and Indigenisation Seminar

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I Swavlamban is an Indian Navy seminar and exhibition on innovation and indigenisation.

STATEMENT II Swavlamban 2026 is the first edition of the seminar.

STATEMENT III It is held as a joint exercise with foreign navies.

Which one of the following is correct in respect of the above statements?

a. Both Statement II and Statement III are correct and both of them explain Statement I

b. Both Statement I and Statement II are correct and Statement I explains Statement II

c. Only one of the Statements II and III is correct and that explains Statement I

d. Neither Statement II nor Statement III is correct

ANSWER: (d)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

A seminar and exhibition is a domestic event, so a joint exercise with foreign navies in Statement III does not fit, and 'first edition' in Statement II should be checked against the series.

2 THROUGH FACTUAL KNOWLEDGE

The 2026 event is the fifth edition (Statement II is wrong) and it is a domestic seminar and not a joint exercise (Statement III is wrong), confirming option (d).

DEFENCE

08

Rs 770 Crore Deal for Improved Low Level Light Weight Radar

NEWS IN BRIEF

- The Defence Ministry signed a contract of about Rs 770 crore with Bharat Electronics Limited (BEL) on 21 October 2026 for improved Low Level Light Weight Radars (LLLR-I) for the Army.
- The radar detects and tracks fighter-sized aircraft as well as mini and micro drones at low altitude.
- It can also prioritise aerial targets so Army air defence units can focus on the most urgent threats.
- The deal supports the push to raise indigenous content in air defence and cut dependence on imports.



Low Level Light Weight Radar (representative)

KEY CONCEPTS EXPLAINED

Low-level radar	A radar tuned to detect aircraft and drones flying close to the ground, where hills and clutter hide them from long-range radars.
Micro drone detection	Finding very small, slow, low-flying objects with a tiny radar cross-section, a hard task for conventional radars.
Threat prioritisation	Ranking detected aerial targets by danger, so limited weapons are used on the most serious threats first.

UNIQUE FACT

Low-flying aircraft and small drones can slip under long-range air defence radars, so layered air defence uses light, mobile low-level radars to fill that gap.

EXAM TRAP

Do not confuse LLLR with a missile or a satellite system. It is a ground-based radar sensor made by BEL for detection and tracking, while interceptors such as Akash do the engaging.

PRELIMS MEMORY BANK

- LLLR-I: improved low level radar
- Contract: about Rs 770 crore
- Maker: Bharat Electronics Ltd
- Detects aircraft and mini drones
- Signed 21 October 2026

08 DEFENCE
Rs 770 Crore Deal for Improved Low Level Light Weight Radar

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I The Low Level Light Weight Radar (LLLR-I) improves the Army's ability to detect low-flying aircraft and drones.

STATEMENT II LLLR-I is a missile that destroys these targets.

Which one of the following is correct in respect of the above statements?

a. Both Statement I and Statement II are correct and Statement II explains Statement I

b. Both Statement I and Statement II are correct but Statement II does not explain Statement I

c. Statement I is correct but Statement II is not correct

d. Statement I is not correct but Statement II is correct

ANSWER: (c)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

A radar senses and tracks targets, while destroying them needs an interceptor, so describing LLLR-I as a missile cannot be right.

2 THROUGH FACTUAL KNOWLEDGE

LLLR-I is a ground-based BEL radar for detection and tracking (Statement I is correct), while interceptors such as Akash engage targets (Statement II is wrong), so option (c).

DEFENCE

09

Akash Air Defence System Reaches Central Asia

NEWS IN BRIEF

- India has exported the Akash surface-to-air missile system to Tajikistan and Turkmenistan, according to reports of early October 2026; Armenia was the first foreign customer.
- Akash is a short to medium-range system developed by DRDO and produced by Bharat Dynamics Limited and Bharat Electronics Limited.
- It engages fighter aircraft, cruise missiles, guided munitions and drones, and it is a medium-range layer of India's air defence.
- The sales mark a shift for Central Asian states that have mostly bought Russian equipment.



Akash missile launch

KEY CONCEPTS EXPLAINED

IGMDP	The Integrated Guided Missile Development Programme under which DRDO developed Akash, Prithvi, Agni, Trishul and Nag.
Ramjet propulsion	An engine that compresses air by forward speed alone, giving Akash speeds of about Mach 2.5 to 3.5.
Multi-target engagement	Akash's Rajendra radar can track many targets and guide several missiles at once, in group or autonomous mode.

UNIQUE FACT

Akash can engage targets at ranges of roughly 4.5 to 25 km and altitudes up to about 20 km, and it carries a 60 kg pre-fragmented warhead with a proximity fuze.

EXAM TRAP

Do not confuse Akash with Astra or BrahMos. Akash is a ground-based surface-to-air missile, Astra is an air-to-air missile, and BrahMos is a supersonic cruise missile used against surface targets.

PRELIMS MEMORY BANK

Developer: DRDO, under IGMDP | Makers: BDL and BEL | Range about 4.5 to 25 km | Exports: Armenia, Tajikistan, Turkmenistan | Variants: Akash Prime, Akash-NG

09 DEFENCE
Akash Air Defence System Reaches Central Asia

PRELIMS PRACTICE MCQ

With reference to Indian missile systems, consider the following:

I Akash

II Astra

III BrahMos

IV Trishul

How many of the above are surface-to-air missile systems?

a Only one

b Only two

c Only three

d All the four

ANSWER: (b)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Astra has a name linked to air combat and BrahMos is known as a cruise missile used against surface targets, which cuts the count down from four.

2 THROUGH FACTUAL KNOWLEDGE

Akash and Trishul are surface-to-air missile systems, Astra is an air-to-air missile and BrahMos is a supersonic cruise missile, so only two, option (b).

DEFENCE

10

Exercise AUSTRAHIND 2026: Fifth India-Australia Army Exercise

NEWS IN BRIEF

- The fifth edition of the India-Australia joint military exercise AUSTRAHIND began on 19 October 2026 at the Foreign Training Node in Thiruvananthapuram, Keralam, and runs until 1 November.
- About 120 personnel from each army take part, including the Garhwal Rifles and Australia's 13th Brigade, and New Zealand sent an observer delegation for the first time.
- The focus is joint sub-conventional operations in island and coastal environments under UN Chapter VII, including planning, surveillance and HADR.
- The fourth edition was held at Irwin Barracks, Perth, from 13 to 26 October 2025.



AUSTRAHIND exercise line-up

KEY CONCEPTS EXPLAINED

Sub-conventional operations	Military tasks below full-scale war, such as counter-terrorism, protection of key installations and peacekeeping-style operations.
UN Chapter VII	The part of the UN Charter that allows peace-enforcement action in response to threats to international peace.
HADR	Humanitarian assistance and disaster relief, an area where militaries cooperate to respond to natural disasters.

UNIQUE FACT

AUSTRAHIND alternates between the two countries, with Perth in 2025 and Keralam in 2026, and this year adds a New Zealand observer delegation.

EXAM TRAP

Do not confuse AUSTRAHIND with AUSINDEX or Malabar. AUSTRAHIND is an India-Australia army exercise, AUSINDEX is a naval exercise, and Malabar is a multilateral naval exercise.

PRELIMS MEMORY BANK

- India-Australia army exercise
- Fifth edition, 19 Oct to 1 Nov
- Venue: Thiruvananthapuram
- About 120 troops from each side
- New Zealand observers present

10 DEFENCE
Exercise AUSTRAHIND 2026: Fifth India-Australia Army Exercise

PRELIMS PRACTICE MCQ

With reference to Exercise AUSTRAHIND 2026, consider the following statements:

1. It is a joint military exercise between the Indian and Australian armies.
2. The 2026 edition is being held in Keralam.
3. It focuses on sub-conventional operations in island and coastal environments.

Which of the statements given above is/are correct?

a. 1 and 2 only
b. 2 and 3 only
c. 1 and 3 only
d. 1, 2 and 3

ANSWER: (d)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

All three statements are consistent with each other: a joint army exercise between India and Australia, hosted in Keralam, naturally trains for coastal and island operations.

2 THROUGH FACTUAL KNOWLEDGE

AUSTRAHIND is an India-Australia army exercise (statement 1) held at Thiruvananthapuram, Keralam (statement 2) and its theme is sub-conventional operations in island and coastal environments (statement 3), confirming option (d).

DEFENCE

11

SIMBEX 2026: 33rd India-Singapore Maritime Exercise

NEWS IN BRIEF

- The 33rd edition of the Singapore-India Maritime Bilateral Exercise (SIMBEX) is being held from 21 to 26 October 2026 at Visakhapatnam.
- The Republic of Singapore Navy sent RSS Supreme, and the opening ceremony was held on board INS Nilgiri and INS Kamorta.
- SIMBEX is an annual bilateral exercise between the Indian Navy and the Republic of Singapore Navy, and the previous edition was held in Singapore in 2025.
- Senior officers from the Eastern Naval Command and the Singapore fleet attended the opening.



SIMBEX: Indian and Singapore naval officers



SIMBEX planning session

KEY CONCEPTS EXPLAINED

Bilateral naval exercise	A drill between the navies of two countries to improve interoperability and trust, covering harbour and sea phases.
Interoperability	The ability of different forces to operate together using compatible procedures, communications and tactics.
Eastern Naval Command	The Indian Navy command headquartered at Visakhapatnam that looks after the Bay of Bengal region.

UNIQUE FACT

SIMBEX alternates between India and Singapore, with the 2025 edition held in Singapore and the 33rd edition hosted at Visakhapatnam, home of the Eastern Naval Command.

EXAM TRAP

Do not confuse SIMBEX with other bilateral exercises. SIMBEX is a naval exercise with Singapore, while AUSTRAHIND is an army exercise with Australia and Malabar is multilateral.

PRELIMS MEMORY BANK

India and Singapore navies | 33rd edition, 21-26 Oct 2026 | Venue: Visakhapatnam | Singapore ship: RSS Supreme | Held in Singapore in 2025

11 DEFENCE
SIMBEX 2026: 33rd India-Singapore Maritime Exercise

PRELIMS PRACTICE MCQ

SIMBEX, whose 33rd edition is being held at Visakhapatnam, is a bilateral naval exercise between the Indian Navy and the navy of

a Singapore

b Australia

c Japan

d Indonesia

ANSWER: (a)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

The name itself combines 'Singapore' and 'India' with 'Bilateral Exercise', pointing to Singapore.

2 THROUGH FACTUAL KNOWLEDGE

SIMBEX is the Singapore-India Maritime Bilateral Exercise, and the Republic of Singapore Navy sent RSS Supreme to the 33rd edition, confirming option (a).

DEFENCE

12

INS Vikrant: Rafale-M Trials Begin in Goa

NEWS IN BRIEF

- The Indian Navy has begun trials of the Rafale Marine (Rafale-M) fighter in Goa to find the changes needed to operate it from INS Vikrant, reports of 22 and 23 October 2026 said.
- The tests check the jet's fit with Vikrant's launch and recovery system, which is STOBAR: take-off from a ski-jump ramp and landing on arrestor wires.
- India agreed in April 2025 to buy 26 Rafale-M jets (22 single-seat and 4 twin-seat) for about Rs 63,000 crore, with delivery expected by end 2028 or early 2029.
- INS Vikrant was commissioned on 2 September 2022, was built by Cochin Shipyard Limited and carries about 30 aircraft; the Rafale-M will fly from Vikrant and INS Vikramaditya.



Rafale-M in carrier take-off



INS Vikrant at sea

KEY CONCEPTS EXPLAINED

STOBAR	Short Take-Off But Arrested Recovery: aircraft use a ski-jump to launch and arrestor wires to land, with no catapult.
Rafale-M	The naval Rafale with reinforced landing gear, a tail hook, RBE2 AESA radar and the SPECTRA electronic warfare suite.
Indigenous aircraft carrier	A carrier designed by the Navy's Warship Design Bureau and built in India, with about 76 percent indigenous content.

UNIQUE FACT

Vikrant displaces nearly 45,000 tonnes and is about 262 m long, and the Rafale-M was originally designed for catapult-assisted take-offs, so the trials test its ski-jump compatibility.

EXAM TRAP

Do not confuse INS Vikrant with INS Vikramaditya. Vikrant is the indigenously built carrier from Cochin, Vikramaditya was acquired from Russia, and both use STOBAR rather than catapults.

PRELIMS MEMORY BANK

Rafale-M trials in Goa | 26 jets, about Rs 63,000 crore | Carrier system: STOBAR | Built by Cochin Shipyard, 2022 | Indigenous content about 76 percent

12 DEFENCE
INS Vikrant: Rafale-M Trials Begin in Goa

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I The Indian Navy has begun trials of the Rafale-M in Goa before it can operate from INS Vikrant.

STATEMENT II The Rafale-M was originally designed for catapult-assisted take-offs, whereas INS Vikrant uses a ski-jump.

STATEMENT III INS Vikrant uses electromagnetic catapults to launch aircraft.

Which one of the following is correct in respect of the above statements?

a. Both Statement II and Statement III are correct and both of them explain Statement I

b. Both Statement I and Statement II are correct and Statement I explains Statement II

c. Only one of the Statements II and III is correct and that explains Statement I

d. Neither Statement II nor Statement III is correct

ANSWER: (c)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Statement III contradicts Statement II, since a ship cannot both use a ski-jump and electromagnetic catapults, so only one of the two can be right, and the ski-jump one explains why trials are needed.

2 THROUGH FACTUAL KNOWLEDGE

Vikrant is a STOBAR carrier with a ski-jump and arrestor wires, so Statement II is correct and explains Statement I, while Statement III is wrong, confirming option (c).

PHYSICS

13

Oskar Klein Medal 2026: Ashoke Sen Is the First Indian Winner

NEWS IN BRIEF

- Theoretical physicist Ashoke Sen received the 2026 Oskar Klein Medal on 22 October 2026 and is described as the first Indian physicist to win it.
- The medal is awarded annually by Stockholm University with the Nobel Committee for Physics.
- Sen also gave the 2026 Oskar Klein Memorial Lecture, 'Gravity from Strings and Strings from Gravity', in Stockholm.
- Sen is ICTS-Infosys Madhava Chair Professor at ICTS Bengaluru, known for S-duality, black hole entropy and string field theory.



Prof. Ashoke Sen

KEY CONCEPTS EXPLAINED

String theory	A framework in which fundamental particles are tiny vibrating strings, aiming to unify gravity with quantum physics.
S-duality	A symmetry linking a strongly coupled theory to a weakly coupled one, one of Sen's best known areas of work.
ICTS	International Centre for Theoretical Sciences, Bengaluru, the institute where Sen is a professor.

UNIQUE FACT

The medal is named after Oskar Klein, a Swedish theoretical physicist, and Sen's earlier honours include the Breakthrough Prize in Fundamental Physics (2012) and the Dirac Medal (2014).

EXAM TRAP

Do not mix up the Oskar Klein Medal with the Nobel Prize or the Dirac Medal. It is a Stockholm University award, and the Dirac Medal is a separate honour Sen won in 2014.

PRELIMS MEMORY BANK

First Indian winner | Ashoke Sen, ICTS Bengaluru | Date: 22 October 2026 | Stockholm University and Nobel Physics Committee | Field: string theory

13 PHYSICS
Oskar Klein Medal 2026: Ashoke Sen Is the First Indian Winner

PRELIMS PRACTICE MCQ

Consider the following statements:

STATEMENT I The Oskar Klein Medal is awarded by the Nobel Foundation in Oslo.

STATEMENT II The Oskar Klein Medal is named after the Swedish theoretical physicist Oskar Klein.

Which one of the following is correct in respect of the above statements?

a. Both Statement I and Statement II are correct and Statement II explains Statement I

b. Both Statement I and Statement II are correct but Statement II does not explain Statement I

c. Statement I is correct but Statement II is not correct

d. Statement I is not correct but Statement II is correct

ANSWER: (d)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

A medal named after a Swedish physicist and linked to Stockholm is unlikely to be awarded from Oslo, so Statement I looks doubtful while Statement II is natural.

2 THROUGH FACTUAL KNOWLEDGE

The medal is awarded by Stockholm University with the Nobel Committee for Physics of the Royal Swedish Academy of Sciences, and honours Oskar Klein, so Statement I is wrong and Statement II is correct, option (d).

FOOD TECHNOLOGY

14

Plant-Based Meat: Study Models Emission Gains and Nutrient Gaps

NEWS IN BRIEF

- A study accepted in Nature Food, discussed in October 2026, added plant-based meat alternatives to the global land-use model MAgPIE and projected outcomes to 2100.
- Replacing 75 percent of livestock products would cut emissions from agriculture, forestry and other land use about 65 percent below the baseline by 2100.
- Replacing ruminant meat alone delivers nearly half of that potential, and lower farmland expansion helps protect forests and other natural land.
- Wider substitution raises the risk of inadequate zinc and vitamin B12 supply, a micronutrient trade-off.

KEY CONCEPTS EXPLAINED

Plant-based meat	Protein foods made from plants such as soy or pea that mimic the taste and texture of meat.
MAgPIE	A global land-use model that simulates agricultural demand, land use and emissions.
Micronutrient trade-off	A gain on emissions that comes with a risk of shortfall in nutrients such as zinc and vitamin B12.

UNIQUE FACT

Swapping only ruminant meat captured nearly half of the possible emission cuts, which makes ruminants the priority target, and the EU agreed in principle in March 2026 to bar 31 meat terms such as steak on plant-based labels, pending final votes.

EXAM TRAP

Do not treat plant-based meat as cultivated (lab-grown) meat. Plant-based meat is made from plant proteins, while cultivated meat is grown from animal cells.

PRELIMS MEMORY BANK

Journal: Nature Food | Model: MAgPIE, to 2100 | 75 percent swap: about 65 percent lower emissions | Ruminant swap: nearly half of gains | Shortfalls: zinc and vitamin B12

14 FOOD TECHNOLOGY
Plant-Based Meat: Study Models Emission Gains and Nutrient Gaps

PRELIMS PRACTICE MCQ

With reference to protein foods, consider the following:

I Textured soy chunks

II Pea protein sausage

III Cell-cultured chicken

IV Wheat gluten seitan

How many of the above are plant-based meat alternatives?

a Only one

b Only two

c Only three

d All the four

ANSWER: (c)

SOLUTION EXPLAINED

1 THROUGH LOGICAL ANALYSIS

Cell-cultured chicken is grown from animal cells and not from plants, which removes one item and leaves three.

2 THROUGH FACTUAL KNOWLEDGE

Soy chunks, pea protein sausage and wheat gluten are made from plant proteins, while cell-cultured chicken is cultivated meat, so only three, option (c).