MISSION X

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Jumping Genes Behind Explosive Ant Diversification

NEWS IN BRIEF

- A new study links a burst of ant diversification, in which ants branched into thousands of new species after the dinosaurs went extinct, to the activity of jumping genes within ant DNA.
- Jumping genes, or transposable elements (TEs), are DNA sequences that can move from one location on the genome to another.
- TEs make up about 50% of the human genome and up to 90% of the maize genome, underlining how widespread this mechanism is across life forms.
- The study adds to evidence that transposon activity, long seen mainly as a source of genomic instability, can also be a direct driver of rapid evolutionary diversification.

KEY CONCEPTS EXPLAINED

Transposable elements (TEs): DNA sequences capable of changing their position within a genome, classified as retrotransposons or DNA transposons based on their mechanism of movement.

Autonomous vs non-autonomous TEs: Autonomous TEs can move independently; non-autonomous TEs lack the machinery to move and depend on other transposons for relocation.

Epigenetic silencing: The main natural control on TE activity; in humans this works through heterochromatin packing via histone modification and DNA methylation, plus RNA-based silencing (piRNAs, miRNAs, siRNAs).

⚡ UNIQUE FACT

Transposons have a dual nature: inserting into coding or regulatory regions can cause diseases like haemophilia and certain cancers, yet the same mobility also drives genetic diversity and adaptive evolution, especially when environmental stress increases transposon activity in plants.

⚠ EXAM TRAP

Do not assume jumping genes are purely harmful. While TE insertion can disrupt genes and cause disease, this study is explicitly about their role in driving rapid, beneficial evolutionary diversification, not disease causation.

📌 PRELIMS MEMORY BANK

- Also called: Transposable elements / transposons
- ~50% of human genome, ~90% of maize genome
- Types: Retrotransposons, DNA transposons
- Controlled by: Epigenetic silencing (methylation, piRNAs)
- 2026 finding: Linked to post-extinction ant diversification

PRELIMS PRACTICE MCQ

With reference to transposable elements (jumping genes), consider the following statements:

1. They are DNA sequences capable of changing their position within a genome.
2. They constitute a larger proportion of the maize genome than of the human genome.
3. Their activity can only cause disease and has no role in evolutionary adaptation.

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: A

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 3 can be eliminated on logic alone: the passage explicitly ties transposon activity to a beneficial outcome, a burst of ant species diversification, which directly contradicts a claim that their only role is disease causation.

② THROUGH FACTUAL KNOWLEDGE

Transposable elements do change genomic position (confirming statement 1) and make up a larger share of the maize genome (~90%) than the human genome (~50%), confirming statement 2; their evolutionary role is well documented alongside their disease-linked effects.

Russian Scientist's Suspected Plague Death Sparks Alert

NEWS IN BRIEF

- A 28-year-old researcher at the Irkutsk Anti-Plague Institute in Siberia died after reportedly contracting pneumonic plague, caused by the bacterium Yersinia pestis, after a lab accident in late September 2026.
- Russian officials disputed the lab-accident account, listing the cause of death as 'pneumonia of unknown origin', while the WHO said the risk to public health appears low.
- About 200 contacts were tested by Rospotrebnadzor, Russia's health watchdog; some tested positive for common cold or COVID-19, with no other dangerous pathogens found.
- Pneumonic plague, unlike the bubonic form, can spread directly between humans through respiratory droplets, raising the stakes of any confirmed lab-linked exposure.

KEY CONCEPTS EXPLAINED

Yersinia pestis: The bacterium responsible for plague, historically linked to pandemics like the Black Death; transmitted via fleas (bubonic), blood (septicaemic), or droplets (pneumonic).

Pneumonic plague: The most dangerous form of plague, infecting the lungs and capable of direct person-to-person transmission, unlike the flea-borne bubonic form.

Anti-Plague Institutes: Specialised Russian/Soviet-era institutes, like the one in Irkutsk, that study and maintain samples of plague and other highly pathogenic bacteria.

⚡ UNIQUE FACT

Pneumonic plague is the only form of plague capable of direct human-to-human transmission via respiratory droplets; the bubonic form (flea-borne) and septicaemic form (bloodstream) do not spread this way, making a confirmed pneumonic case far more significant for public health response.

⚠ EXAM TRAP

Do not confuse bubonic plague with pneumonic plague when assessing transmissibility. Bubonic plague spreads via flea bites and does not transmit person-to-person, while pneumonic plague, the form reported in this case, can spread directly between humans via respiratory droplets.

📌 PRELIMS MEMORY BANK

- Pathogen: Yersinia pestis bacterium
- Location: Irkutsk Anti-Plague Institute, Siberia
- Form: Pneumonic plague (airborne, human-to-human)
- ~200 contacts tested by Rospotrebnadzor
- WHO assessed public health risk as low

PRELIMS PRACTICE MCQ

With reference to plague, consider the following statements:

1. It is caused by the bacterium Yersinia pestis.
2. Bubonic plague can spread directly from person to person through respiratory droplets.
3. Pneumonic plague is considered the most transmissible and dangerous form of the disease.

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: bubonic plague is explicitly the flea-borne form of the disease, and attributing direct person-to-person respiratory spread to it contradicts the very distinction that separates it from the pneumonic form.

② THROUGH FACTUAL KNOWLEDGE

Plague is indeed caused by Yersinia pestis (statement 1), and pneumonic plague, not bubonic, is the form capable of human-to-human airborne transmission and is considered the most dangerous (statement 3), making C the correct combination.

Canine Distemper Virus Outbreak Claims Ninth Tiger at Kanha

NEWS IN BRIEF

- A three-year-old tiger cub died on 6 October 2026 at Kanha Tiger Reserve, Madhya Pradesh, after showing symptoms of Canine Distemper Virus (CDV), taking the outbreak's death toll at the reserve to nine.
- The outbreak first surfaced in April 2026 when a tigress and her four cubs died in succession in the reserve's Sarahi range.
- CDV spreads from domestic dogs to tigers indirectly, typically when a tiger returns to feed on a kill that a dog has already scavenged and contaminated.
- Kanha officials said alert monitoring has so far limited confirmed cases to one or two at a time despite the virus's potential to wipe out an entire feline population.

KEY CONCEPTS EXPLAINED

Canine Distemper Virus (CDV): A highly contagious viral disease primarily affecting dogs but capable of cross-species 'spillover' infection into wild carnivores, including tigers and lions, often fatally.

Spillover infection: Transmission of a pathogen from its typical host species (here, domestic/feral dogs) to a new species (wild tigers) that did not evolve strong immunity to it.

Indirect transmission via kills: A mechanism unique to this outbreak pattern, where dogs scavenging on a tiger's kill contaminate the carcass, infecting the tiger when it returns to feed.

⚡ UNIQUE FACT

Canine Distemper Virus is not naturally a tiger pathogen; tigers contract it only through spillover from domestic or feral dog populations, meaning dog vaccination and population control around reserve buffer zones are directly protective interventions for tiger conservation.

⚠ EXAM TRAP

Do not assume CDV originates in tigers or spreads tiger-to-tiger as its primary route. The disease is fundamentally a canine (dog) virus that spills over to tigers through indirect contact, typically via scavenged kills, not sustained tiger-to-tiger transmission.

📌 PRELIMS MEMORY BANK

- Virus: Canine Distemper Virus (CDV)
- Location: Kanha Tiger Reserve, Madhya Pradesh
- Death toll: 9 (outbreak began April 2026)
- Transmission: Dogs to tigers via contaminated kills
- Response: Dog vaccination around buffer zones

PRELIMS PRACTICE MCQ

With reference to Canine Distemper Virus (CDV) and its recent impact on tigers, consider the following statements:

1. It is a virus that naturally originates in and spreads primarily between wild tiger populations.
2. It can spill over from domestic or feral dogs to wild carnivores including tigers.
3. Vaccinating dog populations near tiger reserve buffer zones is a recognised mitigation measure.

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: B

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 1 can be eliminated on logic alone: a disease described as spreading to tigers through contaminated kills left behind by dogs cannot simultaneously be described as naturally originating and spreading within wild tiger populations themselves.

② THROUGH FACTUAL KNOWLEDGE

CDV is fundamentally a canine virus that spills over into wild carnivores like tigers (statement 2), and dog vaccination around reserve buffers is the documented response measure being used at Kanha (statement 3), confirming option B.

WHO's IARC Confirms Epstein-Barr Virus as Major Cancer Driver

NEWS IN BRIEF

- The WHO's International Agency for Research on Cancer (IARC) reaffirmed Epstein-Barr Virus (EBV) as a Group 1 carcinogen, calling it one of the causative agents behind a substantial global cancer burden.
- EBV, also called human herpesvirus 4, spreads mainly through saliva, including kissing and sharing food, drinks or utensils.
- Most infections are asymptomatic or mild, but the virus remains dormant in the body for life after initial infection and can reactivate under immunological stress.
- IARC's classification links EBV reactivation to cancers including Burkitt's lymphoma and stomach cancer, as well as to multiple sclerosis.

KEY CONCEPTS EXPLAINED

Group 1 carcinogen: IARC's highest-confidence classification, meaning there is sufficient evidence the agent causes cancer in humans; EBV joins agents like tobacco and asbestos in this category.

Viral latency: The ability of a virus like EBV to remain dormant within host cells indefinitely after initial infection, with the potential to reactivate later under conditions like immune suppression.

Oncovirus: A virus capable of causing cancer in its host by promoting uncontrolled cell growth; EBV is a well-studied example alongside HPV and Hepatitis B.

⚡ UNIQUE FACT

EBV is estimated to infect over 90% of the global adult population at some point in their lives, making it one of the most widespread human viruses, yet only a small fraction of those infected ever develop an EBV-associated cancer or complication.

⚠ EXAM TRAP

Do not assume EBV infection directly or inevitably causes cancer. The virus establishes lifelong latency in nearly all infected individuals, but cancer and conditions like multiple sclerosis arise only in a minority of cases, typically linked to reactivation under specific conditions.

📌 PRELIMS MEMORY BANK

- Also called: Human herpesvirus 4
- IARC classification: Group 1 carcinogen
- Spread via: Saliva (kissing, shared utensils)
- Linked cancers: Burkitt's lymphoma, stomach cancer
- Also linked to: Multiple sclerosis

PRELIMS PRACTICE MCQ

With reference to the Epstein-Barr Virus (EBV), consider the following statements:

1. It has been classified by IARC as a Group 1 carcinogen.
2. It is transmitted primarily through airborne respiratory droplets rather than saliva.
3. Once a person is infected, the virus can remain dormant in the body for life.

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: the passage specifically identifies saliva, through kissing and shared utensils, as the main transmission route, which directly contradicts a claim of primarily airborne respiratory spread.

② THROUGH FACTUAL KNOWLEDGE

EBV is confirmed as an IARC Group 1 carcinogen (statement 1) and is well documented to establish lifelong viral latency after initial infection (statement 3), making C the correct combination.

Comet C/46K1R1 Makes Close Approach to Earth

NEWS IN BRIEF

- Comet C46K1R1, discovered by the Catalina Sky Survey on 14 September 2026, made its closest approach to Earth on 6 October 2026 at about 29.4 million miles (47.3 million km) away.
- The comet brightened rapidly after discovery, reaching magnitude 11.9 by early October with a visible coma about 4 arcminutes wide and a tail roughly 2 arcminutes long.
- It is moving across the sky at approximately 5 degrees per day and is still awaiting an official designation from the Minor Planet Center (MPC).
- Its perihelion, the point of closest approach to the Sun, is expected around 25 October 2026.

KEY CONCEPTS EXPLAINED

Coma and tail: A comet's coma is the glowing cloud of gas and dust around its icy nucleus, formed as solar heating causes the ice to sublimate; the tail forms as solar wind pushes this material away from the Sun.

Minor Planet Center (MPC): The internationally recognised body responsible for cataloguing and officially designating newly discovered comets, asteroids and other minor solar system bodies.

Perihelion: The point in a comet's or planet's orbit when it is closest to the Sun, often when a comet is at its brightest due to maximum solar heating.

⚡ UNIQUE FACT

Comet C46K1R1's rapid brightening within weeks of discovery is typical of comets making a close approach to both Earth and the Sun in quick succession, a pattern that can make a previously unknown object suddenly visible to amateur astronomers using modest equipment.

⚠ EXAM TRAP

Do not confuse a comet's closest approach to Earth with its perihelion (closest approach to the Sun). For C46K1R1, these are two distinct dates, 6 October for Earth approach and around 25 October for perihelion, a distinction UPSC may test through sequencing.

📌 PRELIMS MEMORY BANK

- Discovered by: Catalina Sky Survey, 14 Sept 2026
- Closest Earth approach: 6 October 2026
- Distance at approach: ~47.3 million km
- Perihelion (closest to Sun): ~25 October 2026
- Awaiting official MPC designation

PRELIMS PRACTICE MCQ

With reference to comets, consider the following statements:

1. A comet's perihelion refers to its closest approach to the Earth.
2. A comet's coma is formed by the sublimation of ice as it is heated by the Sun.
3. Newly discovered comets are officially designated by the Minor Planet Center.

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: B

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 1 can be eliminated on logic alone: perihelion is a term rooted in 'helios' (Sun), referring to proximity to the Sun, not Earth, a closest approach to Earth is a separate, differently named event.

② THROUGH FACTUAL KNOWLEDGE

A comet's coma does form through ice sublimation under solar heating (statement 2), and the Minor Planet Center is indeed the recognised body for official comet designation (statement 3), confirming option B.

Claimed Evidence for Earth-like Planet in the Kuiper Belt

NEWS IN BRIEF

- Reports in October 2026 cited scientists uncovering possible evidence of an Earth-like planet within the solar system's Kuiper Belt, the region of icy bodies beyond Neptune's orbit.
- The Kuiper Belt, also called the Edgeworth-Kuiper belt, is named after astronomer Gerard Kuiper, who proposed its existence in the 1950s.
- It contains millions of icy objects called Kuiper Belt Objects (KBOs) or trans-Neptunian objects (TNOs), including the dwarf planet Pluto.
- The belt is considered the main source of short-period comets, those completing an orbit around the Sun in under 20 years.

KEY CONCEPTS EXPLAINED

Kuiper Belt Objects (KBOs): Icy bodies, including dwarf planets, asteroids and comets, orbiting the Sun beyond Neptune in a flat, ring-shaped region; also called trans-Neptunian objects (TNOs).

Short-period comets: Comets that complete one orbit of the Sun in under 20 years, believed to originate primarily from the Kuiper Belt, unlike long-period comets linked to the more distant Oort Cloud.

Dwarf planet reclassification: In 2006, the International Astronomical Union (IAU) reclassified Pluto as a dwarf planet rather than a full planet, partly due to its location among other Kuiper Belt objects.

⚡ UNIQUE FACT

The Kuiper Belt's apparent 'thinness' in earlier observations is now thought by some astronomers to reflect observational bias rather than true sparseness, as more sensitive surveys continue to reveal previously undetected populations of distant icy bodies.

⚠ EXAM TRAP

Do not confuse the Kuiper Belt with the Oort Cloud. The Kuiper Belt is a relatively nearby, flat, ring-shaped region beyond Neptune linked to short-period comets, while the Oort Cloud is a much more distant, spherical shell linked to long-period comets.

📌 PRELIMS MEMORY BANK

- Named after: Astronomer Gerard Kuiper
- Location: Beyond Neptune's orbit
- Contains: KBOs / TNOs, including Pluto
- Source of: Short-period comets (<20 yr orbits)
- Pluto reclassified as dwarf planet in 2006 (IAU)

PRELIMS PRACTICE MCQ

With reference to the Kuiper Belt, consider the following statements:

1. It is located closer to the Sun than the asteroid belt between Mars and Jupiter.
2. It is considered the principal source of short-period comets.
3. Pluto is classified as a dwarf planet located within this belt.

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: B

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 1 can be eliminated on logic alone: the passage places the Kuiper Belt beyond Neptune's orbit, far outside the Mars-Jupiter asteroid belt, so describing it as closer to the Sun than the asteroid belt reverses their actual relative positions.

② THROUGH FACTUAL KNOWLEDGE

The Kuiper Belt is indeed considered the main source of short-period comets (statement 2), and Pluto, reclassified as a dwarf planet in 2006, is located within it (statement 3), confirming option B.

France Test-Fires Upgraded M51.3 Submarine-Launched Missile

NEWS IN BRIEF

- France conducted an acceptance firing of its upgraded M51.3 submarine-launched ballistic missile (SLBM) from the SSBN Le Vigilant on 6 October 2026, in an operation codenamed SMERTRIOS.
- The unarmed missile was launched off Finistère, western France, and landed in the North Atlantic, several hundred kilometres from any coastline.
- The test followed Le Vigilant's mid-life refit (IPER) and was designed to confirm the submarine's ability to operate the upgraded M51 missile system post-refit.
- President Emmanuel Macron observed the launch from the multi-mission frigate Auvergne, underscoring its significance to French strategic deterrence.

KEY CONCEPTS EXPLAINED

SLBM (Submarine-Launched Ballistic Missile): A ballistic missile capable of being launched from a submerged submarine, forming the sea-based leg of a nuclear deterrent, valued for its stealth and survivability.

SSBN: A nuclear-powered, ballistic-missile-carrying submarine, designed to remain submerged for extended periods as a survivable second-strike nuclear platform.

Acceptance firing: A test launch conducted to formally certify that a weapon system, often after maintenance or refit, meets required operational and safety standards before being returned to active service.

⚡ UNIQUE FACT

The M51.3 missile has an estimated range exceeding 9,500 km and is designed to carry TNO-2 oceanic nuclear warheads, with improved accuracy and penetration capability against missile defence systems compared to earlier M51 variants.

⚠ EXAM TRAP

Do not confuse an acceptance firing test with a routine training exercise. This launch specifically certified Le Vigilant's capability to operate the M51 system after a mid-life refit, a safety and operational milestone distinct from regular deterrence patrol drills.

📌 PRELIMS MEMORY BANK

- Missile: M51.3 (upgraded French SLBM)
- Platform: SSBN Le Vigilant
- Operation name: SMERTRIOS
- Range: Exceeds 9,500 km
- Purpose: Post-refit acceptance firing

PRELIMS PRACTICE MCQ

With reference to the M51.3 missile test, consider the following statements:

1. It is an air-launched cruise missile developed by France.
2. It was fired to certify a submarine's capability to operate the system after a mid-life refit.
3. The missile has a range exceeding 9,500 km.

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: B

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 1 can be eliminated on logic alone: the passage repeatedly describes the missile as submarine-launched and fired from an SSBN, which directly contradicts any characterisation of it as air-launched.

② THROUGH FACTUAL KNOWLEDGE

The test was indeed an acceptance firing to certify Le Vigilant's post-refit capability (statement 2), and the M51.3's range does exceed 9,500 km (statement 3), confirming option B.

DRDO Conducts Maiden Jump of Advanced High-Altitude Parachute

NEWS IN BRIEF

- DRDO's Aerial Delivery Research and Development Establishment (ADRDE), Agra, conducted the maiden live jump of its Advanced High-Altitude Parachute (AHAP) system at the Mudh Drop Zone near Nyoma, Ladakh, on 6 October 2026.
- The parachute, manufactured by the Ordnance Parachute Factory (OPF), Kanpur, is designed for mass paratrooper deployment in extreme high-altitude mountain terrain.
- The test jump was conducted from 16,000 feet above mean sea level (AMSL), with deployment at 15,500 feet and landing at a zone elevation of 13,700 feet.
- Defence Minister Rajnath Singh congratulated the development teams, linking the achievement to the Aatmanirbhar Bharat (self-reliant India) initiative.

KEY CONCEPTS EXPLAINED

Static-line parachute: A parachute system where the deployment is automatically triggered by a line attached to the aircraft, enabling rapid, simultaneous deployment for large paratrooper formations, unlike a free-fall system.

High-altitude paradrop: Military parachute operations conducted at significantly higher altitudes than standard drops, requiring specialised equipment to cope with thinner air, lower temperatures and reduced oxygen.

ADRDE and OPF: ADRDE (Agra) is DRDO's dedicated aerial delivery research lab; OPF (Kanpur) is the manufacturing unit that produces parachutes based on such indigenous designs.

⚡ UNIQUE FACT

The AHAP system is rated for operations up to 18,000 feet AMSL, making it suited for rapid troop deployment in high-altitude theatres like Ladakh, where thinner air and extreme cold significantly complicate conventional parachute operations.

⚠ EXAM TRAP

Do not confuse the testing agency with the manufacturing agency. ADRDE, Agra, is the DRDO lab that researched and designed the AHAP system, while the Ordnance Parachute Factory, Kanpur, is the separate entity that manufactures it.

📌 PRELIMS MEMORY BANK

- System: Advanced High-Altitude Parachute (AHAP)
- Designer: ADRDE, Agra (DRDO)
- Manufacturer: Ordnance Parachute Factory, Kanpur
- Test site: Mudh Drop Zone, Nyoma, Ladakh
- Operational range: Up to 18,000 ft AMSL

PRELIMS PRACTICE MCQ

With reference to the Advanced High-Altitude Parachute (AHAP) system, consider the following statements:

1. It was designed by the Aerial Delivery Research and Development Establishment, Agra.
2. It is manufactured by the Ordnance Parachute Factory, Kanpur.
3. Its maiden live jump was conducted at a drop zone in Rajasthan.

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: A

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 3 can be eliminated on logic alone: the passage specifically places the test at the Mudh Drop Zone near Nyoma, which it identifies as being in Ladakh, not Rajasthan, so the stated test location is factually displaced.

② THROUGH FACTUAL KNOWLEDGE

ADRDE, Agra, is confirmed as the design agency (statement 1), and the Ordnance Parachute Factory, Kanpur, is confirmed as the manufacturer (statement 2), making A the correct combination.

India Successfully Test-Fires Indigenous VL-SRSAM

NEWS IN BRIEF

- DRDO and the Indian Navy successfully flight-tested the indigenously designed and developed Vertical Launch Short Range Surface-to-Air Missile (VL-SRSAM) from the Integrated Test Range (ITR), Chandipur, off the Odisha coast.
- The missile was launched vertically from a naval platform against a high-speed unmanned aerial target, validating its close-range aerial intercept capability.
- Radar systems, an electro-optical tracking system (EOTS), and telemetry stations at the ITR tracked the missile's flight path and performance.
- Defence Minister Rajnath Singh described VL-SRSAM as a 'force multiplier for the Indian Navy', with officials confirming the trial proved the system's effectiveness.

KEY CONCEPTS EXPLAINED

Vertical Launch System (VLS): A missile launch method where missiles are stored and fired vertically from a ship's deck, enabling faster reaction times and all-round engagement compared to traditional trainable launchers.

Surface-to-Air Missile (SAM): A missile designed to be launched from the ground or sea to destroy aerial threats such as aircraft, helicopters or incoming missiles.

Sea-skimming threat: A low-altitude anti-ship missile or aerial threat that flies just above the sea surface to evade radar detection, which short-range naval SAMs like VL-SRSAM are designed to counter.

⚡ UNIQUE FACT

VL-SRSAM is specifically designed to counter close-range aerial threats, including sea-skimming missiles that fly low over the ocean surface to evade radar, a threat category that longer-range naval air-defence systems are less optimised to intercept.

⚠ EXAM TRAP

Do not confuse VL-SRSAM's role with that of a long-range naval air-defence missile. VL-SRSAM is explicitly a short-range system for close-in aerial threats, distinct from India's longer-range naval SAM systems like the Barak-8/MR-SAM.

📌 PRELIMS MEMORY BANK

- Full form: Vertical Launch Short Range Surface-to-Air Missile
- Developers: DRDO + Indian Navy
- Test site: ITR Chandipur, Odisha
- Target: High-speed unmanned aerial target
- Role: Close-range naval air defence, incl. sea-skimmers

PRELIMS PRACTICE MCQ

With reference to the VL-SRSAM, consider the following statements:

1. It is a long-range surface-to-air missile designed for deep aerial strikes.
2. It is launched vertically from naval platforms.
3. It was tested at the Integrated Test Range, Chandipur, Odisha.

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: B

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 1 can be eliminated on logic alone: the missile's own name specifies 'Short Range', which directly contradicts describing it as a long-range system for deep aerial strikes.

② THROUGH FACTUAL KNOWLEDGE

VL-SRSAM is indeed launched vertically from naval platforms (statement 2) and was tested at ITR Chandipur, Odisha (statement 3), confirming option B.

INS Sahyadri Arrives in Russia for Exercise Indra 2026

NEWS IN BRIEF

- INS Sahyadri, an indigenously built Shivalik-class guided-missile stealth frigate, arrived at Vladivostok, Russia, around 11-12 October 2026 for the bilateral naval Exercise INDRA 2026 with the Russian Federation Navy.
- The exercise programme includes a harbour phase with professional interactions and cultural exchanges, followed by a sea phase for coordinated operational drills.
- The deployment aligns with India's MAHASAGAR vision for maritime cooperation and follows the 23rd India-Russia Annual Summit held in December 2025.
- The INDRA framework traces back to the first tri-service India-Russia exercise held at Vladivostok in October 2017.

KEY CONCEPTS EXPLAINED

Shivalik-class frigate: A class of indigenously designed and built stealth multi-role frigates of the Indian Navy, incorporating stealth features to reduce radar, infrared and acoustic signatures.

Harbour phase and sea phase: The two standard stages of a bilateral naval exercise: the harbour phase covers interactions and planning ashore, while the sea phase involves live operational drills at sea.

MAHASAGAR vision: India's maritime strategic vision emphasising security and growth for all in the region, guiding its naval cooperation and deployments, including exercises like INDRA.

⚡ UNIQUE FACT

The INDRA exercise series began in 2003 as a bilateral naval exercise but briefly expanded into a tri-service format, with its first such tri-service edition held at Vladivostok in October 2017, before later editions reverted to being primarily naval in focus.

⚠ EXAM TRAP

Do not confuse Exercise INDRA (India-Russia) with other India bilateral naval exercises using different codenames, such as Konkan (India-UK) or Varuna (India-France); UPSC frequently tests the correct country-pairing for each named defence exercise.

📌 PRELIMS MEMORY BANK

- Exercise: INDRA 2026 (India-Russia)
- Indian ship: INS Sahyadri (Shivalik-class frigate)
- Venue: Vladivostok, Russia
- First tri-service edition: Vladivostok, Oct 2017
- Aligned with: India's MAHASAGAR vision

PRELIMS PRACTICE MCQ

With reference to Exercise INDRA, consider the following statements:

1. It is a bilateral naval exercise between India and Russia.
2. INS Sahyadri, which took part in its 2026 edition, is a Shivalik-class frigate.
3. Its first tri-service edition was held in India in 2017.

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: A

SOLUTION EXPLAINED

① THROUGH LOGICAL ANALYSIS

Statement 3 can be eliminated on logic alone: the passage places the first tri-service edition specifically at Vladivostok, Russia, not in India, so claiming an Indian venue reverses the stated host country.

② THROUGH FACTUAL KNOWLEDGE

Exercise INDRA is confirmed as a bilateral India-Russia naval exercise (statement 1), and INS Sahyadri is confirmed as a Shivalik-class frigate (statement 2), making A the correct combination.

INS Trishul Arrives in UK for Exercise Konkan 2026

NEWS IN BRIEF

- INS Trishul, a guided-missile stealth frigate of the Indian Navy, arrived in Plymouth, United Kingdom, on 8 October 2026 for the annual bilateral maritime Exercise KONKAN-26 with the Royal Navy, running until 15 October.
- The exercise follows a two-phase structure: a harbour phase with cross-deck visits, sports fixtures and cultural engagements, followed by a sea phase covering air, surface and sub-surface domain drills.
- Sea phase activities include flying operations, firing exercises, air-defence drills, seamanship evolutions and anti-submarine warfare training.
- The exercise is aligned with the India-UK Vision 2035 roadmap for a Comprehensive Strategic Partnership between the two countries.

KEY CONCEPTS EXPLAINED

Cross-domain naval drills: Exercises covering air, surface and sub-surface warfare domains together, testing a navy's integrated operational coordination across all three dimensions of naval combat.

Anti-submarine warfare (ASW): Naval operations and tactics aimed at detecting, tracking and neutralising hostile submarines, a key component of any advanced bilateral maritime exercise.

India-UK Vision 2035: A bilateral roadmap guiding deeper India-UK cooperation across defence, security, trade and technology, under which exercises like KONKAN are conducted.

⚡ UNIQUE FACT

Before arriving in Plymouth for Exercise KONKAN-26, INS Trishul had already taken part in the 24th edition of Exercise Varuna with the French Navy at Toulon and made a port call at Valencia, Spain, reflecting an extended multi-nation deployment in a single voyage.

⚠ EXAM TRAP

Do not confuse Exercise KONKAN (India-UK) with Exercise Varuna (India-France), even when both are mentioned together in the same deployment narrative; UPSC frequently tests exact country-pairings for India's named bilateral naval exercises.

📌 PRELIMS MEMORY BANK

- Exercise: KONKAN-26 (India-UK)
- Indian ship: INS Trishul (stealth frigate)
- Venue: Plymouth, United Kingdom
- Duration: 8-15 October 2026
- Aligned with: India-UK Vision 2035

PRELIMS PRACTICE MCQ

With reference to Exercise KONKAN-26, consider the following statements:

1. It is a bilateral maritime exercise between India and the United Kingdom.
2. It was conducted off the coast of Toulon, France.
3. Its sea phase includes anti-submarine warfare training.

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: Toulon, France is identified as the venue for the separate Exercise Varuna with the French Navy, which INS Trishul took part in before reaching the UK, not the location of Exercise KONKAN-26.

② THROUGH FACTUAL KNOWLEDGE

Exercise KONKAN-26 is confirmed as an India-UK bilateral maritime exercise held off Plymouth, UK (statement 1), with anti-submarine warfare explicitly listed among its sea-phase drills (statement 3), confirming option C.