

GA01 — Universe & Solar System

GA01 · AFCAT General Awareness — Geography

★ Moderate Yield — 1–2 Questions

AFCAT geography starts in space. Before the atmosphere, before rivers, before crops — there is the solar system. This chapter is one of the most direct and fact-based in AFCAT. The questions are straightforward: which planet is hottest, which is largest, what causes day and night, what is India's standard time. Learn the key facts in this chapter and you will never drop marks here.

➔ **AFCAT Focus:** Venus = hottest planet (NOT Mercury); Jupiter = largest; Mercury = smallest; Saturn = least dense (floats on water); rotation causes day/night; revolution causes seasons; IST = GMT + 5½ hours; standard meridian = 82½°E through Mirzapur. These are the most repeated AFCAT Universe facts.

PART 1 — THE SOLAR SYSTEM

1. Planets in Order — The Essential List

There are 8 planets in our solar system. Remember the order using: "My Very Educated Mother Just Showed Us Neptune"

THE 8 PLANETS — ORDER, TYPE AND AFCAT KEY FACTS

☉ MERCURY

- ▶ Closest to Sun; **smallest planet**
- ▶ No atmosphere; no moons
- ▶ Extreme temp swings: +430°C (day)

* VENUS

- ▶ **Hottest planet** (~462°C always)
- ▶ Thick CO₂ atmosphere = extreme greenhouse effect

🌍 EARTH

- ▶ Only planet known to support life
- ▶ 71% surface is water; one moon
- ▶ Axial tilt: 23½° — causes seasons

to -180°C (night)

- ▶ **NOT the hottest** – common AFCAT trap

- ▶ Rotates east to west (retrograde – opposite to most)
- ▶ Brightest object after Sun and Moon; "Morning/Evening Star"

- ▶ Third from Sun; in the "Goldilocks Zone"

MARS

- ▶ Red colour due to iron oxide on surface
- ▶ Two moons: Phobos and Deimos
- ▶ **Olympus Mons** = tallest volcano in the solar system
- ▶ Sub-zero temperatures; thin CO_2 atmosphere

JUPITER

- ▶ **Largest planet** in the solar system
- ▶ Great Red Spot = giant storm larger than Earth
- ▶ 95 moons (most of any planet)
- ▶ Fastest rotation (~10 hours per day)

SATURN

- ▶ Famous for ring system (ice and rock particles)
- ▶ **Least dense planet** – would float on water!
- ▶ Second largest; 146 moons
- ▶ Beautiful from telescopes; golden-yellow colour

URANUS

- ▶ Rotates on its side (98° axial tilt)
- ▶ Also rotates east to west (retrograde, like Venus)
- ▶ **Coldest planet** (-224°C) despite not being farthest
- ▶ Ice giant; blue-green colour (methane atmosphere)

NEPTUNE

- ▶ **Farthest planet** from the Sun
- ▶ Strongest winds in solar system (2,100 km/h)
- ▶ Ice giant; deep blue colour
- ▶ Triton orbits backward (retrograde moon)

💡 **The 3 Most Repeated AFCAT Traps in This Topic:**

1. **Hottest planet = Venus**, NOT Mercury. Mercury is closest to the Sun but has no atmosphere, so heat escapes. Venus has a thick CO₂ blanket that traps all heat.
2. **Coldest planet = Uranus**, NOT Neptune (even though Neptune is farther).
3. **Smallest planet = Mercury** (since Pluto was reclassified as a dwarf planet in 2006 by IAU).

PART 2 – OTHER CELESTIAL BODIES

2. Beyond the Planets

⚠ Asteroids & Meteorites

- ▶ **Asteroid Belt** lies between Mars and Jupiter – rocky bodies that did not form a planet (Jupiter's gravity prevented it)
- ▶ **Meteor:** streak of light when a space rock burns up in Earth's atmosphere ("shooting star")
- ▶ **Meteorite:** a meteor that survives and reaches Earth's surface
- ▶ **Asteroid vs Comet:** asteroids = rocky; comets = icy (develop a tail when near the Sun)

☁ Comets & Dwarf Planets

- ▶ **Comets:** made of ice, dust and gases; develop a glowing tail (coma) when close to the Sun
- ▶ **Halley's Comet:** appears every 75–76 years; last seen 1986; next ~2061
- ▶ **Pluto:** reclassified as a **dwarf planet** in 2006 by the International Astronomical Union (IAU) – no longer the 9th planet
- ▶ **Other dwarf planets:** Eris, Ceres (in Asteroid Belt), Makemake, Haumea

PART 3 – EARTH'S MOVEMENTS & TIME

3. Rotation and Revolution

🌀 Rotation (Spinning on Axis)

- ▶ Period: 23 hours 56 minutes (one sidereal day)
- ▶ Direction: West to East (anticlockwise from North Pole)
- ▶ Causes: Day and Night
- ▶ Causes the Coriolis Effect — deflects winds right in NH, left in SH
- ▶ Causes apparent movement of Sun, Moon and stars
- ▶ Creates tidal bulges on Earth

★ Revolution (Orbit Around Sun)

- ▶ Period: 365¼ days (one sidereal year)
- ▶ Direction: West to East (anticlockwise from North Pole)
- ▶ Causes: Seasons
- ▶ Earth's 23½° axial tilt + revolution = different solar angles throughout year
- ▶ Causes Solstices and Equinoxes
- ▶ Leap year every 4 years (to account for the ¼ day)

FOUR KEY DATES — SUN POSITION AND RESULT

21 MARCH

**Spring
Equinox**

Sun over
Equator
12 hrs day
everywhere



21 JUNE

**Summer
Solstice
(NH)**

Sun over Tropic
of Cancer
Longest day in
NH



23 SEPTEMBER

**Autumn
Equinox**

Sun over
Equator again
12 hrs day
everywhere



22 DECEMBER

**Winter
Solstice
(NH)**

Sun over Tropic
of Capricorn
Shortest day in
NH

4. Latitudes, Longitudes & India's Time

KEY PARALLELS AND THEIR SIGNIFICANCE

Arctic Circle — 66½°N Northern boundary of temperate zone; midnight sun in summer; polar night in winter

Tropic of Cancer — 23½°N Sun directly overhead on 21 June; passes through 8 Indian states (Gujarat to Mizoram)

Equator — 0° Equal day and night throughout the year; maximum solar energy; divides Earth into NH and SH

Tropic of Capricorn — 23½°S Sun directly overhead on 22 December; southern boundary of tropics

Antarctic Circle — 66½°S Southern boundary of temperate zone; same phenomena as Arctic but opposite season

India's Standard Time — The Calculation AFCAT Loves:

- India's Standard Meridian = **82½°E** (passes through Mirzapur, Uttar Pradesh)
- Calculation: $82.5^\circ \div 15^\circ \text{ per hour} = 5.5 \text{ hours} = 5 \text{ hours } 30 \text{ minutes ahead of GMT}$
- **IST = GMT + 5 hours 30 minutes**
- If it is 12:00 noon at Greenwich → it is **5:30 PM IST**
- India uses one time zone for the entire country despite spanning 68°E to 97°E (~29° = nearly 2 hours of natural difference)

PART 4 — ECLIPSES

5. Solar and Lunar Eclipses

ECLIPSE CONDITIONS — WHAT ALIGNS WHERE

Solar Eclipse

- ▶ Moon comes **BETWEEN Earth and Sun**
- ▶ Moon's shadow falls on Earth

Lunar Eclipse

- ▶ Earth comes **BETWEEN Sun and Moon**
- ▶ Earth's shadow falls on Moon

- ▶ Occurs ONLY on New Moon (Amavasya)
- ▶ Visible only from a narrow strip of Earth (umbra)
- ▶ Total: Sun completely hidden; corona visible
- ▶ Annular: Moon appears smaller; ring of Sun visible

- ▶ Occurs ONLY on Full Moon (Purnima)
- ▶ Visible from entire night side of Earth
- ▶ Total: Moon appears reddish ("Blood Moon") – sunlight refracted by Earth's atmosphere
- ▶ More commonly observed than solar eclipse



AFCAT PYQs – Universe & Solar System

Q1. Which is the hottest planet in our solar system?

AFCAT PYQ

- (a) Mercury (b) Venus (c) Mars (d) Jupiter

✓ Answer: (b) Venus

Venus (avg. 462°C) is the hottest planet, not Mercury. Mercury is closest to the Sun but has no atmosphere – heat escapes. Venus has a thick CO₂ atmosphere that traps ALL heat (runaway greenhouse effect). Temperature is uniform day and night on Venus. This is AFCAT's most repeated solar system question. If you memorise nothing else from this chapter, remember: **Venus = hottest**.

Q2. If it is 12 noon at Greenwich (GMT), what is the Indian Standard Time?

AFCAT PYQ

- (a) 5:30 AM (b) 5:30 PM (c) 6:30 PM (d) 6:30 AM

✓ Answer: (b) 5:30 PM

IST = GMT + 5 hours 30 minutes. India's standard meridian is 82½°E. Since India is east of Greenwich, it is ahead: 12:00 noon + 5:30 = **5:30 PM IST**. The formula: longitude ÷ 15 = hours ahead/behind GMT. 82.5 ÷ 15 = 5.5 hours = 5 hours 30 minutes. This calculation appears in AFCAT frequently – memorise it as a formula, not just the answer.

Q3. Pluto was reclassified as a dwarf planet in which year?

AFCAT PYQ

- (a) 2000 (b) 2003 (c) 2006 (d) 2010

✓ Answer: (c) 2006

The **International Astronomical Union (IAU)** reclassified Pluto as a dwarf planet in **2006**, reducing the number of planets in our solar system from 9 to 8. Pluto failed to meet the third criterion of being a "cleared neighbourhood" — its orbit overlaps with other Kuiper Belt objects. Today our solar system has 8 planets + 5 recognised dwarf planets (Pluto, Eris, Ceres, Makemake, Haumea).

Q4. The tallest volcano in the solar system is located on:

⚡ Tricky

- (a) Earth (b) Venus (c) Mars (d) Jupiter's moon Io

✓ Answer: (c) Mars

Olympus Mons on Mars is the tallest volcano in the solar system — approximately 21.9 km high (nearly 3× the height of Mount Everest) and ~600 km wide at the base. It is a shield volcano. Mars has no tectonic plates, so lava kept piling up in the same spot for billions of years, creating this enormous structure. Mauna Kea (Hawaii, Earth) is the tallest from base to summit if measured from the ocean floor, but Olympus Mons wins on absolute height.

🧠 Quick Memory Chart — GAO1

📁 Planet Superlatives

- ◆ Hottest: **Venus** (NOT Mercury!)
- ◆ Coldest: **Uranus** (-224°C)
- ◆ Largest: **Jupiter**
- ◆ Smallest: **Mercury**
- ◆ Least dense: **Saturn** (floats on water)
- ◆ Retrograde rotation: Venus, Uranus

☀️ Earth's Movements

- ◆ Rotation → Day & Night, Coriolis
- ◆ Revolution → Seasons, Solstices
- ◆ Axial tilt: **23½°**
- ◆ 21 June: NH Summer Solstice (longest day)
- ◆ 22 Dec: NH Winter Solstice (shortest day)

🕒 Time & Eclipses

- ◆ IST = GMT + 5½ hours (82½°E meridian)
- ◆ Standard meridian: Mirzapur, UP
- ◆ 15° longitude = 1 hour time difference
- ◆ Solar eclipse: New Moon; Moon between Sun & Earth
- ◆ Lunar eclipse: Full Moon; Earth between

- 21 Mar & 23 Sep:
Equinoxes (equal
day/night)

Sun & Moon

- Pluto: reclassified
2006 (dwarf planet)



Practice Exercise

E1. Which planet has the Great Red Spot, a storm that has lasted for centuries?

- (a) Saturn (b) Mars (c) Jupiter (d) Neptune

E2. Halley's Comet appears approximately every:

- (a) 25 years (b) 50 years (c) 76 years (d) 100 years

E3. The International Date Line approximately follows which meridian?

- (a) 0° (Prime Meridian) (b) 90°E (c) 180° (d) 90°W

Answers:

E1 → (c) Jupiter [Great Red Spot = anticyclonic storm larger than Earth; observed for 350+ years] | E2 → (c) 76 years [last seen 1986; next ~2061; named after Edmund Halley who predicted its return] | E3 → (c) 180° [bends around island groups to avoid splitting countries; east = calendar behind by 1 day]

Moving ahead: Now that the solar system foundation is set, Chapter GA02 digs into Earth itself – its internal structure, the rocks it's made of, and the atmospheric layers that wrap around it. Everything from earthquakes to rainfall starts making sense once you understand how Earth is built from the inside out.



Mock Tests



Subject Quiz



Telegram

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