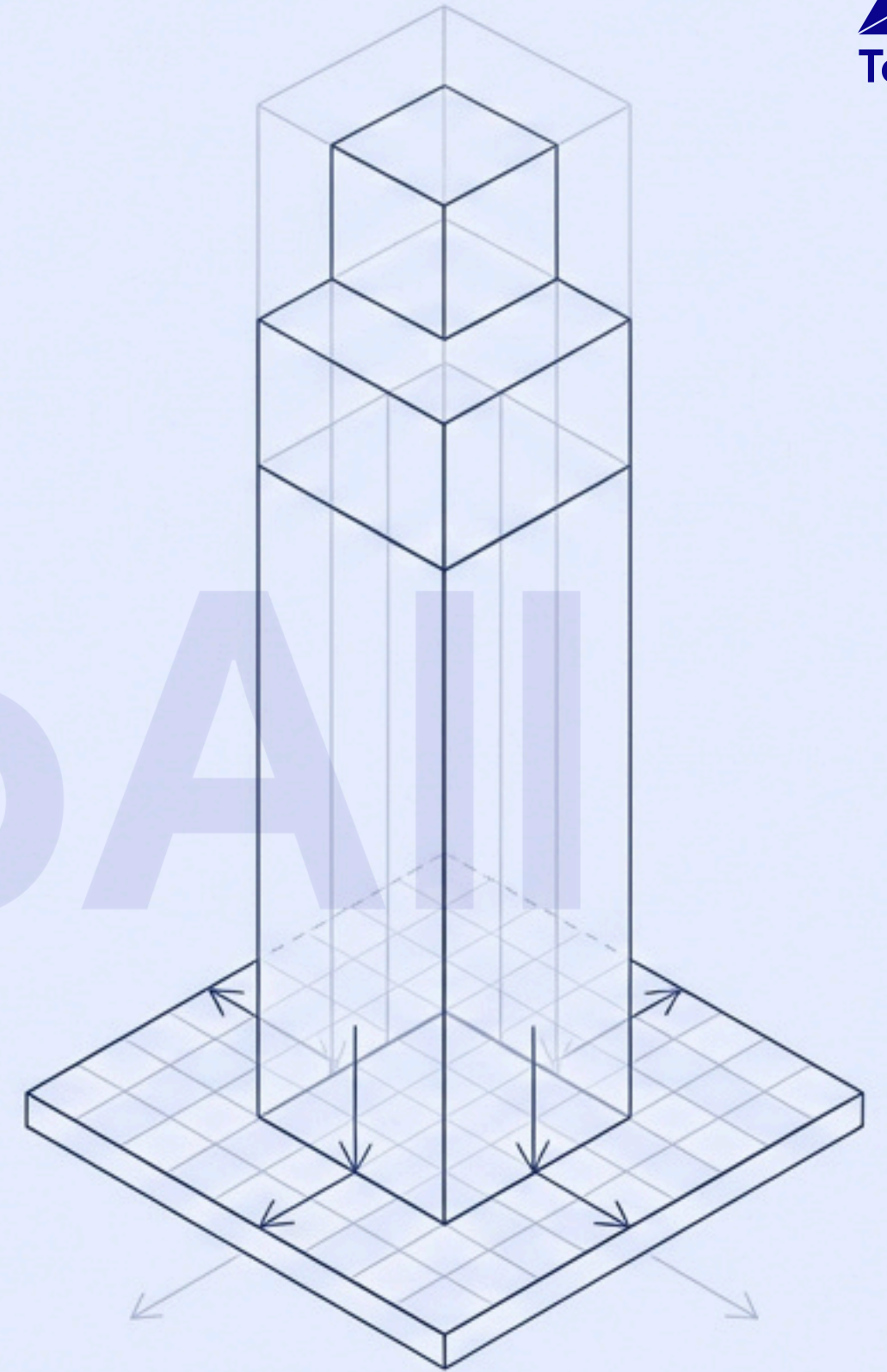


CLASS 11 PHYSICS • CHAPTER 9.2.3

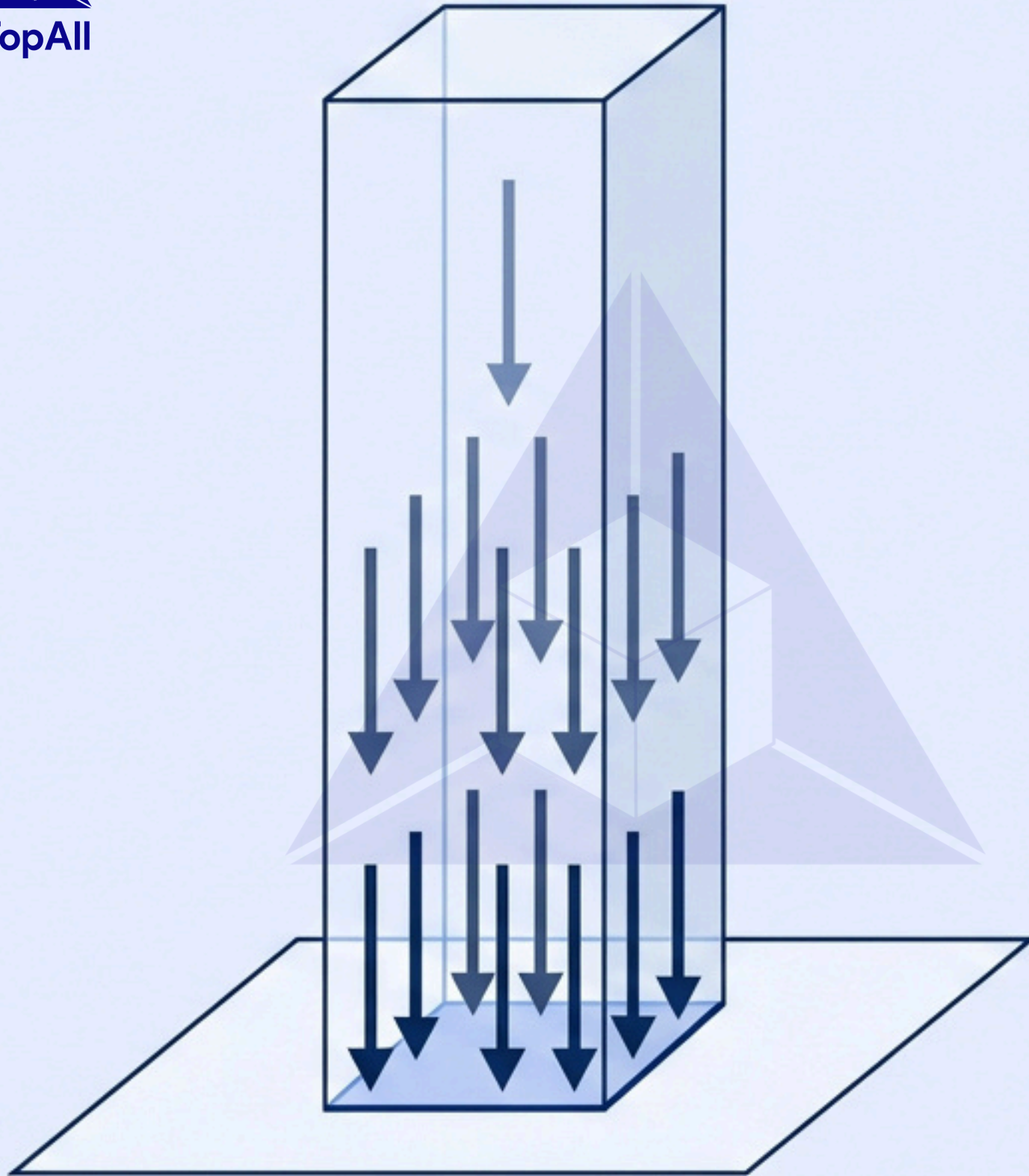
Atmospheric Pressure & Gauge Pressure

Understanding fluid pressure
measurement for NEET/JEE.

MECHANICAL PROPERTIES OF FLUIDS



Top of the atmosphere



Sea Level

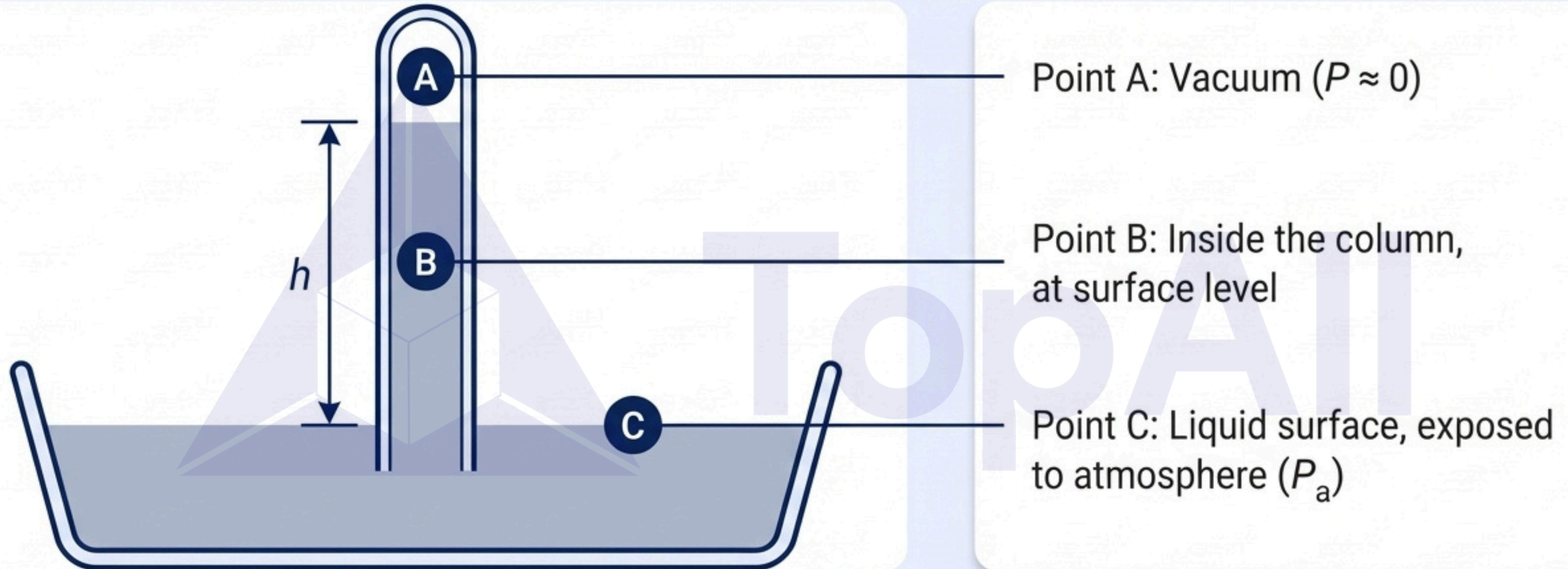
CORE CONCEPT

Defining Atmospheric Pressure (P_a)

- The pressure at any point is equal to the weight of a column of air of unit cross-sectional area extending to the top of the atmosphere.
- At sea level, the standard atmospheric pressure is strictly defined.

$$1 \text{ atm} = 1.013 \times 10^5 \text{ Pa}$$

Measuring the Atmosphere



Because the fluid is at rest, the pressure inside the column at Point B equals the pressure at Point C.



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The Barometer Equation

Eq. 9.8


$$P_a = \rho g h$$

ρ = Density of mercury

g = Acceleration due to gravity

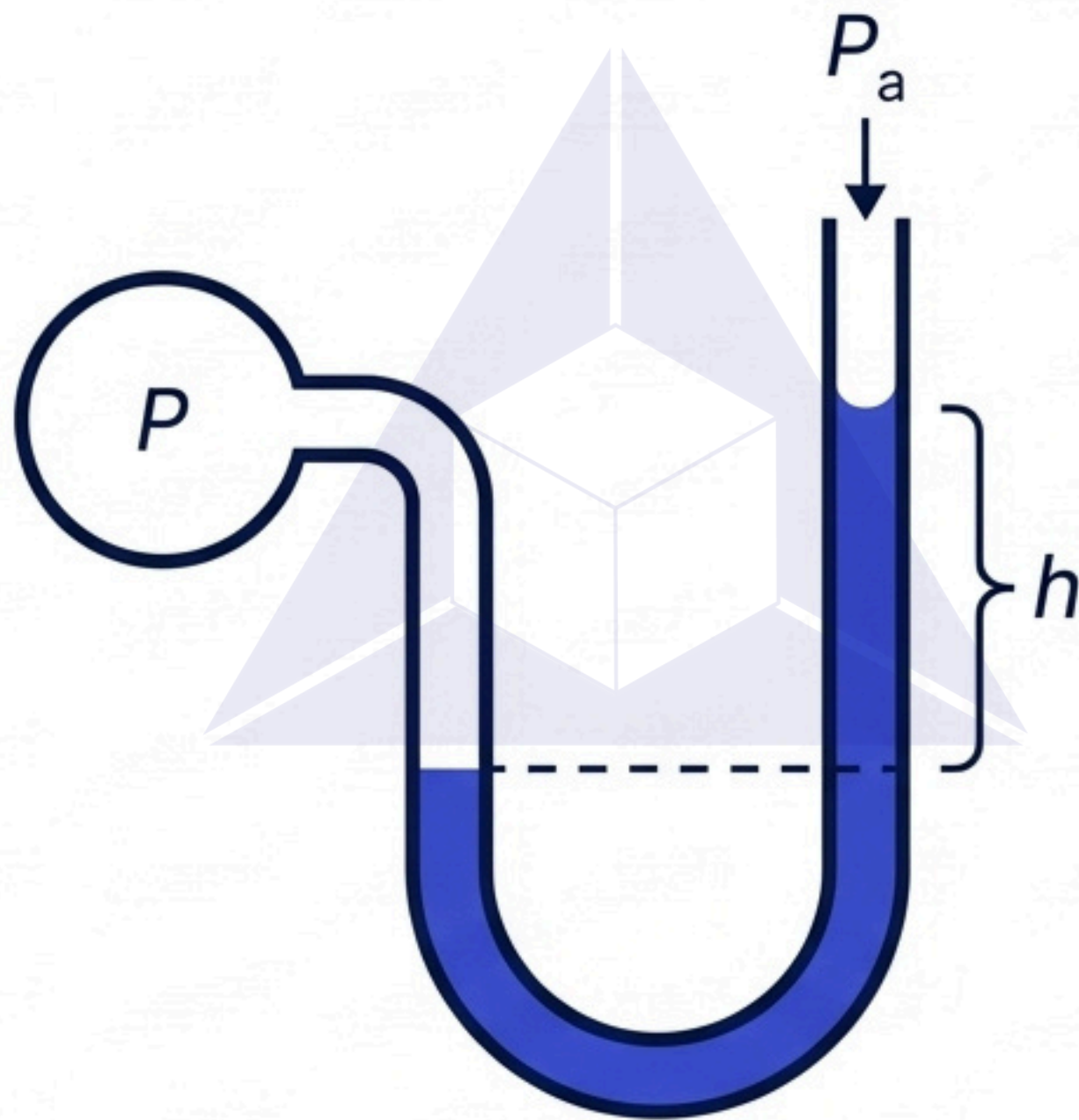
h = Height of mercury column (~76 cm at sea level)

EXAM TIP

Commonly used units in medicine/meteorology:

- 1 torr = 1 mm of Hg = 133 Pa
- 1 bar = 10^5 Pa

Measuring System Pressure



- A U-tube containing a suitable liquid (oil for small differences, mercury for large).
- One end is open to the atmosphere (P_a); the other connects to the system (P).
- The height difference (h) between the two arms is proportional to the pressure difference.

Measures the difference: $P - P_a = \rho g h$

Understanding Pressure Types

Absolute Pressure (P)

- The actual, total pressure at a given point in a fluid.
- Always positive; zero only in a perfect vacuum.

Gauge Pressure (P_g)

- The excess pressure above atmospheric pressure.
- What most instruments (like a manometer or tire gauge) actually measure.
- $P_g = \rho g h$

$$\text{Absolute Pressure (P)} = \text{Atmospheric Pressure (P}_a\text{)} + \text{Gauge Pressure (P}_g\text{)}$$

Key Takeaways

- ✓ • Atmospheric pressure (P_a) at sea level is 1.013×10^5 Pa.
- ✓ • Torricelli's Barometer measures P_a using a mercury column ($P_a = \rho g h$).
- ✓ • An Open-Tube Manometer measures gauge pressure (P_g).
- ✓ • Remember: Absolute Pressure = Atmospheric Pressure + Gauge Pressure.

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