

VITEEE MASTER SERIES

The Ultimate Formula Companion

A highly curated, creative formula blueprint engineered for ultra-fast concept tracking, high-yield retrieval, and strategic last-minute score optimization.

Cross-Disciplinary Blueprint

Integrated formula mappings for Mathematics, Physics, and Physical Chemistry.

VITEEE Specific Highlights

High-frequency question patterns and edge cases pinpointed dynamically.

Clean Logic Triggers

Formatted with structural emphasis to aid visual memory encoding under exam pressure.

CORE ALGEBRA & CALCULUS BLUEPRINTS

Matrices & Determinants

Concept / Property

Formula Mapping

Adjoint Properties

$$A \cdot \text{adj}(A) = |A| \cdot I_n$$

Determinant of Adjoint

$$|\text{adj}(A)| = |A|^{n-1} \quad | \text{adj}(\text{adj}(A)) | = |A|^{(n-1)^2}$$

Inverse Conditions

$$A^{-1} = (1 / |A|) \cdot \text{adj}(A), \text{ where } |A| \neq 0$$

Symmetric & Skew

Symmetric: $A^T = A$ • Skew-Symmetric: $A^T = -A$ (Diag elements = 0)

HIGH-YIELD TREND

If A is a skew-symmetric matrix of **odd order**, then $|A| = 0$. This property frequently shortcuts multi-step evaluation questions.

Limits, Continuity & Differentiation

Theorem / Standard Limit

Formula Mapping

Trigonometric Limits

$$\lim_{x \rightarrow 0} (\sin x / x) = 1 \quad | \quad \lim_{x \rightarrow 0} (\tan x / x) = 1$$

Exponential Limits

$$\lim_{x \rightarrow 0} (e^x - 1)/x = 1 \quad | \quad \lim_{x \rightarrow 0} (a^x - 1)/x = \ln a$$

1^∞ Indeterminate Form

If $\lim f(x) = 1$ and $\lim g(x) = \infty$, then $\lim [f(x)]^{g(x)} = e^{\lim [f(x)-1]g(x)}$

Leibniz Integral Rule

$$d/dx \left[\int_{\psi(x)}^{\phi(x)} f(t) dt \right] = f(\phi(x)) \cdot \phi'(x) - f(\psi(x)) \cdot \psi'(x)$$

Integral Calculus Applications

Standard Forms

Formula Mapping

Algebraic Inverses

$$\int dx / (x^2 - a^2) = (1/2a) \ln |(x-a)/(x+a)| + C$$

Radical Algebraic

$$\int dx / \sqrt{(a^2 - x^2)} = \sin^{-1}(x/a) + C$$

Definite Integral Property

$$\int_a^b f(x) dx = \int_a^b f(a + b - x) dx \text{ (King's Property)}$$

Vector Algebra & 3D Geometry

Operation

Formula Mapping

Scalar Triple Product

$$[\mathbf{a} \ \mathbf{b} \ \mathbf{c}] = \mathbf{a} \cdot (\mathbf{b} \times \mathbf{c}) = \text{Determinant of component vectors.}$$

Shortest Distance (Lines)

$$d = |(\mathbf{a}^2 - \mathbf{a}^1) \cdot (\mathbf{b}^1 \times \mathbf{b}^2)| / |\mathbf{b}^1 \times \mathbf{b}^2|$$

Coplanarity Condition

Three vectors are coplanar if $[\mathbf{a} \ \mathbf{b} \ \mathbf{c}] = 0$

ELECTRODYNAMICS, MECHANICS & MODERN PHYSICS

Electrostatics & Capacitance

Concept Parameters

Formula Mapping

Coulomb's Law

$$F = (1 / 4\pi\epsilon_0) \cdot (q_1 q_2 / r^2)$$

Electric Field (Dipole)

$$\text{Axial: } E = 2kp / r^3 \quad | \quad \text{Equatorial: } E = kp / r^3 \quad (r \gg a)$$

Potential Energy

$$U = qV = (1 / 4\pi\epsilon_0) \cdot (q_1 q_2 / r)$$

Capacitor Media Shift

$$C = K \cdot C_0 = K \cdot (\epsilon_0 A / d)$$

CRITICAL CONCEPT TRIGGER

When a dielectric slab is inserted with the ****battery disconnected****: Charge **Q** stays constant, Potential **V** drops by **1/K**, Field **E** drops by **1/K**, Energy **U** drops by **1/K**.

Current Electricity & Magnetism

Law / Phenomenon

Formula Mapping

Drift Velocity Link

$$I = n e A v_d \quad | \quad v_d = (e E / m) \cdot \tau$$

Biot-Savart Law

$$dB = (\mu_0 / 4\pi) \cdot (I dl \sin\theta / r^2)$$

Loop Magnetic Field

$$\text{Center of circular coil: } B = \mu_0 N I / 2R$$

Ampere's Law

$$\oint B \cdot dl = \mu_0 I_{\text{enclosed}}$$

Modern Physics & Quantum Triggers

| Phenomenon | Formula Mapping |
|------------------------|--|
| Photoelectric Equation | $E = h\nu = \phi + K.E._{max} \mid h\nu = h\nu_0 + eV_0$ |
| De Broglie Wavelength | $\lambda = h / p = h / \sqrt{(2m K.E.)}$ |
| Radioactive Decay | $N(t) = N_0 e^{-\lambda t} \mid T_{1/2} = 0.693 / \lambda$ |
| Bohr Atom Radius | $r_n \propto n^2 / Z \mid r_n = 0.529 \cdot (n^2 / Z) \text{ \AA}$ |

PHYSICAL & SYSTEMATIC CHEMISTRY KINETICS

Chemical Kinetics & Rate Constants

Order Matrix

Formula Mapping

Zero-Order Equation

$$[A]_t = -kt + [A]_0 \quad | \quad t_{1/2} = [A]_0 / 2k$$

First-Order Equation

$$k = (2.303 / t) \log ([A]_0 / [A]_t) \quad | \quad t_{1/2} = 0.693 / k$$

Arrhenius Energy Equation

$$k = A e^{-E_a / RT} \quad | \quad \log(k_2 / k_1) = (E_a / 2.303R) [1/T_1 - 1/T_2]$$

Electrochemistry Dynamics

Property Metric

Formula Mapping

Nernst Cell Equation

$$E_{cell} = E^{\circ}_{cell} - (0.0591 / n) \log Q \quad (\text{at } T = 298 \text{ K})$$

Gibbs Free Energy Link

$$\Delta G^{\circ} = -n F E^{\circ}_{cell} \quad | \quad \Delta G^{\circ} = -2.303 R T \log K_{eq}$$

Molar Conductivity

$$\Lambda_m = (\kappa \times 1000) / \text{Molarity}$$

HIGH-YIELD TREND MATRIX

Kohlrausch's Law: At infinite dilution, molar conductivity of an electrolyte can be expressed as the sum of the individual contributions of its anions and cations: $\Lambda_m^{\circ} = \nu_+ \Lambda_+^{\circ} + \nu_- \Lambda_-^{\circ}$.

Liquid Solutions & Colligative Trends

| Colligative Property | Formula Mapping |
|--------------------------|---|
| Raoult's Law (RLVP) | $(P^\circ - P_s) / P^\circ = i \cdot X_{\text{solute}}$ |
| Boiling Elevation | $\Delta T_b = i \cdot K_b \cdot m$ (where m = molality) |
| Freezing Depression | $\Delta T_f = i \cdot K_f \cdot m$ |
| Osmotic Pressure Balance | $\pi = i \cdot C R T$ |