11th & 12th Maharashtra Board – Short Notes PDF (Physics, Chemistry, Biology, Maths)

⭐PHYSICS – SHORT NOTES

Units & Measurement

- SI Units: metre (m), kg, second (s), ampere (A), kelvin (K)
- Derived units: velocity (m/s), force (N), energy (J)
- Errors: systematic, random

Kinematics

- v = u + at
- s = ut + 1/2 at^2
- v^2 = u^2 + 2as
- Speed = distance/time, Velocity = displacement/time

Laws of Motion

- 1st: Inertia
- 2nd: F = ma
- 3rd: Action = -Reaction
- Friction opposes motion

Work, Energy & Power

- Work = F × s
- KE = 1/2 mv^2, PE = mgh
- Power = Work/Time

Gravitation

- F = G(m1m2/r^2)
- g = 9.8 m/s^2
- Weight = mg

Waves

- v = f × λ
- Transverse & Longitudinal waves

Light (Optics)

- Reflection: i = r
- Refraction: n = sin i / sin r
- Lens & Mirror formula: 1/f = 1/v + 1/u

Electricity

- Ohm's Law: V = IR
- Series: R = R1 + R2, Parallel: 1/R = 1/R1 + 1/R2
- Power = VI

Magnetism

- Like poles repel, unlike attract
- Right-hand rule for current & field

Modern Physics

- Photoelectric effect, E = mc^2

⭐CHEMISTRY – SHORT NOTES

Atomic Structure

- Atom = Proton (+), Neutron (0), Electron (-)
- Atomic number (Z) = protons
- Mass number (A) = p + n
- Isotopes, Orbitals: s, p, d, f

Periodic Table

- Groups (vertical), Periods (horizontal)
- Trends: Atomic size ↓ across period, ↑ down group
- Electronegativity ↑ across period, max F

Chemical Bonding

- Ionic: transfer electrons
- Covalent: share electrons
- Metallic: free electrons
- VSEPR shapes: Linear-180°, Trigonal-120°, Tetrahedral-109.5°

States of Matter

- Solid, Liquid, Gas
- Gas Laws: Boyle's, Charles', Avogadro

Chemical Reactions

- Combination, Decomposition, Displacement, Redox

Acids, Bases & Salts

- pH<7: Acid, pH>7: Base, pH=7: Neutral

• Strong acids: HCl, H2SO4; Strong bases: NaOH, KOH

Mole Concept

• 1 mole = 6.022×10^23
• Moles = Mass/Molar mass
• Gas at STP: 22.4 L/mol

Organic Chemistry Basics

• Hydrocarbons: Alkane CnH2n+2, Alkene CnH2n, Alkyne CnH2n-2
• Functional groups: Alcohol -OH, Aldehyde -CHO, Ketone -CO-, Carboxylic acid -COOH

Thermodynamics

• ΔH = Heat change, Exothermic (-), Endothermic (+)

⭐BIOLOGY – SHORT NOTES

Cell Structure & Function

• Prokaryotic: No nucleus, Eukaryotic: Nucleus present
• Organelles: Nucleus, Mitochondria, Ribosome, Golgi, Lysosome, Chloroplast

Cell Division

• Mitosis: 2 identical cells
• Meiosis: 4 gametes

Plant Physiology

• Photosynthesis: CO2 + H2O → Glucose + O2
• Transpiration: water loss via stomata

Human Physiology

• Digestive system: Mouth → Stomach → Small Intestine
• Respiratory system: Alveoli, Hemoglobin
• Circulatory system: 4-chamber heart, RBC, WBC, Platelets
• Excretory system: Kidney → Nephron

Genetics

• DNA = Genetic material, Gene = unit of heredity
• Chromosomes = DNA + proteins
• Mendel’s laws: Dominance, Segregation, Independent assortment

Reproduction

- Asexual: Binary fission, budding
- Sexual: Gamete fusion → Zygote

Evolution & Ecology

- Natural selection (Darwin)
- Food chain: Producer → Consumer → Decomposer
- Ecosystem: Biotic + Abiotic

Microorganisms

- Bacteria: Helpful & harmful
- Viruses: Need host
- Fungi: Decomposers

Plant & Animal Tissues

- Plant: Meristematic, Permanent
- Animal: Epithelial, Connective, Muscular, Nervous

⭐MATHS – SHORT NOTES

Algebra

- Identities: (a+b)^2, (a-b)^2, a^2-b^2, (a+b+c)^2

Trigonometry

- Ratios: sinθ = perp/hyp, cosθ = base/hyp, tanθ = sinθ/cosθ
- Identities: sin^2θ + cos^2θ =1, 1+tan^2θ=sec^2θ
- Values: sin0°=0, sin30°=1/2, sin45°=√2/2, sin60°=√3/2, sin90°=1

Coordinate Geometry

- Distance: √[(x2−x1)^2 + (y2−y1)^2]
- Midpoint: ((x1+x2)/2 , (y1+y2)/2)
- Slope: (y2−y1)/(x2−x1)
- Line: y = mx + c

Calculus

- Derivatives: d/dx(x^n)=nx^(n-1), d/dx(sin x)=cos x, d/dx(cos x)=−sin x
- Integration: ∫ x^n dx = x^(n+1)/(n+1), ∫ e^x dx = e^x + C

Sets & Relations

- $A \subset B$, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Probability

- P = favorable/total, P(A') = 1-P(A)

Vectors

- |a| = √(a1^2 + a2^2 + a3^2)
- Dot: $a \cdot b = |a||b|\cos\theta$, Cross: $|a \times b| = |a||b|\sin\theta$

Matrices & Determinants

- Matrix addition: element-wise, Multiplication: row × column
- 2×2 determinant: |a b| |c d| = ad-bc

Statistics

- Mean = Σx/n, Median = middle, Mode = most repeated

Note: This PDF contains **short, exam-oriented, high-yield notes** for Class 11 & 12 Maharashtra Board Science + Maths.