



## NSEJS 2023

### Question-wise Chapter & Concept Analysis

STUDENT GUIDE FOR CLASSES 7, 8 AND 9

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**BIOLOGY**

**20 questions**

**CHEMISTRY**

**20 questions**

**PHYSICS**

**20 questions**

**60 QUESTIONS | 120 MINUTES | 216 MARKS**

Chapter, main idea, concepts, skill and revision task for every question

**A learning map, not just a list of answers.**

Use each card to find the chapter behind the question and the next topic to revise.

Student name: \_\_\_\_\_

Class: \_\_\_\_\_ Date: \_\_\_\_\_

## How to use this analysis

Start with the chapter name, understand the central idea, revise the listed concepts and then return to the original question without looking at the answer.

### 1. Find the chapter

A difficult question becomes manageable when you know which lesson it belongs to.

### 2. Learn the bridge idea

Class 7 and 8 students can first study the basic idea before moving to the Olympiad-level detail.

### 3. Re-solve and record

Write the mistake in an error notebook and solve the question again after two or three days.

## Paper structure and skill balance

| Part            | Questions                            | How to attempt                                                                    |
|-----------------|--------------------------------------|-----------------------------------------------------------------------------------|
| Section A-1     | 1-48                                 | Only one option is correct. Use elimination only after the main concept is clear. |
| Section A-2     | 49-60                                | One or more options may be correct. Test (a), (b), (c) and (d) separately.        |
| Subject balance | 20 Biology, 20 Chemistry, 20 Physics | Preparation must be balanced; no subject can be ignored.                          |

### Important for younger students

You do not have to master every advanced term immediately. First learn the chapter, the basic definition and one simple example. Then return to the original question.

## BIOLOGY

Biology combines body systems, genetics, plant structure and physiology, applied zoology and multiple-correct reasoning. Learn each scientific term through a diagram or example.

### Q1 Human Circulation - Heart Valves

Recall + Anatomy

**What the question checks:** Identify the valve that allows blood to move from the left atrium to the left ventricle without flowing backwards.

**Concepts involved:** Four chambers of the heart; atrioventricular valves; mitral/bicuspid valve; unidirectional blood flow.

**What to revise:** Draw the four chambers and label the tricuspid, mitral, pulmonary and aortic valves.

### Q2 Neural Control - Reflex Arc

Concept + Sequence

**What the question checks:** Recognise the minimum chain of nerve cells involved in a common reflex response.

**Concepts involved:** Receptor; sensory neuron; interneuron; motor neuron; effector; spinal reflex.

**What to revise:** Trace one reflex, such as withdrawing a hand from a hot object, from stimulus to response.

### Q3 Biotechnology - Cybrids

Classification + Recall

**What the question checks:** Distinguish cytoplasmic hybrids from ordinary cross-bred animals and crop varieties.

**Concepts involved:** Somatic hybridisation; cytoplasmic hybrid or cybrid; protoplast fusion; Pomato and Bromato.

**What to revise:** Make a small chart comparing hybrid, somatic hybrid and cybrid.

### Q4 Animal Tissues - Pseudostratified Epithelium

Description + Application

**What the question checks:** Use the description of nuclei at different heights, cilia and goblet cells to identify where this epithelium occurs.

**Concepts involved:** Basement membrane; cilia; goblet cells; pseudostratified columnar epithelium; respiratory and reproductive passages.

**What to revise:** Compare simple, stratified and pseudostratified epithelia with one body location each.

### Q5 Genetics - Recessive Inheritance

Genetics + Probability

**What the question checks:** Infer the parents' genotypes from the first two children and then find the chance for the third child.

**Concepts involved:** Dominant and recessive alleles; homozygous and heterozygous; Punnett square; independent births.

**What to revise:** Practise  $Tt \times tt$  and explain why earlier births do not change the probability of the next birth.

**Q6 Chemical Coordination - Adrenal Gland**

Diagram + Hormones

**What the question checks:** Read a sectional diagram of the adrenal gland and connect cortical zones with steroid hormones.

**Concepts involved:** Adrenal cortex and medulla; zona fasciculata; zona reticularis; cortisol; corticosterone.

**What to revise:** Draw the gland as concentric layers and write one major hormone beside each region.

**Q7 Human Eye - Presbyopia**

Cause and Effect

**What the question checks:** Connect weakening ciliary muscles and loss of lens flexibility with an age-related vision defect.

**Concepts involved:** Accommodation; ciliary muscles; near point; presbyopia; myopia and hypermetropia.

**What to revise:** Make a table of common eye defects, cause and correcting lens.

**Q8 Applied Zoology - Stored-grain Pests**

Scientific-name Recall

**What the question checks:** Identify the Angoumois grain moth from its scientific genus.

**Concepts involved:** Stored grain protection; Sitotroga; insect pests of wheat and paddy; larval damage.

**What to revise:** Learn a short list of crop and stored-grain pests with the material they attack.

**Q9 Reproduction in Flowering Plants - Gamete Formation**

Numerical + Reproduction

**What the question checks:** Count the meiotic divisions needed to produce enough pollen grains and functional embryo sacs for 300 seeds.

**Concepts involved:** Microsporogenesis; megasporogenesis; four pollen grains per pollen mother cell; one functional megaspore per ovule.

**What to revise:** Revise the number of products formed by meiosis in anther and ovule, then practise counting problems.

**Q10 Plant Anatomy - Equisetum Stem**

Anatomy + Recall

**What the question checks:** Recall the plant whose stem contains both carinal and vallecular canals.

**Concepts involved:** Pteridophytes; Equisetum; vascular bundles; carinal canals; cortical vallecular canals.

**What to revise:** Compare the internal features of a fern, Equisetum and a flowering plant stem.

**Q11 Chromosomes - Satellite Chromosomes**

Genetics + Recall

**What the question checks:** Identify the human acrocentric chromosomes that carry satellites and nucleolar organiser regions.

**Concepts involved:** Secondary constriction; satellite; acrocentric chromosome; NOR; chromosomes 13, 14, 15, 21 and 22.

**What to revise:** Learn chromosome shapes and the meaning of primary and secondary constrictions.

**Q12 Plant Cell Wall - Bordered Pits**

Structure + Recall

**What the question checks:** Name the thick central part of a pit membrane formed by circular deposition of microfibrils.

**Concepts involved:** Secondary wall; pit membrane; torus; margo; movement of water through xylem.

**What to revise:** Draw a bordered pit pair and label torus, margo and pit aperture.

**Q13 Morphology of Flowering Plants - Inflorescence**

Diagram + Classification

**What the question checks:** Use a set of sketches to separate cymose inflorescences from racemose ones.

**Concepts involved:** Determinate and indeterminate growth; terminal flower; dichasial and monochasial cymes.

**What to revise:** Practise identifying inflorescences from diagrams rather than only names.

**Q14 Developmental Biology - Gene Classes**

Higher-order Recall

**What the question checks:** Decide which gene class is not placed with the main groups normally controlling mammalian embryonic development in the question.

**Concepts involved:** Hox genes; growth factors; proto-oncogenes; tumour suppressors; embryonic patterning.

**What to revise:** Understand the broad job of each gene class instead of memorising the option.

**Q15 Plant Physiology - CAM Pathway**

Concept + Ecology

**What the question checks:** Recognise night-time CO<sub>2</sub> fixation by PEP as an adaptation of succulent plants such as Aloe.

**Concepts involved:** CAM photosynthesis; stomatal opening at night; PEP carboxylase; oxaloacetate; water conservation.

**What to revise:** Compare C<sub>3</sub>, C<sub>4</sub> and CAM plants in a three-column table.

**Q16 Ecology - Hemiparasitic Plants**

Classification + Recall

**What the question checks:** Identify the common Indian mistletoe that photosynthesises but draws water and minerals from a host.

**Concepts involved:** Hemiparasite; epiphyte; haustorium; Dendrophthoe; complete parasites such as Cuscuta.

**What to revise:** Compare total parasites, partial parasites and epiphytes with examples.

**Q49 Animal Kingdom - Mammalian Orders**

Multiple Correct + Matching

**What the question checks:** Check each order-feature pair independently instead of looking for one overall pattern.

**Concepts involved:** Lagomorpha incisors; microchiropteran wing and tail; armadillo polyembryony; Proboscidea.

**What to revise:** Prepare a one-line diagnostic feature for important mammalian orders.

**Q50 History of Genetics and Pedigree Studies**

Multiple Correct + History

**What the question checks:** Recognise names used in historical heredity case studies while understanding that the old labels are now considered stigmatising.

**Concepts involved:** Zero family; Jukes; Kallikak; historical eugenics literature; responsible interpretation of old terminology.

**What to revise:** Learn the names only as historical references and do not treat the descriptions as modern scientific judgments.

**Q51 Plant Physiology - Root Gravitropism**

Multiple Correct +  
Mechanism

**What the question checks:** Evaluate several proposed parts of gravity sensing and bending in roots.

**Concepts involved:** Statoliths and amyloplasts; columella cells; PIN carriers; auxin redistribution; root cap.

**What to revise:** Sketch a horizontal root and show where gravity is sensed and how unequal growth produces curvature.

**Q52 Photosynthesis - Cyclic Photophosphorylation**

Multiple Correct +  
Comparison

**What the question checks:** Check which photosystem, products and electron path belong to cyclic photophosphorylation.

**Concepts involved:** Photosystem I; P700; cyclic electron flow; ATP production; no photolysis; no NADPH.

**What to revise:** Compare cyclic and non-cyclic photophosphorylation point by point.

## CHEMISTRY

Chemistry mixes conceptual periodic trends with calculations, organic structures and practical applications. Keep units and electron-pair reasoning visible at every step.

### Q17 Periodicity - Electron Gain Enthalpy

Concept + Periodicity

**What the question checks:** Separate an exothermic first electron addition from an endothermic second electron addition to an already negative ion.

**Concepts involved:** Electron affinity; electron-electron repulsion; formation of  $\text{Cl}^-$  and  $\text{O}_2^-$ ; successive electron gain enthalpy.

**What to revise:** Draw an energy arrow for the first and second electron additions to an atom.

### Q18 Chemical Kinetics - Isotope Effect

Concept + Bond Energy

**What the question checks:** Explain why hydrogen reacts faster than deuterium even though their chemistry is similar.

**Concepts involved:** Kinetic isotope effect; zero-point energy; H-H and D-D bond strength; activation energy.

**What to revise:** Connect stronger effective bond energy with a larger activation barrier.

### Q19 Isotopes - Water and Heavy Water

Comparison + Recall

**What the question checks:** Compare dielectric constant, refractive index and intermolecular association of  $\text{H}_2\text{O}$  and  $\text{D}_2\text{O}$ .

**Concepts involved:** Isotopic substitution; physical properties; hydrogen bonding; refractive index; dielectric constant.

**What to revise:** Make a short  $\text{H}_2\text{O}$ -versus- $\text{D}_2\text{O}$  comparison table.

### Q20 s-Block Chemistry - Potassium Superoxide

Application + Recall

**What the question checks:** Recognise the compound used in closed breathing systems because it removes  $\text{CO}_2$  and releases  $\text{O}_2$ .

**Concepts involved:**  $\text{KO}_2$ ; superoxide ion; air purification; breathing masks; submarines and spacecraft.

**What to revise:** Write the reaction showing simultaneous  $\text{CO}_2$  absorption and  $\text{O}_2$  generation.

### Q21 Chemical Bonding - Lewis Structure of $\text{I}_3^-$

Structure + Counting

**What the question checks:** Count all lone pairs after drawing the correct linear Lewis structure.

**Concepts involved:** Valence electrons; expanded octet; central and terminal iodine atoms; linear geometry; lone-pair counting.

**What to revise:** Always draw the complete Lewis structure before counting electron pairs.

**Q22 Periodic Table - Naturally Absent Elements**

Recall + Periodic Table

**What the question checks:** Recall the two elements below uranium that are not normally found as stable natural elements.

**Concepts involved:** Technetium  $Z=43$ ; promethium  $Z=61$ ; natural radioactivity; synthetic elements.

**What to revise:** Mark Tc and Pm on a periodic table and remember why gaps appeared historically.

**Q23 States of Matter - Extreme Temperatures**

Recall + Modern Science

**What the question checks:** Match very high temperature with plasma and near-absolute-zero conditions with a Bose-Einstein condensate.

**Concepts involved:** Ionised gas; plasma; bosons; Bose-Einstein condensate; absolute zero.

**What to revise:** Place solid, liquid, gas, plasma and BEC on a simple temperature-based concept map.

**Q24 Organic Chemistry - Acid Activation**

Structure + Mechanism

**What the question checks:** Read bond labels in a carboxylic-acid structure and identify the bond whose pi character changes first on protonation.

**Concepts involved:** Carbonyl oxygen; protonation by  $\text{H}_3\text{O}^+$ ;  $\text{C}=\text{O}$  pi bond; acid-catalysed mechanism.

**What to revise:** Practise following curved-arrow electron movement through the first step only.

**Q25 General Organic Chemistry - Lewis Basicity**

Structure + Ranking

**What the question checks:** Compare how freely the nitrogen lone pair is available in benzylamine, pyridine and pyrrole.

**Concepts involved:** Lone-pair availability; aromaticity; resonance; aliphatic amine; pyridine and pyrrole.

**What to revise:** Ask whether the lone pair is part of an aromatic sextet before ranking basicity.

**Q26 Hydrocarbons - Maximum Branching**

Combinatorial Reasoning

**What the question checks:** Find the greatest possible number of terminal methyl groups in an eleven-carbon alkane.

**Concepts involved:** Carbon skeleton as a tree; tetravalency; primary and quaternary carbons; highly branched isomers.

**What to revise:** Build carbon skeletons with sticks or dots and count terminal carbons.

**Q27 States of Matter - Ideal Gas Equation**

Numerical + Gas Laws

**What the question checks:** Use the mass of methane to find moles, then calculate the bursting temperature of a fixed-volume bulb.

**Concepts involved:**  $PV=nRT$ ; molar mass of methane; pressure-volume-temperature relation; kelvin scale.

**What to revise:** Write known values with units before substituting into the gas equation.



**Q28 Ionic Equilibrium - Very Dilute Acid**

Concept + pH

**What the question checks:** Understand why water autoionisation matters when HCl concentration is only  $10^{-8}$  M.

**Concepts involved:**  $K_w$ ; contribution of pure water; charge balance; pH slightly below 7.

**What to revise:** Do not use  $\text{pH} = -\log C$  blindly when acid concentration is close to  $10^{-7}$  M.

**Q29 Atomic Structure - Average Atomic Mass**

Numerical + Isotopes

**What the question checks:** Calculate a weighted mean from isotope masses and percentage abundances.

**Concepts involved:** Natural abundance; isotope mass; weighted average; relative atomic mass.

**What to revise:** Multiply each isotope mass by its decimal abundance and then add.

**Q30 Volumetric Analysis - Mixed Carbonates**

Multi-step Numerical

**What the question checks:** Use normality and equivalent mass to find the composition of a  $\text{Na}_2\text{CO}_3$ - $\text{K}_2\text{CO}_3$  mixture.

**Concepts involved:** Equivalents; normality; neutralisation; equivalent masses 53 and 69; simultaneous mass and equivalent equations.

**What to revise:** Set up one equation for total mass and one for total acid equivalents.

**Q31 Mole Concept - Carat to Atoms**

Numerical + Units

**What the question checks:** Convert carats to grams, grams to moles and moles to carbon atoms.

**Concepts involved:** Carat; molar mass of carbon; Avogadro number; scientific notation.

**What to revise:** Practise chained unit conversion and cancel units at each step.

**Q32 Surface Chemistry - Hard Water**

Application + Concept

**What the question checks:** Decide which cleansing agent still forms foam in water containing calcium and magnesium ions.

**Concepts involved:** Soap scum; insoluble calcium/magnesium salts; synthetic sulphonate detergents; hard water.

**What to revise:** Compare soaps and detergents by structure and behaviour in hard water.

**Q53 Atomic Models - Bohr Theory**

Multiple Correct + Theory

**What the question checks:** Judge each statement about stationary orbits, potential energy, quantisation and limitations of the model.

**Concepts involved:** Bohr postulates; energy levels; radiation; hydrogen spectrum; failure for multi-electron atoms.

**What to revise:** Write three successes and three limitations of the Bohr model.

**Q54 Periodicity - Ionisation Energy Anomalies**

Multiple Correct + Data

**What the question checks:** Check measured comparisons that do not all follow a simple down-the-group rule.

**Concepts involved:** Ag-Au; Pd-Pt; Sn-Pb; Sb-Bi; relativistic and shielding effects; exceptions to trends.

**What to revise:** Learn the trend first, then add a small list of important anomalies.

**Q55 Acid-Base Chemistry - Solvent System**

Multiple Correct + Advanced Concept

**What the question checks:** Decide whether a solute behaves as an acid or base in liquid ammonia or liquid hydrogen chloride.

**Concepts involved:** Solvent autoionisation; levelling effect; proton donation and acceptance; non-aqueous acid-base systems.

**What to revise:** For each solvent, identify its characteristic positive and negative ions before classifying the solute.

**Q56 Redox and Complex Formation - Polyiodide**

Multiple Correct + Interpretation

**What the question checks:** Interpret  $I^- + I_2 \rightarrow I_3^-$  using both formal oxidation-number bookkeeping and complex formation.

**Concepts involved:** Triiodide/polyiodide ion; charge-transfer complex; formal oxidation and reduction; no acid-base step.

**What to revise:** Distinguish a real electron-transfer reaction from formal oxidation-state bookkeeping.

## PHYSICS

Physics is strongly application-based. Draw the situation, choose the governing law, check units and interpret graphs or circuit nodes before calculating.

### Q33 Work and Energy - Equal Kinetic Energy

Concept + Ratio

**What the question checks:** Compare speed and momentum of two masses when their kinetic energies are equal.

**Concepts involved:**  $K = mv^2/2$ ;  $K = p^2/2m$ ; inverse square-root speed relation; square-root momentum relation.

**What to revise:** Derive both ratios before judging the two statements.

### Q34 Current Electricity - Wire Dimensions

Multi-step Numerical

**What the question checks:** Eliminate cross-sectional area by combining resistance and mass relations for the same wire.

**Concepts involved:**  $R = \rho L/A$ ; mass = density  $\times A \times L$ ; resistivity; density; dimensional consistency.

**What to revise:** Practise combining two equations to remove an unknown quantity.

### Q35 Sound - Temperature Dependence

Numerical + Proportion

**What the question checks:** Find the air temperature from the change in speed of sound.

**Concepts involved:**  $v$  proportional to  $\sqrt{T}$ ; absolute temperature; Celsius-Kelvin conversion; ratio method.

**What to revise:** Always convert temperature to kelvin before using a square-root law.

### Q36 Electromagnetic Induction - Lenz Law

Concept + Application

**What the question checks:** Explain why a magnet falling through a conducting ring has an acceleration below  $g$  that changes with time.

**Concepts involved:** Changing magnetic flux; induced current; opposing magnetic force; magnetic braking; non-uniform motion.

**What to revise:** Use Lenz law as "the induced effect opposes the change that produces it."

### Q37 Fluids - U-tube Manometer

Diagram + Numerical

**What the question checks:** Balance water and mercury pressures at the same horizontal level.

**Concepts involved:** Hydrostatic pressure  $\rho gh$ ; relative density; pressure equality; U-tube.

**What to revise:** Draw a horizontal reference line through the two liquids before writing the equation.

**Q38 Ray Optics - Newton Lens Formula**

Numerical + Optics

**What the question checks:** Use distances measured from the two focal points to find focal length.

**Concepts involved:** Object and image distances from foci;  $xx' = f^2$ ; convex lens; real image.

**What to revise:** Learn when Newton's form is faster than the ordinary lens formula.

**Q39 Momentum and Energy - Ballistic Pendulum**

Two-stage Numerical

**What the question checks:** Use momentum conservation during impact and mechanical energy during the later rise.

**Concepts involved:** Perfectly inelastic collision; conservation of momentum;  $mgh$ ; two-stage reasoning.

**What to revise:** Separate the short collision from the slower swing; a different law applies in each stage.

**Q40 Current Electricity - Resistor Network**

Circuit + Reasoning

**What the question checks:** Notice equipotential nodes made by plain wires, then reduce three parallel branches.

**Concepts involved:** Node identification; short-circuit connections; series and parallel resistance; equivalent resistance.

**What to revise:** Mark all points joined by ideal wire with the same letter before simplifying.

**Q41 Pressure - Order of Magnitude**

Estimation + Units

**What the question checks:** Estimate the pressure exerted by a standing adult using a sensible weight and foot-contact area.

**Concepts involved:**  $\text{Pressure} = \text{force}/\text{area}$ ; estimation; powers of ten; SI unit pascal.

**What to revise:** Practise deciding the correct order of magnitude before doing exact arithmetic.

**Q42 Current Electricity - Bulbs and Fuse**

Circuit + Application

**What the question checks:** See through the cross-connections to recognise that three rated bulbs are in parallel.

**Concepts involved:** Power rating;  $I = P/V$ ; parallel circuit; total current; fuse rating.

**What to revise:** Redraw the circuit using only nodes A and B, then add branch currents.

**Q43 Ray Optics - Convex Mirror**

Concept + Image Motion

**What the question checks:** Predict how object-image separation changes as an object approaches the mirror.

**Concepts involved:** Virtual image; convex mirror formula; object and image distance; qualitative graph.

**What to revise:** Calculate two trial positions to check the direction of change.

**Q44 Current Electricity - Series-Parallel Possibilities**

Reasoning + Enumeration

**What the question checks:** Test all distinct series-parallel arrangements of 2, 4 and 6 ohm resistors.

**Concepts involved:** Series sum; parallel reciprocal; systematic enumeration; impossible equivalent resistance.

**What to revise:** List arrangements in families instead of trying them randomly.

**Q45 Work, Energy and Friction**

Numerical + Energy

**What the question checks:** Use the fall in gravitational potential energy and the track length to find average friction.

**Concepts involved:** Work-energy theorem; potential energy; dissipative work; average force.

**What to revise:** Start with initial and final mechanical energy, then assign the difference to friction.

**Q46 Magnetism - Parallel Currents**

Concept + Magnetism

**What the question checks:** Separate electric neutrality of wires from the magnetic attraction of currents in the same direction.

**Concepts involved:** Current-carrying neutral conductor; magnetic force; right-hand rule; same-direction currents attract.

**What to revise:** Compare electrostatic and magnetic interactions as two different effects.

**Q47 Heat and Temperature - Kelvin Scale**

Basic Numerical

**What the question checks:** Convert a clinical Celsius temperature to the absolute scale.

**Concepts involved:**  $T(K) = t(\text{degree C}) + 273.15$ ; absolute zero; significant figures.

**What to revise:** Remember the exact offset 273.15 for precise conversion.

**Q48 Gravitation - Orbital Speed**

Formula + Ratio

**What the question checks:** Use the inverse square-root dependence of circular-orbit speed on orbital radius.

**Concepts involved:**  $v = \sqrt{GM/r}$ ; same central mass; proportional reasoning; powers of ten.

**What to revise:** Form the ratio before substituting large numbers.

**Q57 Work, Power and Efficiency - Cranes**

Multiple Correct + Application

**What the question checks:** Compare two cranes lifting the same load through the same height in different times.

**Concepts involved:** Same useful work  $mgh$ ; power = work/time; efficiency; input energy and fuel.

**What to revise:** Keep work, power and energy separate: same work does not mean same power.

**Q58** Current Electricity - Bulbs in Series

Multiple Correct + Circuit

**What the question checks:** Evaluate brightness, power and fusing while remembering that tungsten resistance changes with temperature.

**Concepts involved:** Rated resistance  $V^2/P$ ; series current; brightness; cold versus hot filament resistance; open circuit after fusing.

**What to revise:** First solve with rated resistance, then correct the physical conclusion for temperature dependence.

**Q59** Fluids - Floating Bodies

Multiple Correct + Numerical

**What the question checks:** Use submerged fractions in water and oil to determine densities, mass and buoyant force.

**Concepts involved:** Archimedes principle; floating equilibrium; density ratio; sphere volume; apparent loss of weight.

**What to revise:** For every floating object, begin with buoyant force=weight.

**Q60** Kinematics - Velocity-Time Graph

Multiple Correct + Graph

**What the question checks:** Use slope and signed area to test acceleration, displacement, distance, average speed and retardation.

**Concepts involved:** Slope of v-t graph; positive and negative areas; displacement versus distance; average speed.

**What to revise:** Divide the graph into triangles and rectangles and keep negative area separate.

## Chapter clusters and preparation priority

| Subject          | Major cluster                                | Questions                  | Preparation message                                                     |
|------------------|----------------------------------------------|----------------------------|-------------------------------------------------------------------------|
| <b>Biology</b>   | Human physiology                             | 1, 2, 6, 7                 | Learn labelled structures together with their functions.                |
|                  | Genetics, biotechnology and development      | 3, 5, 11, 14, 50           | Use Punnett squares, definitions and careful historical context.        |
|                  | Plant structure, reproduction and physiology | 9, 10, 12, 13, 15, 51, 52  | Diagrams and process sequences are especially important.                |
|                  | Ecology and applied biology                  | 8, 16                      | Connect textbook science with agriculture and the environment.          |
|                  | Animal tissues and diversity                 | 4, 49                      | Diagnostic features must be compared precisely.                         |
| <b>Chemistry</b> | Atomic structure and periodicity             | 17, 21, 22, 29, 31, 53, 54 | Understand trends, then learn key exceptions and applications.          |
|                  | Physical chemistry and calculations          | 18, 19, 23, 27, 28, 30     | Units, powers of ten and stepwise equations decide accuracy.            |
|                  | Organic structure and reaction reasoning     | 24, 25, 26                 | Use structures, lone pairs and bond stability rather than memory alone. |
|                  | Inorganic, surface and acid-base chemistry   | 20, 32, 55, 56             | Focus on applications and exact definitions.                            |
| <b>Physics</b>   | Mechanics, work and gravitation              | 33, 39, 41, 45, 48, 57, 60 | Choose the correct law and represent information with ratios or graphs. |
|                  | Electricity and magnetism                    | 34, 36, 40, 42, 44, 46, 58 | Redraw circuits and mark nodes before calculating.                      |
|                  | Ray optics                                   | 38, 43                     | Visualise object and image positions before using formulae.             |
|                  | Fluids                                       | 37, 59                     | Pressure equality and Archimedes principle are the core ideas.          |
|                  | Sound and temperature                        | 35, 47                     | Use absolute temperature and maintain correct units.                    |

## Preparation roadmap for Classes 7, 8 and 9

### CLASS 7 - BUILD THE LANGUAGE

- Learn scientific words, units and labelled diagrams.
- Strengthen fractions, ratios and powers of ten.
- Cover cells, plants, body systems, force, heat and light.
- Solve short, direct questions before advanced ones.

### CLASS 8 - CONNECT IDEAS

- Compare organisms, materials and processes.
- Use equations for density, speed, pressure and electricity.
- Begin atoms, molecules and simple chemical calculations.
- Practise one diagram and one numerical every day.

### CLASS 9 - BUILD THE NSEJS BRIDGE

- Master Class 9 motion, force, work-energy, atoms, tissues and diversity.
- Add mole concept, bonding, genetics, fluids, optics and magnetism.
- Practise multiple-correct questions statement by statement.
- Take mixed timed tests and maintain an error notebook.

### A useful weekly routine

| Day       | Task                                            | Time      |
|-----------|-------------------------------------------------|-----------|
| Monday    | Read one chapter and make a one-page summary.   | 45-60 min |
| Tuesday   | Solve 10 basic questions from the same chapter. | 45 min    |
| Wednesday | Practise diagrams, graphs and scientific terms. | 30-45 min |
| Thursday  | Solve 5 Olympiad bridge questions.              | 45-60 min |
| Friday    | Review mistakes and solve again without help.   | 30 min    |
| Saturday  | Take a mixed science quiz.                      | 60 min    |
| Sunday    | Revise and update the chapter checklist.        | 30 min    |



## My NSEJS 2023 chapter checklist

Tick a box only when you can explain the topic in your own words and solve at least five questions without help.

| Done                     | Biology                         | Done                     | Chemistry                             | Done                     | Physics                         |
|--------------------------|---------------------------------|--------------------------|---------------------------------------|--------------------------|---------------------------------|
| <input type="checkbox"/> | Heart valves and reflex arc     | <input type="checkbox"/> | Electron affinity and isotope effects | <input type="checkbox"/> | Equal kinetic energy ratios     |
| <input type="checkbox"/> | Genetics and Punnett squares    | <input type="checkbox"/> | Lewis structures and lone pairs       | <input type="checkbox"/> | Wire resistance and resistivity |
| <input type="checkbox"/> | Adrenal gland and hormones      | <input type="checkbox"/> | Extreme states of matter              | <input type="checkbox"/> | Sound and temperature           |
| <input type="checkbox"/> | Plant reproduction and meiosis  | <input type="checkbox"/> | Organic basicity and branching        | <input type="checkbox"/> | Lenz law and magnetic braking   |
| <input type="checkbox"/> | Plant anatomy and inflorescence | <input type="checkbox"/> | Gas laws and pH                       | <input type="checkbox"/> | U-tube and floating bodies      |
| <input type="checkbox"/> | CAM and gravitropism            | <input type="checkbox"/> | Isotopes and weighted average         | <input type="checkbox"/> | Lens and mirror image motion    |
| <input type="checkbox"/> | Photosynthesis light reactions  | <input type="checkbox"/> | Normality and equivalent mass         | <input type="checkbox"/> | Momentum and ballistic pendulum |
| <input type="checkbox"/> | Mammalian orders                | <input type="checkbox"/> | Soap, detergent and hard water        | <input type="checkbox"/> | Resistor networks and bulbs     |
| <input type="checkbox"/> | Parasitic plants                | <input type="checkbox"/> | Bohr model and ionisation trends      | <input type="checkbox"/> | Work, energy and efficiency     |
| <input type="checkbox"/> | Historical genetics context     | <input type="checkbox"/> | Non-aqueous acids and polyiodides     | <input type="checkbox"/> | Velocity-time graphs            |

## Question review sheet

| Question | My mistake | Chapter to revise | Date solved again |
|----------|------------|-------------------|-------------------|
|          |            |                   |                   |
|          |            |                   |                   |
|          |            |                   |                   |
|          |            |                   |                   |

Chapter names and difficulty guidance in this booklet are Mathiit study classifications, not official examination labels.