

## Topics for Homi Bhabha Junior Scientist Exam (Class 6)

#	Physics Topics	Chemistry Topics	Biology Topics
1	Measurements	Composition of substances	Classification of Plants
2	Types of Motion	Methods of separation	Classification of Animals
3	Force and Pressure	Types of changes	Food
4	Work and Power	Man-made materials	Diseases
5	Energy	Acids, bases and salts	Human Body
6	Light	Metals and non-metals	Micro-organisms
7	Heat	General chemistry	Summary charts and diagrams
8	Sound	Air, water and soil	
9	Magnetism		
10	Electricity		
11	Machines		
12	Universe		

## Syllabus for IPM Mathemagic Exam (Class 2-4)

#	IPM Class 2	IPM Class 3	IPM Class 4
1	Numbers	Numbers	Kinds of numbers
2	Addition & Subtraction	Roman Numerals	Place value of digits
3	Multiplication	Addition & Subtraction	Comparison of numbers
4	Fractions	Multiplication	Sequence & Series
5	Money	Division	Magic Square
6	Time & Calendar	Length	Roman Numerals
7	Shapes	Mass	BODMAS
8	Measurements	Capacity	Simple Equations
9	Data Handling	Money	Algebraic Expressions
10	Analytical Thinking	Time	Divisibility Test
11		Calendar	LCM and HCF
12		Fractions	Common & Decimal fractions
13		Pictorial representations	Decimal units of measurement
14		Introduction to geometry (angles, triangles, circle)	Time, Calendar and other units
15			Angles
16			Triangle
17			Quadrilaterals
18			Circle

## Syllabus for IPM Mathemagic Exam (Class 5-7)

#	IPM Class 5	IPM Class 6	IPM Class 7
1	Numbers	Integers	Fractions and decimals
2	Face value and digits	Square and square roots	Square and square roots
3	Sequence and series	Average	Average
4	Square numbers	Arithmetic equations	Indices
5	BODMAS	Sequence and series	Ratio and Proportion
6	Equations	Unitary Method	LCM and HCF
7	Algebraic expressions	Time Work relationship	Percentage
8	LCM and HCF	Simple and compound interest	Simple and compound interest
9	Fractions	Ratio and proportion	Profit and loss
10	Unitary method	Circle	Time, Speed and Distance
11	Percentage	Perimeter and area	Time and Work
12	Profit and Loss	Volume and surface area	Algebraic Expressions
13	Simple Interest	Polygons	Simple and Quadratic Equations
14	Time, Speed and Distance	Parallel Lines	Angles
15	Angles	Graphs	Polygons
16	Perimeter		Perimeter and Area
17	Area (Triangle, Square, Rectangle)		Volume and Surface Area

## Syllabus for Ganit Prabhutva Exam – Class 5

#	Ganit Prabhutva and Ganit Pradnya Exam Syllabus – Class 5
1	Numbers and primary operations on numbers
2	Roman Numerals
3	Divisibility
4	Common and Decimal Fractions
5	Measurement – Decimal and other units
6	Unitary Method
7	Time, Distance and Speed
8	Percentage
9	Simple Interest
10	Profit and Loss
11	Geometry
12	Perimeter and Area
13	Past papers and practice tests

## Syllabus for CV Raman Exam – Junior Group - Class 5/6

#	CV Raman Exam Syllabus – Junior Group – Class 5/6
1	Units of measurement, accuracy and estimation
2	Types of motion
3	Forces and types of forces
4	Simple Machines
5	Work and Energy
6	Universe
7	Types of changes
8	States of matter, and properties of substances
9	Living World: Classification of plants and animals, balance in nature
10	Human Body: Skeleton, Muscles, Internal Organs, Digestion
11	Diseases and causative agents; First Aid
12	Natural resources: Air, Water, Soil, Environment and Community Health
13	Food
14	Important points to note, past papers and practice tests

## KEC Advanced Courses – Conceptual Physics

#	Conceptual Physics Course – suitable for students in Class 7/8
1	Measurements
2	Scalars and Vectors
3	Kinematics
4	Newtons Laws of Motion
5	Force and Turning Forces
6	Centre of gravity and equilibrium
7	Pressure in fluids and atmospheric pressure
8	Heat
9	Light
10	Work, Power and Energy
11	Electricity
12	Magnetism
13	Simple Machines
14	Chemical Bonding
15	Balancing chemical equations
16	Periodic Table

## KEC Advanced Courses – Fundamental / Advanced Chemistry

#	Fundamental Chemistry (suggested for Class 7/8)	Advanced Chemistry (suggested for Class 8/9)
1	Matter and its composition	Matter and its composition (in further detail)
2	Atomic structure	Atomic structure (in further detail)
3	Elements, compounds and mixtures	Chemical symbols, formulae, valency, radicals and oxidation numbers
4	Chemical bonding & formation of compounds	Chemical bonding & formation of compounds
5	Physical & chemical changes; redox reactions	Periodic table and classification of elements
6	Balancing chemical equations	Study of Gas Laws: Kinetic theory, Boyles Law, Charles Law, Avogadro Number
7	Periodic Table	Mole concept and stoichiometry
8	Metals and non-metals	Electrochemistry
9	Acids, bases and salts	Metallurgy
10	Hydrocarbons	Organic Chemistry I (IUPAC, Hydrocarbons)
11	Study of Hydrogen	Organic Chemistry II (compounds, ethers, esters, alcohols, amino acids, proteins)
12	Study of Oxygen and oxides	Some important compounds studied in detail
13	Water	Analytical chemistry
14	Man-made material: Synthetic fibres, Plastic, Glass, Pottery, Fertilizers etc.	Practical chemistry
15	Practical Chemistry	

## KEC Advanced Courses – Conceptual Maths

#	Conceptual Maths (suggested for Class 8)	Course serves as preparation for Ganit Prabhutva and Pradnya exams for Class 8 students
1	Module 1	Number operations, divisibility, factors, decimals, ratio and proportion, unitary method, LCM and HCF
2	Module 2	Percentage, Profit and Loss, Discounts, Commissions, Average, Speed, Work and Time, Calendar, Clock analysis, Simple and compound interest
3	Module 3	Square and square roots, Cube and cube roots, Conjugate surds, Indices
4	Module 4	Series, Arithmetic Progressions, Crypt arithmetic, Magic squares, Diagrams for recreational mathematics
5	Module 5	Set theory and applications, Venn diagram, Introduction to counting and combinatorics, Simple problems on these concepts
6	Module 6	Basics of algebra: operations, expressions, equations, inequations and identities. Simultaneous linear equations. Polynomials and their expansion, division, factorization.
7	Module 7	Basic concepts of plane geometry: point, segment, ray, line, angles. Parallel Lines, polygons and their angles. Types of triangles and quadrilaterals. Area & perimeters of triangles, quadrilaterals, polygons and circles. Pythagoras theorem and pythagorian triplets. Concurrency and similarity of triangles. Concept of locus with simple examples of locus.
8	Module 8	Elements and properties of triangles and quadrilateral. Elements and properties of circle. Incircle, circumcircle, centroid, orthocenter. Area and perimeters of plane figures Introduction to shape and their measures, geometric constructions
9	Module 9	Presentation of solution for mathematical problems and proof Techniques for tackling MCQs
10	Module 10	Presentation of Data Mean, Median and Mode



## KEC Advanced Courses – Maths for Physics (Class 9)

### Why Maths for Physics course?

Mathematics is the language of physics. Sound maths skills are essential for subtle understanding of concepts and solving numerical problems in Physics. Physics can be learnt effectively only to the extent of prior knowledge of maths. Maths can be learnt without Physics. But Physics cannot be learnt without maths.

In class 11, 12, the essential maths is learnt but not as a pre-requisite for Physics. Often, it is learnt after learning Physics topics. This affects conceptual clarity and skills of solving Physics problems.

'Maths for Physics' course covers the complete spectrum of maths skills required for effectively doing Physics of JEE advance, NEET. Half of the course material and teaching time is spent on maths explanations and pure maths problems, primarily for acquiring working skills. The other half is meant for applying maths rigorously to several situations in Physics. This includes challenging numerical problems in various topics of Physics.

### Topics Covered

#### **Algebra**

Algebra is the backbone of calculations in numerical problems in science. Also, it is the essential background for several other branches of Maths and Science.

#### **Trigonometry**

Trigonometry is based mainly on Pythagoras theorem. Almost all branches of Physics make use of trigonometric ratios. They are extensively used especially in Vectors, Statics, Dynamics, Geometric optics.

#### **Coordinate geometry**

Coordinate geometry forms the basis of learning other Maths topics such as Vectors, Functions. It is common in science to communicate in the form of curves drawn on coordinate plane. Graph based question in Physics are often asked in competitive exams.

#### **Vectors**

Physics is about studying physical quantities and many of them are vector quantities. Knowledge of Vector maths is so essential that it is regarded as a topic of Physics and included in Physics textbooks.

## **Relations and Functions**

Physics is about studying physical quantities which are related to each other. Mathematics of Relations and Functions provides a sound perspective for studying interdependence of quantities. Also, it is the genesis of Calculus which further analyses the variation of quantities with respect to each other.

## **Shapes of standard curves**

Laws of Physics and variations of physical quantities can be effectively explained in terms of a limited number of standard relations, functions, shape and properties of their curves. Graph based questions in Physics can be solved swiftly using mathematical properties of standard curves.

## **Calculus**

In Physics, many a quantity such as velocity, acceleration are most appropriately defined essentially in the language of Calculus. Also, many a concept such as work, potential, flux in their most general form are properly understood essentially through Calculus. Learning them without Calculus is incomplete. Method of Calculus is often faster than other methods of solving a problem of Physics.

There is a vast difference between ability of solving problems before and after learning Algebra. Similarly, there is a vast difference between understanding of Physics before and after learning Vectors and Calculus.

## Previous students of the course

Previous students could swiftly learn Physics topics to the depth required for JEE advance, NEET and confidently solve exercises of the same difficulty level. Most of them joined JEE advance lectures at KEC while they were half-way through this course. This course opens the option of completing several Physics topics of JEE advance, NEET while still in school. Every previous student explored this option to more or less extent.

Previous students reported that their challenge and pressure of JEE advance, NEET preparation in class 11, 12 was greatly reduced essentially due to completing 'Maths for Physics' course while they were in school.

Reference and contact details of previous students will be provided on request. Contact on 9821005500.

## Venue

From June to February at KEC classroom Goregaon East. Online during lockdown.

**Part A -: ESSENTIAL MATHS****(Maths background for effective learning of Physics for JEE advance, NEET)****Trigonometry:**

Trigonometry of acute angles  
Trigonometry of all angles  
Solution of triangle

**Coordinate geometry:**

System of coordinates in 2D and in 3D  
Distance formula in 2D and in 3D  
Equation of straight line in 2D, Slope

**Vectors in 1D, 2D and 3D space:**

Scalar quantities & Vector quantities  
Magnitude, Zero vector, unit vector  
Geometric representation of vector  
Addition and subtraction of vectors  
Concept of position vector  
Resolution of vectors  
Unit vector along coordinate axes  
Algebraic notation of vectors  
Matrix notation of vectors  
Convenience of algebraic & matrix notation  
Scalar product and vector product of 2 vectors  
Scalar product of 3 vectors  
Geometric perspective of vector products

**Algebra:**

Solution of simultaneous equations,  
Solution of quadratic equation, Nature of roots  
Value of determinant

**Relations and functions:**

Relations, Functions as sets & as curves  
Secant, Tangent, Normal, Asymptote  
System of equations & its solution set

**Standard curves:**

Shapes & properties of standard curves  
Scaling & translation of curves

**Calculus :**

Functions, Continuity, Differentiability  
Infinite & infinitesimal, Limiting cases  
Derivative and its various perspectives  
Differentiation formulae, Chain rule  
Differentiation of implicit functions  
Application of derivatives, Maxima Minima  
Integration and its various perspectives  
Integration formulae  
Indefinite and Definite integrals

**Part B -: APPLICATION TO PHYSICS****(emphasis on concept questions & numericals similar to pattern of Engineering/Medical entrance exams)**

Units, dimensions &amp; basics

Study of motion, Rectilinear motion

Force, momentum, work, energy

Circular motion, SHM

Gravitation

Electrostatics, Magnetism

Current electricity

Optics