

 UPKAR'S

**NATIONAL DEFENCE
ACADEMY
&
NAVAL ACADEMY
EXAMINATION**

Objective Type Questions

(According to the Latest Syllabus)

Editorial Board

UPKAR PRAKASHAN, AGRA



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Distt.—Nainital—263 139

(Uttarakhand)

Mob. : 7060421008

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ISBN : 978-93-6319-936-1

Code No. 3102

Printed at : UPKAR PRAKASHAN (Upkar Stationery Pvt Ltd) Bypass Road, AGRA

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IMPORTANT INSTRUCTIONS AND SYLLABUS

A. SCHEME OF THE EXAMINATION

1. The subjects of the written examination, the time allowed and the maximum marks allotted to each subject will be as follows :

Subject	Subject Code	Duration	Max. Marks
Mathematics	01	2½ hours	300
General Ability Test	02	2½ hours	600
Total			900

2. THE PAPERS IN ALL THE SUBJECTS WILL CONSIST OF OBJECTIVE TYPE QUESTIONS ONLY. THE QUESTION PAPERS (TEST BOOKLETS) OF MATHEMATICS AND PART 'B' OF GENERAL ABILITY TEST WILL BE SET BILINGUALLY IN HINDI AS WELL AS ENGLISH.

3. In the question papers, wherever necessary, questions involving the Metric System of Weights and Measures only will be set.

4. Candidates must write the papers in their own hand. In no circumstances will they be allowed the help of a scribe to write the answers for them.

5. The Commission have discretion to fix qualifying marks in any or all the subjects at the examination.

6. The candidates are not permitted to use calculators or Mathematical or logarithmic table for answering objective type papers (Test Booklets). They should not, therefore, bring the same inside Examination Hall.

B. SYLLABUS OF THE EXAMINATION

Paper-I (Code No. 01)

MATHEMATICS

(Maximum Marks-300)

1. Algebra :

Concept of a set, operations on sets, Venn diagrams. De Morgan laws. Cartesian product, relation, equivalence relation.

Representation of real numbers on a line Complex numbers—basic properties, modulus, argument, cube roots of unity. Binary system of numbers. Conversion of a number in decimal system to binary system and vice-versa. Arithmetic, Geometric and Harmonic progressions. Quadratic equations with real coefficients. Solution of linear inequations of two variables by graphs. Permutation and Combination. Binomial theorem and its applications. Logarithms and their applications.

2. Matrices and Determinants :

Types of matrices, operations on matrices. Determinant of a matrix basic properties of determinants. Adjoint and inverse of a square matrix Applications—Solution of a system of linear equations in two or three unknowns by Cramer's rule and by Matrix Method.

3. Trigonometry :

Angles and their measures in degrees and in radians. Trigonometrical ratios. Trigonometric identities Sum and difference formulae. Multiple and Sub-multiple angles. Inverse trigonometric functions. Applications—Height and distance, properties of triangles.

4. Analytical Geometry of Two and Three Dimensions :

Rectangular Cartesian Coordinate system. Distance formula. Equation of a line in various forms. Angle between two lines. Distance of a point from a line. Equation of a circle in standard and in general form. Standard forms of parabola, ellipse and hyperbola. Eccentricity and axis of a conic. Point in a three dimensional space, distance between two points. Direction Cosines and direction ratios. Equation of a plane and a line in various forms. Angle between two lines and angle between two planes. Equation of a sphere.

5. Differential Calculus :

Concept of a real valued function-domain, range and graph of a function. Composite functions, one to one, onto and inverse functions. Notion of limit, Standard limits—examples. Continuity of functions—examples, algebraic operations on continuous functions. Derivative of function at a point, geometrical and physical interpretation of a derivative-applications. Derivatives of sum, product and quotient of functions, derivative of a function with respect to another function, derivative of a composite function. Second order derivatives. Increasing and decreasing functions. Application of derivatives in problems of maxima and minima.

6. Integral Calculus and Differential Equations :

Integration as inverse of differentiation, integration by substitution and by parts, standard integrals involving algebraic expressions, trigonometric, exponential and hyperbolic functions. Evaluation of definite integrals—determination of areas of plane regions bounded by curves—applications. Definition of order and degree of a differential equation, formation of a differential equation by examples. General and particular solution of a differential equation, solution of first order and first

degree differential equations of various types—examples. Application in problems of growth and decay.

7. Vector Algebra :

Vectors in two and three dimensions, magnitude and direction of a vector. Unit and null vectors, addition of vectors, scalar multiplication of a vector, scalar product or dot product of two vectors. Vector product or cross product of two vectors. Applications—work done by a force and moment of a force, and in geometrical problems.

8. Statistics and Probability :

Statistics : Classification of data. Frequency distribution, cumulative frequency distribution—examples. Graphical representation—Histogram, Pie Chart, frequency polygon—examples. Measure of Central tendency—Mean, median and mode. Variance and standard deviation—determination and comparison. Correlation and regression.

Probability : Random experiment, outcomes and associated sample space, events, mutually exclusive and exhaustive events, impossible and certain events. Union and intersection of events. Complementary, elementary and composite events. Definition of probability—classical and statistical—examples. Elementary theorems on probability—simple problems. Conditional probability, Bayes' theorem—simple problems. Random variable as function on a sample space. Binomial distribution, examples of random experiments giving rise to Binomial distribution.

Paper-II (Code No. 02)

GENERAL ABILITY TEST

(Maximum Marks—600)

PART 'A'

ENGLISH

(Maximum Marks—200)

The question paper in English will be designed to test the candidate's understanding of English and work-man-like use of words. The syllabus covers various aspects like : Grammar and usage, vocabulary, comprehension and cohesion in extended texts to test the candidate's proficiency in English.

PART 'B'

GENERAL KNOWLEDGE

(Maximum Marks—400)

The question paper on General Knowledge will broadly cover the subjects : Physics, Chemistry, General Science, Social Studies, Geography and Current Events.

The syllabus given below is designed to indicate the scope of these subjects included in this paper. The topics mentioned are not to be regarded as exhaustive and questions on topics of similar nature not specifically

mentioned in the syllabus may also be asked. Candidate's answers are expected to show their knowledge and intelligent understanding of the subject.

Section 'A' (Physics)

Physical Properties and States of Matter, Mass, Weight, Volume, Density and Specific Gravity, Principle of Archimedes, Pressure Barometer.

Motion of objects, Velocity and Acceleration, Newton's Laws of Motion, Force and Momentum, Parallelogram of Forces, Stability and Equilibrium of bodies, Gravitation, elementary ideas of Work, Power and Energy.

Effects of Heat. Measurement of Temperature and Heat. Change of State and Latent Heat. Modes of transference of Heat.

Sound waves and their properties, Simple musical instruments.

Rectilinear propagation of Light. Reflection and refraction, Spherical mirrors and Lenses, Human Eye.

Natural and Artificial Magnets. Properties of a Magnet, Earth as a Magnet.

Static and Current Electricity. Conductors and Non-conductors, Ohm's Law. Simple Electrical Circuits. Heating, Lighting and Magnetic effects of Current. Measurement of Electrical Power, Primary and Secondary Cells. Use of X-rays.

General Principles in the working of the following :

Simple Pendulum, Simple Pulleys, Siphon, Levers, Balloon, Pumps, Hydrometer, Pressure Cooker, Thermos Flask, Gramophone, Telegraphs, Telephone, Periscope, Telescope, Microscope, Mariner's Compass, Lightning Conductors. Safety Fuses.

Section 'B' (Chemistry)

Physical and Chemical changes. Elements, Mixtures and Compounds, Symbols, Formulae and Simple Chemical Equations. Law of Chemical Combination (excluding problems). Properties of Air and Water.

Preparation and Properties of Hydrogen, Oxygen, Nitrogen and Carbon dioxide, Oxidation and Reduction.

Acids, Bases and Salts.

Carbon—Different forms.

Fertilizers—Natural and Artificial.

Materials used in the preparations of substances like Soap, Glass, Ink, Paper, Cement, Paints, Safety Matches and Gun-powder.

Elementary ideas about the Structure of Atom, Atomic Equivalent and Molecular Weights. Valency.

Section 'C' (General Science)

Difference between the living and non-living.

Basis of Life—Cells Protoplasm and Tissues.

Growth and Reproduction in Plants and Animals.
Elementary knowledge of human Body and its important organs.
Common Epidemics, their causes and prevention.
Food—Source of Energy for Man, Constituent of food, Balanced Diet.
The Solar System Meteors and Comets, Eclipses.
Achievements of Eminent Scientists.

Section ‘D’ (History, Freedom Movement etc.)

A broad survey of Indian History, with emphasis on Culture and Civilisation.

Freedom Movement in India.

Elementary study of Indian Constitution and Administration.

Elementary knowledge of Five Year Plans of India.

Panchayati Raj, Co-operatives and Community Development.

Bhoodan, Sarvodaya, National Integration and Welfare State, Basic teachings of Mahatma Gandhi.

Forces shaping the modern World; Renaissance Exploration and Discovery. War of American Independence, French Revolution, Industrial Revolution and Russian Revolution, Impact of Science and Technology on Society. Concept of One World, United Nations Panchsheel, Democracy, Socialism and Communism. Role of India in the Present World.

Section ‘E’ (Geography)

The Earth, its shape and size, Latitudes and Longitudes. Concept of Time, International Date line, Movements of Earth and their effects.

Origin of Earth, Rocks and their classification; Weathering—Mechanical and Chemical, Earthquakes and Volcanoes.

Ocean Current and Tides.

Atmosphere and its composition; Temperature and Atmospheric Pressure, Planetary winds, Cyclones and Anti-cyclones; Humidity; Condensation and Precipitation; Types of Climate. Major Natural regions of the World.

Regional Geography of India—Climate, Natural Vegetation. Mineral and Power resources; location and distribution of agricultural and industrial activities.

Important Sea Ports and main sea, land and air routes of India. Main items of Imports and Exports of India.

Section ‘F’ (Current Events)

Knowledge of Important events that have happened in India in the recent years.

Current important world events.

Prominent personalities—both Indian and International including those connected with cultural activities and sports.

Note—Out of maximum marks assigned to Part ‘B’ of this paper questions on Sections ‘A’, ‘B’, ‘C’, ‘D’, ‘E’ and ‘F’ will carry approximately 25%, 15%, 10%, 20%, 20% and 10% weightages respectively.

INTELLIGENCE AND PERSONALITY TEST

The SSB procedure consists of two stage Selection process-stage-I and stage-II. Only those candidates who clear the stage-I are permitted to appear for stage II. The details are :

- (a) **Stage-I** comprises of Officer Intelligence Rating (OIR) tests are Picture Perception *Description Test (PP & DT). The candidates will be shortlisted based on combination of performance in QIR Test and PP and DT.
- (b) **Stage-II** comprises of Interview, Group Testing Officer Tasks, Psychology Tests and the Conference. These tests are conducted over 4 days. The details of these tests are given on the website www.joinin-dianarmy.nic.in.

The personality of a candidate is assessed by three different assessors *viz.* the Interviewing Officer (IO), Group Testing Officer (GTO) and the Psychologist. There are no separate weightage for each test. The marks are allotted by assessors only after taking into consideration the performance of the candidate holistically in all the test. In addition, marks for Conference are also allotted based on the initial performance of the Candidate in the three techniques and decision of the Board. All these have equal weightage.

The various tests of IO, GTO and Psych are designed to bring out the presence/absence of Officer Like Qualities and their trainability in a candidate. Accordingly candidates are Recommended or Not Recommended at the SSB.