

Syllabus

Part I questions will be approximately at the same level as the CAT entrance exam for IIMs and the erstwhile CSAT in UPSC.

The syllabus and references for Part II are given below. The resources in the references are indicative. They typically contain much more material than required by the syllabus.

(a) math and programming

Basics of sets, relations, recurrences, simple combinatorial problems

Matrices and basic matrix algebra

Calculus: limits, extrema, simple differentiation and integration, integration as area under a curve

Probability: conditional, marginal and joint probabilities, Bayes theorem, random variables, simple distributions, expectation, mean, variance, median, percentiles

Basic Boolean algebra, number representation and conversion

Programming: variables, types, declarations, assignments, conditionals, iteration, recursion, functions. Familiarity with programming is required, but knowledge of specific programming languages will not be needed to solve the exam's questions.

Elementary data structures

Basic algorithms: search, sort, HCF, LCM, prime sieves etc.

(a) psych/neuro/life sciences

Psychophysics: absolute and difference thresholds, Weber's law, Fechner's Law.

Learning: Associative and non-associative learning, Pavlovian conditioning, Hebbian learning.

Memory: modal model of memory, working memory, phonological loop; Long-term memory: encoding, retrieval, forgetting.

Visual perception and attention: basics of colour, depth and motion perception, perceptual constancy, and principles of perceptual organization, early and late selection.

Basics of hypothesis testing (e.g. t-test, chi-square, ANOVA), significance, p-value, error types, power and size effects.

Basic neuroanatomy. Physical layout of the brain, names of important components and their functions, e.g. cortex, cerebellum, brainstem etc.

Neuron structure and function: components, action potential, synaptic transmission, neurotransmitters

Nervous system: nerves, receptors, neurotransmission, neuroregulation

Genetics: Mendelian, heredity, traits, selection, eusociality

Molecular genetics: DNA, RNA, genes, coding, regulation

Philosophy of mind: qualia, behaviorism, materialism, dualism, free-will and related concepts

Linguistics: Morphology, Syntax, Semantics, Phonetics, Phonology, Language acquisition

References:

For mathematics, any class 12 mathematics book used by CBSE.

For basics of computation, any class 11 and 12 book used by CBSE. No specific programming language is needed.

Charles Stangor, (2010). MIT – Introduction to Psychology (Open Source – free to download on the internet)

B H Cohen, (2014) Explaining Psychological Statistics. 4th Ed. John Wiley & Sons.

S K Mangal, (2004) Statistics in Psychology and Education. 2nd Ed. Prentice Hall India.

Stanford Encyclopedia of Philosophy, plato.stanford.edu

Thomas Jessell, Siegelbaum, S., & Hudspeth, A. J. (2000). *Principles of neural science* (Vol. 4, pp. 1227-1246). E. R. Kandel, J. H. Schwartz, & T. M. Jessell (Eds.). New York: McGraw-hill.

Verma, P. S., Agarwal, V. K., & Verma, P. S. (2007). *Cell biology, genetics, molecular biology, evolution and ecology*. S. Chand & Company Limited.

Fromkin, V., Rodman, R., & Hyams, N. (2018). *An introduction to language*. Cengage Learning.