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FREE SYLLABUS

IIT JAM BT 2027 Syllabus

The complete official syllabus for JAM 2027 Biotechnology (BT) in one clean list. Tick each topic as you finish it.

60
questions in **3 hours**, for **100 marks**.

6
sections across **Biology, Chemistry, Maths and Physics**.

3
question types: **MCQ, MSQ and NAT**.

14 Feb
2027, afternoon session, **2:30 to 5:30 PM**.

The IIT JAM BT 2027 paper

Section	Question type	Questions	Marks
A	MCQ: one correct option	30 (10 × 1 mark, 20 × 2 marks)	50
B	MSQ: one or more correct options	10 (2 marks each)	20
C	NAT: type a number	20 (10 × 1 mark, 10 × 2 marks)	30
Total		**60**	**100**

Marking. MCQ: a wrong answer costs 1/3 mark on a 1-mark question and 2/3 mark on a 2-mark question. MSQ: no negative marking and no partial marks. NAT: no negative marking.

No fixed subject split. JAM does not publish how many marks come from Biology, Chemistry, Maths or Physics. Prepare all six sections.

Exam day. Sunday, 14 February 2027, 2:30 to 5:30 PM. **Result:** 18 March 2027. **Organizing institute:** IIT Kharagpur.

Official syllabus, word for word. Every topic in this PDF is copied unchanged from the JAM 2027 Biotechnology (BT) syllabus released by IIT Kharagpur, the organizing institute. Checked on 31 October 2026. Official website: jam.iitkgp.ac.in

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☐ Tick a box when you finish a topic. All six sections can come in the paper, including Chemistry, Maths and Physics.

SECTION 1
General Biology

☐ **1.1 Cell Biology**

Structure of prokaryotic and eukaryotic cells; Membrane structure and function; Organelles and internal organization of the eukaryotic cell; Cell communication – signalling pathways: endocrine and paracrine signalling; Extracellular matrix and apoptosis; Cell cycle – stages of mitosis and meiosis.

☐ **1.2 Biochemistry**

Structure and function of biological macromolecules; Enzymes – basic mechanisms of enzyme catalysis and regulation, Hill coefficient, Michaelis-Menten kinetics, enzyme inhibition, vitamins as coenzymes; Bioenergetics – free-energy change, high-energy compounds, biological oxidation-reduction reactions and reduction potential; Metabolism – glycolysis, TCA cycle and their regulation, oxidative phosphorylation, photosynthesis, nitrogen fixation, urea cycle.

☐ **1.3 Genetics**

Mendelian inheritance; Exception to Mendelian law of independent assortment; Genetic interactions, linkage, recombination and chromosome mapping, Chromosomal mutations; Genetic disorders; Population Genetics

☐ **1.4 Molecular Biology**

Landmark experiments that established DNA is the genetic material; DNA replication; Proof-reading and repair of DNA; DNA recombination; Transcription; RNA processing; Translation; Regulation of gene expression including operons and differential gene expression in multicellular eukaryotes.

☐ **1.5 Evolution and Ecology**

Darwinian view – natural selection, fossil record and descent with modification; Different types of speciation; Phylogenetic classification; Origin of life – abiotic synthesis of biological macromolecules, protocell, dating fossils and origin of multicellularity; Climate patterns; Terrestrial and aquatic biomes; Environmental constraints on species distribution; Factors affecting population density; Interactions among communities; Ecosystems; Ecological remediation.

SECTION 2
Microbial, Plant and Animal Biotechnology

☐ **2.1 Microbiology**

Microbial genetics - transformation, conjugation and transduction; Structural features of viruses, bacteria, fungi and protozoa; Pathogenic microorganisms; Nutrition-based classification of microbes; Microbial metabolism; Isolation and Cultivation of microorganisms; Growth kinetics; Microbial control and sterilization; Microbial fermentation – batch, fed-batch and continuous; Bioreactor and its components; Introduction to downstream processing - product recovery and purification; Effluent treatment.

2.2 Plant Biology

Types of tissues and organs; Primary and secondary growth; Morphogenesis; Transport in vascular plants; Plant nutrition; Development of flowering plants – gametophytic and sporophytic generations; Plant growth regulators; Photobiology; Plant Tissue Culture – Cellular totipotency and microporopagation; Transgenic plants; Plant response to biotic and abiotic stresses.

2.3 Animal Biology

Digestive, circulatory, respiratory, excretory, nervous, reproductive and endocrine systems; Basics of immunology – Innate and adaptive immunity, Immune cells, immunoglobulins and major histocompatibility complexes; Animal development – Fertilization, embryonic pattern formation, cleavage, gastrulation, cellular differentiation and morphogenesis; Mammalian cell culture, animal cloning; Transgenic animals.

SECTION 3
Biotechniques

3.1 Biochemical and Microscopy Techniques

Chromatography; Centrifugation; Electrophoresis; ELISA, Western blotting and immunostaining; Principles of light, fluorescence and electron microscopy.

3.2 Molecular Biology Techniques

DNA cloning – plasmid vectors, and restriction enzymes; Polymerase Chain Reaction; Expression of cloned eukaryotic genes in bacteria; Hybridization techniques; DNA sequencing; Recombinant DNA technology in medicine, agriculture and forensic sciences.

3.3 Computational Biology

Bioinformatics; Sequence and structure databases; DNA, RNA and protein sequence analysis; Secondary structure and 3D structure prediction; Biochemical databases.

3.4 Instrumental Techniques – Spectroscopy

fundamentals of molecular spectroscopy, emission and absorption spectroscopy, UV-Vis, circular dichroism, FTIR and 1-D proton NMR spectroscopy, basics of mass spectrometry; Basics of calorimetry; Basic concepts of crystallography; Flowcytometry.

SECTION 4
Chemistry

10+2+3 level

4.1 Structure and properties of Atoms

Bohr's theory; Periodicity in properties.

4.2 Bonding in molecules

Chemical bonding; Complex formation; Physical and chemical basis of molecular interactions.

4.3 Chemical kinetics, thermodynamics, and equilibrium

Chemical equilibrium; Chemical thermodynamics (first and second law); and Chemical kinetics (zero and first order reactions).

4.4 Physical and chemical properties of compounds

Chemical catalysis; Acid-base concepts; Concepts of pH and buffer; Conjugative effects and resonance; Inductive effects; Electromeric effects; Photochemistry; and Electrochemistry.

4.5 Chemistry of organic compounds

Hydrocarbons; Alkyl halides; Alcohols; Aldehydes; Ketones; Carboxylic acids; Amines and their derivatives; Aromatic hydrocarbons, halides, nitro and amino compounds, phenols, diazonium salts, carboxylic and sulphonic acids; Soaps and detergents; Stereochemistry of carbon compounds.

SECTION 5
Mathematics
10+2 level

5.1 General mathematics

Sets; Relations and Functions; Logarithms; Complex numbers; Linear and Quadratic equations; Sequences and Series; Trigonometry; Cartesian System of Rectangular Coordinates; Straight lines and Family; Three Dimensional Geometry; Permutations and Combinations; Binomial Theorem; Vectors; Matrices and Determinants; Functions; Limits and Continuity; Differentiation; Ordinary Differential Equations; Application of Derivatives; Integration as inverse process of differentiation; Definite and indefinite integrals; Methods of Integration; Integration by parts.

5.2 Probability & Statistics

Mean, median, mode and standard deviation; Random variables; Poisson, normal and binomial distributions; Correlation and regression analysis.

SECTION 6
Physics
10+2 level

6.1 General physics

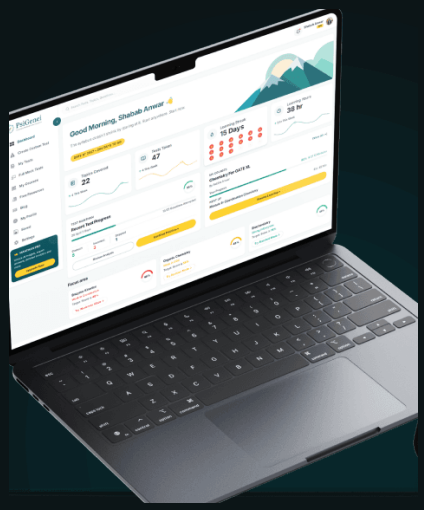
Units and measurements; Motion in one and two dimensions; Laws of motion; Work and kinetic energy; Conservation of energy; System of particles and rotational motion; Mechanical properties of solids and fluids; Thermal properties of matter; Heat and laws of thermodynamics; Kinetic theory of gases; Electric charge and field; Electric potential and capacitance; Current, resistance and simple circuits; Moving charges and magnetic field; Magnetism and matter; Electromagnetic induction; Electromagnetic waves; Alternating currents; Optics: Geometrical Optics – Reflection by spherical mirrors, Refraction at spherical surfaces and lenses, Total internal reflection and Optical instruments; Wave optics – Reflection and refraction of plane waves, Interference, Diffraction, Polarization, and Young's experiment: Dual nature of radiation and matter; Atoms, nuclei and nuclear physics; Semiconductor materials, devices and simple circuits.

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Syllabus source: JAM 2027 Biotechnology (BT) syllabus, IIT Kharagpur (jam.iitkgp.ac.in). Pattern and dates: JAM 2027 official website. Checked 31 October 2026. Check the official website for any later change.