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Synthetic Biology Market Size, Share, Trends and Forecast by Product, Technology, Application, and Region, 2025-2033

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Abstracts

The global synthetic biology market size was valued at USD 18.5 Billion in 2024. Looking forward, IMARC Group estimates the market to reach USD 66.7 Billion by 2033, exhibiting a CAGR of 15.3% from 2025-2033. North America currently dominates the market, holding a market share of over 41.8% in 2024. The dominance of North America can be attributed to robust biotechnology infrastructure, increasing investments in research operations, and supportive government initiatives.

Synthetic Biology Market Analysis:

Major Market Drivers: The global synthetic biology market is experiencing robust growth, driven by increasing improvements in gene editing technologies.

Key Market Trends: Collaborative efforts between academia, industry, and government are enhancing innovation and development capabilities.

Geographical Trends: North America dominates the market owing to the growing investments in biotechnology. However, Asia Pacific is emerging as a fast-growing market due to the increasing research activities and government initiatives in the region.

Competitive Landscape: Key players are investing in research operations to drive innovation and address complex biological challenges. Some of the major market players in the synthetic biology industry include GenScript Biotech Corporation, Amyris Inc., Ginkgo Bioworks, Mammoth Biosciences, Novozymes, Merck KGaA, among many others.

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Challenges and Opportunities: Challenges include ethical and safety concerns related to genetically modified products. Nonetheless, opportunities for the market to develop regulatory-compliant, ethically considered innovations are projected to overcome these challenges.

Synthetic Biology Market Trends/Drivers:

Advancements in gene editing technologies

At present, various techniques like CRISPR-Cas9 are capable of improving the field of biology research by enabling precise and efficient manipulation of genetic material, strengthening the synthetic biology market demand. Researchers are designing, editing, and engineering DNA sequences with exceptional accuracy, facilitating the creation of intricate synthetic organisms customized according to specific functions. This innovation is opening new avenues for the development of novel aspects, like disease treatment through gene therapies and creation of bioengineered organisms capable of producing valuable compounds such as enzymes and biofuels, thus aiding in market expansion. Moreover, The World Health Organization (WHO) released groundbreaking recommendations for the global governance of human genome editing, emphasizing safety, efficacy, and ethics.

Demand for sustainable solutions

The rising demand for sustainable and environment-friendly solutions across various industries is propelling the synthetic biology market. Synthetic biology presents various new avenues for sectors to fulfill their demands to reduce the environmental impact of their operations. In line with this, the production of bioplastics extracted from renewable resources and the development of biofuels with reduced carbon emissions aligning with the global push towards sustainability are contributing to the market growth. Apart from this, synthetic biology is capable of creating microbes for bioremediation which is a method to detoxify contaminants or help clean up the environment and address various urgent ecological complications. Furthermore, synthetic biology is revolutionizing the sustainability efforts of the beauty sector. Vogue Business estimates that 20-40% of beauty products become waste annually, and the industry generates 120 billion units of difficult-to-recycle packaging yearly. Moreover, eight out of ten cosmetic ingredients are unsustainably sourced. To address these challenges, synthetic biology modifies microorganism DNA to create sustainable materials. The synthetic biology market price reflects rapid growth due to innovation and diverse applications.

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Collaborative ecosystem and investment

The collaborative synergy between academia, industry, and government entities fosters a conducive environment for research operations within the synthetic biology field. Collaborations facilitate the exchange of knowledge, assets, and perspectives, thus quickening the rate of invention. Governing authorities frequently provide grants and funds to assist research endeavors, while established businesses and startups work together to pool resources for ground-breaking ventures that promote market growth. In addition to this, the surge in venture capital investments in biotechnology startups injects vital capital into the field, nurturing the growth of nascent ideas into tangible products and synthetic biology market application. This collaborative ecosystem sustains a cycle of research, innovation, and commercialization, propelling the global synthetic biology market forward.

Additionally, the future of the synthetic biology market promises unparalleled innovation, sustainability solutions, and expansive growth potential. Companies, such as Algal Bio utilize a diverse array of strains to innovate novel solutions, while startups like Basecamp Research employ machine learning (ML) to decipher the design principles of nature for synthetic protein engineering.

Synthetic Biology Industry Segmentation:

IMARC Group provides an analysis of the key trends in each segment of the global synthetic biology market, along with forecast at the global, regional, and country levels from 2025-2033. The market has been categorized based on product, technology, application.

Breakup by Product:

- Oligonucleotide/Oligo Pools and Synthetic DNA
- Enzymes
- Cloning Technologies Kits
- Xeno-nucleic Acids
- Chassis Organism

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Oligonucleotide/oligo pools and synthetic DNA dominates the market

The report has provided a detailed breakup and analysis of the market based on the product. This includes oligonucleotide/oligo pools and synthetic DNA, enzymes, cloning technologies kits, Xeno-nucleic acids, and chassis organism. According to the report, oligonucleotide/oligo pools and synthetic DNA represented the largest segment.

The growing demand for synthetic biology products, specifically oligonucleotide/oligo pools and synthetic DNA, is mainly fueled by the exponential growth in fields such as personalized medicine, gene therapy, and molecular diagnostics that have amplified the need for precise and customizable genetic materials. Additionally, the rise of synthetic biology startups and the democratization of gene editing technologies have made these products more accessible, empowering researchers across diverse disciplines to engage in innovative projects, thereby creating a favorable synthetic biology market outlook. For example, Synbio Technologies offers oligo pool synthesis for companies or clients who need to mass-produce short DNA strands, also known as oligonucleotides.

Breakup by Technology:

NGS Technology

PCR Technology

Genome Editing Technology

Bioprocessing Technology

Others

A detailed breakup and analysis of the market based on the technology has also been provided in the report. This includes NGS, PCR, genome editing, bioprocessing, and other technologies.

Next-generation sequencing (NGS) technology has become instrumental in deciphering complex biological information, facilitating the analysis of vast genetic data sets, and accelerating the discovery of novel genetic components, which in turn, is presenting lucrative market opportunities. Moreover, polymerase chain reaction (PCR) technology remains a cornerstone for DNA amplification, crucial in generating sufficient genetic

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material for various applications, from research to diagnostics. Besides this, genome editing technologies, particularly CRISPR-Cas9, hold immense promise for precision genetic modifications, driving advancements in gene therapies and customized genetic engineering. Bioprocessing technologies form a critical facet, enabling efficient large-scale production of bioengineered compounds, ranging from pharmaceuticals to biofuels. Companies are also investing and focusing on these aspects to create novel technologies. For example, Bayer and Mammoth Biosciences collaborated to develop a novel gene editing technology to unlock the full potential of CRISPR systems.

Additionally, the synthetic biology market statistics highlight a robust growth trajectory, driven by advancements in biotechnology and increasing investment in research and development.

Breakup by Application:

- Healthcare
- Clinical
- Non-Clinical/Research
- Non-Healthcare
- Biotech Crops
- Specialty Chemicals
- Bio-Fuels
- Others

The report has provided a detailed breakup and analysis of the market based on the application. This includes healthcare (clinical and non-clinical/research) and non-healthcare (biotech crops, specialty chemicals, bio-fuels, and others).

The bolstering growth of the healthcare sector, wherein synthetic biology is used in the development of personalized medicines, gene therapies, and diagnostics, is contributing to the synthetic biology market growth. In addition, the numerous non-clinical or

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research applications of synthetic biology encompassing drug discovery, functional genomics, and biomolecule production, are fueling scientific exploration and market growth. Beyond healthcare, synthetic biology's expanding usage in biotech crops engineered for improved yield and resistance to pests is positively influencing the market. Furthermore, the increasing product adoption across the specialty chemicals industry, wherein bioengineered pathways create sustainable routes to produce high-value compounds is impelling the market growth. Apart from this, the growing use of synthetic biology in the biofuel sector to optimize microorganisms for efficient biofuel production is strengthening the market growth. Key market players are focusing on collaborating with each other to develop various novel technologies in synthetic biology. For instance, scientists led by Gerard Wright at McMaster University developed a synthetic biology platform for novel glycopeptide antibiotics (GPA) discovery. They engineered Streptomyces coelicolor as a chassis for GPA biosynthesis, overcoming challenges in cloning large biosynthetic gene clusters (BGCs) using an optimized transformation-associated recombination (TAR) system. The platform enabled the synthesis of corbomycin and the discovery of novel GPAs, expanding antibiotic candidates' repertoire.

Breakup by Region:

North America

United States

Canada

Asia-Pacific

China

Japan

India

South Korea

Australia

Indonesia

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Others

Europe

Germany

France

United Kingdom

Italy

Spain

Russia

Others

Latin America

Brazil

Mexico

Others

Middle East and Africa

North America exhibits a clear dominance, accounting for the largest synthetic biology market share

The market research report has also provided a comprehensive analysis of all the major regional markets, which include North America (the United States and Canada); Asia Pacific (China, Japan, India, South Korea, Australia, Indonesia, and others); Europe (Germany, France, the United Kingdom, Italy, Spain, Russia, and others); Latin America (Brazil, Mexico, and others); and the Middle East and Africa. According to the report, North America accounted for the largest market share.

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The presence of a well-established research and innovation ecosystem in North America, characterized by leading academic institutions, cutting-edge biotechnology companies, and significant government investments, provides a fertile ground for advancements in synthetic biology. Moreover, the region's emphasis on R&D and technological innovation fosters collaborations that span academia and industry, driving the development of novel applications across sectors including healthcare, agriculture, and energy. In addition to this, the increasing focus on sustainable solutions and the demand for eco-friendly products align with synthetic biology's potential to offer greener alternatives. This, coupled with favorable regulatory frameworks that encourage biotechnology R&D, creates an environment conducive to the expansion of the North American synthetic biology market. In December 2022, the Investment Strategy by the Office of Strategic Capital (OSC) identifies synthetic biology as a priority technology area for private sector investment, aiming to attract capital and foster innovation in this field for national security purposes. The synthetic biology market overview reveals its rapid expansion, driven by innovation, research investment, and diverse applications.

Competitive Landscape:

The global synthetic biology market features a dynamic competitive landscape shaped by a blend of established players and innovative startups. Leading companies, with their significant financial resources and expansive research capabilities, dominate the market by offering a diverse range of synthetic biology products and services and highlighting how big is the synthetic biology market? These companies actively engage in collaborations, strategic partnerships, and mergers to enhance their offerings and expand their market reach. Furthermore, a surge in venture capital investments has catalyzed the emergence of agile startups, injecting fresh ideas and disruptive technologies into the field. The competitive arena is characterized by a focus on innovation, technology integration, and the ability to address diverse market segments, accentuating the evolutionary nature of the global synthetic biology market. On of the key players, Eurofins Genomics Blue Heron, introduced its IVT mRNA Synthesis Service, using cutting-edge technology for rapid and efficient mRNA transcript production. Tailored for various fields including molecular biology and gene therapy, it offers customizable synthesis with quick turnaround times and expert support, benefiting synthetic biology research and applications. According to synthetic biology market recent news, Aanika Biosciences is revolutionizing synthetic biology adoption across industries like food and agriculture through insurance. Their subsidiary, Aanika Insurance Services (AIS), offers cost-effective coverage, encouraging biologic use while ensuring risk mitigation and frequent sampling. Partnering with Western Growers

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Insurance Services, Aanika aims to expand its reach to farmers, distributors, and retailers.

The report has provided a comprehensive analysis of the competitive landscape in the market. Detailed profiles of all major companies have also been provided. Some of the key players in the market include:

Agilent Technologies Inc.

Amyris Inc.

Codexis Inc.

Danaher Corporation

Eurofins Scientific

GenScript Biotech Corporation

Illumina Inc.

Merck KGaA

New England Biolabs

Synthego Corporation

Thermo Fisher Scientific Inc.

Twist Bioscience

Viridos Inc.

Key Questions Answered in This Report

1.What is synthetic biology?

2.How big is the synthetic biology market?

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3.What is the expected growth rate of the global synthetic biology market during 2025-2033?

4.What are the key factors driving the global synthetic biology market?

5.What is the leading segment of the global synthetic biology market based on product?

6.What is the leading segment of the global synthetic biology market based on technology?

7.What is the leading segment of the global synthetic biology market based on application?

8.What are the key regions in the global synthetic biology market?

9.Who are the key players/companies in the global synthetic biology market?

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