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Synthetic Biology Market (By Product, Technology, Application, End User, and Region), Key Company Profiles, Market Dynamics, Trends and Recent Developments – Global Forecast to 2034

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Abstracts

The global synthetic biology market was valued at US$ 19.60 billion in 2025, and is projected to reach US$ 80.18 billion by 2034. Synthetic biology involves the design and engineering of biological systems by integrating principles from biology, engineering, computer science, and biotechnology. It encompasses technologies such as synthetic DNA, genome engineering, enzymes, synthetic biological circuits, and computational tools that enable the design, development, and optimization of biological systems. These technologies support a wide range of applications across healthcare, agriculture, food production, industrial biotechnology, and environmental management.

The synthetic biology market is experiencing rapid growth, driven primarily by its expanding applications across healthcare, agriculture, environmental science, and industrial biotechnology. Synthetic biology enables the design and development of custom biological systems and organisms, allowing industries to address complex challenges, improve efficiency, and unlock new revenue opportunities. In agriculture, the technology is being used to develop crops with greater climate resilience, improved yields, and enhanced resource efficiency, supporting global food security. For example, Pivot Bio’s nitrogen-producing microbial products for corn and wheat enable farmers to reduce their dependence on synthetic fertilizers while lowering the environmental impact of agricultural production.

Synthetic biology is also gaining momentum in the development of bio-based materials and bioplastics, addressing environmental concerns while supporting the transition toward more sustainable, circular-economy models. Rising demand for bio-based

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products, increasing adoption of personalized therapies, particularly gene and cell therapies, and continued advances in DNA sequencing and synthesis are further supporting market expansion. In addition, synthetic biology is driving innovations in biopharmaceutical manufacturing and creating new opportunities across food and agriculture.

Strategic collaborations and partnerships among key market participants are also contributing to market expansion by accelerating commercialization and broadening applications. For instance, in September 2024, Ginkgo Bioworks and NOVUS International entered into a partnership to develop advanced feed additives designed to address the evolving needs of the animal agriculture industry. Key market players include Thermo Fisher Scientific Inc., Merck KGaA, Agilent Technologies, Novozymes, Ginkgo Bioworks, Amyris, and GenScript.

Over the forecast period, demand is expected to benefit from the expanding application of synthetic biology in therapeutic genome editing, cellular recording, and multiplexed diagnostics. In May 2024, Ginkgo Bioworks and Sojitz announced a legally binding definitive agreement aimed at accelerating the adoption of synthetic biology for developing sustainable industrial processes. The partnership also seeks to establish relationships with major Japanese companies, supporting the broader commercial adoption of synthetic biology across industrial sectors.

Furthermore, Artificial intelligence (AI) and machine learning (ML) are emerging as important technologies for accelerating biological discovery and achieving specific design objectives in synthetic biology. AI-driven approaches are being applied to protein structure modeling, pathway engineering, biological design, and predictive analytics. For instance, in April 2026, Biohub introduced the Virtual Biology Initiative to develop a foundational dataset for biology that can facilitate AI-powered discoveries and accelerate innovation. AI platforms can also reduce the number of laboratory experiments required by improving prediction and optimization, thereby increasing research efficiency and potentially shortening development timelines.

Recent Developments

In May 2026, Ribbon Bio launched MiroSynth Cell-Free DNA, a synthetic DNA product manufactured without bacterial cloning steps, alongside MiroMine, an in-lab cell-free DNA assembly kit that enables researchers to create synthetic DNA constructs. The launches reflect Ribbon Bio’s effort to broaden access to complex DNA by shifting synthesis from centralized, capacity-limited services

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toward more accessible, flexible, and scalable solutions for the biopharmaceutical and synthetic biology sectors.

In September 2024, Constructive Bio, a company leveraging deeply recoded synthetic genomes, engineered cellular machinery, and novel chemistry to advance drug discovery, raised USD 58 million in Series A financing.

By Product: Global Synthetic Biology Market – Key Takeaways

By product, the enzymes segment dominated the synthetic biology market in 2025, driven by their extensive use in genome editing, DNA assembly, and synthetic pathway engineering. Enzymes play a critical role in key biotechnology processes, including DNA manipulation, protein engineering, and metabolic pathway construction. Their broad applications across pharmaceuticals, agriculture, biofuels, and industrial biotechnology continue to drive demand for highly efficient and specific biocatalysts. In addition, advances in enzyme engineering are expanding their use in gene editing and synthetic biology workflows, reinforcing their importance in both research and industrial applications.

The oligonucleotides & synthetic DNA segment is another significant segment of the synthetic biology market, supported by the growing adoption of gene-editing technologies in therapeutic development, agricultural biotechnology, and research applications. Increasing demand for customized DNA sequences and oligonucleotides is further supporting segment growth. In addition, the introduction of innovative products and technologies by established market players and emerging startups is expected to expand applications and drive market growth in the coming years.

The cloning technology kits segment is expected to register the fastest growth over the forecast period, driven by their ability to streamline gene insertion, amplification, and modification processes across research and commercial applications. The growing adoption of synthetic biology, alongside increasing demand for personalized medicine and advanced genetic engineering workflows, is fueling the need for efficient, reliable, and user-friendly cloning solutions. Advances in cloning technologies and the development of innovative

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kits are further expected to support segment expansion during the forecast period.

By Technology: Global Synthetic Biology Market – Key Takeaways

The PCR segment accounted for the largest share of the synthetic biology market in 2025 and is expected to maintain its leading position throughout the forecast period. Polymerase Chain Reaction (PCR) is a widely used technology for the amplification, detection, and analysis of specific DNA sequences. Real-time PCR assays offer high sensitivity, specificity, and rapid results, making them valuable across a broad range of genomic and molecular biology applications. The technology is extensively used in DNA cloning, genomics, genetic research, and forensic analysis, supporting continued demand for PCR-based products and solutions.

The genome editing technology segment is projected to register substantial growth over the forecast period, driven by the expanding adoption of advanced gene-editing tools and their ability to enable precise modifications of genetic material. These technologies facilitate the development of organisms and biological products with specific, desirable traits, supporting applications across human and animal healthcare, agriculture, and biotechnology research. Continued advancements in gene-editing platforms, coupled with their expanding use in therapeutic development and agricultural innovation, are expected to further strengthen segment growth over the forecast period.

The global synthetic biology Next-Generation Sequencing (NGS) market is gaining traction as sequencing technologies become increasingly integrated into the design, engineering, and validation of biological systems. NGS enables high-throughput analysis of engineered genomes, synthetic DNA constructs, microbial strains, and other biological systems, allowing researchers to identify genetic variations, validate engineered sequences, and optimize biological pathways.

By Application: Global Synthetic Biology Market – Key

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Takeaways

The healthcare segment dominated the synthetic biology market in 2025, driven by the growing application of synthetic biology in drug discovery, diagnostics, personalized medicine, and cell and gene therapy. Advances in gene editing and biopharmaceutical development are expanding treatment options for chronic, genetic, and rare diseases while enabling more precise and targeted interventions. Increasing pharmaceutical R&D, along with strategic collaborations, investments, and product launches, is expected to further support the segment's growth during the forecast period.

The industrial biotechnology segment represented another major application area in the synthetic biology market in 2025, driven by the increasing use of engineered biological systems to develop sustainable chemicals, biofuels, biomaterials, and other bio-based products.

The food & agriculture segment is another important application area in the synthetic biology market, driven by the growing use of engineered biological systems to improve crop productivity, enhance nutritional value, develop sustainable food ingredients, and support alternative protein production.

By End User: Global Synthetic Biology Market – Key Takeaways

The biotechnology and pharmaceutical companies accounted for largest revenue share in 2025, driven by the increasing adoption of synthetic biology in therapeutic development and biopharmaceutical innovation. These companies leverage synthetic biology to develop gene therapies, monoclonal antibodies, personalized medicines, and other advanced treatments for complex and rare diseases. Rising R&D investments are further accelerating the discovery of novel biologics, optimization of drug development processes, and improvement of therapeutic efficacy, supporting continued segment growth.

The industrial biotechnology companies segment is driven by the increasing adoption of synthetic biology to develop sustainable chemicals, biofuels, biomaterials, enzymes, and other bio-based products. Growing demand for renewable alternatives to petroleum-derived products, coupled with advances in

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metabolic engineering and microbial fermentation, is encouraging companies to integrate synthetic biology into industrial production processes.

The academic and research institutes segment is expected to grow at a significant rate over the forecast period, supported by their critical role in advancing synthetic biology research and innovation. These institutions are actively exploring emerging applications in gene editing, synthetic genomes, metabolic engineering, and other areas of biological engineering. Increasing research funding, along with collaborations between academia, biotechnology companies, and pharmaceutical firms, is strengthening research capabilities and accelerating the development of new synthetic biology technologies and applications.

By Region: Global Synthetic Biology Market – Key Takeaways

North America accounted for the largest share of the synthetic biology market in 2025, supported by strong public and private investment, including substantial venture capital funding and government-backed initiatives. The region's well-established research ecosystem, comprising leading universities, research institutions, biotechnology companies, and pharmaceutical firms, continues to accelerate technological innovation. In addition, growing demand for sustainable solutions across healthcare, agriculture, energy, and industrial biotechnology is driving the development and adoption of synthetic biology applications.

The Europe synthetic biology market is experiencing significant growth, supported by strong public funding and European Union initiatives that promote research and innovation. Increasing emphasis on sustainability and environmental regulations is driving the development of eco-friendly solutions, particularly in agriculture and energy. Europe's strong academic and research ecosystem, combined with collaborations among academia, industry, and startups, is further supporting innovation and market expansion.

Germany synthetic biology market is expected to grow significantly over the forecast period, supported by strong biotechnology investments, advanced research infrastructure, and substantial public and private funding. The country’s focus on innovative therapies and biomedical research is driving

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demand for synthetic biology applications.

The UK synthetic biology market is supported by strong government backing and research funding through initiatives such as the Biotechnology and Biological Sciences Research Council (BBSRC). Growing interest in bio-based products and sustainable technologies is also expected to support market growth over the forecast period.

The Asia Pacific synthetic biology market is expected to grow at a significant rate during the forecast period, supported by expanding research activities, increasing biopharmaceutical manufacturing, and rising adoption of advanced biotechnology solutions. Growing investments in synthetic biology research and development are further strengthening the regional ecosystem. China, Japan, India, Australia, and South Korea are expected to remain key contributors to regional market growth.

Japan synthetic biology market is expected to witness significant growth, driven by rising demand for gene therapies and innovative treatments. Investments by major companies in advanced technologies, manufacturing facilities, and production capabilities are enhancing efficiency and scalability, strengthening Japan’s position as a hub for synthetic biology and biopharmaceutical innovation.

iGATE RESEARCH report titled “Synthetic Biology Market (By Product, Technology, Application, End User, and Region), Key Company Profiles, Market Dynamics, Trends and Recent Developments – Global Forecast to 2034” provides a comprehensive analysis of the Global Synthetic Biology Market.

This report has been analyzed from 13 View Points:

1) Global – Synthetic Biology Market and Forecast (2022 - 2034)

2) Global – Synthetic Biology Market Share and Forecast (2022 - 2034)

3) By Product - Global Synthetic Biology Market and Forecast (2022 - 2034)

4) By Technology – Global Synthetic Biology Market and Forecast (2022 - 2034)

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5) By Application – Global Synthetic Biology Market and Forecast (2022 - 2034)

6) By End User – Global Synthetic Biology Market and Forecast (2022 - 2034)

7) By Region – Global Synthetic Biology Market and Forecast (2022 - 2034)

8) By Country – Global Synthetic Biology Market and Forecast (2022 - 2034)

9) Regulatory Landscape – Global Synthetic Biology Market

10) Global Synthetic Biology Market – Trends & Technological Advancements

11) Global Synthetic Biology Market – Recent Developments

12) Global Synthetic Biology Market – Key Company Profiles

13) Global Synthetic Biology – Market Dynamics

By Product - Global Synthetic Biology Market and Forecast

1. Enzymes Segment

2. Oligonucleotide/Oligo Pools & Synthetic DNA

3. Cloning Technologies Kits

4. Xeno-Nucleic Acids

5. Chassis Organism

By Technology - Global Synthetic Biology Market and Forecast

1. PCR Technology

2. Genome Editing Technology

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3. Next-Generation Sequencing (NGS) Technology

4. Bioprocessing Technology

5. Other Technologies

By Application - Global Synthetic Biology Market and Forecast

1. Healthcare & Pharmaceuticals

2. Food & Agriculture

3. Industrial Biotechnology

4. Environmental Applications

5. Academic & Research Applications

By End User - Global Synthetic Biology Market and Forecast

1. Biotechnology and Pharmaceutical Companies

2. Academic & Research Institutes

3. Industrial Biotechnology Companies

4. Contract Research Organizations (CROs)

5. Government & Public Research Organizations

By Region - Synthetic Biology Market & Forecast

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1. North America

United States

Canada

Mexico

2. Europe

Germany

United Kingdom

France

Italy

Spain

Denmark

Sweden

Norway

3. Asia Pacific

Japan

China

India

Australia

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Thailand

South Korea

4. Latin America

Brazil

Argentina

5. Middle East & Africa

South Africa

Saudi Arabia

UAE

Kuwait

Global Synthetic Biology Market – Key Company Profiles

1. Agilent Technologies Inc.
2. Amyris Inc.
3. Codexis Inc.
4. Danaher Corporation
5. Eurofins Scientific
6. GenScript Biotech Corporation
7. Ginkgo Bioworks Holdings Inc.

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8. Illumina Inc.

9. Merck KGaA

10. New England Biolabs

11. Novonesis A/S

12. Precigen Inc.

13. Synthego Corporation

14. Thermo Fisher Scientific Inc.

15. Twist Bioscience Corporation

16. Viridos Inc.

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Contents

1. EXECUTIVE SUMMARY

2. RESEARCH METHODOLOGY

2.1 Research Design
2.2 Research Approach
2.3 Data Collection Methods
2.4 Market Assumptions

3. GLOBAL - SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 - 2034)

4. GLOBAL - SYNTHETIC BIOLOGY MARKET SHARE AND FORECAST (2022 - 2034)

4.1 By Product - Synthetic Biology Market Share and Forecast
4.2 By Technology – Synthetic Biology Market Share and Forecast
4.3 By Application – Synthetic Biology Market Share and Forecast
4.4 By End User – Synthetic Biology Market Share and Forecast
4.5 By Region – Synthetic Biology Market Share and Forecast

5. BY PRODUCT - GLOBAL SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 – 2034)

5.1 Global Synthetic Biology – Enzymes Segment Market and Forecast
5.2 Global Synthetic Biology – Oligonucleotide/Oligo Pools & Synthetic DNA Market and Forecast
5.3 Global Synthetic Biology – Cloning Technologies Kits Market and Forecast
5.4 Global Synthetic Biology – Xeno-Nucleic Acids Market and Forecast
5.5 Global Synthetic Biology – Chassis Organism Market and Forecast

6. BY TECHNOLOGY - GLOBAL SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 – 2034)

6.1 Global Synthetic Biology – PCR Technology Market and Forecast
6.2 Global Synthetic Biology – Genome Editing Technology Market and Forecast
6.3 Global Synthetic Biology – Next-Generation Sequencing (NGS) Market and Forecast

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info@marketpublishers.com

6.4 Global Synthetic Biology – Bioprocessing Technology Market and Forecast
6.5 Global Synthetic Biology – Other Technologies Market and Forecast

7. BY APPLICATION - GLOBAL SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 – 2034)

7.1 Global Synthetic Biology – Healthcare & Pharmaceuticals Market and Forecast
7.2 Global Synthetic Biology – Food & Agriculture Market and Forecast
7.3 Global Synthetic Biology – Industrial Biotechnology Market and Forecast
7.4 Global Synthetic Biology – Environmental Applications Market and Forecast
7.5 Global Synthetic Biology – Academic & Research Applications Market and Forecast

8. BY END USER – GLOBAL SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 – 2034)

8.1 Global Synthetic Biology – Biotechnology and Pharmaceutical Companies Market and Forecast
8.2 Global Synthetic Biology – Academic & Research Institutes Market and Forecast
8.3 Global Synthetic Biology – Industrial Biotechnology Companies Market and Forecast
8.4 Global Synthetic Biology – Contract Research Organizations (CROs) Market and Forecast
8.5 Global Synthetic Biology – Government & Public Research Organizations Market and Forecast

9. BY REGION - SYNTHETIC BIOLOGY MARKET AND FORECAST (2022 – 2034)

9.1 North America - Synthetic Biology Market and Forecast
  9.1.1 United States - Synthetic Biology Market and Forecast
  9.1.2 Canada - Synthetic Biology Market and Forecast
  9.1.3 Mexico - Synthetic Biology Market and Forecast
9.2 Europe - Synthetic Biology Market and Forecast
  9.2.1 Germany - Synthetic Biology Market and Forecast
  9.2.2 United Kingdom - Synthetic Biology Market and Forecast
  9.2.3 France - Synthetic Biology Market and Forecast
  9.2.4 Italy - Synthetic Biology Market and Forecast
  9.2.5 Spain - Synthetic Biology Market and Forecast
  9.2.6 Denmark - Synthetic Biology Market and Forecast
  9.2.7 Sweden - Synthetic Biology Market and Forecast
  9.2.8 Norway - Synthetic Biology Market and Forecast

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info@marketpublishers.com

9.2.9 Rest of Europe - Synthetic Biology Market and Forecast
9.3 Asia Pacific - Synthetic Biology Market and Forecast
9.3.1 Japan - Synthetic Biology Market and Forecast
9.3.2 China - Synthetic Biology Market and Forecast
9.3.3 India - Synthetic Biology Market and Forecast
9.3.4 Australia - Synthetic Biology Market and Forecast
9.3.5 Thailand - Synthetic Biology Market and Forecast
9.3.6 South Korea - Synthetic Biology Market and Forecast
9.3.7 Rest of Asia Pacific - Synthetic Biology Market and Forecast
9.4 Latin America - Synthetic Biology Market and Forecast
9.4.1 Brazil - Synthetic Biology Market and Forecast
9.4.2 Argentina - Synthetic Biology Market and Forecast
9.4.3 Rest of Latin America - Synthetic Biology Market and Forecast
9.5 Middle East & Africa - Synthetic Biology Market and Forecast
9.5.1 South Africa - Synthetic Biology Market and Forecast
9.5.2 Saudi Arabia - Synthetic Biology Market and Forecast
9.5.3 UAE - Synthetic Biology Market and Forecast
9.5.4 Kuwait - Synthetic Biology Market and Forecast
9.5.5 Rest of Middle East & Africa - Synthetic Biology Market and Forecast

10. GLOBAL SYNTHETIC BIOLOGY MARKET – REGULATORY LANDSCAPE

11. GLOBAL SYNTHETIC BIOLOGY MARKET – TRENDS & TECHNOLOGICAL ADVANCEMENTS

12. GLOBAL SYNTHETIC BIOLOGY MARKET – RECENT DEVELOPMENTS

13. GLOBAL SYNTHETIC BIOLOGY MARKET – KEY COMPANY PROFILES

13.1 Agilent Technologies Inc.
13.2 Amyris Inc.
13.3 Codexis Inc.
13.4 Danaher Corporation
13.5 Eurofins Scientific
13.6 GenScript Biotech Corporation
13.7 Ginkgo Bioworks Holdings Inc.
13.8 Illumina Inc.
13.9 Merck KGaA
13.10 New England Biolabs

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13.11 Novonesis A/S
13.12 Precigen Inc.
13.13 Synthego Corporation
13.14 Thermo Fisher Scientific Inc.
13.15 Twist Bioscience Corporation
13.16 Viridos Inc.

14. GLOBAL SYNTHETIC BIOLOGY – MARKET DYNAMICS

14.1 Global Synthetic Biology Market – Drivers
14.2 Global Synthetic Biology Market – Challenges

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