Claims

1. An automated system for the synthesis of a double-stranded DNA molecule according to provided biological sequence information, comprising:

an assembly unit for assembling the double-stranded DNA molecule according to the provided biological sequence information, the assembly unit comprising or connected to vessels containing a plurality of oligonucleotide molecules and containing components for transporting reagents within the system and for executing steps in an automated method for synthesizing the double-stranded DNA molecule, wherein the method comprises the assembly of one or more dsDNA molecule(s) by joining the plurality of oligonucleotides, and wherein no human intervention occurs after the method is initiated and until the method is completed;

and further comprising software programming instructions for the assembly of the plurality of oligonucleotide molecules into the double stranded DNA molecule in the automated method.

2. The automated system of claim 1, wherein the assembly unit further comprises reagents and components for transporting reagents within the system and for executing steps in an automated method from software programming instructions for at least one error correction reaction, and the oligonucleotides are overlapping and are assembled into the dsDNA molecule.

3. The automated system of any one of claims 1-2 wherein the oligonucleotides are provided to a sub-unit of the assembly unit for amplification of the oligonucleotides by a step of PCR.

4. The automated system of any one of claims 1-3 wherein the oligonucleotides are from 40-100 nucleotides in length.

5. The automated system of any one of claims 1-3 wherein the plurality of oligonucleotide molecules are 30-110 nucleotides in length.

6. The automated system of any one of claims 1-3 wherein the double stranded DNA molecule is greater than 500 bp in size.

7. The automated system of any one of claims 1-6 wherein the software programming comprises instructions for simultaneously assembling the oligonucleotides.

8. The automated system of any one of claims 1-7 wherein the overlapping oligonucleotides are assembled in an isothermal reaction.

9. The system of any one of claims 1-8 further comprising programming instructions for performing one step of the method in a first zone of a reaction container and a second step of the method in a second zone of a reaction container.

10. The system of claim 9 wherein the conditions for a step are established in a reaction zone and a sample is subsequently moved into the reaction zone.

11. The automated system of any one of claims 1-10 wherein the oligonucleotides are assembled in a simultaneous reaction.

12. The automated system of any one of claims 1-11 wherein the overlapping oligonucleotides are assembled in a reaction using an exonuclease and a DNA polymerase.

13. The automated system of any one of claims 1-12 wherein the oligonucleotides are provided to a sub-unit of the assembly unit for amplification of the oligonucleotides by a step of PCR.

14. The automated system of any one of claims 2-13 wherein the error correction reaction comprises the use of a mismatch endonuclease.

15. The automated system of claim 14 wherein the error correction reaction further comprises the use of exonuclease III.

16. The automated system of any one of claims 1-15 wherein the system further comprises software and reagents for the transcription of the DNA molecule into an RNA molecule.

17. The automated system of claim 16 wherein the system further comprises software and reagents for the translation of the RNA molecule into a protein molecule.

18. The system of claim 17 wherein the protein is further processed by the system to produce a virus particle or a portion of a virus particle.

19. The system of claim 18 wherein the virus particle or portion of a virus particle comprises a protein antigen.

20. The system of any one of claims 1-19 wherein the assembly unit further comprises or is connected to a vessel comprising a host cell.

21. The system of any one of claims 1-16 wherein a DNA assembly step is performed in a first reaction zone of a reaction container and an RNA transcription step is performed in a second reaction zone of a reaction container.

22. The system of any one of claims 2-15 wherein a first PCR step is performed in a first reaction zone of a container and an error correction step is performed in a second zone of a reaction container, and a second PCR step is performed in a third reaction zone of a reaction container.

23. The system of any one of claims 1-22 wherein the reaction container is a 96 well plate.

24. The automated system of any one of claims 1-15 wherein the assembly unit further comprises or is connected to vessels containing a nucleic acid molecule selected from the group consisting of: a plasmid, a vector, a regulatory sequence, a promoter sequence, a binding element for a trans-acting factor, and a signal sequence.