Decode the Bacteria Activity - Instructor Copy
Age: 14+

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Activity Description

After having a lesson discussing plasmids, genes, and DNA transcription and translation, students will then apply their knowledge and "decode" a bacteria and make a plasmid sequence. Students will work in groups, with a maximum of four people per group since there are four different gene sequences prepared in this handout. Each student will be given a worksheet that contains the sequence of DNA that they need to transcribe into mRNA. The mRNA sequences will then correlate with different components of a plasmid/gene sequence. Students will then use the mRNA sequence key to determine what gene their DNA sequence correlates with. Then students will have to work together to order each of their original DNA sequences with each other to make a functional plasmid.

Duration of Activity: 15-20 mins

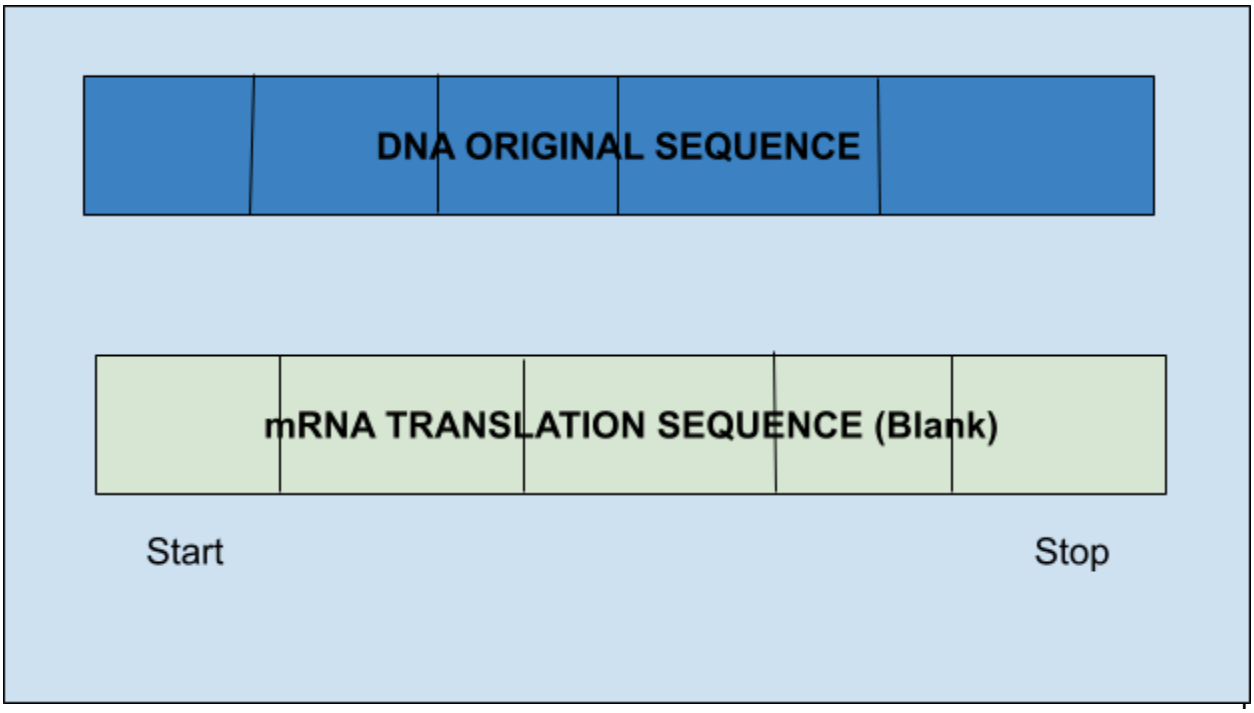
Materials:

- Print Pages 5-16 of this document equal to the number of students
- Pencil or Pen
- Eraser
- Highlighters (Optional)
- Gene Function Key (Teacher Only)

Maximum Number of Participants: N/A (Requires groups of four and print out as many copies of student worksheets as needed)

Note: If there are groups that have less than four students, students may transcribe multiple gene sequences. (eg. in a group of two each student would transcribe two gene sequences, or in a group of three students, one individual may need to transcribe an extra sequence or they may all work together to transcribe the final sequence)

Example of Cards for students:



Answer Key-TEACHER

Teacher - Gene Function & Sequence Key

Origin of Replication:

DNA- GAG GTG CGC TTT GCC AAT

mRNA- CUC CAC GCG AAA CGG UUA

Antibiotic Resistance:

DNA- AGG TTC CGA GGT CTG AAA

mRNA- UCC AAG GCU CCA GAC UUU

Promoter:

DNA- CTG GAT ACC ATG GGG CTT

mRNA-GAC CUA UGG UAC CCC GAA

Gene of Interest:

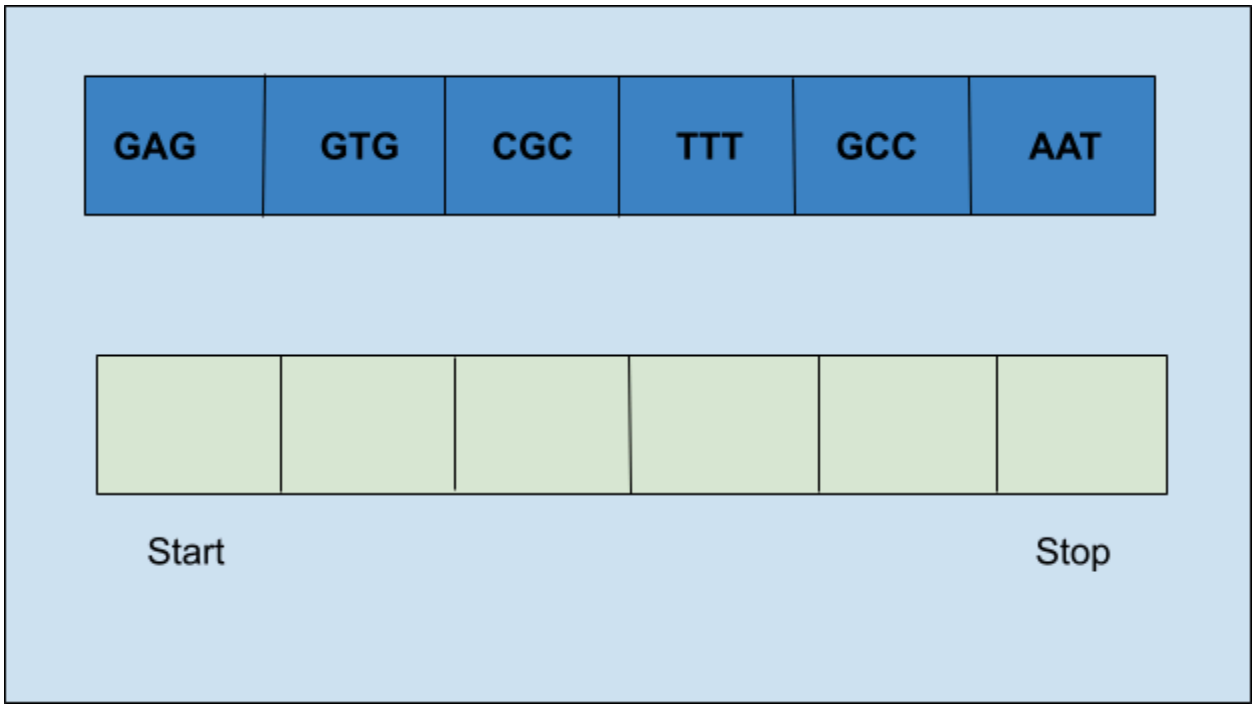
DNA- TAT CGC GAG CCT AGG TGC

mRNA- AUA GCG CUC GGA UCC ACG

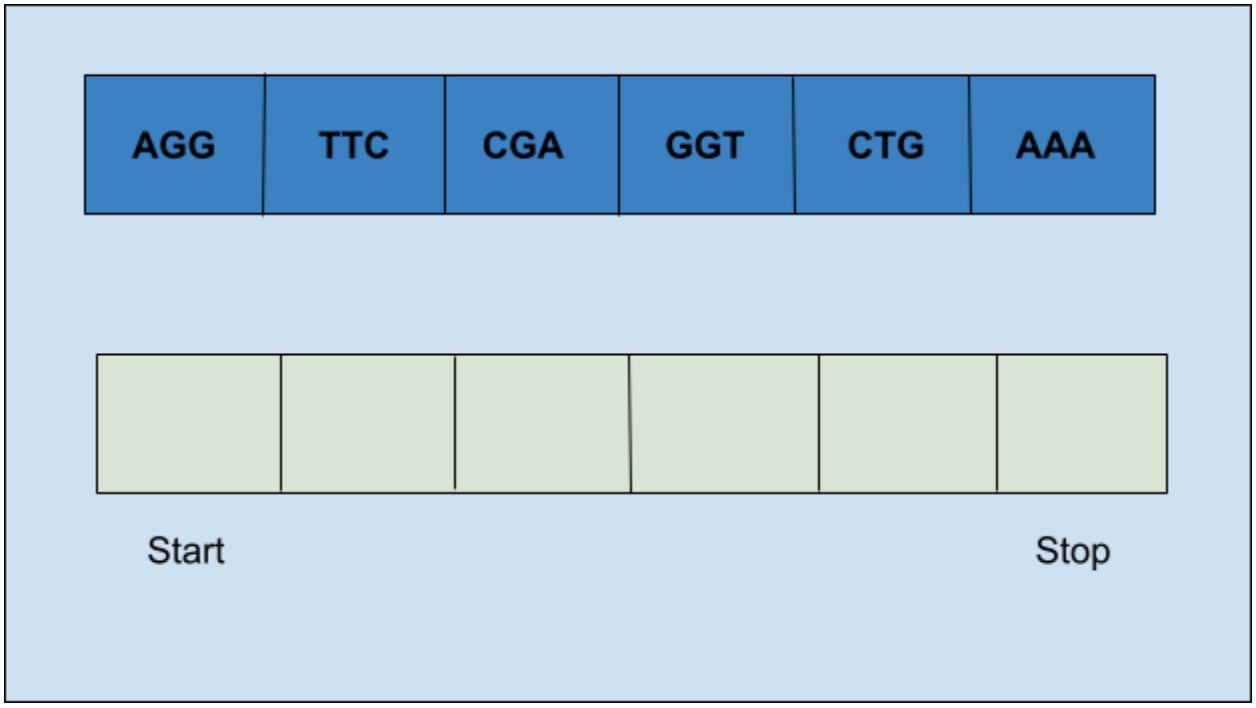
Final Answer:

3’-GAG GTG CGC TTT GCC AAT AGG TTC CGA GGT CTG AAA CTG GAT ACC ATG GGG CTT TAT CGC GAG CCT AGG TGC-5’

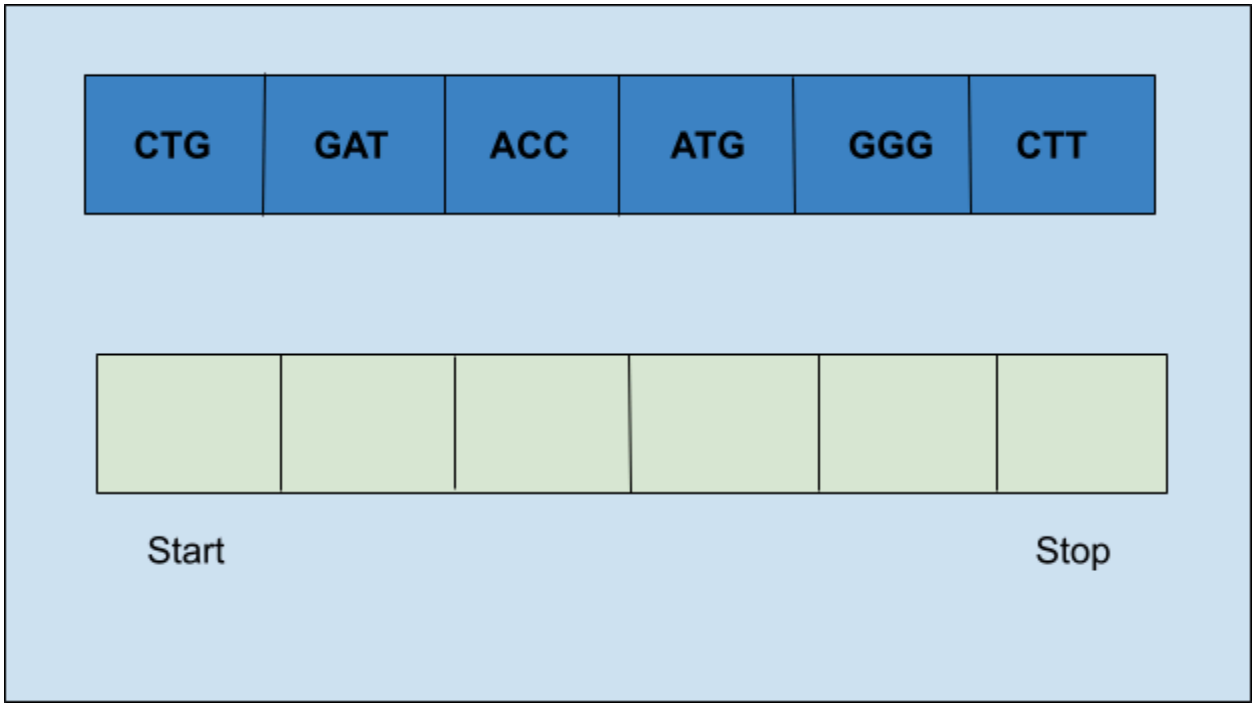
Origin of Replication



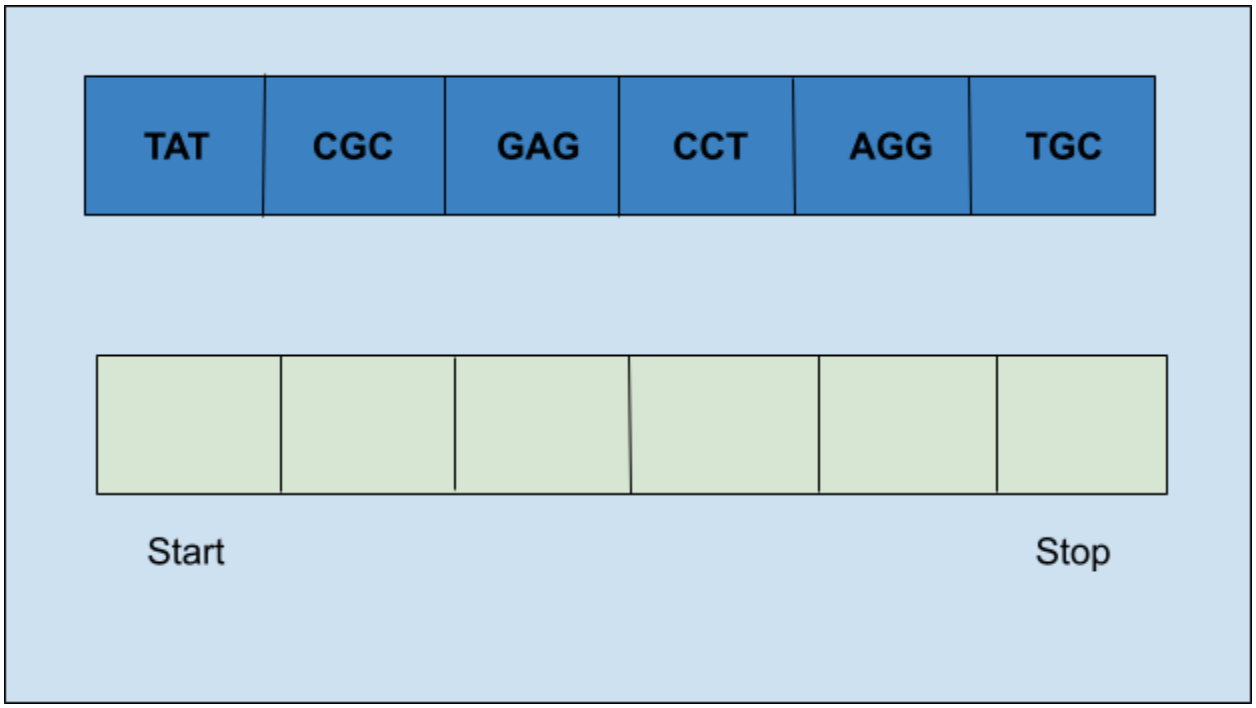
Antibiotic Resistance



Promoter

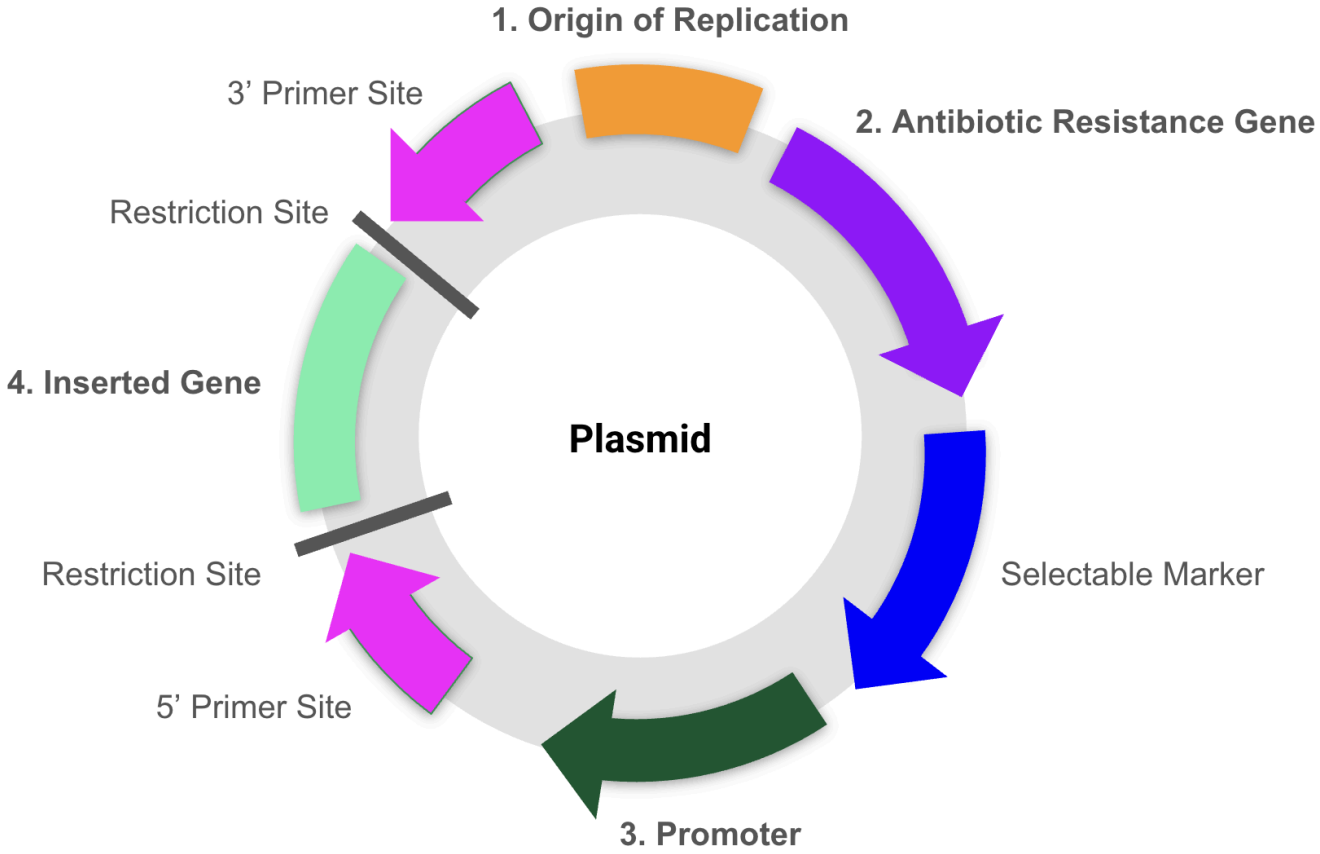


Gene of Interest



Decode The Bacteria-Worksheet C

Your group has been tasked to translate **four** DNA sequences that correspond to different sections of a plasmid. Your goal is to translate these sequences and then write the entire DNA sequence in the correct order. Each person from your group has been given a different sequence that they **must translate into mRNA.** Remember that when you are transcribing DNA to mRNA: **G↔C, A→U, T→A**. Once you have completed transcription you will then **use the mRNA sequence key** to find what plasmid gene your mRNA sequence matches with. Once each group member has found their matching sequence you will then **order all of your original DNA sequences and write them together in order as your final answer**. See the image of a plasmid below to know the order in which your sequences should go:

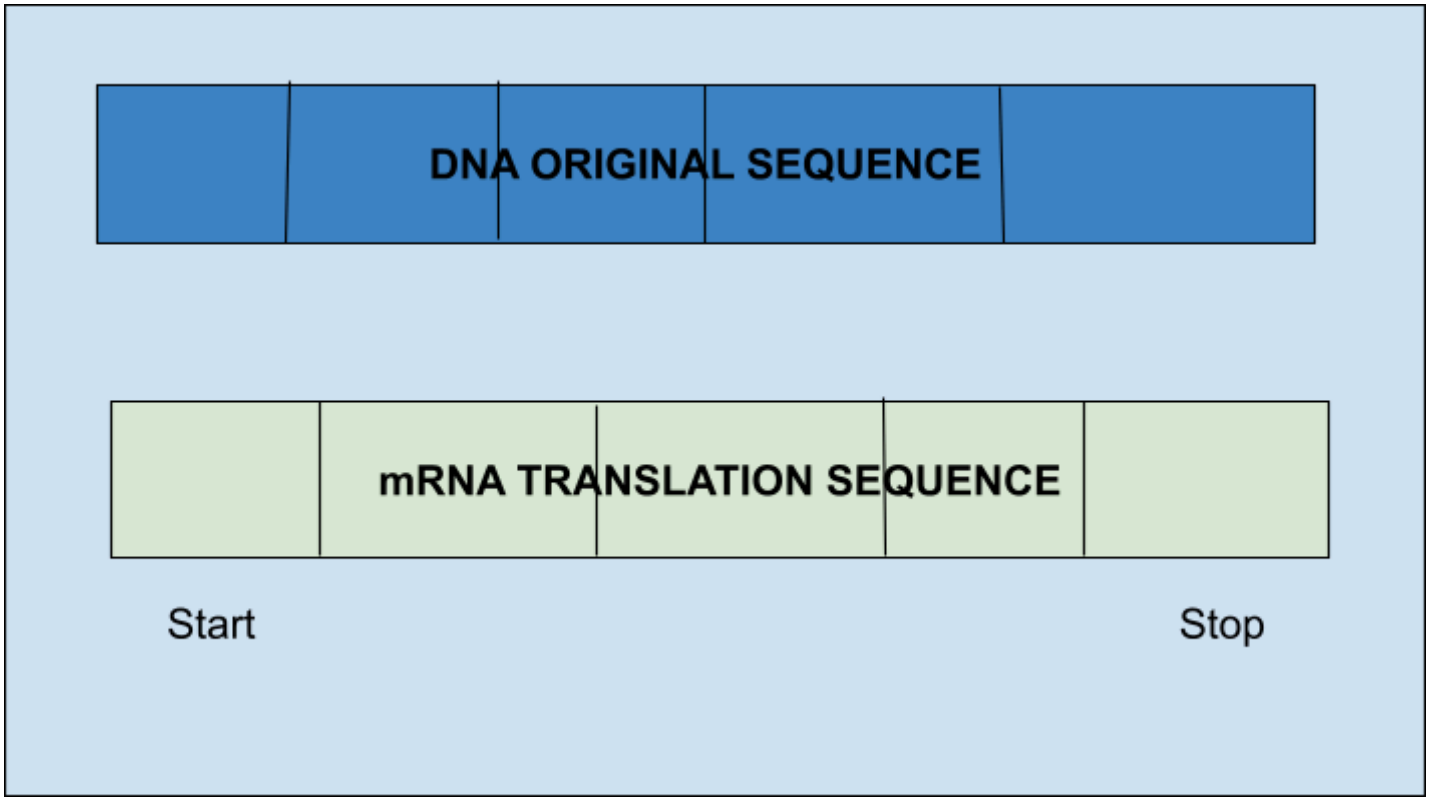


Gene Sequence Order:

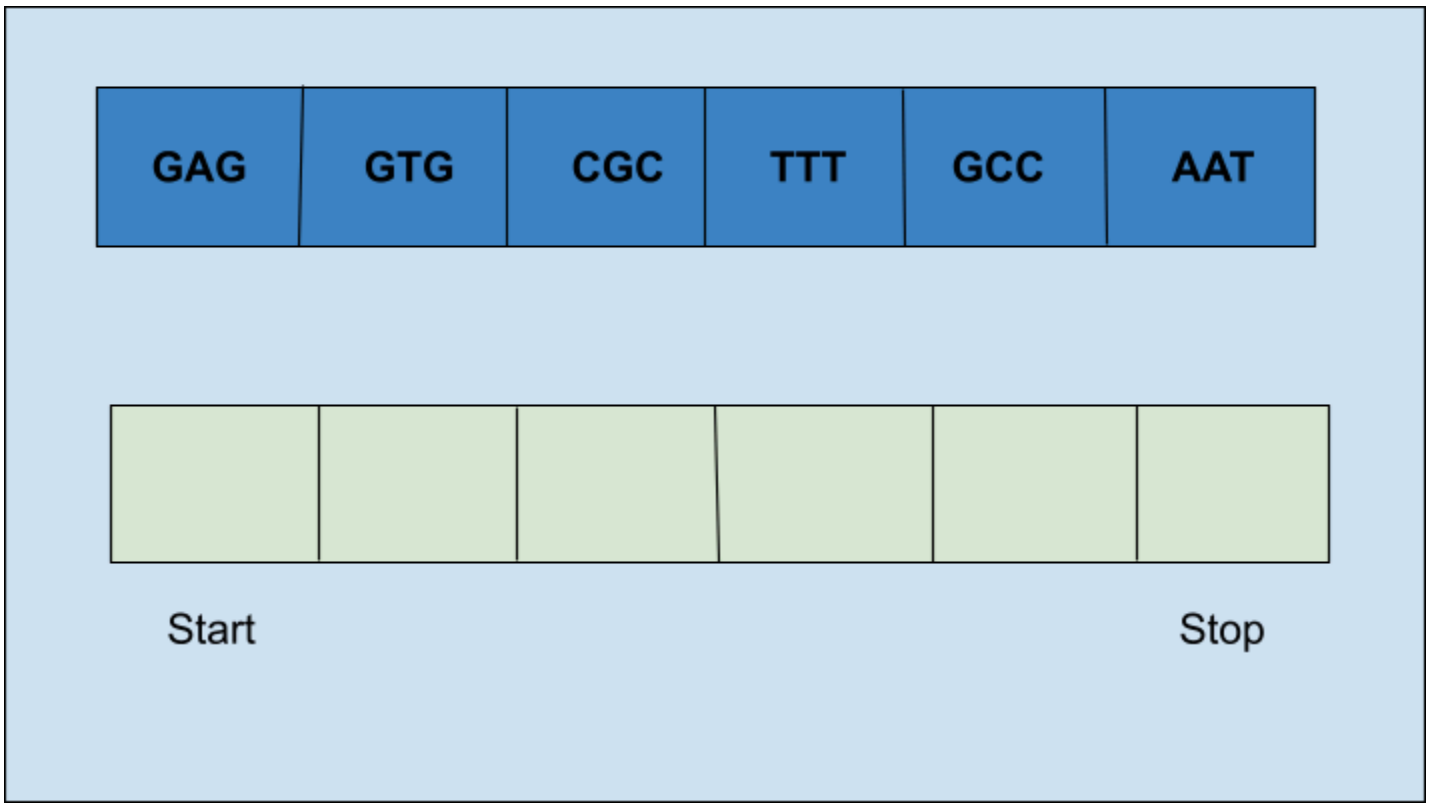
1. Origin of Replication Gene
2. Antibiotic Resistance Gene
3. Promoter Gene

4. Gene of Interest/Inserted Gene

Example Template



Your Sequence



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mRNA Sequence Key

Origin of Replication:

CUC CAC GCG AAA CGG UUA

Antibiotic Resistance:

UCC AAG GCU CCA GAC UUU

Promoter:

GAC CUA UGG UAC CCC GAA

Gene of Interest:

AUA GCG CUC GGA UCC ACG

Final Answer

(Start)3’- _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

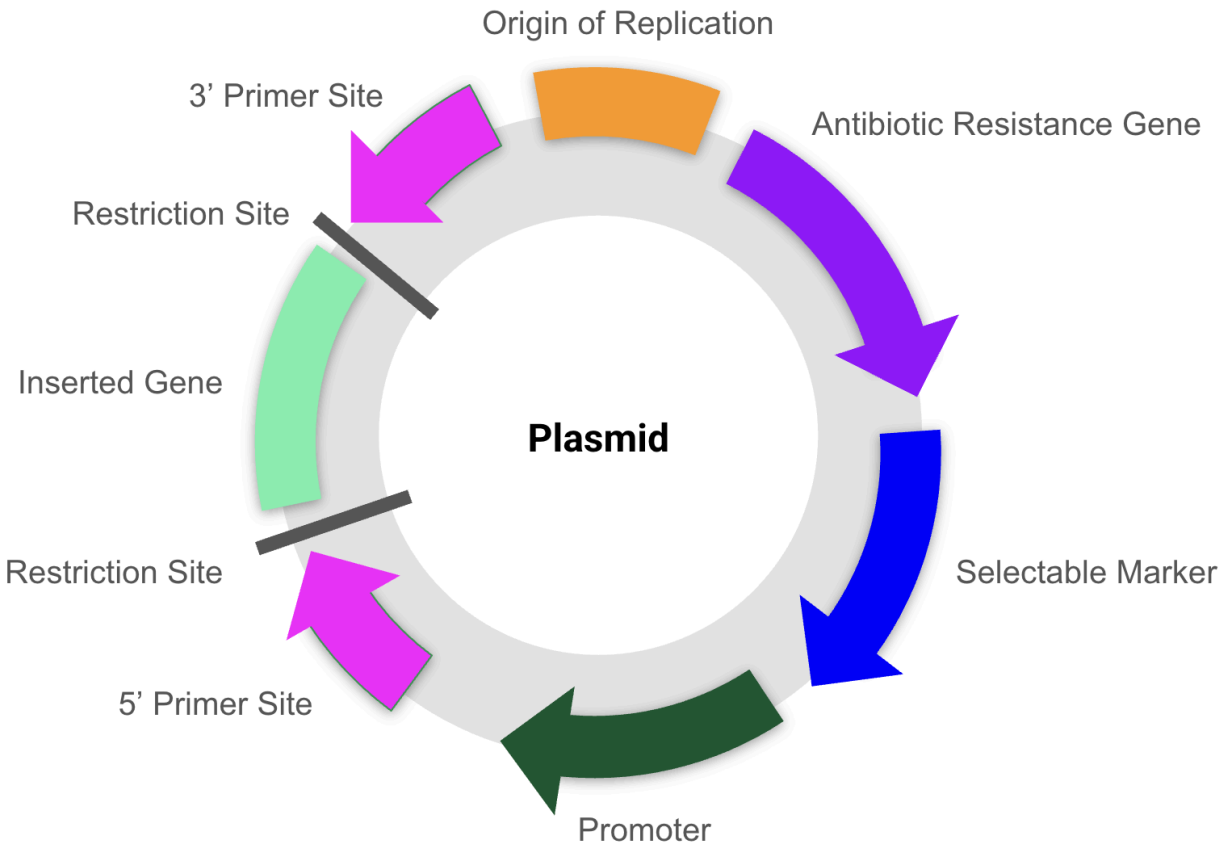
_ _

_ _

_ _ _ _ _ _ _ _ _ _ _ _ -5’(Stop)

Decode The Bacteria-Worksheet A

Your group has been tasked to translate **four** DNA sequences that correspond to different sections of a plasmid. Your goal is to translate these sequences and then write the entire DNA sequence in the correct order. Each person from your group has been given a different sequence that they **must translate into mRNA.** Remember that when you are transcribing DNA to mRNA: **G↔C, A→U, T→A**. Once you have completed transcription you will then **use the mRNA sequence key** to find what plasmid gene your mRNA sequence matches with. Once each group member has found their matching sequence you will then **order all of your original DNA sequences and write them together in order as your final answer**. See the image of a plasmid below to know the order in which your sequences should go:



Gene Order:

1. Origin of Replication Gene
2. Antibiotic Resistance Gene
3. Promoter Gene
4. Gene of Interest/Inserted Gene

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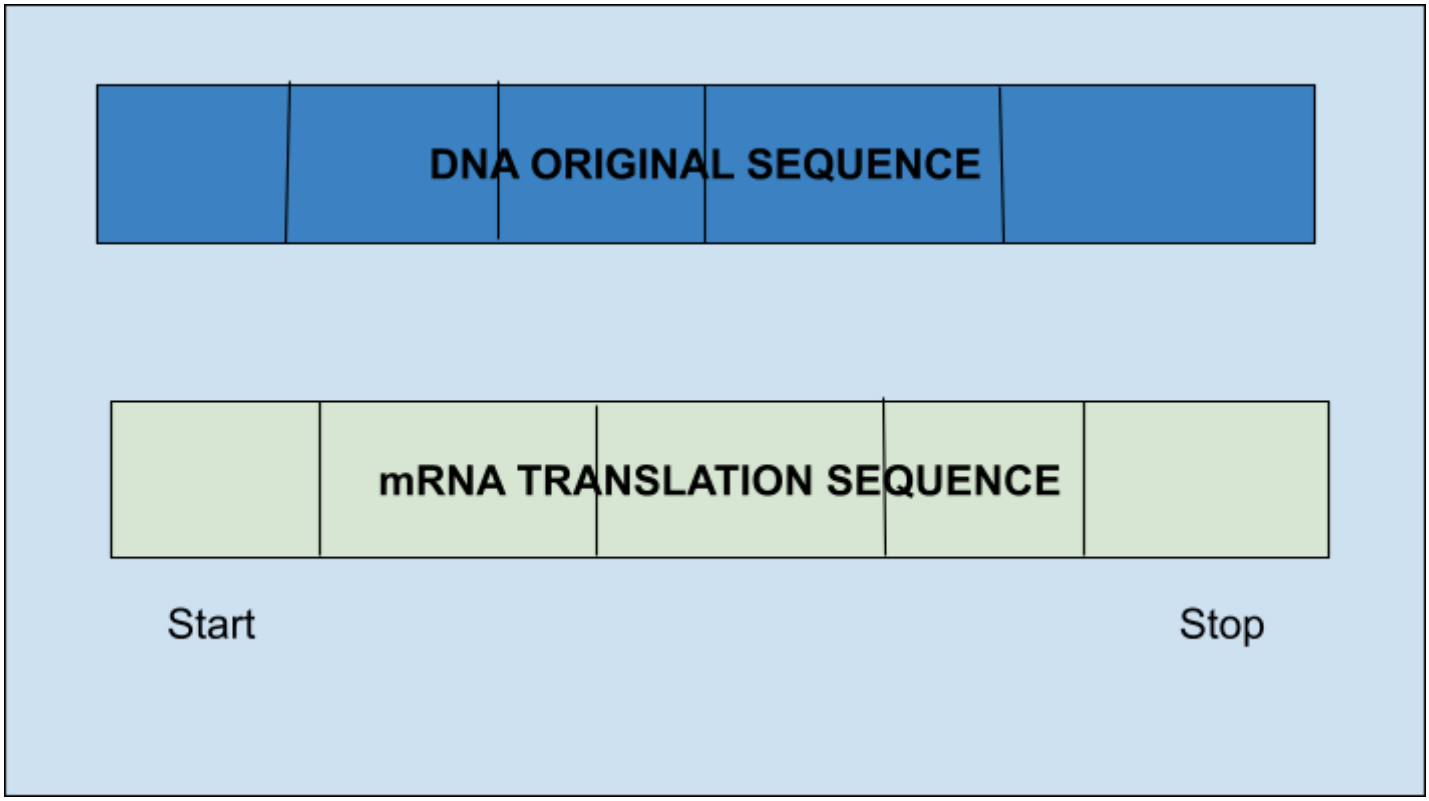
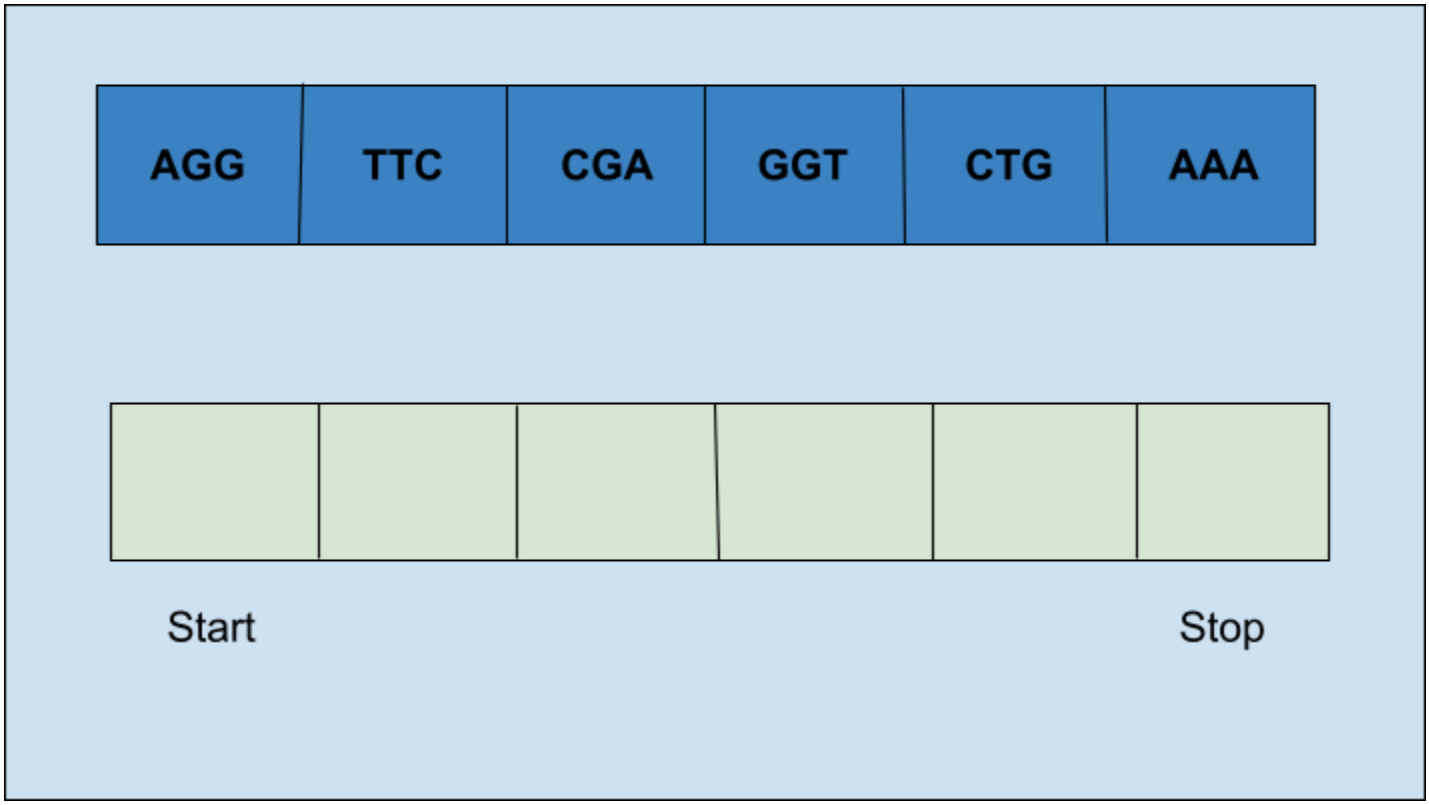
Example Template



Your Sequence



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mRNA Sequence Key

Origin of Replication:

CUC CAC GCG AAA CGG UUA

Antibiotic Resistance:

UCC AAG GCU CCA GAC UUU

Promoter:

GAC CUA UGG UAC CCC GAA

Gene of Interest:

AUA GCG CUC GGA UCC ACG

Final Answer

(Start)3’- _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

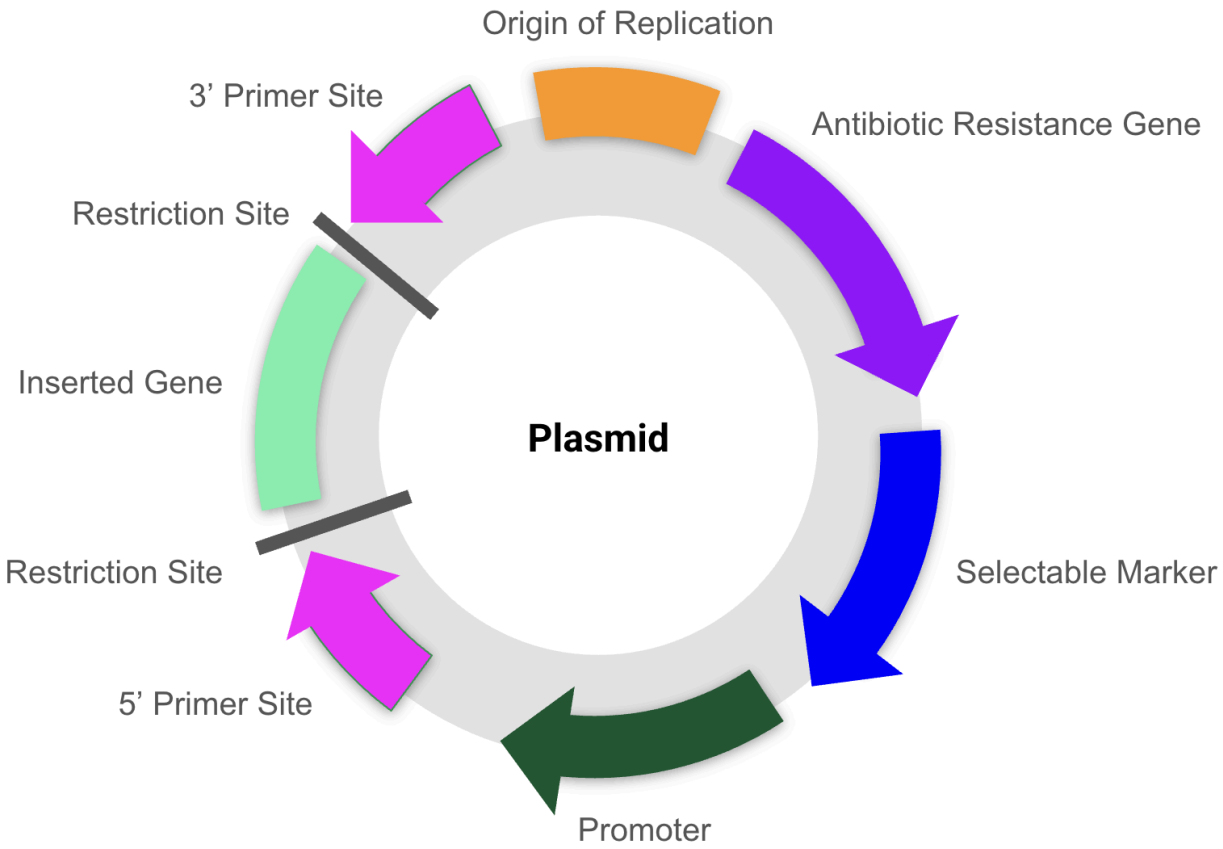
_ _

_ _

_ _ _ _ _ _ _ _ _ _ _ _ -5’(Stop)

Decode The Bacteria-Worksheet D

Your group has been tasked to translate **four** DNA sequences that correspond to different sections of a plasmid. Your goal is to translate these sequences and then write the entire DNA sequence in the correct order. Each person from your group has been given a different sequence that they **must translate into mRNA.** Remember that when you are transcribing DNA to mRNA: **G↔C, A→U, T→A**. Once you have completed transcription you will then **use the mRNA sequence key** to find what plasmid gene your mRNA sequence matches with. Once each group member has found their matching sequence you will then **order all of your original DNA sequences and write them together in order as your final answer**. See the image of a plasmid below to know the order in which your sequences should go:



Gene Order:

1. Origin of Replication Gene
2. Antibiotic Resistance Gene
3. Promoter Gene
4. Gene of Interest/Inserted Gene

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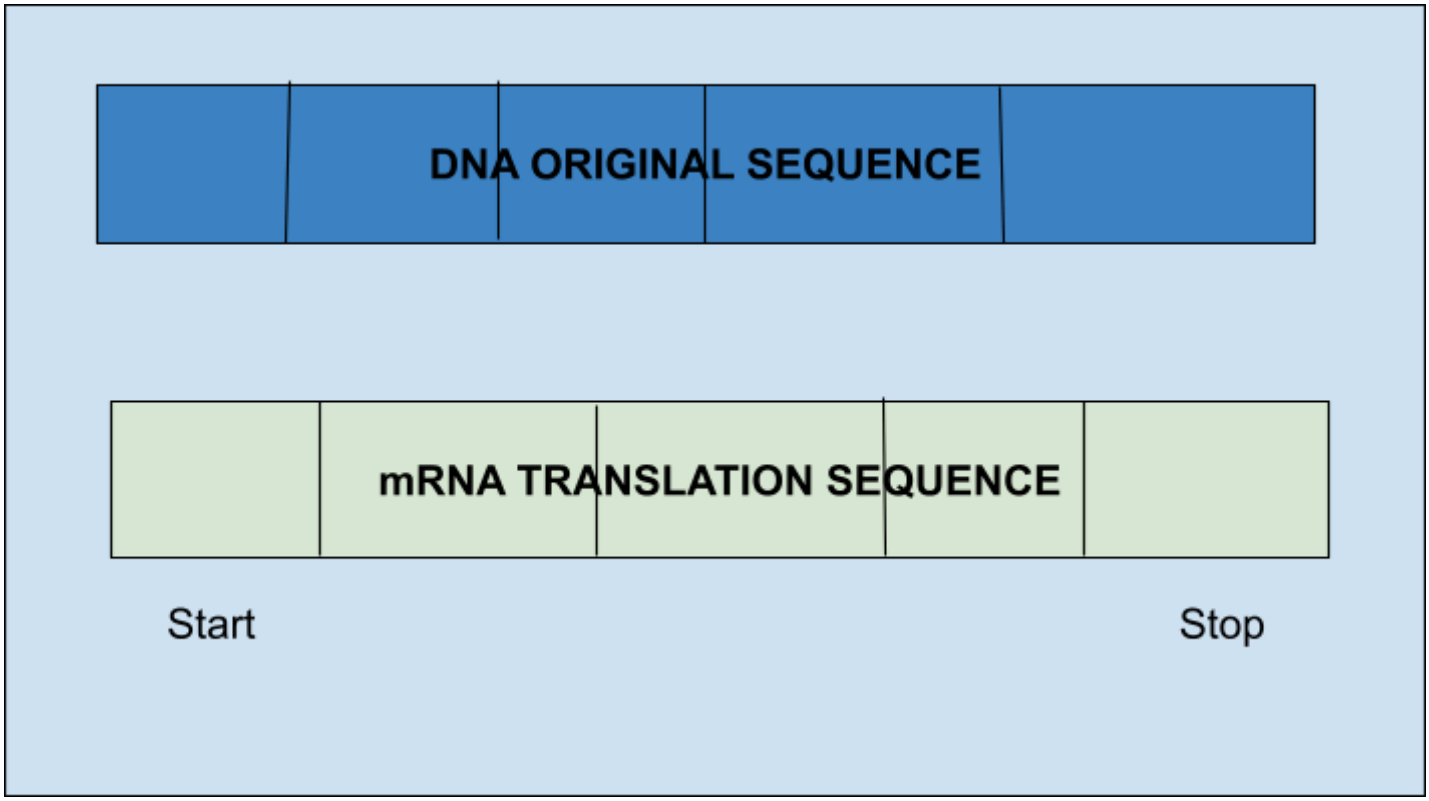
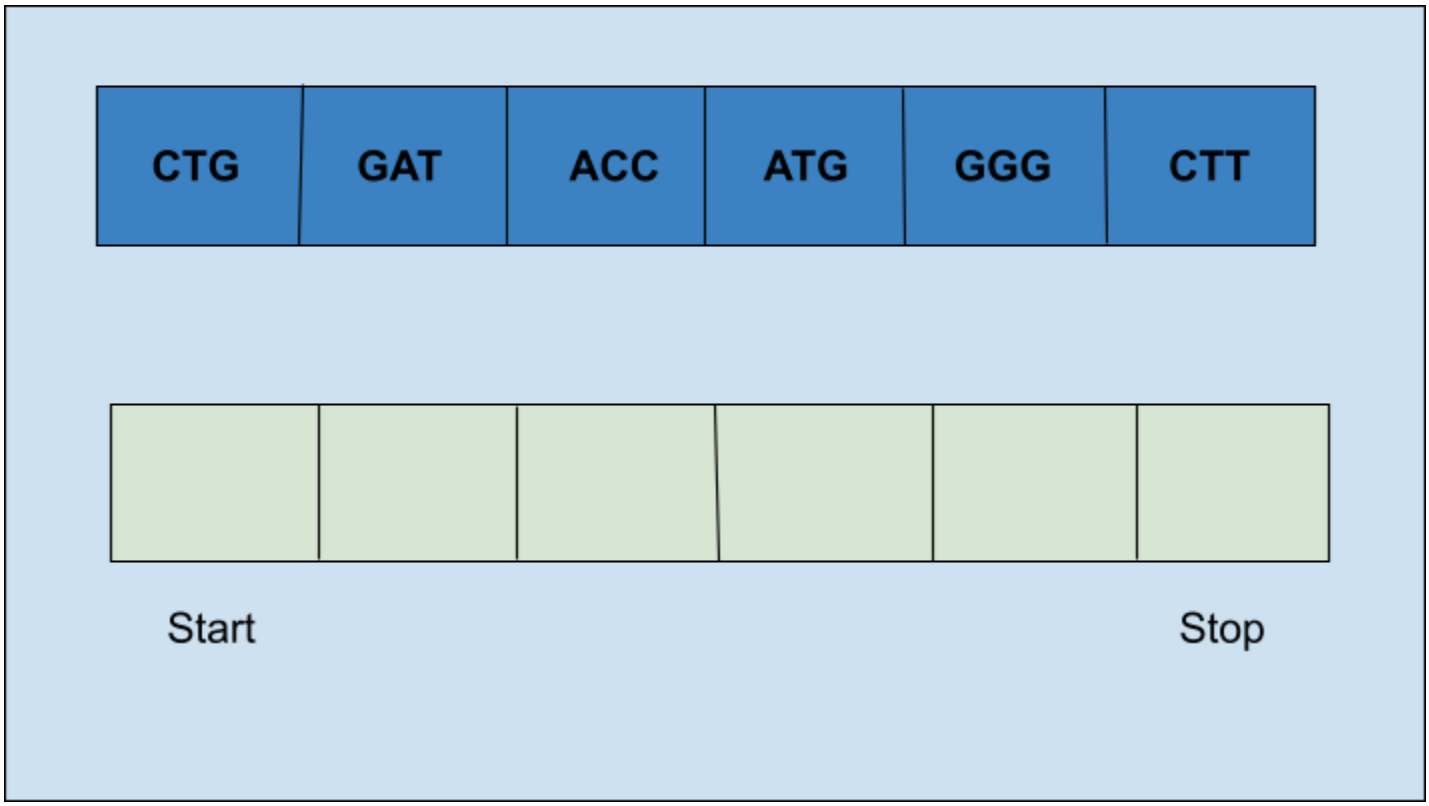
Example Template



Your Sequence



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mRNA Sequence Key

Origin of Replication:

CUC CAC GCG AAA CGG UUA

Antibiotic Resistance:

UCC AAG GCU CCA GAC UUU

Promoter:

GAC CUA UGG UAC CCC GAA

Gene of Interest:

AUA GCG CUC GGA UCC ACG

Final Answer

(Start)3’- _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

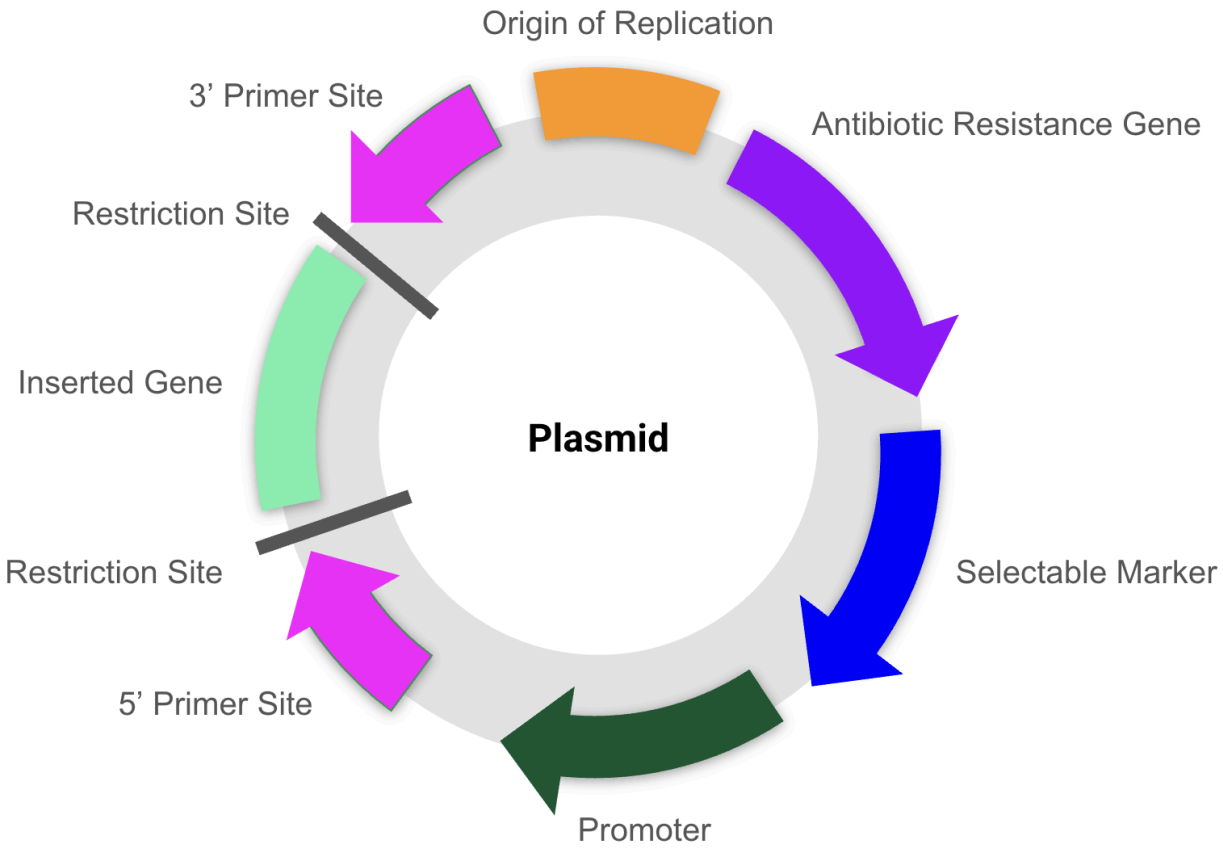
_ _

_ _

_ _ _ _ _ _ _ _ _ _ _ _ -5’(Stop)

Decode The Bacteria-Worksheet B

Your group has been tasked to translate **four** DNA sequences that correspond to different sections of a plasmid. Your goal is to translate these sequences and then write the entire DNA sequence in the correct order. Each person from your group has been given a different sequence that they **must translate into mRNA.** Remember that when you are transcribing DNA to mRNA: **G↔C, A→U, T→A**. Once you have completed transcription you will then **use the mRNA sequence key** to find what plasmid gene your mRNA sequence matches with. Once each group member has found their matching sequence you will then **order all of your original DNA sequences and write them together in order as your final answer**. See the image of a plasmid below to know the order in which your sequences should go:



Gene Order:

1. Origin of Replication Gene
2. Antibiotic Resistance Gene
3. Promoter Gene
4. Gene of Interest/Inserted Gene

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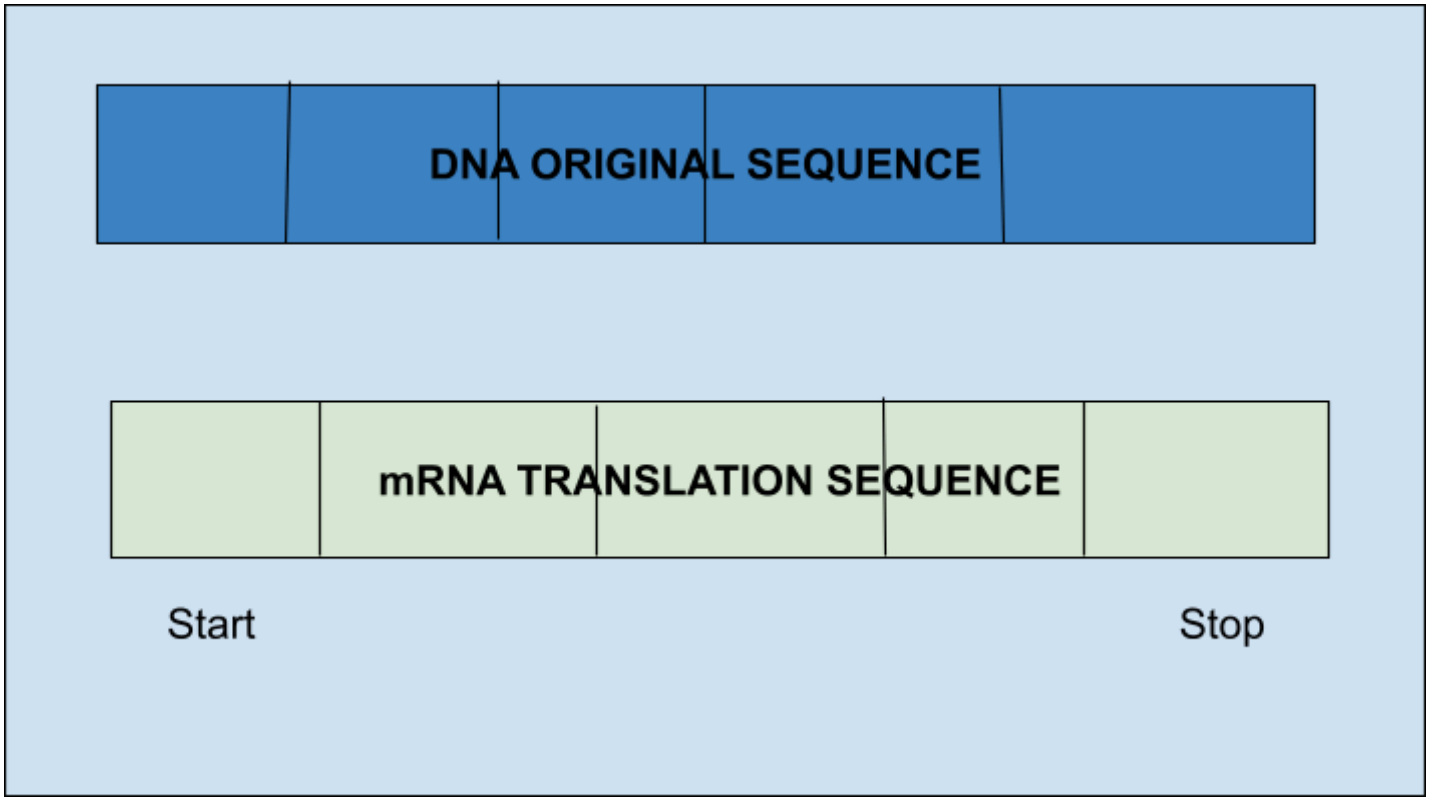
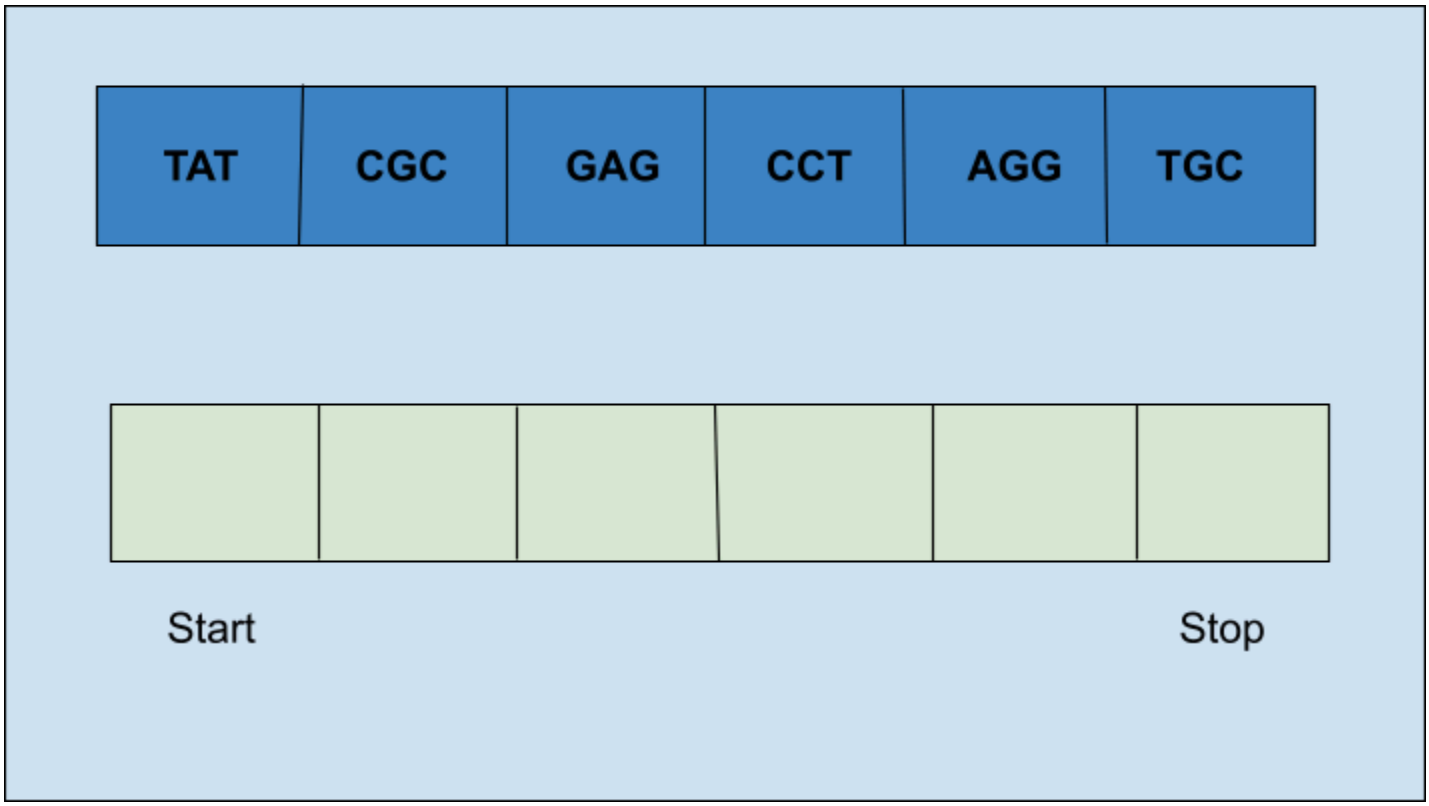
Example Template



Your Sequence



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mRNA Sequence Key

Origin of Replication:

CUC CAC GCG AAA CGG UUA

Antibiotic Resistance:

UCC AAG GCU CCA GAC UUU

Promoter:

GAC CUA UGG UAC CCC GAA

Gene of Interest:

AUA GCG CUC GGA UCC ACG

Final Answer

(Start)3’- _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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_ _ _ _ _ _ _ _ _ _ _ -5’(Stop)