December 2025

ABE "Tools of the Trade" Literacy Activity

By Georgia Ewan, ABE Australia

ABE Master Teacher Fellowship Program

AMGEN Biotech Experience

Scientific Discovery for the Classroom

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Scientific Discovery for the Classroom

The projects designed by the 2024–25 ABE Master Teacher Fellows are a compilation of curricula and materials that are aligned with the Amgen Biotech Experience (ABE) and further support teachers and students in their biotechnology education. These projects were created over the course of a 1-year Fellowship in an area of each Fellow's own interest. Each is unique and can be adapted to fit the needs of your individual classroom. Objectives and goals are provided, along with expected outcomes. Projects can be used in conjunction with your current ABE curriculum or as an extension.

As a condition of the Fellowship, these classroom resources may be downloaded and used by other teachers for free. The projects are generally not edited or revised by the ABE Program Office for content, clarity, or language except to ensure safety protocols have been clearly included where appropriate.

We are grateful to the ABE Master Teacher Fellows for sharing their work with the ABE community. If you have questions about any of the project components, please reach out to us at ABEInfo@edc.org, and we will be happy to connect you with the author and provide any assistance needed.

AMGEN Biotech Experience

Scientific Discovery for the Classroom

Australia

ABE "Tools of the Trade" Literacy Activity

TIME FRAME: 2 hours

SUGGESTED AGE RANGE: 15–18 year olds

SUGGESTED COURSE OR CONTENT AREA: Students to use alongside the Amgen Biotech Experience

CONNECTION DESCRIPTIONS: Teachers will explore literacy and writing.

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PROGRAM SITE: ABE Australia

1. Overview

Students write their own descriptive reports about various "tools of the trade" used in the Amgen Biotech Experience. The teaching sequence is based on the "I do", "We do" and "You do" model of instruction which gradually shifts the cognitive load from teacher to student, scaffolding their learning to build more confidence and independence.

1. **I Do – Teacher modelling:** The teacher introduces a model descriptive report that mirrors what students will eventually create (Model Text 1). This text is used to explicitly explain the structure and stages of the report and highlight key scientific terminology and language features.
2. **We Do – Collaborative Construction:** In small groups, students co-write a descriptive report on a different biotechnology tool (Model Text 2). They follow the model text and apply the same structure and language features modeled by the teacher, allowing for peer learning and scaffolded practice.
3. **You Do – Independent Writing:** Students individually write their own descriptive report about a different tool (Model Text 3), applying the knowledge and writing strategies they've developed throughout the lesson.

This activity includes model texts and annotations for the following tools:

1. Equipment: Micropipettes, Gel electrophoresis, Centrifuge, PCR
2. Biological tools: Restriction Enzymes, DNA Ligase, DNA polymerase

Teacher flexibility: This resource is designed for adaptability.

- Teachers may select to complete the "I do", "We do" and "You do" model of instruction twice—one based on equipment and the next based on biological tools.
- Educators may select which tools to focus on based on curriculum goals or class needs.

- Scaffolding can be adjusted to support a range of student abilities and experiences.

2. Learning Goal

- Independently write a descriptive report on biotechnology equipment and biological tools using appropriate stages, scientific terms and language features.

3. Key Vocabulary

Micropipettes, Gel electrophoresis, Centrifuge, PCR, Restriction Enzymes, DNA Ligase, DNA polymerase

Also, see underlined words in slides.

4. Materials

- ABE Tools of the Trade Literacy Activity slides
- Printed model text (each is on a separate page at the end of this document)
- Large posters and markers or access to a shared document

Optional:

- Scaffolding activities
- Printed rubric

5. Teacher Preparation

Adjust the slide presentation based on class needs.

- Choose which texts to use for the “I do”, “ We do” and “You do” sections
- Print the model text out for each student
- Determine the level of scaffolding for the “We do” and “I do” writing and print associated materials

High-Level Scaffolding (More Structured & Guided)	• Provide students with the sample Text 1 and Text 2 cut into sections (based on stages). Rearrange the sample texts into the correct order. • Adjust the sample texts into a close passage (leaving key scientific language as blanks). Example is on page 13. • Provide students with a list of sequential conjunctions, cause and effect conjunctions and evaluative language that they can substitute into the sample texts.
Mid-Level Scaffolding (Shared Responsibility)	• Provide the visual summary to students

Low-Level Scaffolding (More Independence)	• Students can draw their own visual summary • Only allow students their annotated model text when writing collaboratively and individually

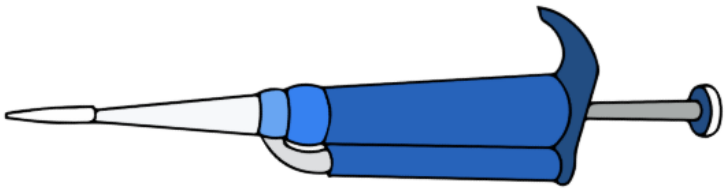
6. Sequence of Activities

Instruction method	Activity	Time	Materials
	1. Teacher introduces the range of equipment and biological tools students will explore through descriptive report writing. The teacher also introduces the 'I do, We do, You do' model, explaining how each phase supports students in developing their writing skills.	2 mins	ABE Tools of the Trade Literacy Activity slides Slide 1
I do	2. Teacher distributes the handout of the chosen model text (Model Text 1) for the equipment. Students read the text individually or with teacher guidance.	5 mins	Model Text handout (Choose 1 from pp. 6–9)
	3. Teacher uses the slideshow animations to explicitly unpack each stage of the descriptive report (function, how it works, application in gene cloning and importance/impact). Students annotate their copy of the model text alongside the teacher's explanations.	3 mins	
	4. Teacher leads a discussion to identify and underline the scientific language of the text. Students underline the words on their model text.	3 mins	
	5. Teacher leads a discussion to identify the subgenres of the text and the associated language features of these stages. Students use different coloured highlighters to visually code these features on their copy of the model text.	3 mins	
We do	6. Students form small groups (3–4) to co-construct Text 2—a descriptive report on a different biotechnology equipment. Students follow the model text and apply the	20 mins	Posters and markers OR a shared document.

	same structure and language features. Each student has a turn writing. NOTE: Various levels of scaffolding can be applied at this step.		Scaffold materials if needed (e.g., p. 13)
	7. Groups can review, annotate, and apply a simple rubric to evaluate peers' posters or digital documents.	10 mins	Rubric p. 14
I do	8. Students work individually to write a Text 3, based on the model and supported writing text. They edit, check, redraft, annotate and publish their text. NOTE: Various levels of scaffolding can be applied at this step—See teacher preparation.	10 mins	Scaffold materials if needed (e.g., p. 13)
	9. Students assess their writing using the same rubric applied in the collaborative task. Optional: Class can read and annotate the sample text provided to improve their individual descriptive report and reinforce learning.	10 mins	Model Text handout (Choose from pp. 6–9) Rubric p. 14
Repeat	10. Repeat the full lesson sequence using model texts and tasks focused on biological tools (e.g., DNA ligase, PCR, restriction enzymes).	1 hour	ABE Tools of the Trade Literacy Activity slides Model Text handout (Choose 1 from pp. 10–12)

Micropipettes - Model text

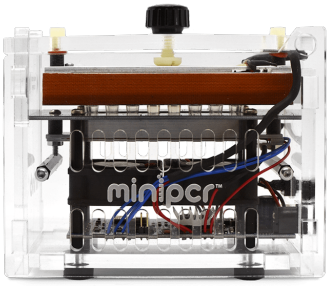
Micropipettes are laboratory tools used to measure and transfer very small volumes of liquid, typically in microlitres (µL). Liquid is drawn into a disposable tip of the micropipette by pressing the plunger to the first stop and slowly releasing it while submerged in the liquid. It is then dispensed by pressing the plunger to the second stop, followed by tip ejection to maintain sterility. In gene cloning, micropipettes are essential for accurately measuring reagents such as enzymes, buffers, and DNA fragments. This accuracy is crucial, as even small volume errors can affect the success of digestion, ligation or transformation.



Gel electrophoresis - Model text

Gel electrophoresis is a technique used to separate biomolecules such as DNA based primarily on molecular size, shape and charge. DNA samples are loaded into wells in an agarose gel, and then an electric current is applied across the gel. DNA fragments migrate toward the positive electrode due to the negatively charged phosphate groups in their backbone. Smaller or more highly charged fragments travel further through the porous gel matrix because of reduced resistance. In gene cloning, gel electrophoresis is essential for verifying the size of DNA fragments after restriction digestion or PCR. This verification is crucial, as it ensures that the gene of interest and the plasmid vector are the correct sizes before ligation, helping confirm successful cloning steps.

PCR - Model text

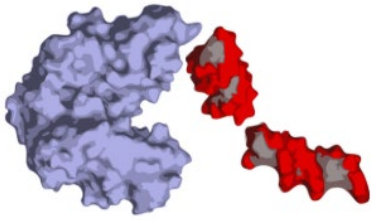


PCR (Polymerase Chain Reaction) is a laboratory technique used to amplify specific DNA sequences, from a small initial sample. Primers, nucleotides and DNA polymerase are used in a thermal cycler to replicate DNA through many cycles of denaturation, annealing and extension. During denaturation, the DNA is heated to separate into single strands. The temperature is then lowered to allow primers to bind to their complementary sequences, followed by a higher temperature that enables a heat-stable DNA polymerase (such as Taq) to synthesize new strands. In gene cloning, PCR is essential for amplifying the gene of interest and for screening bacterial colonies after transformation. This screening is crucial, as it helps confirm whether bacteria have successfully taken up the correct plasmid construct.

Centrifuge - Model text

Centrifuges are devices used to mix or separate substances based on density by spinning samples at high speeds. In molecular biology, they are often used at lower speeds to quickly collect liquids at the bottom of tubes or to mix reagents evenly. This is achieved by placing tubes in a balanced rotor and spinning them briefly, which forces the contents to the bottom and ensures uniform distribution. In gene cloning, centrifugation is essential for mixing small volumes of reagents such as enzymes, buffers and DNA. This mixing is important, as it ensures that all components are in contact and react efficiently, which supports the success of processes like digestion, ligation and transformation.

Restriction Enzymes - Model text



Restriction enzymes are proteins that cut DNA at specific sequences called recognition sites. These enzymes are naturally found in bacteria, where they function as a defense mechanism against viral infection. Viruses inject their DNA into bacterial cells, so restriction enzymes cleave the foreign DNA, which prevents the virus from hijacking the cell's machinery.

A restriction enzyme scans a DNA molecule for a specific recognition sequence, typically a palindromic site 4–8 base pairs long. It first identifies the target site, then binds to the DNA, and after that cleaves both strands, producing either sticky ends with overhangs or blunt ends with straight cuts. This site-specific cleavage is essential for preparing DNA fragments for cloning.

Restriction enzymes are essential in gene cloning because they generate complementary ends that ensure the gene is inserted in the correct location and orientation. Consequently, restriction enzymes allow precise and predictable digestion of both the plasmid vector and the gene of interest.

DNA Ligase

DNA ligase is an enzyme that joins DNA fragments together. This enzyme is naturally found in all cells, where it seals breaks in the DNA backbone. DNA replication produces short Okazaki fragments on the lagging strand, so ligase joins these fragments to form a continuous DNA strand.

DNA ligase recognizes breaks in the sugar-phosphate backbone of double-stranded DNA. It first identifies the nick, then binds to the site, and after that catalyzes a phosphodiester bond between adjacent nucleotides, sealing the strand. This joining activity is essential for connecting DNA fragments during recombinant DNA construction.

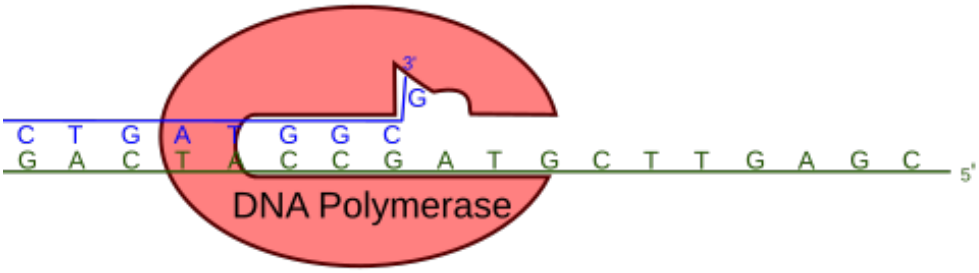
DNA ligase is vital in gene cloning because it permanently joins the gene of interest to the plasmid vector. As a result, it ensures a stable recombinant DNA molecule is created that can be replicated and expressed in host cells.

DNA Polymerase

DNA polymerase is an enzyme that synthesizes new DNA. This enzyme is naturally found in all cells, where it copies DNA during cell division. DNA replication involves a template strand, so that polymerase adds complementary nucleotides to this strand to ensure each daughter cell receives an identical copy of DNA.

DNA polymerase firstly identifies an RNA primer which has been attached to the template strand, then it binds to the primer, and after that extends the strand by adding nucleotides in the 5’ to 3’ direction. This process is essential in amplifying genes in molecular biology.

DNA polymerase is crucial in gene cloning because it amplifies DNA sequences using techniques like PCR. This usually leads to enough copies of the target gene to allow for successful insertion into a plasmid vector.



Example of Increased Scaffolding
Gel Electrophoresis - Text 2

_____ _____ is a technique used to separate _____ such as DNA based primarily on _____ _____, _____ and _____. DNA samples are loaded into _____ in an _____ _____, and an _____ _____is applied across the gel. DNA fragments migrate toward the _____ _____ the negatively charged _____ groups in their _____. Smaller or more highly charged fragments travel further through the _____ _____ _____ reduced _____. In gene cloning, gel electrophoresis is for verifying the size of DNA fragments after _____ _____ or _____. This verification is , it ensures that the _____ __ _____ and the _____ _____ are the correct sizes before _____ , helping confirm successful cloning steps.

Sample Rubric - Equipment

Criteria	Achievement (tick one)		
	Limited	Developing	High level
The descriptive report contains appropriate stages: • Function • How it works • Application in gene cloning • Importance/impact			
Technical, scientific vocabulary is used.			
The descriptive report contains appropriate language features • Sequential conjunctions • Cause and effect conjunctions • Evaluative language			

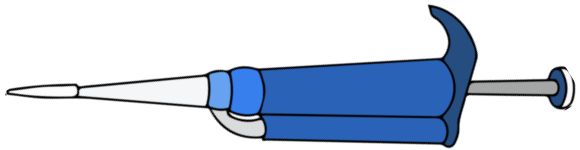
Sample Rubric - Biological tools

Criteria	Achievement (tick one)		
	Limited	Developing	High level
The descriptive report contains appropriate stages: • Function • Natural role • How it works • Application in gene cloning • Importance/impact			
Technical, scientific vocabulary is used.			
The descriptive report contains appropriate language features • Sequential conjunctions • Cause and effect conjunctions • Evaluative language • High modality language			

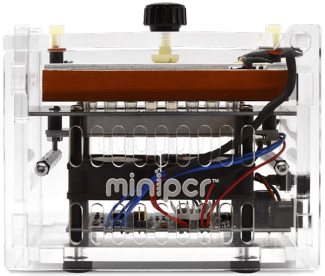
Literacy activity

Equipment

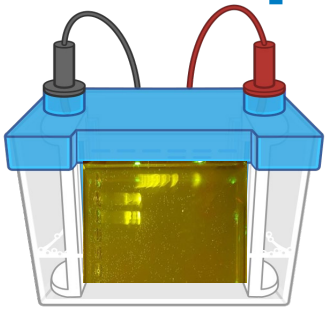
Micropipettes



PCR



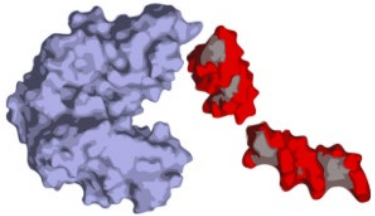
Gel electrophoresis



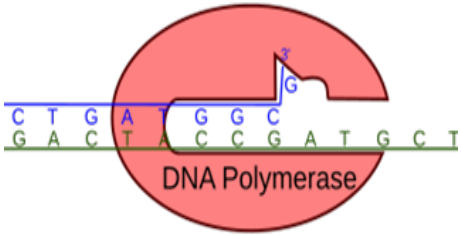
Centrifuge

Biological tools

Restriction Enzymes



DNA Polymerase



DNA Ligase

Model Text - Stages

Micropipettes

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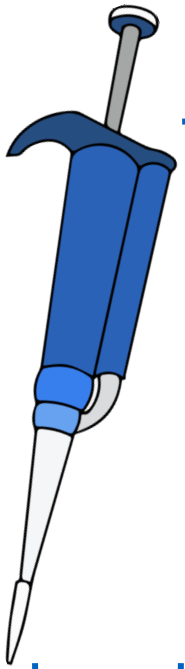
- **Function**
- **How It Works**
- **Application in Gene Cloning**
- **Importance/Impact**

Micropipettes

Visual Summary

How It Works

Function



Application in Gene Cloning

Importance/Impact

Model Text - Scientific language

Micropipettes

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- **Function**
- **How It Works**
- **Application in Gene Cloning**
- **Importance/Impact**

Micropipettes

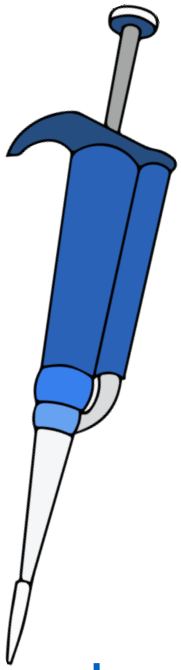
Function

- Precise measurement and transfer
- Small volumes µL

Application in Gene Cloning

Accurately mixing reagents → Enzymes, buffers and DNA fragments

Visual Summary



How It Works

1. Pressing the plunger to the first stop ← Drawing liquid in (aspirating)
2. Slowly releasing it while submerged in the liquid
3. Pressing plunger to second stop to dispense
4. Tip ejection → Maintains sterility

Importance/Impact

small volume errors can affect the success → e.g. digestion, ligation, or transformation

Model Text - Language features

Micropipettes

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Sequential conjunctions to explain steps in a process

Cause and effect conjunctions

Evaluative language

Model Text - Stages

Gel electrophoresis

Gel electrophoresis is a technique used to separate biomolecules such as DNA based primarily on molecular size, shape and charge. DNA samples are loaded into wells in an agarose gel, and then an electric current is applied across the gel. DNA fragments migrate toward the positive electrode due to the negatively charged phosphate groups in their backbone. Smaller or more highly charged fragments travel further through the porous gel matrix because of reduced resistance. In gene cloning, gel electrophoresis is essential for verifying the size of DNA fragments after restriction digestion or PCR. This verification is crucial, as it ensures that the gene of interest and the plasmid vector are the correct sizes before ligation, helping confirm successful cloning steps.

Function

How It Works

Application in Gene Cloning

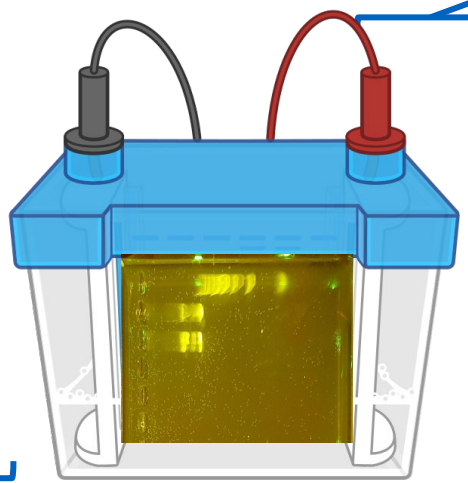
Importance/Impact

Visual Summary

Gel electrophoresis

How It Works

Function



Application in Gene Cloning

Importance/Impact

Model Text - Scientific language

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- **Function**
- **How It Works**
- **Application in Gene Cloning**
- **Importance/Impact**

Visual Summary

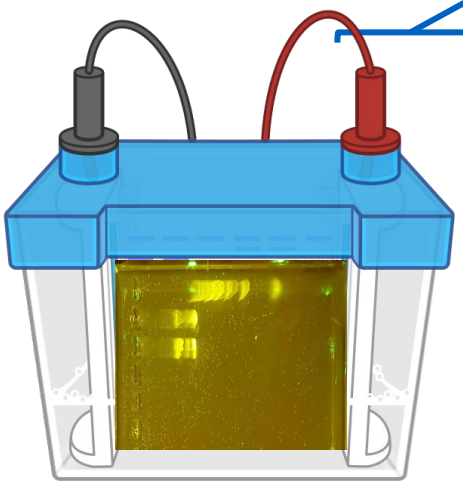
Gel electrophoresis

How It Works

Function

Separate biomolecules

Weight, molecular shape and degree of charge.



DNA samples are loaded into wells → Porous, agarose gel

↓

Electric current is applied

↓

DNA migrates towards positive end → Negative Phosphate groups in DNAl

↓

Smaller fragments move further → ↓ resistance

Application in Gene Cloning

Verifying the size of DNA fragments ← after digestion or PCR.

Importance/Impact

Gene of interest is correct sizes → confirm successful steps

Model Text - Language features

Gel electrophoresis

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Sequential conjunctions to explain steps in a process

Cause and effect conjunctions

Evaluative language

Model Text - Stages

Polymerase Chain Reaction

PCR (Polymerase Chain Reaction) is a laboratory technique used to amplify specific DNA sequences, from a small initial sample.

Primers, nucleotides, and DNA polymerase are used in a thermal cycler to replicate DNA through many cycles of denaturation, annealing, and extension. During denaturation, the DNA is heated to separate into single strands. The temperature is then lowered to allow primers to bind to their complementary sequences, followed by a higher temperature that enables a heat-stable DNA polymerase (such as *Taq*) to synthesize new strands. In gene cloning, PCR is essential for amplifying the gene of interest and for screening bacterial colonies after transformation. This screening is crucial, as it helps confirm whether bacteria have successfully taken up the correct plasmid construct.

Function

How It Works

Application in Gene Cloning

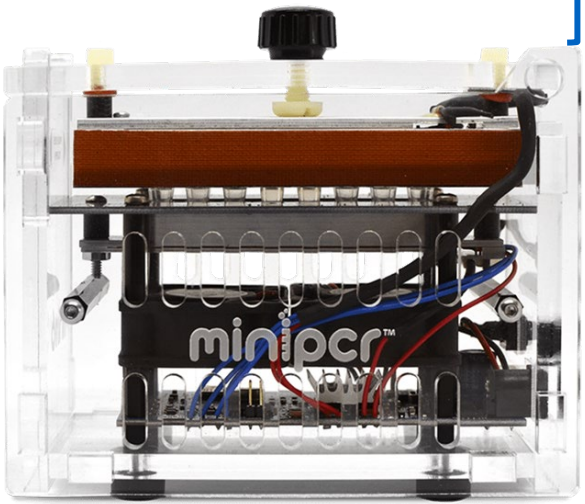
Importance/Impact

PCR

Visual Summary

How It Works

Function



Application in Gene Cloning

Importance/Impact

Model Text - Scientific language

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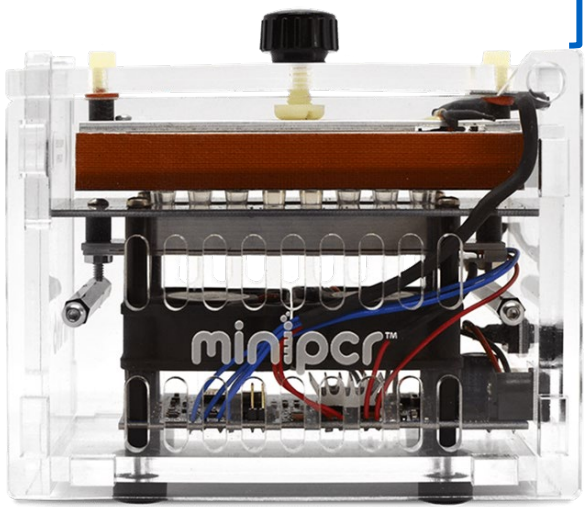
- **Function**
- **How It Works**
- **Application in Gene Cloning**
- **Importance/Impact**

PCR

Visual Summary

Function

- Amplify specific DNA sequences
- Small initial sample



How It Works

- Denaturation: DNA heated to separate into single strands — 95°C
- ↓
- Annealing: Temp ↓ to attach primer — 53°C
- ↓
- Extension DNA Polymerase synthesizes new strands — 68°C; Heat resistant Taq
- ↓
- Amplification of DNA — 30 cycles = billion copies

Application in Gene Cloning

- Amplify gene of interest
- Screening bacterial colonies after transformation

Importance/Impact

- Confirm transformation

Model Text - Language features

Polymerase Chain Reaction

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Sequential conjunctions to explain steps in a process

Cause and effect conjunctions

Evaluative language

Model Text - Stages

Centrifuge

Centrifuges are devices used to mix or separate substances based on density by spinning samples at high speeds. In molecular biology, they are often used at lower speeds to quickly collect liquids at the bottom of tubes or to mix reagents evenly. This is achieved by placing tubes in a balanced rotor and spinning them briefly, which forces the contents to the bottom and ensures uniform distribution. In gene cloning, centrifugation is essential for mixing small volumes of reagents such as enzymes, buffers, and DNA. This mixing is important, as it ensures that all components are in contact and react efficiently, which supports the success of processes like digestion, ligation, and transformation.

Function

How It Works

Application in Gene Cloning

Importance/Impact

Centrifuge

Visual Summary

Function

How It Works

Application in Gene Cloning

Importance/Impact

Model Text - Scientific language

Centrifuge

Centrifuges are devices used to mix or separate substances based on density by spinning samples at high speeds. In molecular biology, they are often used at lower speeds to quickly collect liquids at the bottom of tubes or to mix reagents evenly. This is achieved by placing tubes in a balanced rotor and spinning them briefly, which forces the contents to the bottom and ensures uniform distribution. In gene cloning, centrifugation is essential for mixing small volumes of reagents such as enzymes, buffers, and DNA. This mixing is important, as it ensures that all components are in contact and react efficiently, which supports the success of processes like digestion, ligation, and transformation.

Function

How It Works

Application in Gene Cloning

Importance/Impact

Centrifuge

Visual Summary

Function

- Separate or mix substances
- Based on density

How It Works

- Place tubes in a rotor
  - Must be balanced
- Spin briefly
- Components are forced to the bottom
- Ensures uniform distribution

Application in Gene Cloning

- mixing small volumes of reagents
  - E.g. enzymes, buffers DNA

Importance/Impact

- components are in contact and react efficiently → success of processes

Model Text - Language features

Centrifuge

Centrifuges are devices used to mix or separate substances based on density by spinning samples at high speeds. In molecular biology, they are often used at lower speeds to quickly collect liquids at the bottom of tubes or to mix reagents evenly. This is achieved by placing tubes in a balanced rotor and spinning them briefly, which forces the contents to the bottom and ensures uniform distribution. In gene cloning, centrifugation is essential for mixing small volumes of reagents such as enzymes, buffers, and DNA. This mixing is important, as it ensures that all components are in contact and react efficiently, which supports the success of processes like digestion, ligation, and transformation.

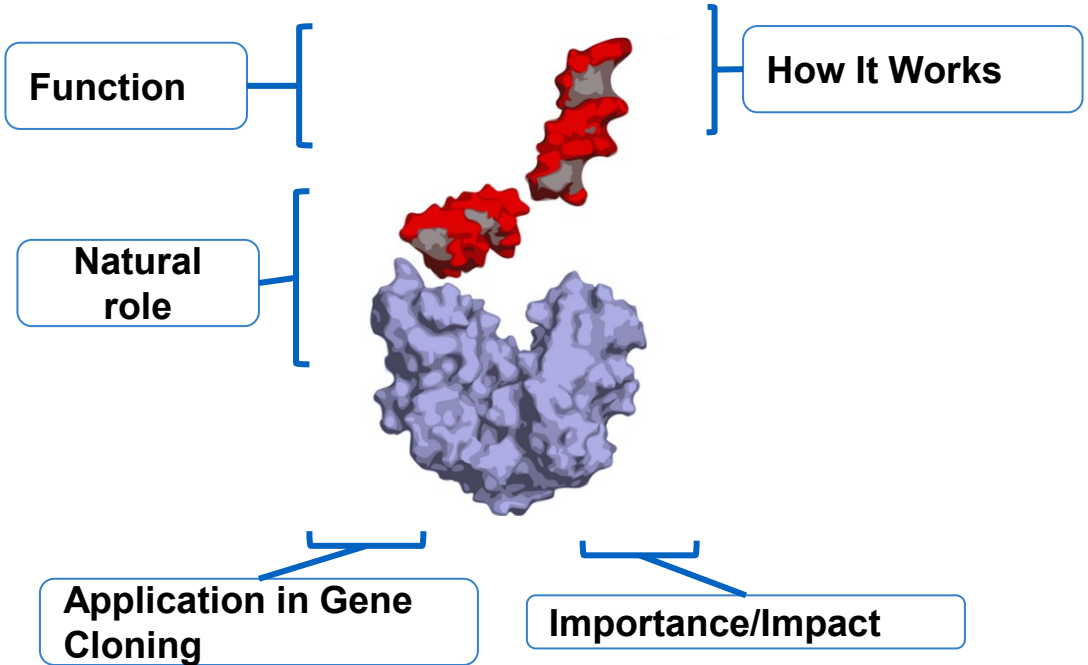
Sequential conjunctions to explain steps in a process

Cause and effect conjunctions

Evaluative language

Model Text - Stages

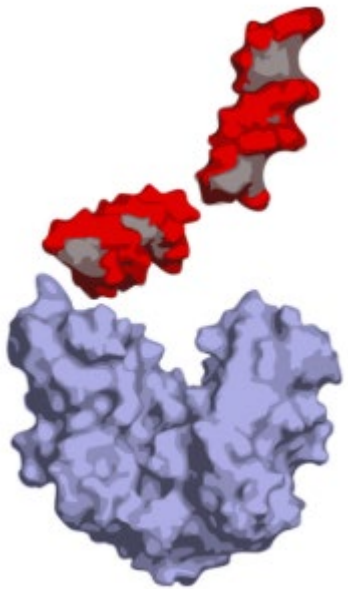
Read the model text on Restriction Enzymes and in the right margin, label the 5 stages of the text .



Restriction Enzymes

Function

How It Works



Natural role

Application in Gene Cloning

Importance/Impact

Model Text - Stages

Restriction Enzymes

Restriction enzymes are proteins that cut DNA at specific sequences called recognition sites. These enzymes are naturally found in bacteria, where they function as a defense mechanism against viral infection. Viruses inject their DNA into bacterial cells, so restriction enzymes cleave the foreign DNA, which prevents the virus from hijacking the cell's machinery.

Function

Natural role

A restriction enzyme scans a DNA molecule for a specific recognition sequence, typically a palindromic site 4–8 base pairs long. It first identifies the target site, then binds to the DNA, and after that cleaves both strands, producing either sticky ends with overhangs or blunt ends with straight cuts. This site-specific cleavage is essential for preparing DNA fragments for cloning.

How It Works

Model Text - Stages

Restriction Enzymes continued...

Restriction enzymes are essential in gene cloning because they generate complementary ends that ensures the gene is inserted in the correct location and orientation. Consequently, restriction enzymes allow precise and predictable digestion of both the plasmid vector and the gene of interest.

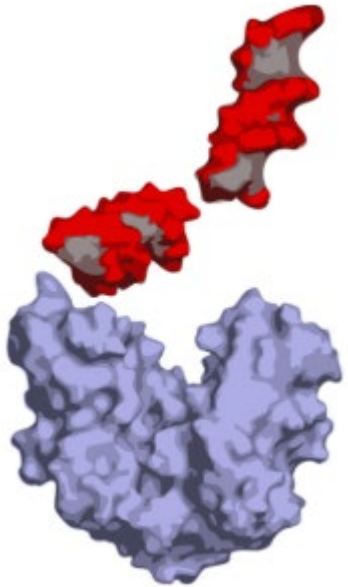
Application in Gene Cloning

Importance/Impact

Model Text - Stages

Read the model text on Restriction Enzymes and underline the scientific language within the text .

Restriction enzymes



proteins

recognition sites

Model Text - Scientific language

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How It Works

Model Text - Scientific language

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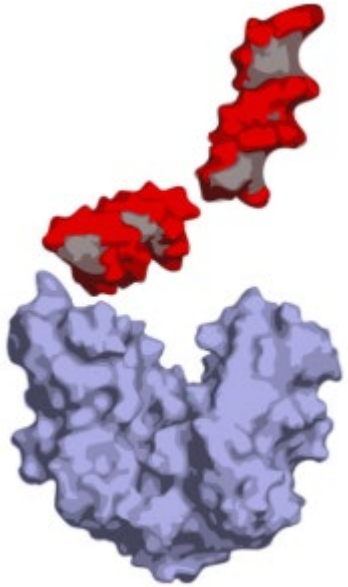
Application in Gene Cloning

Importance/Impact

Visual Summary

Restriction enzymes

- **Function**
  - Proteins
  - Cut DNA
  - Recognition sites
- **Natural role**
  - Bacteria
  - Defense mechanism



- **How It Works**
  - Scans DNA for a specific recognition sequence
    - Palindromic 4-8 bp
  - Identifies target site
  - Cleaves both DNA strands
  - Produces sticky or blunt ends

Virus injects DNA → Restriction enzyme cleaves DNA → Virus cannot hijack cell

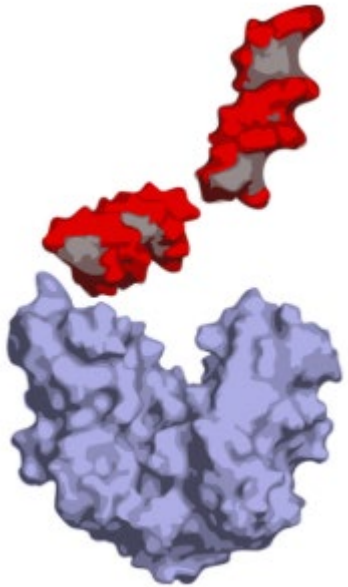
- **Application in Gene Cloning**
  - Preparing DNA fragments for cloning.
  - Generate complementary ends
  - Correct location and orientation of genes
- **Importance/Impact**
  - Precise and predictable digestion

Model Text - Stages

Read the model text on Restriction Enzymes and highlight the language features within the text .

Cause and effect conjunctions

Sequential conjunctions to explain steps in a process



Evaluative language

Model Text - Language features

Restriction Enzymes

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Cause and effect conjunctions

because

since

thus

therefore

as

For this reason

hence

As a result

Consequently

Model Text - Language features

Restriction Enzymes

First of all

initially

To begin with

afterward

subsequently

next

then

Finally

Ultimately

In the end

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Sequential conjunctions to explain steps in a process

Model Text - Language features

Restriction Enzymes

Restriction enzymes are essential in gene cloning because they generate complementary ends that ensures the gene is inserted in the correct location and orientation. Consequently, restriction enzymes allow precise and predictable digestion of both the plasmid vector and the gene of interest.

Evaluative language

High modality

Cause and effect conjunctions

Modal language is used to take a position or present a point of view.
Stronger language has higher modality

indispensable

required

vital

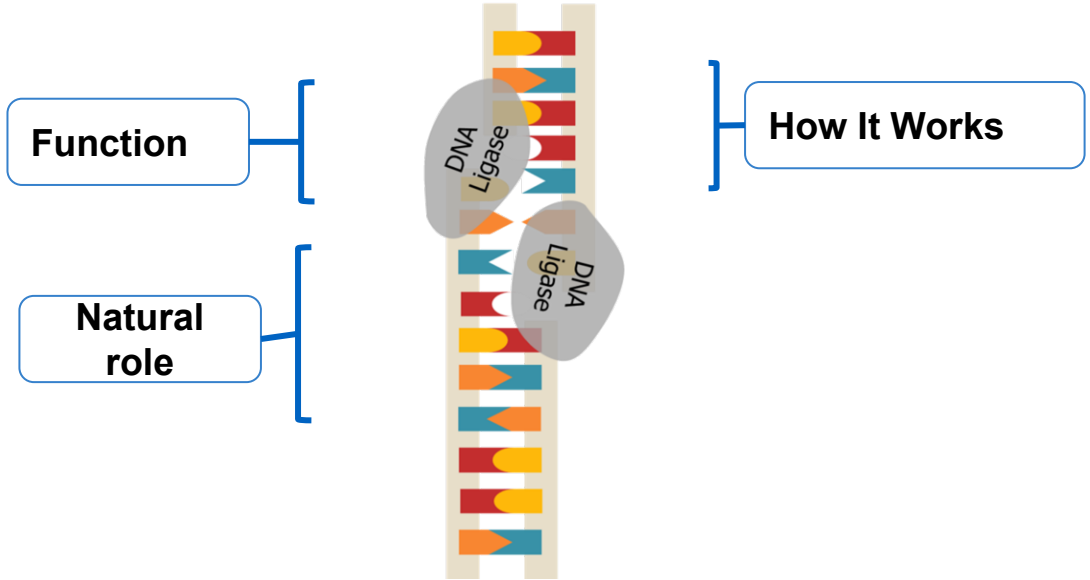
necessary

crucial

important

Model Text - Stages

Read the model text on DNA Ligases and in the right margin, label the 5 stages of the text .



DNA Ligase

Function

Natural role

How It Works

Application in Gene Cloning

Importance/Impact

Model Text - Stages

DNA Ligase

DNA ligase is an enzyme that joins DNA fragments together. This enzyme is naturally found in all cells, where it seals breaks in the DNA backbone. DNA replication produces short Okazaki fragments on the lagging strand, so ligase joins these fragments to form a continuous DNA strand.

Function

Natural role

DNA ligase recognizes breaks in the sugar-phosphate backbone of double-stranded DNA. It first identifies the nick, then binds to the site, and after that catalyzes a phosphodiester bond between adjacent nucleotides, sealing the strand. This joining activity is essential for connecting DNA fragments during recombinant DNA construction.

How It Works

Model Text - Stages

DNA Ligase

DNA ligase is vital in gene cloning because it permanently joins the gene of interest to the plasmid vector. As a result, it ensures a stable recombinant DNA molecule is created that can be replicated and expressed in host cells.

Application in Gene Cloning

Importance/Impact

Model Text - Stages

Read the model text on DNA Ligase and underline the scientific language within the text .

DNA Ligase

enzyme

DNA fragments

Model Text - Scientific language

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Application in Gene Cloning

Importance/Impact

Visual Summary

DNA Ligase

Function
- Enzyme
- Joins DNA

Natural role
- All cells
- Seals breaks in DNA backbone
- DNA replication

Okazaki fragments on lagging strand → Ligase joins fragments → Continuous DNA strand

How It Works

Recognizes breaks in DNA backbone → Sugar phosphate

↓

Catalyzes a phosphodiester bond between adjacent nucleotides

↓

Strand is sealed

Application in Gene Cloning
- Connecting DNA fragments for recombinant DNA construction
- permanently joins the gene of interest to the plasmid vector.

Importance/Impact
- Creation of stable recombinant DNA molecule

Model Text - Stages

Read the model text on DNA Ligase and highlight the language features within the text .

Cause and effect conjunctions

Sequential conjunctions to explain steps in a process

Evaluative language

Model Text - Language features

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Model Text - Language features

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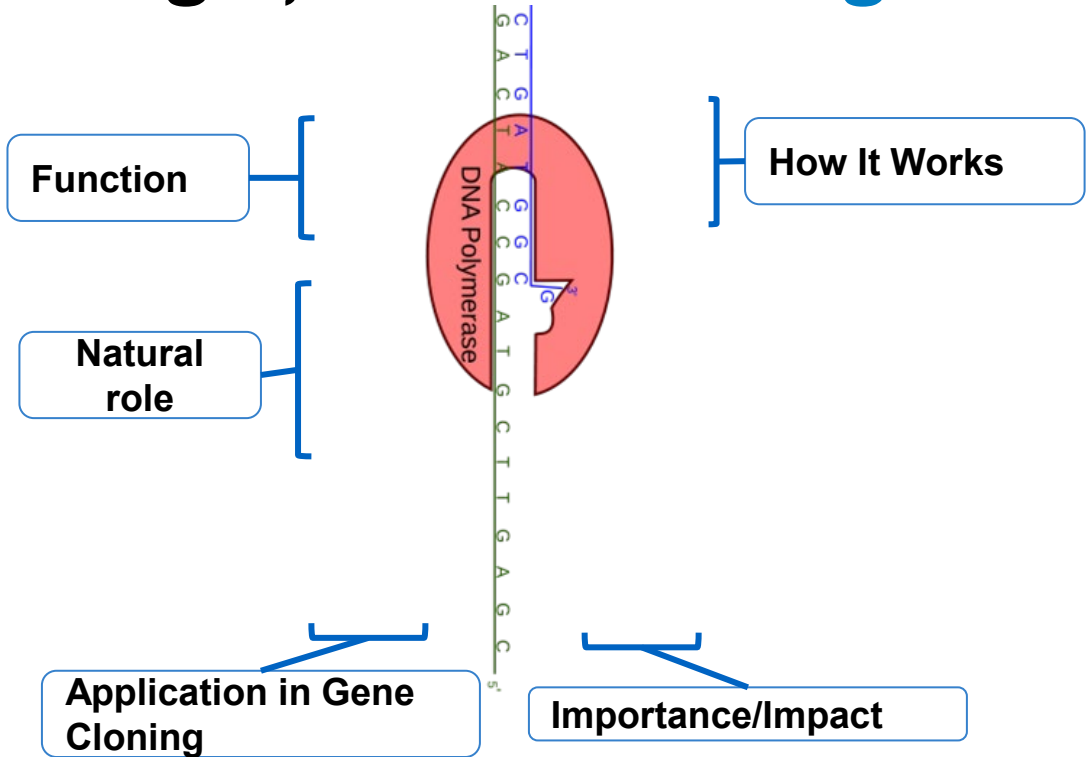
Evaluative language

High modality

Cause and effect conjunctions

Model Text - Stages

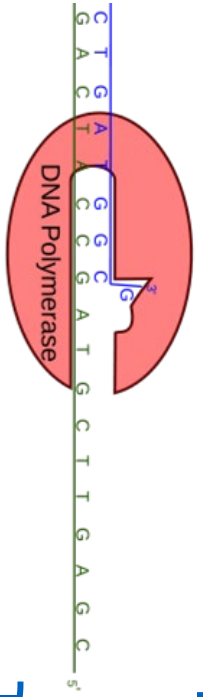
Read the model text on DNA polymerase and in the right margin, label the 5 stages of the text.



DNA polymerase

Function

Natural role



How It Works

Application in Gene Cloning

Importance/Impact

Model Text - Stages

DNA Polymerase

DNA polymerase is an enzyme that synthesizes new DNA. This enzyme is naturally found in all cells, where it copies DNA during cell division. DNA replication involves a template strand, so that polymerase adds complementary nucleotides to this strand to ensure each daughter cell receive an identical copy of DNA.

DNA polymerase firstly identifies a RNA primer which has been attached to the template strand, then it binds to the primer, and after that extends the strand by adding nucleotides in the 5’ to 3’ direction. This process is essential in amplifying genes in molecular biology.

Function

Natural role

How It Works

Model Text - Stages

DNA Polymerase

DNA polymerase is crucial in gene cloning because it amplifies DNA sequences using techniques like PCR. This usually leads to enough copies of the target gene to allow for successful insertion into a plasmid vector.

Application in Gene Cloning

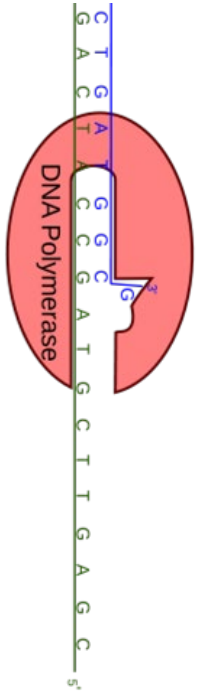
Importance/Impact

Model Text - Stages

Read the model text on DNA polymerase and underline the scientific language within the text .

DNA polymerase

enzyme



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Application in Gene Cloning

Importance/Impact

Visual Summary

DNA Polymerase

Enzyme

Synthesizes new DNA strands

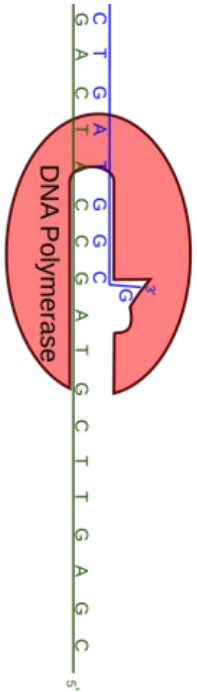
Function

All cells

Copies DNA

Cell division

Natural role



How It Works

Identifies a primer attached to the template strand

Sugar phosphate

Binds to primer

Extends the strand by adding nucleotides in the 5’ to 3’ direction.

DNA replication involves a template strand

Polymerase adds nucleotides to the template strand

Identical copy of DNA

Application in Gene Cloning

Amplifying genes in molecular biology.

Used in PCR to amplify target genes

Importance/Impact

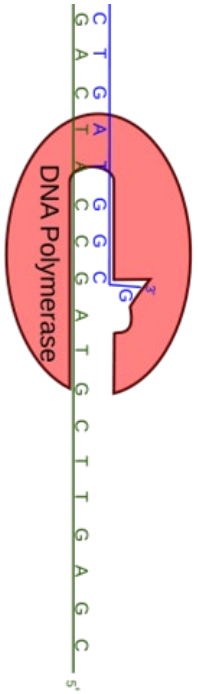
Enough copies of target sequence for successful insertion into plasmids

Model Text - Stages

Read the model text on DNA polymerase and highlight the language features within the text.

Cause and effect conjunctions

Sequential conjunctions to explain steps in a process



Evaluative language

Model Text - Language features

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Evaluative language

High modality

Cause and effect conjunctions