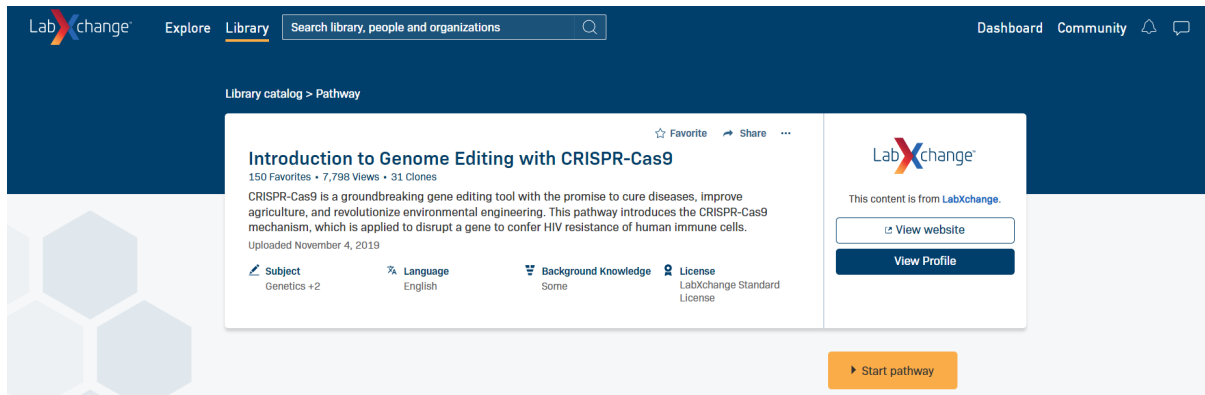


Unit 3: Advanced Biotechnology

1: Introduction to Gene Editing with CRISPR-Cas9



The screenshot shows the LabXchange website interface. At the top, there is a navigation bar with 'LabXchange' logo, 'Explore', 'Library', and a search bar. Below the navigation bar, the page title is 'Library catalog > Pathway'. The main content area features a card for the pathway 'Introduction to Genome Editing with CRISPR-Cas9'. The card includes the following information:

- 150 Favorites • 7,798 Views • 31 Clones
- CRISPR-Cas9 is a groundbreaking gene editing tool with the promise to cure diseases, improve agriculture, and revolutionize environmental engineering. This pathway introduces the CRISPR-Cas9 mechanism, which is applied to disrupt a gene to confer HIV resistance of human immune cells.
- Uploaded November 4, 2019
- Subject: Genetics +2
- Language: English
- Background Knowledge: Some
- License: LabXchange Standard License

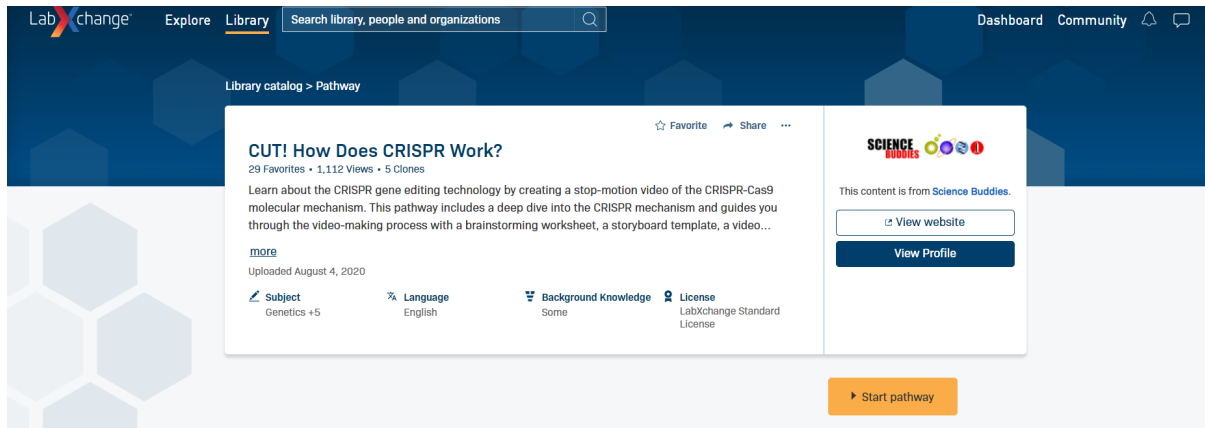
On the right side of the card, there is a 'LabXchange' logo and a note 'This content is from LabXchange.' Below this, there are two buttons: 'View website' and 'View Profile'. At the bottom right of the card, there is an orange button labeled 'Start pathway'.

Learning objectives

1. You will summarize the potential applications of the gene editing tool CRISPR-Cas9.
2. You will recall the origin of the gene editing tool CRISPR-Cas9 as a bacterial defense mechanism.
3. You will examine the molecular mechanism of CRISPR-Cas9.
4. You will summarize CRISPR-triggered DNA repair mechanisms.

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2: Gene Editing and Bioethics



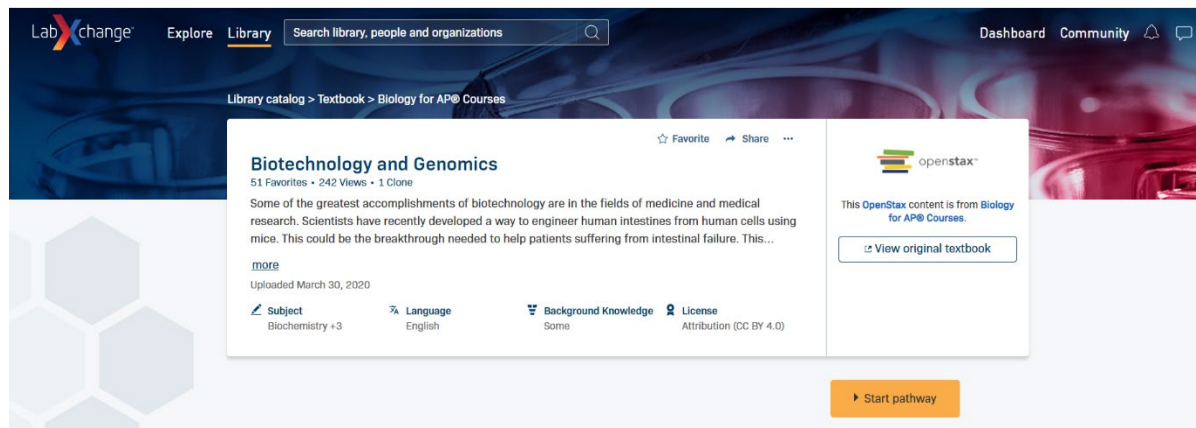
The screenshot shows a LabXchange pathway page. At the top, there is a navigation bar with 'LabXchange', 'Explore', 'Library', and a search bar. The page title is 'Library catalog > Pathway'. The main content area features a white card with the title 'CUT! How Does CRISPR Work?' and a description: 'Learn about the CRISPR gene editing technology by creating a stop-motion video of the CRISPR-Cas9 molecular mechanism. This pathway includes a deep dive into the CRISPR mechanism and guides you through the video-making process with a brainstorming worksheet, a storyboard template, a video...'. Below the description, there are metadata fields: 'Subject: Genetics +5', 'Language: English', 'Background Knowledge: Some', and 'License: LabXchange Standard License'. To the right of the card, there is a 'SCIENCE BUDDIES' logo and a 'View website' button. At the bottom right of the page, there is a 'Start pathway' button.

Learning objectives

1. You will examine the molecular mechanism of CRISPR-Cas9 genome editing.
2. You will build a model to visualize the molecular mechanism of CRISPR-Cas9.
3. You will identify the ethical implications of the CRISPR technology and its applications.

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3: Biotechnology and Genomics



The screenshot shows the LabXchange library interface. At the top, there is a navigation bar with 'LabXchange' logo, 'Explore', 'Library', and a search bar. Below the navigation bar, the breadcrumb trail reads 'Library catalog > Textbook > Biology for AP® Courses'. The main content area features a white card for the textbook 'Biotechnology and Genomics'. The card includes the title, a star icon for 'Favorite', and a share icon. Below the title, it shows '51 Favorites • 242 Views • 1 Clone'. A short description follows: 'Some of the greatest accomplishments of biotechnology are in the fields of medicine and medical research. Scientists have recently developed a way to engineer human intestines from human cells using mice. This could be the breakthrough needed to help patients suffering from intestinal failure. This...'. There is a 'more' link and the upload date 'Uploaded March 30, 2020'. Below this, there are four metadata fields: 'Subject: Biochemistry +3', 'Language: English', 'Background Knowledge: Some', and 'License: Attribution (CC BY 4.0)'. To the right of the card, there is an OpenStax logo and a note: 'This OpenStax content is from Biology for AP® Courses.' with a 'View original textbook' button. At the bottom right of the card area, there is a 'Start pathway' button.

Learning objectives

1. You will name three types of gene sequencing.
2. You will discuss whole-genome sequencing.
3. You will define pharmacogenomics.
4. You will describe an example of a polygenic human disease.
5. You will identify examples of basic techniques used to manipulate genetic material (DNA and RNA).
6. You will describe the difference between molecular and reproductive cloning.
7. You will define a proteome.
8. You will identify examples of uses of biotechnology in medicine and agriculture.
9. You will describe a protein signature and discuss its relevance to cancer screening.
10. You will describe genomics.
11. You will define a genetic map.
12. You will describe an example of a genomic mapping method.
13. You will name three types of gene sequencing.
14. You will discuss whole-genome sequencing.

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15. You will define pharmacogenomics.
16. You will describe an example of a polygenic human disease.
17. You will define a proteome.
18. You will describe a protein signature and discuss its relevance to cancer screening.