

# Separation Exploration (Grade 11 and 12)

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**Part A.** Watch The GlycoNet Story video:

<https://www.youtube.com/watch?v=CQGEglogTpQ> and answer the questions.

1. What is the importance of understanding glycomics (the study of sugars)?
2. What is GlycoNet?
3. Why bring these researchers together?
4. What kind of good can result from these GlycoNet partnerships?
5. What areas have they made progress in?

Meet the GlycoNet Scientists from Ryerson University, Wakarchuk Laboratory. Go to [www.glyconetchromatography.weebly.com](http://www.glyconetchromatography.weebly.com), watch the video clips and answer the questions.

## **Video clip#1: Tasnim 1 – Graduate student**

1. What is Tasnim's area of research?

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2. Why would Tasnim fluorescently label/tag molecules? Research this.

**Video clip #2: Tasnim 2 – A typical day for Tasnim Abukar**

1. Tasnim mentions that she uses TLC (Thin Layer Chromatography) on a typical day. What is TLC? What is it used for?
2. What did Tasnim say was the basis of the separation in the TLC?
3. Tasnim mentioned that another technique that she uses a lot is FPLC (fast protein liquid chromatography). What is this?
4. What is elution?

**Video clip #3: Ray Martinez-Rodriguez – Summer student (1:10 minutes)**

1. What does the enzyme that Jose works with do?

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2. What are two problems with this protein (enzyme)?
3. Jose describes how a His-tag can help fix one of the two problems mentioned above. What does it help with? Do an Internet search for His-tag (histidine tag) purification and IMAC (immobilized metal affinity column). He mentions using a nickel column. Draw a picture of an IMAC column and explain.
4. Immobilized lactase in a calcium alginate gel and pouring milk through it to break down the lactase is a similar idea to the IMAC mentioned above. How are these two procedures similar and how are they different?

**Video clip #4: Dr. Ting Du - Post doctoral fellow (26 seconds)**

1. Dr. Du talks about purifying her target protein. How does she do that?
2. She also talks about constructing an operon. What is an operon?

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3. What is the function of the proteins in the operon that she is talking about?

**Video clip #5: Laura Kell, Research Technician (58 s)**

As Laura talks about her job, she mentions two main responsibilities. One of them is training and mentoring other team members and assisting them to push the projects along.

1. Is this surprising to you that a research technician has this responsibility as part of their job?
  
2. What is the other part of her job?
  
3. Laura describes her typical day and says, “Well, there is no typical day.” Does this appeal to you? Would you like a job where there are different things happening day-to-day or something more consistent?
  
4. What is an enzyme and substrate?

Click on the “**Lab Techniques**” tab at the top of the website page. You will see some of the Ryerson University scientists at work, demonstrating lab techniques such as: gel electrophoresis, TLC and SPE (solid phase extraction). View the TLC demonstration video. Summarize the concept in 1-2 sentences.

Last update: April, 2020

## Part B: Literacy Connection

Read the June 9, 2017 CNN article “The Shifting Science of DNA in the Courtroom” by Channon Hodge: <http://www.cnn.com/2017/06/09/health/dna-technology-forensic-evidence/index.html>

or

Connect to Grade 11 Genetics and Biodiversity by reading the August 28, 2014 *Science News for Students* article by Alison Pearce Stevens, “Saving the Banana.”  
<https://www.sciencenewsforstudents.org/article/saving-banana>

**On the Lines:** Main Idea, Who? What happened? Include 2 definitions of key words

**Between the Lines:** Why? Benefits? Consequences?

**Beyond the Lines:** Do you agree? How does this affect your community/city/country?

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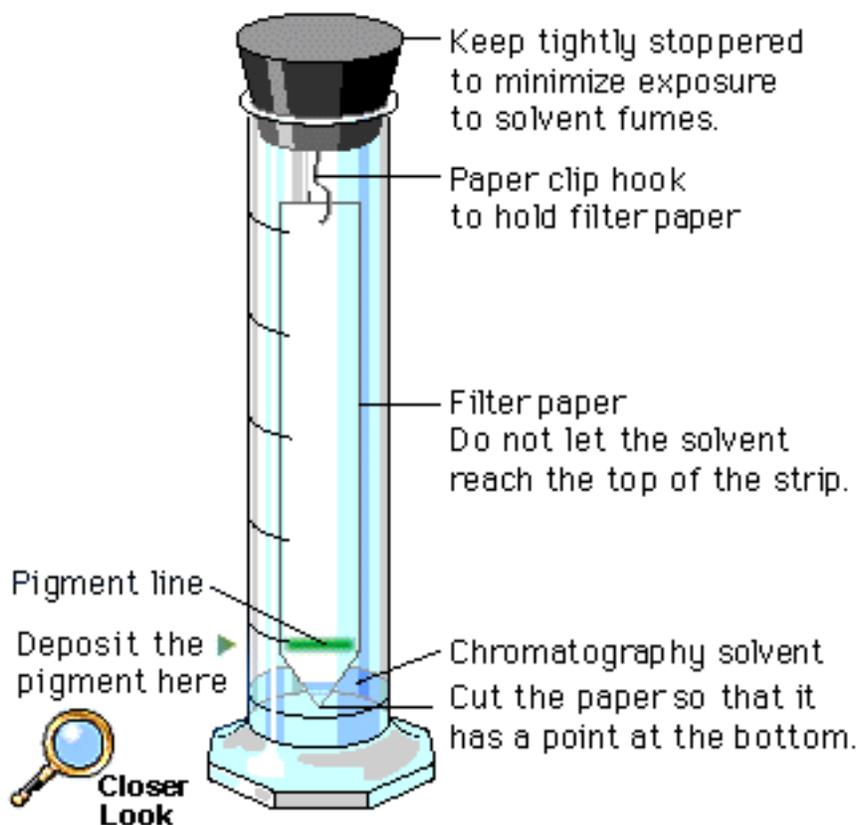
# Ink Chromatography Inquiry

## Rationale

Separating mixtures is actually a very important technique in biology, biochemistry and chemistry. You may want to separate one antibody from a mixture of antibodies so that you can test it and purify it. You may want to cut up DNA into pieces and then separate these pieces based on charge and size.

## Demonstration:

Your teacher will demonstrate how to set up the ink chromatography. After brainstorming with your partner, decide what variable you will change to alter the outcome of the separation.



Be sure the tip of the filter paper touches the solvent, but keep the pigment line above it.

Image credit: <http://tinyurl.com/yagg9d69>

If I change \_\_\_\_\_ (independent variable), then the **retention value (Rf value – dependent value)** will change.

Last update: April, 2020

# Narrative Laboratory Report<sup>1</sup>

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## Rationale

The idea behind a narrative laboratory report is to move students beyond a question and answer style of analysis or even a formal laboratory report. They have to ask themselves the core questions: What did I look for? How did I look for it? What did I find? What did it mean?

It is hoped that by asking students to step back and take a wider view of their work, they will move towards open inquiry where they begin to wonder and generate their own questions to answer (and being comfortable with that). After the initial uncertainty about marks and stepping out of their comfort zone, students generally like the freedom to work in this way, if the topic captivates them. It is the responsibility of the teacher to select opportunities for the students that have an interesting context or some aspect that is fascinating.

### What was I looking for?

(Describe your research question here along with your hypothesis)

- Should be 1-2 sentences, includes a testable question & hypothesis

### How did I look for it?

(Describe your method)

- Should be reproducible and step-by-step

### What did I find? (Show any observations that you had)

- Should include tables (succinct & organized with headings) and graphs (label axes, include title, legend if necessary)

### What does this mean? (Analysis and Conclusion)

- Should include analysis of scientific observations and data; should discuss results and **why** they occurred
- Written in paragraph form

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## Rubric for Narrative Report

	Level 1	Level 2	Level 3	Level 4
What was I looking for?	Research question did not include a properly testable question	Research question was somewhat focused with a testable question	Research question was well focused with a testable question	Research problem/question was highly focused with a testable question
How did I look for it?	Method was incomplete	Method was mostly there	Method was written in a generally reproducible way	Method was written in a detailed and highly reproducible way
What did I find?	Observations were present but were not organized/succinct; graphs lacking axes, labels & title	Observations were somewhat organized & succinct with table headings, good graphs	Observations were well organized & succinct with table headings, excellent graphs	Observations were highly organized & succinct with table headings, excellent graphs
What does this mean?	Analysis did not focus on the key question and did not address scientific error	Analysis somewhat captured the key questions but did not address the scientific error well	Analysis generally captured the key questions and addressed most of the scientific error	Analysis captured the key questions and worked in scientific error in a high level way

Last update: April, 2020