Part 1 – The Pathogen

It is your first day at your new job as a microbiologist within the pharmaceutical industry at a big drug company. You are getting ready for work and turn on the news.

“There has been an increase in cases involving illnesses like Sleeping Sickness. If there was only something that could be done for these patients.”

Maybe this is why you were hired.

You arrive at work and wait with your team for your first assignment.

A women wearing a business suit with her hair up walks in “Nice to meet you all. I hope you are ready to work and start on your first assignment. You will be working on Sleeping Sickness. We need to find out all we can.” She hands out a folder to all of you, “Please take a look through the folder.”

The folder had a piece of paper with terms like pathogen, disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition on it. There are a lot of different terms to describe pathologies and you wonder why that is.

As you look through the folder you ask your boss, “Isn’t Sleeping Sickness the illness that has been in the news lately?”

“Yes it is, the more we know about Sleeping Sickness the easier it will be to help patients.”

She gathers her things and starts making her way out of the room, “Good luck”.

Sleeping Sickness
Part 2 – Bacterial and Viral Connection

As you and your team are working on your assignment you notice that one teammate is acting weird around you.

“Please sit on the other side of the table, I don’t want to get sick!” he said.

“You won’t get sick. It is bacterial infection” you reply.

He looks at you like he doesn’t believe you.

“You only get sick if it is a viral infection” you say.

You don’t understand why he doesn’t believe you. You start to cough and take a sip of your coffee because your throat is itchy.

“I’ll tell you what, let’s see who is right. Let’s look into the differences between bacterial and viral infections. I will look at Streptococcus, and you can look at Influenza” you reply.

“Sure, and we can look at how they are transmitted – because I am certain both are contagious – and maybe look at how they impact the body and get treated?” he mentioned.

“Sure” you say.

“Good, game on!” he said.

You ask other team members to join you in your quest to prove him wrong, while he grabs the rest for help.
Part 3 – Lifestyle and Immune System Response

Your boss reviewed your team’s findings to provide suggestions and provide information on what to do next.

Your boss walks into the room, she seems pleased. However she started to bite on her pencil while she looks in her notebook.

“Something is missing with your research... have you gone and talked to someone with Sleeping Sickness? Got to know them? Seen them? Understand how Sleeping Sickness affects their lives? This is important to know because it lets us understand the disease in a personal level” she said.

She had a point. Your team did not consider how having Sleeping Sickness can gradually change someone’s life.

Your team was left alone to come up with a method to find more information about Sleeping Sickness in a ‘personal level’.

“Let’s conduct a research survey on people with Sleeping Sickness” one teammate says.

“I think we should do an in-depth interview on someone with Sleeping Sickness, learn about their lifestyle and immune system response” another teammate says.

“Maybe we should look at different perspectives of how Sleeping Sickness effects people’s immune system” someone else blurts out.

Everyone is getting excited.
Sleeping Sickness

Part 4 – Historical and Cultural Perspectives

As you walk to work you notice a group of people with signs in front of the building.

“Big companies like yours do not care about people’s health or wellbeing because they just want to make more money!” a stranger yells out.

You do not know what is happening. Is this a protest?

“Drug companies do not care about their communities! Have they ever opened a history book? Do they know that a lot of these diseases have been managed well before drugs were even made! Have drug companies listened to different cultural stories on diseases? Natural remedies are not a new thing!” another stranger yells out.

You break through the crowd trying to get to work, “Hey! You! Do you work here? Do you know the history of diseases and how they were managed? Do you care about us and our wellbeing?” a person demanded.

You keep making your way to your office.

You reach your office and can’t stop thinking about the protest happening outside. Sometimes you forget about the impact a disease had historically and how different cultures deal with it.

You decide to look into this with your team for your report on Sleeping Sickness and include a historical and cultural section.

The team meets to discuss the different societal and cultural implications of Sleeping Sickness.

“My grandfather came from Asia. I can ask him about Sleeping Sickness” a teammate said.

“I could call a Cree Elder in our community and ask them about Sleeping Sickness” you replied.

“Well I am Ukrainian. I could ask my grandmother about Sleeping Sickness too” another teammate contributes.

“What about in America? Maybe Sleeping Sickness was dealt with differently in the past” someone else mentions.

There are many different cultures and historical application, but you want to add a few into your teams report so that the historical and cultural implications are included.
Sleeping Sickness

**Part 5 – Synchrotron and Protein Data Bank**

To complete your report, your team was assigned to go to the Canadian Light Source to look at the CMCF beamlines and attend a workshop.

When you arrive, the beamline scientist gives you a tour of the synchrotron and says “Many 3D structures have been discovered using the CMCF beamlines, even some involved with Sleeping Sickness. Come to think of it, you can find the peer reviewed journal article about Sleeping Sickness on the Protein Data Bank, under 4NEV.” He continues on with the tour and shows you where you will be working for the next week.

You try and take everything in, every little bit of information will help to complete the report and determine if a new drug for Sleeping Sickness can be developed.
Meningitis

Part 1 – The Pathogen

It is your first day at your new job as a microbiologist within the pharmaceutical industry at a big drug company. You are getting ready for work and turn on the news.

“There has been an increase in cases involving illnesses like Meningitis. If there was only something that could be done for these patients.”

Maybe this is why you were hired.

You arrive at work and wait with your team for your first assignment.

A women wearing a business suit with her hair up walks in “Nice to meet you all. I hope you are ready to work and start on your first assignment. You will be working on Meningitis. We need to find out all we can.” She hands out a folder to all of you, “Please take a look through the folder.”

The folder had a piece of paper with terms like pathogen, disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition on it. There are a lot of different terms to describe pathologies and you wonder why that is.

As you look through the folder you ask your boss, “Isn’t Meningitis the illness that has been in the news lately?”

“Yes it is, the more we know about Meningitis the easier it will be to help patients.”

She gathers her things and starts making her way out of the room, “Good luck”.


Meningitis

Part 2 – Bacterial and Viral Connection

As you and your team are working on your assignment you notice that one teammate is acting weird around you.

“Please sit on the other side of the table, I don’t want to get sick!” he said.

“You won’t get sick. It is bacterial infection” you reply.

He looks at you like he doesn’t believe you.

“You only get sick if it is a viral infection” you say.

You don’t understand why he doesn’t believe you. You start to cough and take a sip of your coffee because your throat is itchy.

“I’ll tell you what, let’s see who is right. Let’s look into the differences between bacterial and viral infections. I will look at Streptococcus, and you can look at Influenza” you reply.

“Sure, and we can look at how they are transmitted – because I am certain both are contagious – and maybe look at how they impact the body and get treated?” he mentioned.

“Sure” you say.

“Good, game on!” he said.

You ask other team members to join you in your quest to prove him wrong, while he grabs the rest for help.
Part 3 – Lifestyle and Immune System Response

Your boss reviewed your team’s findings to provide suggestions and provide information on what to do next.

Your boss walks into the room, she seems pleased. However she started to bite on her pencil while she looks in her notebook.

“Something is missing with your research... have you gone and talked to someone with Meningitis? Got to know them? Seen them? Understand how Meningitis affects their lives? This is important to know because it lets us understand the disease in a personal level” she said.

She had a point. Your team did not consider how having Meningitis can gradually change someone’s life.

Your team was left alone to come up with a method to find more information about Meningitis in a ‘personal level’.

“Let’s conduct a research survey on people with Meningitis” one teammate says.

“I think we should do an in-depth interview on someone with Meningitis, learn about their lifestyle and immune system response” another teammate says.

“Maybe we should look at different perspectives of how Meningitis effects people’s immune system” someone else blurts out.

Everyone is getting excited.
Meningitis

Part 4 – Historical and Cultural Perspectives

As you walk to work you notice a group of people with signs in front of the building.

“Big companies like yours do not care about people’s health or wellbeing because they just want to make more money!” a stranger yells out.

You do not know what is happening. Is this a protest?

“Drug companies do not care about their communities! Have they ever opened a history book? Do they know that a lot of these diseases have been managed well before drugs were even made! Have drug companies listened to different cultural stories on diseases? Natural remedies are not a new thing!” another stranger yells out.

You break through the crowd trying to get to work, “Hey! You! Do you work here? Do you know the history of diseases and how they were managed? Do you care about us and our wellbeing?” a person demanded.

You keep making your way to your office.

You reach your office and can’t stop thinking about the protest happening outside. Sometimes you forget about the impact a disease had historically and how different cultures deal with it.

You decide to look into this with your team for your report on Meningitis and include a historical and cultural section.

The team meets to discuss the different societal and cultural implications of Meningitis.

“My grandfather came from Asia. I can ask him about Meningitis” a teammate said.

“I could call a Cree Elder in our community and ask them about Meningitis” you replied.

“Well I am Ukrainian. I could ask my grandmother about meningitis too” another teammate contributes.

“What about in America? Maybe Meningitis was dealt with differently in the past” someone else mentions.

There are many different cultures and historical application, but you want to add a few into your teams report so that the historical and cultural implications are included.
Part 5 – Synchrotron and Protein Data Bank

To complete your report, your team was assigned to go to the Canadian Light Source to look at the CMCF beamlines and attend a workshop.

When you arrive, the beamline scientist gives you a tour of the synchrotron and says “Many 3D structures have been discovered using the CMCF beamlines, even some involved with Meningitis. Come to think of it, you can find the peer reviewed journal article about Meningitis on the Protein Data Bank, under 4QQ1.” He continues on with the tour and shows you where you will be working for the next week.

You try and take everything in, every little bit of information will help to complete the report and determine if a new drug for Meningitis can be developed.
Malaria

Part 1 – The Pathogen

It is your first day at your new job as a microbiologist within the pharmaceutical industry at a big drug company. You are getting ready for work and turn on the news.

“There has been an increase in cases involving illnesses like Malaria. If there was only something that could be done for these patients.”

Maybe this is why you were hired.

You arrive at work and wait with your team for your first assignment.

A women wearing a business suit with her hair up walks in “Nice to meet you all. I hope you are ready to work and start on your first assignment. You will be working on Malaria. We need to find out all we can.” She hands out a folder to all of you, “Please take a look through the folder.”

The folder had a piece of paper with terms like pathogen, disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition on it. There are a lot of different terms to describe pathologies and you wonder why that is.

As you look through the folder you ask your boss, “Isn’t Malaria the illness that has been in the news lately?”

“Yes it is, the more we know about Malaria the easier it will be to help patients.”

She gathers her things and starts making her way out of the room, “Good luck”.

Part 2 – Bacterial and Viral Connection

As you and your team are working on your assignment you notice that one teammate is acting weird around you.

“Please sit on the other side of the table, I don’t want to get sick!” he said.

“You won’t get sick. It is bacterial infection” you reply.

He looks at you like he doesn’t believe you.

“You only get sick if it is a viral infection” you say.

You don’t understand why he doesn’t believe you. You start to cough and take a sip of your coffee because your throat is itchy.

“I’ll tell you what, let’s see who is right. Let’s look into the differences between bacterial and viral infections. I will look at Streptococcus, and you can look at Influenza” you reply.

“Sure, and we can look at how they are transmitted – because I am certain both are contagious – and maybe look at how they impact the body and get treated?” he mentioned.

“Sure” you say.

“Good, game on!” he said.

You ask other team members to join you in your quest to prove him wrong, while he grabs the rest for help.
Part 3 – Lifestyle and Immune System Response

Your boss reviewed your team’s findings to provide suggestions and provide information on what to do next.

Your boss walks into the room, she seems pleased. However she started to bite on her pencil while she looks in her notebook.

“Something is missing with your research… have you gone and talked to someone with Malaria? Got to know them? Seen them? Understand how Malaria affects their lives? This is important to know because it lets us understand the disease in a personal level” she said.

She had a point. Your team did not consider how having Malaria can gradually change someone’s life.

Your team was left alone to come up with a method to find more information about Malaria in a ‘personal level’.

“Let’s conduct a research survey on people with Malaria” one teammate says.

“I think we should do an in-depth interview on someone with Malaria, learn about their lifestyle and immune system response” another teammate says.

“Maybe we should look at different perspectives of how Malaria effects people’s immune system” someone else blurts out.

Everyone is getting excited.
Malaria

Part 4 – Historical and Cultural Perspectives

As you walk to work you notice a group of people with signs in front of the building.

“Big companies like yours do not care about people’s health or wellbeing because they just want to make more money!” a stranger yells out.

You do not know what is happening. Is this a protest?

“Drug companies do not care about their communities! Have they ever opened a history book? Do they know that a lot of these diseases have been managed well before drugs were even made! Have drug companies listened to different cultural stories on diseases? Natural remedies are not a new thing!” another stranger yells out.

You break through the crowd trying to get to work, “Hey! You! Do you work here? Do you know the history of diseases and how they were managed? Do you care about us and our wellbeing?” a person demanded.

You keep making your way to your office.

You reach your office and can’t stop thinking about the protest happening outside. Sometimes you forget about the impact a disease had historically and how different cultures deal with it.

You decide to look into this with your team for your report on Malaria and include a historical and cultural section.

The team meets to discuss the different societal and cultural implications of Malaria.

“My grandfather came from Asia. I can ask him about Malaria” a teammate said.

“I could call a Cree Elder in our community and ask them about Malaria” you replied.

“Well I am Ukrainian. I could ask my grandmother about Malaria too” another teammate contributes.

“What about in America? Maybe Malaria was dealt with differently in the past” someone else mentions.

There are many different cultures and historical application, but you want to add a few into your teams report so that the historical and cultural implications are included.
Malaria

Part 5 – Synchrotron and Protein Data Bank

To complete your report, your team was assigned to go to the Canadian Light Source to look at the CMCF beamlines and attend a workshop.

When you arrive, the beamline scientist gives you a tour of the synchrotron and says “Many 3D structures have been discovered using the CMCF beamline, even some involved in Malaria. Come to think of it, you can find the peer reviewed journal article about Malaria on the Protein Data Bank, under 4FGJ, 4FGK and 4FGL.” He continues on with the tour and shows you where you will be working for the next week.

You try and take everything in, every little bit of information will help to complete the report and determine if a new drug for Malaria can be developed.
Part 1 – The Pathogen

It is your first day at your new job as a microbiologist within the pharmaceutical industry at a big drug company. You are getting ready for work and turn on the news.

“There has been an increase in cases involving illnesses like Whooping Cough. If there was only something that could be done for these patients.”

Maybe this is why you were hired.

You arrive at work and wait with your team for your first assignment.

A woman wearing a business suit with her hair up walks in “Nice to meet you all. I hope you are ready to work and start on your first assignment. You will be working on Whooping Cough. We need to find out all we can.” She hands out a folder to all of you, “Please take a look through the folder.”

The folder had a piece of paper with terms like pathogen, disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition on it. There are a lot of different terms to describe pathologies and you wonder why that is.

As you look through the folder you ask your boss, “Isn’t Whooping Cough the illness that has been in the news lately?”

“Yes it is, the more we know about Whooping Cough the easier it will be to help patients.”

She gathers her things and starts making her way out of the room, “Good luck”.

Whooping Cough
Whooping Cough

Part 2 – Bacterial and Viral Connection

As you and your team are working on your assignment you notice that one teammate is acting weird around you.

“Please sit on the other side of the table, I don’t want to get sick!” he said.

“You won’t get sick. It is bacterial infection” you reply.

He looks at you like he doesn’t believe you.

“You only get sick if it is a viral infection” you say.

You don’t understand why he doesn’t believe you. You start to cough and take a sip of your coffee because your throat is itchy.

“I’ll tell you what, let’s see who is right. Let’s look into the differences between bacterial and viral infections. I will look at Streptococcus, and you can look at Influenza” you reply.

“Sure, and we can look at how they are transmitted – because I am certain both are contagious – and maybe look at how they impact the body and get treated?” he mentioned.

“Sure” you say.

“Good, game on!” he said.

You ask other team members to join you in your quest to prove him wrong, while he grabs the rest for help.
Whooping Cough

Part 3 – Lifestyle and Immune System Response

Your boss reviewed your team’s findings to provide suggestions and provide information on what to do next.

Your boss walks into the room, she seems pleased. However she started to bite on her pencil while she looks in her notebook.

“Something is missing with your research... have you gone and talked to someone with Whooping Cough? Got to know them? Seen them? Understand how Whooping Cough affects their lives? This is important to know because it lets us understand the disease in a personal level” she said.

She had a point. Your team did not consider how having Whooping Cough can gradually change someone’s life.

Your team was left alone to come up with a method to find more information about Whooping Cough in a ‘personal level’.

“Let’s conduct a research survey on people with Whooping Cough” one teammate says.

“I think we should do an in-depth interview on someone with Whooping Cough, learn about their lifestyle and immune system response” another teammate says.

“Maybe we should look at different perspectives of how Whooping Cough effects people’s immune system” someone else blurts out.

Everyone is getting excited.
As you walk to work you notice a group of people with signs in front of the building.

“Big companies like yours do not care about people’s health or wellbeing because they just want to make more money!” a stranger yells out.

You do not know what is happening. Is this a protest?

“Drug companies do not care about their communities! Have they ever opened a history book? Do they know that a lot of these diseases have been managed well before drugs were even made! Have drug companies listened to different cultural stories on diseases? Natural remedies are not a new thing!” another stranger yells out.

You break through the crowd trying to get to work, “Hey! You! Do you work here? Do you know the history of diseases and how they were managed? Do you care about us and our wellbeing?” a person demanded.

You keep making your way to your office.

You reach your office and can’t stop thinking about the protest happening outside. Sometimes you forget about the impact a disease had historically and how different cultures deal with it.

You decide to look into this with your team for your report on Whooping Cough and include a historical and cultural section.

The team meets to discuss the different societal and cultural implications of Whooping Cough.

“My grandfather came from Asia. I can ask him about Whooping Cough” a teammate said.

“I could call a Cree Elder in our community and ask them about Whooping Cough” you replied.

“Well I am Ukrainian. I could ask my grandmother about Whooping Cough too” another teammate contributes.

“What about in America? Maybe Whooping Cough was dealt with differently in the past” someone else mentions.

There are many different cultures and historical application, but you want to add a few into your teams report so that the historical and cultural implications are included.
Whooping Cough

Part 5 – Synchrotron and Protein Data Bank

To complete your report, your team was assigned to go to the Canadian Light Source to look at the CMCF beamlines and attend a workshop.

When you arrive, the beamline scientist gives you a tour of the synchrotron and says “Many protein structures have been discovered using the CMCF beamline, even some involved in Whooping Cough. Come to think of it, you can find the peer reviewed journal article about Whooping Cough on the Protein Data Bank, under 5BU6.” He continues on with the tour and shows you where you will be working for the next week.

You try and take everything in, every little bit of information will help to complete the report and determine if a new drug for Whooping Cough can be developed.
Questions

Problem One

Closed Questions

What does pathogen mean?

What does a microbiologist do?

Give an example of disease, illness, ailment, disorder, infection, medical condition, syndrome, and abnormal condition on it. What do each of these terms mean?

What are the signs and symptoms for your group’s assigned disease?

How does someone get sick with your group’s assigned disease?

What does pharmaceutical mean?

Problem One

Open Ended Questions

Tell me about your group’s assigned disease.

What is the reason in having different terms like pathogen, disease, illness, ailment, disorder, infection, medical condition, syndrome and abnormal condition to describe someone who is unwell?

How can you become a microbiologist? What kind of careers could you have?

Describe what a pharmaceutical drug company.

When you see the word pathogen, what does that mean to you?
Questions

Problem Two

Closed Questions

What is Streptococcus? What are the signs and symptoms of Streptococcus?

What is Influenza? What are the signs and symptoms of Influenza?

Can a bacterial infection be transmitted the same way as a viral infection? Why or why not?

Can the body deal with a bacterial infection the same way as a viral infection? Why or why not?

What are the differences between the ways that a bacterial and a viral infection can be treated?

Problem Two

Open Ended Questions

What are the differences between a bacterial and a viral infection?

Would you rather have a bacterial or viral infection? Why?
Questions

**Problem Three**

**Closed Questions**

What does ‘lifestyle’ mean?

What does the immune system do?

What is a research survey? What type of data would you expect?

What is an in-depth interview? What type of data would you expect?

How would your group’s assigned disease impact someone’s life?

What is the immune response for your group’s assigned disease?

**Problem Three**

**Open Ended Questions**

There are many different ways to collect data scientifically. Which way would be best to get the information that you need? Why?

In what way would your group’s assigned disease impact the following people’s lives: women with three children, a college student, a 5 year old that lives with their grandparents, an owner of a large food chain, and typical grade 11 student?

Why would someone’s immune system respond differently to your group’s assigned disease?
Questions

Problem Four

Closed Questions

What does protest mean?

Why do people protest?

What are some examples alternative medical remedies for disease and illnesses that you know of? Are there other remedies for your group’s assigned disease used by Asians? First Nations? Ukrainians? Your culture?

Has your group's assigned disease been cared for differently in the past then it is today? In what way?

Problem Four

Open Ended Questions

Do you feel people should protest? Why or why not?

There are many different cultures in the world that have their own way of caring for diseases and illnesses. Has your group’s assigned disease been seen in different cultures? How have cultures cared for people with your group’s assigned disease?

How has society changed in the way that people with your group’s assigned disease are taken cared of compared to how society treated these patients in the past?
Questions

Problem Five

Closed Questions

What kind of synchrotron is located at the Canadian Light Source? How does the synchrotron work?

What are the CMCF beamlines? What kind of information can you get when using the CMCF beamlines?

What is a protein structure?

What is crystallography?

What is the Protein Data Bank? What information can you get from the Protein Data Bank?

What is a peer reviewed journal article? Why would there be links to peer reviewed journal articles on the Protein Data Bank?

What information is there about your group’s assigned disease when researching it on the Protein Data Bank?

How do proteins interact with drugs?

What information do you get when looking at the 3D structure involved with your group’s assigned disease to help you determine if the drug company can develop a drug for it? Can a drug be made for your group’s assigned disease? Why or why not?

Problem Five

Open Ended Questions

What can be researched at the Canadian Light Source? How?

Describe what a synchrotron is.

Why would the CMCF beamlines be useful for a drug company?

Describe what crystallography is.

Why is there a Protein Data Bank? How can the Protein Data Bank be useful?

When looking at the 3D structure involved with your group’s assigned disease on the Protein Data Bank and reading the peer reviewed article about the 3D structure of your group’s assigned disease, do you think there is a possibility of developing a drug for your disease? Why or why not?
MEETING THE PROBLEM – Group Worksheet

Complete all four questions before starting your research.
Do questions 1-3 on your own.

1. What is the problem?

2. What do YOU KNOW about the problem? Brainstorm and list all your ideas.
3. What do YOU NEED TO KNOW about the problem? Brainstorm and list all your ideas.

Share your ideas with your group.
Do questions 4-5 as a group.

4. What is the PROBLEM?

When is the next meeting? _______________
Name:_______________________ Date:_____________________

RESEARCH – Individual Worksheet

1. What are YOU RESEARCHING?

2. Research Notes:
   *** DO NOT FORGET TO INCLUDE CREDIBLE CITATIONS***
DISCUSSING RESEARCH – Group Worksheet

Each team member will share his or her findings with the group.

1. What does your group KNOW? Brainstorm and list your ideas.

2. What does your group NEED TO KNOW? Brainstorm and list all ideas.

3. Revisit your group’s problem and consider what your group KNOWS and what you still NEED TO KNOW. Do you need to change your problem?