MEDICAL GEOGRAPHY

A MEDICAL-BASED APPROACH TO ECOLOGY

Ecology is an important branch of biology, and has led to many important discoveries and developments in healthcare, agriculture, genetics, and anthropology. However, for elementary school students, this information can be made more relevant to their everyday lives by making the connection to, and describing the significant impact ecology has in, modern day medicine.

MEDICAL GEOGRAPHY

A MEDICAL-BASED APPROACH TO ECOLOGY

Rationale

Ecology is the study of an organism and its environment. Within our environment there are millions of other organisms. Each organism impacts our survival in a myriad of ways, including affecting our food supply, health, and even our finances. Understanding the connection between the environment, the organisms that share this earth with us, the possible disasters we can avoid, and the benefits we can reap, leads for a richer more fulfilling learning experience.

Goals:

The goal of this unit is to teach foundational ecology, while also connecting those ideas to current day medical issues. Students should be able to conceptualize pathogens as living organisms, understand their niche in our ecosystem, and develop an understanding of how crucial it is that we recognize and determine the best strategies to combat them. Additionally, many of the factors that contribute to pathogen growth are found in ecological conditions (temperature, moisture, biodiversity of hosts), and the understanding of ecology could further our understanding of medicine. It is a symbiotic relationship!

NGSS Standards:

This unit covers all middle school Next Generation Science Standards having to do with:

Matter and Energy in Organisms and Ecosystems

Interdependent Relationships in Ecosystems

MS-LS1-6, MS-LS2-1, MS-LS2-2 , MS-LS2-3,

MS-LS2-4, MS-LS2-5 MS-LS1-7

THIS UNIT CONTAINS:

16 Worksheet/Activities

2 Torah-Related Activities

1 Vocabulary Review Sheet

1 Summative Assessment

OTHER WORKS BY THIS AUTHOR

Would you like to see more than just unit one? Currently, G. Grant is developing a full year of medical biology for seventh and eighth grades. This includes biomedical engineering, creating unique surgery tools and techniques, simulating doctor visits and proper diagnoses, surgical dissections, cell modeling and much more.

FOREWORD FOR THE TEACHER

HOW TO USE THIS UNIT

Thank you for joining me on the journey to enrich the minds of biology students, one classroom at a time. The goal of this unit is to **teach ecology through the lens of medical geography**. This means that you will enable students to see how the environment, and the organisms that surround them, can affect their daily lives. You will also have the opportunity to expose them to concepts not usually covered by a standard life science curriculum, such as disease control, food and water safety, and possible medical developments that can be adapted from other organisms.

On the next page, you will find a logic model of the information presented in this unit.

This unit is also structured to allow for Problem-Based-Learning. PBL is an excellent pedagogic strategy, where instead of a summative test, students work towards a real-life goal. Throughout a unit, students will be absorbing and synthesizing information in order to create something new or solve a problem in their lives. This kind of learning strengthens the desire to succeed and is a better model for how we need to problem solve in real life. Ideally, students would follow up this diorama by studying a location similar to the biome chosen for their project, identifying similar problems, and suggesting solutions.

You will also find a comprehensive chart detailing the time, concepts, activities, and extensions connected with each lesson. I hope you enjoy teaching this unit as much as I did!

Geography affects the climate

- based on distance to equator
- Climate includes average rainfall, and temperatue

Organisms will survive in different climates based on the climate factors

- Producers, consumers, decomposers, and scavengers all fill a unique niche within their habitat.
- The food chains and energy pyramids that can be constructed showing the realtionships between different organisms can show the transfer of energy throughout the ecosystem

Warm, moist climates have the most biodiversity, and therefore the most pathogens.

- It is important to note that the populations of different organisms within a community are interdependent.
- Eradicating pathogen hosts may lead to ecological disturbances, or the infection of new hosts as pathogens strive to survive.

Pathogens thrive in warm, moist areas with a large diverse populations of potential hosts

- Normally a pathogen has a parasitic relationship with its host, and it releases toxins causing disease in the host

Pathogens can spread through contaminated water, food, air, and objects

- Careful handeling and procedures can prevet infectious diseases from spreading
- Vaccinations can prevent diseases from spreading.

Lesson	Time	Objective	Student Activities	Real-World Extension
1: Biomes	2 sessions	Identify temperature and average rainfall of each biome	Preparation for PBL end of unit project to design a diorama	Indicate to students that as the unit progresses, they can determine problems specific to one biome and engineer solutions.
2: Indigenous Disease	1 session	Identify which biomes have the most indigenous diseases and develop a theory explaining that occurrence	Students discuss how diseases transverse natural borders.	Students engineer a device to protect against a biological threat in “Biological Safety”. This helps them conceptualize how a toxin can infect many people, even outside its indigenous biome.
3. Pathogen Growth	2 sessions	Recognize conditions under which pathogens flourish and apply that knowledge to determine if conditions and objects are sanitary or contaminated.	Students will study descriptions of three passengers and determine which ones are a contagious threat and need to be sent home, and which passengers can be lead into the country.	Students use glitter to emulate the transmission of germs.
4. Pathogen Alert	1 session	Students determine how to kill a growing pathogen.	Students plan and execute a procedure to kill a yeast culture.	Students distinguish between proven medical pathways and unproven folk-tale remedies.
5. The Danger of the Dead Deer	3 sessions	Students distinguish between biotic and abiotic factors; determine how energy is returned to the environment, and identify organisms as scavengers, decomposers, or predators.	Students hold a “preservation contest”, where they compete to create a method for preserving a piece of raw chicken.	Students make a set of laws for a fictional butcher shop to ensure safe food handling. Students can study petrified dog feces or animals preserved in formaldehyde or other chemicals to determine why they do not decompose.
6. You are what you eat!	1 session	Students distinguish between producers, consumers, and decomposers.	Identifying themselves as consumers, students discuss FDA approval, safe and unsafe eating habits.	Students identify real-illnesses that result from unsafe food handling.

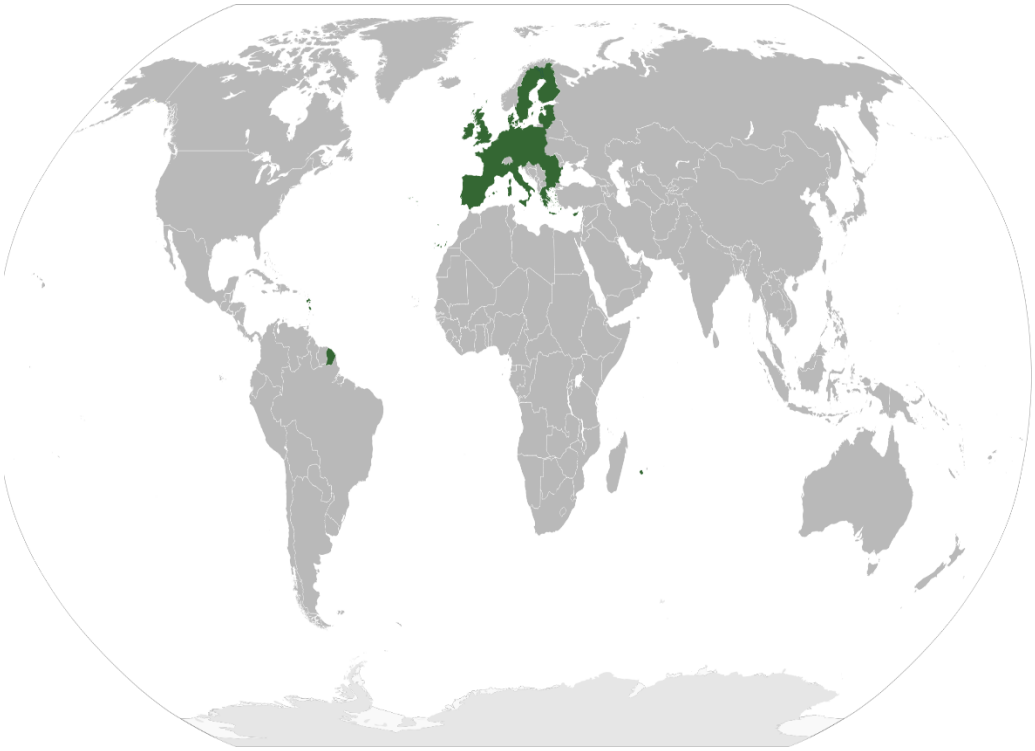
Lesson	Time	Objective	Student Activities	Real-World Extension
7. It's all the mosquito's fault!	1 session	Students analyze how a pathogen spreads via mosquitos, and connect this information with different relationships existing between different organisms.	Students can tour a virtual biome (VR technology preferred, but even a video will do) and search for examples of parasitism, commensalism, and mutualism.	Students identify dangerous parasites in their everyday lives
8. Why can't we just kill all the mosquitos?	2 sessions	Students identify how organisms relate to one another via food chains and energy pyramids. Students apply this knowledge to determine how one population affects another. Students learn about vaccine, and how the actions of one group of humans can affect another.	Students stage a debate and take sides on whether or vaccinations should be required before admission to schools.	Students discuss what populations could be adversely affected if all the mosquitos were killed.
Torah Connections:	2 sessions	Students see how Torah and science intersect in these hands-on labs.	In "International Germs", students learn the Torah's rule against placing money in one's mouth and then swab and culture the coins to determine how much bacteria was growing on them.	In "Who's Infected", Students will learn how Jewish Law forbids drinking from another person's cup, and will then take part in an interactive contamination lab designed to show the spread of pathogens in drinking water.

Name _____

Class _____

Biome Review:

Use colors to create a map showing the location of different biomes:



Tundra- Grey

Taiga- Purple

Desert- Yellow

Tropical Rain Forest- Green

Temperate Deciduous Forest-Brown

Grasslands (Savanna or Prairies)-Pink

BIOME

DISTRIBUTION

Biomes are determined based on climate, mostly temperature and rainfall. A climate is a weather pattern that repeats over and over. The amount of rainfall and the temperature is chiefly determined by the geographical location of the biome; basically the distance from the equator (latitude) and the elevation.

Name _____

Class _____

Biome Review:

Determine the correct biome:

1. Lowest average temperature _____
2. Has 4 regular seasons _____
3. A frozen dessert _____
4. Very little rainfall _____
5. Contains trees that lose their leaves each year _____
6. Contains evergreen forest _____
7. Very thick canopy and a lot of rainfall _____
8. Home to lions, zebras, and giraffes _____
9. Highest average temperature _____
10. Good soil for agriculture _____

Word Box:

Tundra (or Arctic Tundra)

Taiga (or Coniferous Forest)

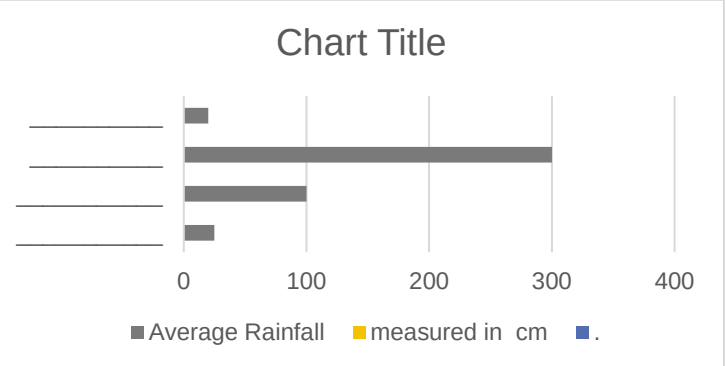
Desert

Tropical Rain Forest

Temperate Deciduous Forest

Grasslands (Savanna or Prairies)

II. Label the Bar Graph Below with The Name of A Biome



Word Box: Desert, Tundra, Tropical Rainforest, Grasslands

TERRESTRIAL ECOSYSTEMS

Biomes are basically a division of the biosphere, where certain organisms have made their home. Obviously, the ability of the organism to survive in this unique temperature and environmental conditions depends on the climate of the biome and the abilities and needs of the organism. Different biomes have different organisms.

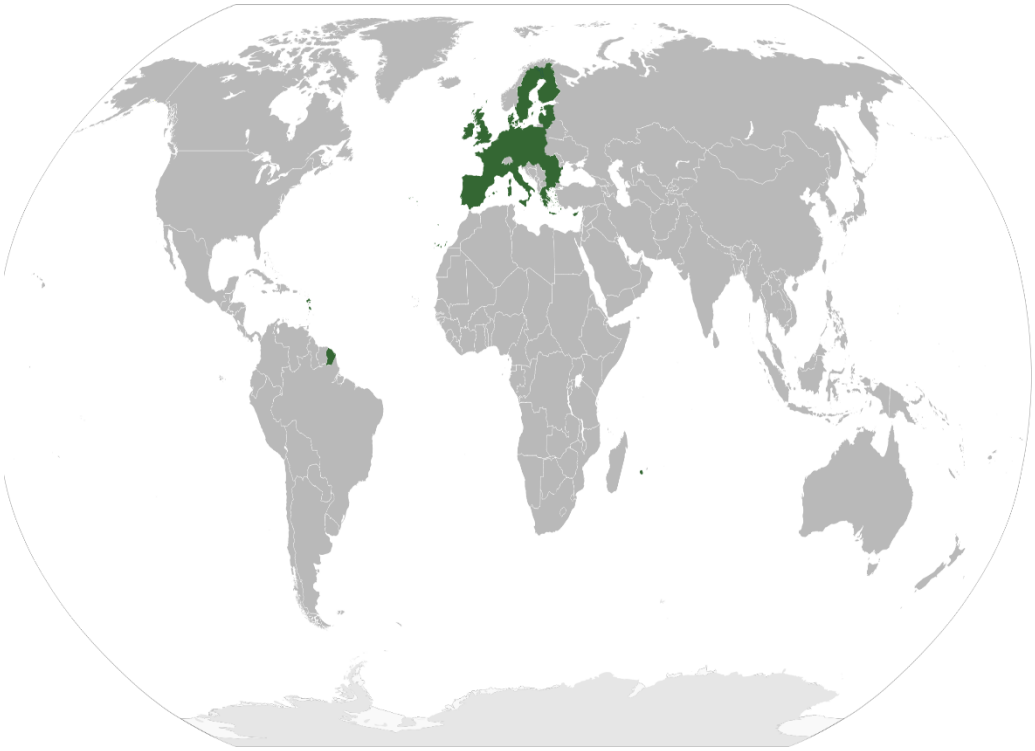
What is the likelihood that a disease will exist in each biome? Draw a bar graph showing the probability of finding a pathogen in the arctic tundra vs the tropical rain forest.

Name _____

Class _____

Indigenous Diseases:

Use colors to create a map showing the origin of known diseases:



SARS-Orange

Malaria- Grey

Cholera- Purple

West Nile Virus- Yellow

HIV- Green

Zika-Brown

Ebola-Pink

Yellow Fever- Black

DISEASE CONTROL

Certain diseases are known as infectious diseases, and can spread from one organism to another. Examples of such diseases are Influenza (the flu), West Nile, and Ebola. It is possible to become infected with these diseases if you come in contact with a contaminated organism, fluids, clothing, equipment, or even air. Another kind of disease is a genetic disease, which is not contagious. These diseases represent mutations in an organisms' DNA, such as Down Syndrown, or Tay Sachs.

Name _____

Class _____

Biological Safety

Many people fear that there will come a day when terrorists secure the means to use a pathogen as a weapon. Using an infectious disease as a means of terrorizing or harming people is called a biological weapon.

One candidate for biological weapons is called anthrax. Anthrax is easy to grow and is readily available. Thankfully, anthrax is not contagious, but the bacterium Bacillus anthracis released a toxin which can cause death within 72 hours. Anthrax infection is able to be treated by antibiotics, but if many people were infected at once, there is no telling if enough antibiotic will be available.

Imagine you are preparing for anthrax exposure. Obviously you over your skin and wear gloves, but how do you protect yourself from inhaling the thin powdery like substance? Inhalation Anthrax is the most dangerous.

Use the materials provided to construct a device that can keep you from inhaling any anthrax particles. When you are ready to test your device, your teacher will allow you to place the device over a dummy head and shoot a puff of baby powder at it. This will allow you to determine how effective your device was.

Available Materials:

-plastic plates and bowls -string

-cloth -rubber bands -scissors

-water -tape -paper

SAFETY

It is important to be careful when using the baby powder in this experiment. Even though inhaling baby powder will not cause toxins to grow in your body, the powder can get caught in the respiratory tract and cause difficulty breathing. Stand back when using the powder and aim it away from your face.

Name _____

Class _____

Growth of Pathogens:

Which factors will increase pathogen growth? Sort the Factors:

Increase Pathogen Growth	Decrease Pathogen Growth

Warm temperatures moisture diversity in organisms

Vaccinations freezing temperature dryness

Antibiotics unsanitary water conditions

Proper waste disposal washing hands hygienic standards

How are pathogens transferred? Is it Safe or Unsafe to Touch this? Write Safe or Unsafe next to each line.

1. Blood _____
2. Bodily Fluid _____
3. Unwashed Food _____
4. Unfiltered Water _____
5. Unpasteurized or otherwise substandard proteins _____
6. Animal Feces _____
7. Sick Person _____
8. Not washing hands after changing a diaper _____
9. Drinking or Using Still Water _____
10. Wear long sleeves and repellant near mosquitos _____

WHAT MAKES YOU SICK?

In ancient times it was believed that an evil spirit makes people ill but now science and medicine have shown us that it is really microorganisms that cause disease. In fact, women had a fifty percent chance of dying after childbirth until one doctor came up with the novel idea of washing his hands and his tools between attending to the sick patient and the birthing mother. The rate of death is childbirth declined greatly after that. Why do you think that is?

Name _____

Class _____

Making Connections: Why Diseases Are Indigenous to Certain Locations

OH Boy! It is your job as a customs official at JFK Airport to ensure that no travelers suffering from infectious diseases enter the United States. When you arrive at the airport for your shift, there are 3 travelers waiting in quarantine. All the passengers are exhibiting symptoms of infectious diseases, but only one of them is actually infected. Of course you could send them all home, but you would rather study their symptoms and personal information and determine who is the infected passenger.

Passenger 1:

Gender: Male

Age: 52

Traveling From: India

Symptoms: jaundice, fever, cough

Personal Information:
Works in a sewage plant

Passenger 2:

Gender: Male

Age: 26

Traveling From: India

Symptoms: Fever, Cough,

Personal Info: Had the Malaria Vaccine

Passenger 3:

Gender: Female

Age: 43

Traveling From: England

Symptoms: Fever

Personal Info: Has never traveled abroad before.

PATHOGEN ALERT

Sit with your class in a circle on the floor. Have one student spread some glitter on her hands. That student should then shake the hand of the student next to him/her, and that student in turn will shake the hand of the next girl in the circle. Continue shaking hands until every student has shaken a hand. Now look at your hands. How many students have the pathogen (glitter)?

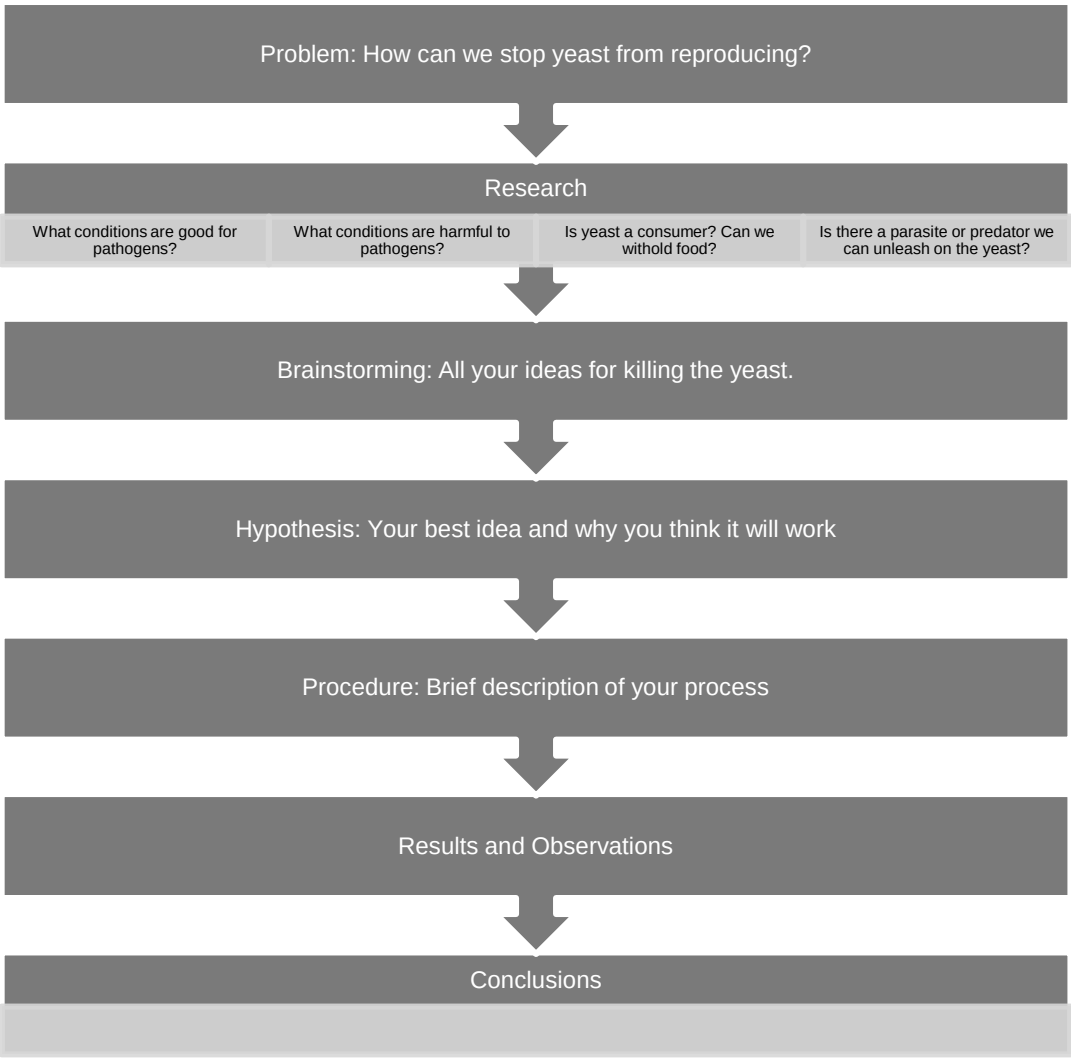
Remember, this is glitter which has maybe only a few hundred pieces. Pathogens can exist in the billions in a space the size of a teaspoon. #washyourhands.

Name _____

Class _____

Lab Activity: Pathogen Alert!

You are a world renown virologist visiting and Algerian school when all of a sudden an absentminded chemistry student accidentally dumps a large amount of yeast into the school's water supply. The Algerian CDC is on their way, but it is up to you to determine a method to stop the yeasts growth before the CDC shows up to decontaminate the water. If the yeast continues to grow, the cleanup process becomes much longer and more expensive.



KILL THE PATHOGEN

Your teacher will provide you with a cup of yeast. Your job is to come up with a way to kill it. When yeast is dead, it no longer breathes, and the amount of yeast in your cup will stop increasing. If you place the yeast culture in a graduated cylinder, you will be able to determine if it is still growing. Alternately, you can set aside half of the yeast as a control and compare your experiment with the cup of yeast that is still alive. Please remember to wash your hands with soap!

Name _____

Class _____

The Dangers of the Dead Deer

1. An environment contains many factors necessary to keep an organism alive, determine which are biotic and which are abiotic
   a. Sun _____
   b. Grass _____
   c. Cave _____
   d. Tree canopy _____
   e. Water _____
   f. Prey _____
2. When an organism dies, it returns its energy to the environment. Decomposers (or detritus feeders) will decompose particles of organic matter.
   Determine which organisms below are decomposers, scavengers (which feed on dead animals), or predators (which hunt animals).
   a. Bacteria
   b. Hyena
   c. Jaguars
   d. Fungi
   e. Vultures
   f. Wolves
3. If you have ever passed a dead animal, you may notice many insects preying on it; you may even notice a foul smell. That foul smell comes from the decomposers helping to get nutrients by breaking down the organic matter. Determine what the appropriate steps would be to protect against infection by those bacteria.

ENERGY

A deer actually returns energy to the environment constantly. When it eats berries and seeds, it is removing energy from the environment. When the deer digests the food, it breaks the food down into other forms, which are either used as energy, and released as heat energy into the environment, or excreted and broken down by decomposers. When it is the prey and is eaten by a predator, it provides energy for that hunter. And finally, whatever the predator does not eat is decomposed and eventually returns to the soil, air, and gives energy to other organisms.

Name _____

Class _____

FDA Lawmakers

Astorina is a beautiful little town, located in middle America. However, lately, many people have been visiting the town doctor complaining of severe stomachaches. After some tests, the doctor has determined that the townspeople are suffering from food poisoning, derived from the bacteria Salmonella. Authorities investigated the manner and determined that all of the sick patients had bought chicken from the town butcher shop. It is your job to write up a list of proposed laws for the butcher shop when preparing and selling the chicken, and a list of prosed guidelines for the townspeople when buying and storing the chicken.

Here are some points to keep in mind:

- Origin of the chicken (are they exposed to dirty water, feces, or other contaminated food)
- What kind of water is the chicken washed with?
- How the chicken is prepared
- What factors could keep bacteria from growing on the chicken (temperature, preservatives etc…)
- How people can store it safely

Gather in groups of two or three and prepare your lists. Review them *Boggle* Style, where students receive a point for each valid law that no other group came up with.

TOXINS

Technically a pathogen is a microorganism that produces a toxin or invades cells. The toxin is a poison that in most cases causes severe damage-it is the toxin that causes most of the symptoms of the disease, not the reproduction of the pathogen.

As consumers and omnivores, we rely on plants and animals for our nutrition. The FDA, food and drug administration, has many laws and guidelines designed to ensure the food we eat is safe from pathogens that can harm us.

Name _____

Class _____

Preservation Contest

Preservation is the ability to keep an organism, or at least its organic material, from decomposing.

There are several ways to keep organic matter safe from decomposers. Please look at the suggested preservation tactics below, not all of them will properly preserve organic matter! Chose the one that you think will preserve a piece of thinly sliced raw chicken for the longest. Take care to use gloves, and to carefully wash anything that comes in contact with the raw chicken.

Preservation Options:

a. Wash with soap. Destroy any microorganisms living on the chicken.
b. Air tight plastic bag. Place the chicken in tightly sealed plastic wrap so that no decomposers can get in.
c. Cooking. Cook the chicken in boiling water. Once it is cooked, decomposers are no longer interested in the organic matter.
d. Cold. Place the chicken somewhere where it is too cold for microorganisms to survive.
e. Salting. Cover the chicken with salt, which often kills microorganisms.
f. Pickling. Place the chicken in vinegar. The acid inhibits any microorganisms from reproducing there.
g. Other. Think of your own method and run it by your teacher. Remember, you cannot use anything that will render the chicken inedible.

Fill in the lab sheet on the following page.

SHIPWRECKED!

Imagine you are shipwrecked on an island with nothing but your favorite chicken to keep you company. Alas, you decide to slaughter him for food, and now that you have eaten your full, you need to preserve the leftovers. How best to preserve them? Extra impressive if you can figure out where to get salt from!

Name _____

Class _____

Preservation Contest Lab Sheet

Problem: How can I perserve the organic matter (chicken) from decomposers?

Research Questions:

What are decomposers?	What can kill or protect against decomposers?	Which methods fit these criteria?

Hypothesis: Which method are you choosing and why?

Procedure:

.Results and Observations

Conclusions

SMOKING

Although not usually a practical solution within a classroom, smoking is a time-honored way of preserving organic material. Some of the very fanciest and most expensive meats are smoked using different kinds of wood as fuel to impart specific aromas and flavors.

Name _____

Class _____

<u>You are what you eat!</u>

Circle the producers

Place an “x” over the consumers (two “

Underline the decomposers

Place a box around the energy source

Mushroom	sheep	frog	grass
Mosquito	human	seaweed	dung beetle
Sun	flower	acorns	eagle
Algae	bacteria	worms	lion

<u>Safe or Unsafe to Eat?</u>

1. Anything from a rusty can _____
2. Unrefrigerated Food _____
3. Raw Eggs _____
4. Honey (if you are under 1) _____
5. Palm Civet (catlike mammal) _____

Which disease is thought to be connected with each of the above unsafe foods?

-E coli -SARS

-Salmonella -tetanus

-Botulism

TOXINS

Technically a pathogen is a microorganism that produces a toxin or invades cells. The toxin is a poison that in most cases causes severe damage-it is the toxin that causes most of the symptoms of the disease, not the reproduction of the pathogen.

As consumers and omnivores, we rely on plants and animals for our nutrition. The FDA, food and drug administration, has many laws and guidelines designed to ensure the food we eat is safe from pathogens that can harm us.

Name _____

Class _____

It's all the mosquito's fault!!!!

Different organisms share different relationships. Write the correct relationship next to each set of organisms.

1. Mosquito and human _____
2. Cleaner Fish and a larger fish _____
3. Acacia Tree and Ants _____
4. Bee and a Flower _____
5. Deer and a Tick _____
6. Rhinoceros and a bird _____
7. Cattle and Egret (Bird) _____

Word Box:

Parasitism

Symbiosis (commensalism or mutualism)

Why is a mosquito a dangerous parasite?

Place the events to becoming infected with West Nile Virus in the correct order.

An animal dies in a warm region	A mosquito bites the bird and sucks some of its blood.	A bird eats from the dead animal and becomes infected with the bacteria
Birds fly to other regions.	Bacteria are drawn to the dead animal	The mosquito bites a human
The mosquito is now carrying the West Nile Virus	The mosquito transfers the basteria to the human's blood.	

SYMBIOSIS

Commensalism refers to a symbiotic relationship where one animal benefits and not necessarily is harm or good done to the second animal.

Mutualism refers to a symbiotic relationship where both animals are benefitting.

Name _____

Class _____

Why can't we just kill all the mosquitos?

1. Label each part of this food chain with the correct title

a. Sun _____
b. Wheat _____
c. Mouse _____
d. Snake _____
e. Eagle _____

Word Box:

Producer, Tertiary Consumer, Energy Source, Primary Consumer, Secondary Consumer.

2. Which of the organisms has the most energy? Which has the least energy? Explain.

Disease Alert!

1. All of the mice in an ecosystem have died. There is no other animal that can fill its unique niche. Write what happens to the population of each organism below. (increase of decrease)

a. Wheat population _____
b. Snake population _____
c. Eagle Population _____

2. The *Teradactyl Progressivess* is a fictional bird that competes with eagles for food. What happens to the population of this bird when the mice population dies out?

Summary Question:

Why is it unsafe for an ecosystem when a population significantly increases or decreases?

NICHES

We know that a community is made of different populations of different organisms that live together in the same habitat. This is possible because each species has its own niche-its own role. A niche may include a specific prey, predator, home and job. If species need to compete for the same food, or the same living territory, the species that is more fit will increase in population, while the species that is less capable will decrease in population. If you see five kinds of birds living together in a forest, you can be sure they have different niches.

Name _____

Class _____

Herd Immunity

There is a highly contagious disease that is easily transferred through the air (airborne) and causes fever, headaches, and a rash similar to chicken pox. However, most doctors today have never send this disease, because the disease was eliminated before 1980. How is a disease eliminated? Great question.

A vaccine is a way of inducing immunity in an organism. Immunity means that your body will recognize and respond to the pathogen. Traditionally, vaccinations contain a small amount of pathogen that is *not capable of producing the associated disease* (not virulent). This non-virulent pathogen is then injected into the body. The immune system will respond by producing an antibody that can identify, attach to, and destroy the pathogen should they ever be exposed.

Herd Immunity develops when all organisms that live in the same area are vaccinated. Having no host, the pathogen may die out.

What's Your Opinion?

Lately, immunizations are a hotly debated topic, because of some studies that show how Autism is related to the MMR (measles, mumps, and rubella) vaccine. Although these studies were officially debunked, many people are wary of the vaccine and choose not to vaccinate their children.

As recently as last year there have been several outbreaks of mumps. While mumps may not be deadly for most of the infected young children, they are ruining the herd immunity which puts people who cannot get the vaccine, namely young babies, the elderly, and the very sick with compromised immune systems, at risk. Additionally, since the infection incubates, it is possible to spread the disease before you are sick, exposing many others.

"Should Children Who Are Not Vaccinated Be Allowed In School"

Write a Response Essay with Your Opinion.

MICRO-MARINE-BIOLOGY

Scientists wondered how invertebrates protect themselves against pathogens- since they have very large populations. Scientists did research and saw that when a sea star was impaled with a thorn from a rose, microscopic study showed different white blood cells gathered at the spot, trying to destroy the invader. After several studies, a Swedish scientist was able to isolate a certain molecular structure from silk worms. This molecular structure has the ability to poke holes in bacteria and kill them. How useful doe sthat sound?! There is much to learn from the different organisms in our ecosystem and if we can apply that knowledge to medicine, we might just have a healthier brighter future.

Name _____

Class _____

Project-Based Learning End-of-Unit Diorama

Create a Diorama that includes the following:

1. At least three features of a biome
    a. Indicate temperature
    b. Indicate rainfall
    c. Indicate vegetation
2. Include both biotic and abiotic factors necessary for an organism to survive in this biome
    a. Include a consumer
    b. Include the organism's habitat
    c. Include energy/food and water supply for the organism; indicate whether the organism is an omnivore, carnivore, or a herbivore.
3. Include a food chain that lives in this biome
    a. Energy source
    b. Producer
    c. Primary consumer
    d. Secondary consumer
4. Demonstrate a relationship that exists between two organisms in your ecosystem
    a. Include both organisms
    b. Demonstrate either a parasitic or symbiotic relationship
5. Chose an indigenous disease to the biome
    a. Include the host
    b. Indicate how the disease can spread to other kinds of organisms
    c. Indicate safety precautions such as vaccination, draining of still water, or other.

PBL

Project Based Learning is an excellent pedagogic strategy, where instead of a summative test, students work towards a real-life goal. Throughout a unit, students will be absorbing and synthesizing information in order to create something new or solve a problem in their lives. This kind of learning strengthens the desire to succeed and is a better model for how we need to problem solve in real life. Ideally, students would follow up this diorama by studying a location similar to the biome chosen for their project, identifying similar problems, and suggesting solutions.

Name _____

Class _____

TORAH AND SCIENCE

Many people think that in order to be a believing Jew and an educated scientist you need to be of two minds; one that follows and believes in the authenticity of the Torah, and one that understands and respects the scientific proofs. Nothing could be further than the truth!

Not only are there myriad examples of how the Torah and science intersect, (some of which will be discussed in this unit), but many Rabbi's deal with the seeming contradictions between Torah and science with ease.

Often times, if you believe the Torah to be proven untrue by science, it is because you misunderstood the Torah concept. It is also important to keep in mind that many disparities can be solved simply by delving deeper into a topic. Remember, science prides itself on its progressiveness, and its ability to develop new theories and instruments that will change the way we understand the world around us Think of how scientists first though matter had no smallest particle, then they said an atom was the smallest particle, then the electron, then the quark, and now they think it may be infinitely divisible once again-and this is one small example. Torah is forever unchanging, so if you are ever faced with a solid dissonance, wait around for the science to catch up to the religion.

In this next section you will find several connections between the science information contained herein and Jewish sources. As you complete the worksheets and activities, keep in mind that many of these texts were written centuries before the associated scientific thought was put to paper. Isn't being Jewish awesome? #amazing.

ENERGY

The following lessons are based on ecology and immunology and disease, but have clear tie-ins to Jewish law and Jewish teachings.

Name _____

Class _____

INTERNATIONAL GERMS

COIN LAB ACTIVITY

The Torah forbids a person to put money in his mouth (source), because money is dirty and may cause illness.

Problem: Which coin carries the most bacteria?

Hypothesis: Study the three coins (penny, nickel, and quarter), and decide which you think contains the most bacteria and why.

Procedure:

1. Label 3 petri dishes (pre-laid with agar, bacteria food)
2. Use a sterile swab to gently rub the first coin.
3. Roll the swab onto the corresponding petri dish, and dispose of the swab.
4. Repeat steps 2 and 3 for the other two coins
   Cover the petri dishes and place them in an incubator or warm place.

Results and Observations:

Time Elapsed	Bacterial Growth
Day 1	
Day 3	
Day 5	
Day 7	

Conclusions:

Extensions:

1. Why did the Torah forbid placing coins in one's mouth?
2. How can you measure the bacterial colony to get an estimated amount of individual bacterium?

AGAR

Bacteria grow nicely when there is food and warmth. Agar is a nutrient rich broth used to line round glass dishes called petri dishes. You may have seen a petri dish if you had a strep culture. Your doctor will swab your throat, attempting to gather bacteria on the swab. He will then place the swab on a petri dish filled with agar, and roll it around. The doctor can't see any bacteria on the swab, but if he waits a while, any bacteria that he collected from your throat will eat the agar and reproduce. Once the bacteria reproduce enough, the doctor will see bacteria colonies that look like ten colored spots appear on the petri dish. If no bacteria appear, it is likely your symptoms are not bacterial. Of course, you might have other kinds of funky organisms growing in your petri dish, such as molds or fungi. Be sure to keep the dish sealed, and to dispose of the experiment using bleach and following the instructions your teacher gives carefully.

Name _____

Class _____

‘WHO’S INFECTED?’ LAB ACTIVITY

Jewish Law forbids drinking from another person’s cup, because you do not know who is sick, and consequently do not know if you are putting yourself in danger by drinking from their cup.

Setting:

Every student has a cup in front of them filled with a clear substance called “water”.

Every student will “share” their drink with another student. The way this works is for each student to pick a partner. One partner will pour some of their water into the other partner’s cup. If your clear water turns red- you are infected and you are out! Students should continue mixing with other students until they are infected and their cup turns red.

Write down which classmates you mixed your water with and

As a class, try to determine where the infection began.

I poured water into these cups:

I received water from these cups:

The infected cup belongs to _____,

Name _____

WATER

Every student will have a cup filled with a clear substance. We will call this “water”, but it actually contains a chemical to allow this experiment to be simulated, so please do not drink it or place your fingers into it. Any contact with skin or eyes should be washed or flushed with water

Class _____

Vocabulary: Unit 1
Ecology and Medical Geography

Biome-

Tundra-

Taiga-

Desert-

Tropical Rain Forest-

Temperate Deciduous Forest-

Grasslands (Savanna or Prairies)-

Indigenous Disease-

Infectious Disease-

Genetic Disease-

Pathogen-

Toxin-

Environment-

Ecosystem-

Abiotic-

Biotic-

Habitat-

Niche-

Population-

Community-

Parasitism -

Symbiosis (commensalism or mutualism)-

Producer (autotroph)-

Consumer (heterotroph)-

Carnivore-

Herbivore -

Omnivore-

Energy Source-

Primary Consumer-

Secondary Consumer-

Tertiary Consumer-

Food Chain-

Energy Pyramid-

Predator-

Prey-

Scavenger--

Decomposer-

Immunity-

Vaccination-

Virulent-

Name_____
Biology

Test on Ecology and Medical Geography

I. Multiple Choice (4 points)

1. Which of the following is a producer?
A. Snail
B. seaweed
C. Sun
D. David

2. Which of the following has the least energy?
A. Tertiary consumers
B. primary consumers
C. Producers
D. Decomposers

3.Which biome is most likely to contain an assortment of pathogens?
A. Arctic Tundra
B. Taiga
C. Desert
D. Tropical Rainforest

4. An omnivore will eat
A. Meat
B. Plants
C. Meat and plants
D. Neither meat nor plants

5. Which is definitely a living thing?
a. robot
b. star
c. bacteria
d. virus

6. The biotic and abiotic factors in an environment and all the interactions is
A. Ecosystem
B. Ecology
C. Community
D. Population

7. An example of a population would be
a. all the seaweed in the lake
b. the frogs and the flies found on the lily pads
c. the lily pads and water home of the frog

d. the entire pond area and everything in it

9.Pathogens are
a. Evil spirits
b. Microscopic organisms
c. Bacteria
d. Viruses

10. Vultures, Hyenas, and worms are all
A. Decomposers
B. Carnivores
C. Scavengers
D. Pollutants

II. Fill in the blank (4 points):

1. Organisms that use energy from the sun to produce food (autotrophs)_____

2. Organisms that feed on and break apart organic matter are called _____

3. An organism that will eat only meat _____

4. A disease that occurs from a pathogen naturally found in a certain location is _____ to that location.

5. Water and sun are examples of _____

6. Organisms that cannot make their own food and instead eat other organisms _____

7. A diagram that shows the passage of energy from producer to tertiary consumer _____

8. A small amount of pathogen that is non-virulent and is used to produce immunity is called a _____.

9. Organisms that hunt down prey are called _____.

10. A geographical area with a similar temperature, amount or rainfall and overall climate _____.

Word bank

Carnivore	indigenous	food chain	vaccination	biome
producers	predators	decomposers	abiotic factors	consumer

III. Thinking question: (20 points)

1. An ecologist by the name of Dr. John W. Rong is faced with a terrifying problem. It seems that the rats in his neighborhood of West Africa are carrying a pathogen that can cause chicken pox. The rats feed on the annoying fleas, which enjoy eating the large crops of corn grown in the area. Dr. Rong can chose to recommend that everyone in his neighborhood get vaccinated, or he can choose to poison the rat population
n. Explain which solution Dr. Rong should chose and why.

