

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 1 Title: Introduction to vaping and vaping culture.

Time: 45 - 90 minutes (good lesson to truncate and use half a class period for.)

*Goals for Lesson

1. Identify students initial thoughts and knowledge on vaping and eCigarettes.
2. Identify potential problems and solutions for vaping.
3. Evaluate sources for potential bias.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How does nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. Should ecigarettes be regulated?

Lesson Assessment:

- Vape Madness - Intro to Vaping and Bias Graphic Organizer
- Vaping Anticipation Guide

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
Prior to 1st Class - <ul style="list-style-type: none">• Teacher will want to gather different videos demonstrating vaping tricks, vape culture, and reinforcing the vape epidemic among teens.	Gather and Print the Following Materials: <ul style="list-style-type: none">• Vape Madness - Intro to Vaping and Bias Graphic Organizer• Reading Vaping Anticipation Guide• Whiteboards and Dry Erase Markers• Exit slip paper.• eCigarettes Overview Article.
Teacher will introduce the concept of vaping through a questioning activity using white boards and whip around quick shares.	<ul style="list-style-type: none">• Whiteboards and Dry Erase Markers

<ul style="list-style-type: none"> ● Ask students to get into groups based on how much they think they know about vaping (novice, apprentice, practitioner, or expert). Break groups up further into smaller group of 3-4. ● Distribute whiteboards and dry erase markers to students groups. ● Have students answer the following questions followed by a quick whip around share. <ul style="list-style-type: none"> ○ Discuss and write down one word that best describes vaping. ○ What do we know about vaping? Write down everything you know about vaping. ○ Is vaping safe? Are eCigarettes safe? ○ Is vaping safer than smoking cigarettes? Why do you think this? ● While students share their responses to these questions, try to refrain from directly giving students information or correcting misconceptions about smoking and vaping. The goal of the unit is for students to reach their own conclusions. This first lesson should really be establishing student buy-in for the topic and gathering their initial thoughts and prior knowledge for vaping. Any glaring misconceptions should be noted and then incorporated into a later lesson discussing nicotine's impact on the body. 	
<p>Teacher will introduce the Vape Madness - Intro to Vaping and Bias Graphic Organizer.</p> <ul style="list-style-type: none"> ● Students will be tasked with watching three short videos about different aspects of vaping and vape culture. For each video the students will need to make observations using the "I Noticed..." and "I Wonder..." portions of the organizer. Pause after each video for the students to fill out the follow-up questions concerning if they noticed any potential bias from the source of the videos. ● Numbered Heads sharing activity. Students will take their Vape Madness - Intro to Vaping and Bias Graphic Organizer and walk around the room to music randomly in order to mix themselves up. <ul style="list-style-type: none"> ○ Stop the music and call out the number 3. Students will gather into groups of 3 and share what they noticed about the vape tricks video. ○ Start the music and have students mix up once again. 	<ul style="list-style-type: none"> ● Vape Madness - Intro to Vaping and Bias Graphic Organizer <p>Video Links:</p> <ul style="list-style-type: none"> ● Vape Tricks <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=QRGywNKPID4 ● Vape Culture <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=5wVGOc458D0 ● Vaping Epidemic in High Schools - CNN

<ul style="list-style-type: none">○ Stop the music and call out the number 4. Students will gather into groups of 4 and share what they noticed about the vape culture video.○ Start the music and have students mix up once again.○ Stop the music and call out the number 2. Students will gather into groups of 2 and share whether or not and why the vape culture video had a potential bias in regards to vaping.○ Start the music and have students mix up once again.○ Stop the music and call out the number 2. Students will gather into groups of 2 and share whether or not and why the CNN high school vaping epidemic video had a potential bias in regards to vaping.○ Start the music and have students mix up once again.○ Stop the music and call out the number 3. Students will gather into groups of 3 and share something they still want to know about vaping before they decide whether and how it should be regulated.	<ul style="list-style-type: none">○ https://www.youtube.com/watch?v=5wVGOc458D0
<p>In order to prepare for the next lesson's article jigsaw students will participate in a prereading exercise over information about vaping.</p> <ul style="list-style-type: none">● Distribute the Reading Vaping Anticipation Guide to students.● Students will need to read each statement and write an A (agree) or D (disagree) in the column marked "Me"	<ul style="list-style-type: none">● Reading Vaping Anticipation Guide

<p>Teacher will end class using a Quickwrite activity to be used as an exit slip.</p> <ul style="list-style-type: none">● On a slip of paper have students answer the following questions:<ul style="list-style-type: none">○ Why do you think it is important for us to understand the culture behind vaping?○ As of today do you think vaping and eCigarettes should or shouldn't be regulated? Why or why not?● OPTIONAL: Have students read and answer the questions from the article "eCigarettes Overview"	<ul style="list-style-type: none">● Exit slip paper.● eCigarettes Overview Article

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 2 Title: Initial Model and How Vaping Impacts Different Parts of Society.

Time: 90 - 180 (in minutes)

*Goals for Lesson

1. Design an initial model to explain how vaping impacts different body systems and leads to addiction.
2. Create a graphic organizer that illustrates how different parts of society are impacted by vaping and eCigarettes.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. How do vaping and eCigarettes impact the human body?
2. Should ecigarettes be regulated?
3. How are different parts of society are affected by the vaping industry?

Lesson Assessment:

- Initial Model
- Star Organizer

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
<p>Begin class by reminding students how we must first immerse ourselves in the vaping culture before we can make decisions on whether and how it should be regulated.</p> <p>OPTIONAL: Collect the eCigarettes Overview Article from last class.</p> <p>Initial model</p> <ul style="list-style-type: none">● Instruct students that we want to capture their initial thoughts about how vaping and nicotine impacts and travels through the body. They may use pictures, labels, numbers, brief written descriptions, etc. in order to illustrate their understanding of the vaping scenario prompt.	<ul style="list-style-type: none">● Vaping Culture Notes powerpoint <p>Gather and Print the Following Materials:</p> <ul style="list-style-type: none">● Initial Model Prompt● Blank paper to draw models on.● Sticky Notes (2 per student)● Paper slips for Quick write

<ul style="list-style-type: none"> ● SCAFFOLD: Students that are struggling may need help getting started. <ul style="list-style-type: none"> ○ Ask them how they think nicotine travels through the body. ○ Ask them how we can show nicotine’s impacts on the body. ○ Give them a body diagram. ○ Read through the scenario and have the students highlight any reactions and nouns. Stress to the students that these elements should be present or accounted for in their model. 	
<p>Vaping Vocabulary Let students know that part of understanding a concept and culture is learning the appropriate language and slang used. In order to gain a better understanding of the jargon associated with vaping students will play a quick quizlet using their devices/phones and match the vaping terms.</p> <p>This activity may also be done out loud whole group where students come up with their own definition and students vote on which they believe to be the real definition or through a different matching game.</p> <ul style="list-style-type: none"> ● Teacher should go to the following link and have students join a Quizlet game: https://quizlet.com/_5j4qh5 	<ul style="list-style-type: none"> ● Vaping Culture Notes powerpoint ● Quizlet: https://quizlet.com/_5j4qh5
<p>POSERS Picture Analysis Show the students the image from the powerpoint of the vaping competition. DO NOT tell the students what is going on in the image or where the picture was taken.</p> <ul style="list-style-type: none"> ● Pass out the POSERS picture Analysis sheet. ● While looking at the photo students will attempt to answer the prompts, using clues from the photo. ● Once students are done, play the clip and see how close students were to what was happening in the photo. ● Stress how this illustrates how serious individuals are about their eCigarettes and vaping tools. 	<ul style="list-style-type: none"> ● Vaping Culture Notes powerpoint ● POSERS picture analysis ● VC Cloud Championships - Vape Summit - Men's Cloud <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=9puCt7HccOY
<p>4 Corners Regulation</p>	<p>No additional materials</p>

<p>Present slide from powerpoint titles “4 Corners Regulation Grouping.” Students will need to place themselves into groups based on how they currently think vaping should be regulated. Remind students that their opinions may change over the course of the unit.</p> <ul style="list-style-type: none"> ● Designate 4 corners that correlate to each of the following options: <ul style="list-style-type: none"> ○ 1 - Vaping eCigarettes should NOT be regulated at all. ○ 2 - Vaping should only be available to individuals above the age of 18. ○ 3 - Vaping should only be used by adults above the age of 18 AND by prescription only to stop smoking. ○ 4 - Vaping should be banned completely because of its potential health risks. ● If need by, split the groups up into smaller 3-4 member groups. ● Have students discuss in their groups why they chose their level of regulation. ● Task one student from each group to summarize and share their groups main points. 	<p>needed.</p>
<p>Students will remain in their small groups for the remainder of the class.</p> <p>Star Organizer</p> <p>Instruct the students that they will need to consider several societal impacts of vaping and eCigarettes and how these parts of society shape our opinion. To categorize these main portions of society they will be using the Star Organizer.</p> <p>The Star Organizer is broken into 5 main components:</p> <ul style="list-style-type: none"> ● Science ● History ● Culture/Social ● Economic ● Politics <p>Have student groups draw a large star on their blank piece of paper. Each point should be labeled for each portion of society as listed above.</p> <p>Give each group of students a different aspect of society (some may be used for multiple groups).</p> <p>Students will be tasked with:</p>	<ul style="list-style-type: none"> ● Star chart - Large blank paper for each group ● Markers ● NEWW Article graphic organizer ● Articles: <ul style="list-style-type: none"> ○ LA eCigarette Ban ○ More Teens Vaping ○ Teens Juul Vaping

<ul style="list-style-type: none"> ● Defining this aspect of society in their own words. ● Describing who informs this part of society. ● How do they think vaping influences this part of society. ● EXAMPLE: Politics <ul style="list-style-type: none"> ○ Governing body that decides the passage of laws and how those laws are enforced. ○ Senators, Representatives, City Council, etc. ○ Make laws and regulations limiting or broadening use of eCigarettes and vaping. <p>Have students share their definitions and how vaping influences these parts of society. Other student groups should add these definitions and ideas to their Star Organizer. You may need to help students summarize or clean up any definitions.</p> <p>Culture: If need be you may give the students the provide definition for culture: <i>Behaviors, arts, interests, societies, and cliques. The ways we interact with vaping and how people develop a lifestyle based around it or including it.</i></p> <p>Have students add portions to the culture section of their star in regards to vaping. Have them think back on the videos from the class before.</p> <p>Examples: Tricks, competitions, socializing, cafes, modding their vape pens, etc.</p> <p>Vaping Article Jigsaw In their groups give each student one of the following articles:</p> <ul style="list-style-type: none"> ○ LA eCigarette Ban ○ More Teens Vaping ○ Teens Juul Vaping 	
<p>Give one Get One OR Closing Quickwrite As a closing activity you may have the students do either activity.</p> <p>Give one get one</p> <ul style="list-style-type: none"> ● Give each student a sticky note and instruct them to finish the prompt on each: <ul style="list-style-type: none"> ○ STICKY NOTE 1: One thing I learned from today's articles were.... ○ STICKY NOTE 2: One thing I thought was interesting from today's articles was.... 	<ul style="list-style-type: none"> ● Vaping Culture Notes powerpoint ● Sticky Notes (2 per student) ● Paper slips for Quick write

- Students will then meet up with other students in the room, share their responses, and then trade one sticky note. Students then move on to a new partner and share/trade.
- Do this 3 - 4 times.

Closing Quickwrite

- Hand out a slip of paper and have students answer the following prompt:
 1. Why do you think it is important for us to understand the culture behind vaping?
 2. How does understanding the culture behind vaping allow us to better reach a decision in regards to whether it should be regulated or not?
- Students may share these whole class/ A-B share if time allows.

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 3 Title: Homeostasis and Feedback Loops

Time: 90 minutes

***Goals for Lesson**

1. Describe a biological system.
2. Describe and give examples of how organisms maintain homeostasis.
3. Model and describe a positive and negative feedback loop.
4. Create a feedback loop for how the body reacts to nicotine and leads to addiction.

***Unit Guiding Questions:**

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

***Lesson Guiding Questions:**

1. In what ways does our body maintain homeostasis?
2. What are positive and negative feedback loops?
3. How can we use feedback loops to describe our understanding of addiction from nicotine?

Lesson Assessment:

- Nicotine and addiction white feedback loop.
- Star Organizer
- Nicotine and Addiction Quickwrite and Closing Quickwrite

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
<p>Prior to 1st Class -</p> <ul style="list-style-type: none">● Teacher will need to make sure the students' star organizer's are available for the end of the lesson..● Print Is It a System Keely Probe● Que video from Bozeman Science - Positive and Negative Feedback Loops	<ul style="list-style-type: none">● Is It a System Keely Probe (Keeley & Tugel, 2009, pp. 81-87)● Homeostasis and Feedback Loops notes● Paper for Quickwrites● Star Organizer's from previous lesson● Bozeman Science - Positive and Negative Feedback Loops

	<ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=CLv3SkF_Eag
<p>Teacher will introduce the concept of what a system is to the class.</p> <ul style="list-style-type: none"> ● Organize students into small groups and distribute the Keely Probe - Is It a System? ● Students will take a couple of minutes reading the through the list and determine which they believe is a system and which they do not think is a system. Stress to the students to come up with some kind of justification for which is and isn't a system. ● Come together whole group and define what the students think a system is. You can record responses. ● You can go through the list item by item and see if your class can reach consensus on each one, or cherry pick a few examples. This can be done in a full class discussion ● OR you can turn this into a philosophical chairs-like activity and designate w=one side of the room to be for individuals that believe the item IS a system and the opposite if they believe it is NOT a system. Students will move accordingly. Take a few moments for students on each side to argue their point. Students may move from side to side freely as they are convinced by the students' thinking. 	<ul style="list-style-type: none"> ● Is IT a System Keely Probe (Keeley & Tugel, 2009, pp. 81-87)
<p>Students will take notes over homeostasis (structural, physiological, and behavioral) and positive and negative feedback loops.</p> <p>Students will then watch the Bozeman Science Video over Positive and Negative Feedback Loops while using 2-1 strategy.</p> <p>From the video students will need to record:</p> <ul style="list-style-type: none"> ● 2 Things they learned from the video. ● 1 Question/wondering they still have from the video. <p>Stand Up - Pair Up - Share</p> <p>After the video have students take their 2-1 and put their hand up. Students should high-five a student on the other side of the room and share their observations and questions. Once done, students should thank their partner and try to find a another. Students' goal should be to speak with 3-4 different individuals in the classroom.</p>	<ul style="list-style-type: none"> ● Homeostasis and Feedback Loops notes ● Paper for Quickwrites ● Bozeman Science - Positive and Negative Feedback Loops <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=CLv3SkF_Eag

<p>Teacher Should have their students get into A-B partner groups and share the following:</p> <ul style="list-style-type: none"> • A - Explain to your partner what a positive feedback loop is and give an example. • B- Explain to your partner what a negative feed loop is and give an example. <p>Vaping and Hoemostasis. From the notes give a quick rundown of how vaping impacts homeostasis from the powerpoint notes.</p> <p>Building a Feedback Loop Have students get with a partner and attempt to create a model feedback loop using the prompt in the powerpoint notes. Go around and check in with students making sure that all parts of the prompt are included.</p> <p>Ask students in individual groups what type of feedback loop they have created and why they think this. Give feedback and redirects as needed. Through questioning try to get the students to realize this is modeling a positive feedback loop for addiction since the body will continue to crave more and more nicotine. As them what we call this when people continually need more of a substance to feel satisfied (addiction). Some students may note how quitting a substance and recovering from addiction would lead to a negative feedback loop.</p> <p>Nicotine and Addiction Quickwrite Have students answer the following questions:</p> <ul style="list-style-type: none"> • How would you describe the feedback loop of vaping? Positive or Negative? Defend your response. • Harvard Medical School classifies addiction as a “chronic disease”, because it “hijacks the brain”, changing both its function and structure. How does this relate to our discussion of feedback loops? 	
<p>Students should get back in their groups from the previous class and get their Star Organizer. In their groups and using their notes they should add information about homeostasis, feedback loops, and addiction to the Science portion of their STAR.</p>	<ul style="list-style-type: none"> • Star Organizer’s from previous lesson

<p>If they still had not added information to the culture portion from the previous lesson they can do that now.</p>	
<p>Closing Quickwrite On the back of the previous quickwrite, have students answer the last two closing questions for this lesson:</p> <ul style="list-style-type: none"> ● How do you think understanding positive and negative feedback loops will help us understand your body's response to vaping? ● In your own words, how would you describe the difference between a positive and a negative feedback loop? 	<ul style="list-style-type: none"> ● Paper for Quick writes

Reference:

Keeley, P., & Tugel, J. (2009). *Uncovering student ideas in science*, (Volume 4): 25 new formative assessment probes. NSTA press.

Teacher will introduce the 4 essential macromolecules for life.

- Start by discussing the hierarchy of life beginning with atoms and working your way up to organisms. Stress to students that we will need to discuss macromolecules in order to understand interactions of materials/substances at the cellular level and then up to the organ and organ system level.
- Go through the rest of the biochemistry notes powerpoint while students take notes. Emphasis how we are carbon based and that all the organic molecules we will be discussing must have a Carbon and Hydrogen bond.

- Biochemistry powerpoint notes

Macromolecule one pager poster Shuffle Activity.

Students will need to be put into groups of 3-4. Each group should be given a large piece of poster paper and markers. They will be researching macromolecules and creating a one-pager poster over these molecules. For this project student groups will be trading posters and working on different portions. The students will be responsible for different sections on each poster for a different macromolecule.

- Students should first title their poster one of the 4 essential macromolecules as you assign them (carbohydrates, proteins, lipids, nucleic acids)
- Next, students will set up a box on their posters with 4 quadrants and labeled the following:
 - Elements
 - Functions
 - Monomers (building blocks)
 - Examples
- For reference here is a simple version of what their poster should look like at this stage:

- **Macromolecule Name (Title)**

Elements	Functions
Monomers (building	Examples

- Biochemistry powerpoint notes
- Large Paper Sheets for Macromolecule one pager poster
- Student devices for research (computer)
- Macromolecule Grid

blocks)	
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- These student groups will then research what elements make up their assigned macromolecule. They will want to include the chemical symbol from the periodic table and the whole element name.
- **STUDENTS WILL ONLY WORK ON THE FIRST BOX!!!**
- Have student groups then move on to a different groups poster. They will then research the functions for this new macromolecule they have the poster for.
- Repeat this group poster switching until all 4 sections are complete.
- Have groups return to their original poster and get with another group that has the same macromolecule (if there is one). They will want to compare their posters and add/delete any information if needed. This is a good time to check in with groups and make sure their information is accurate.
- These groups will then decide who on their team will be willing to present and share each portion of their macromolecule to the class.
- Both student groups will hold and present their posters to the class.
- Teacher should pass out the macromolecule grids to each student.
- Students will fill out their macromolecule grid as notes while the students present their poster.

As an extension students may be shown the video from Khan Academy - Biological Molecules you are what you eat.

- Khan Academy - Biological Molecules you are what you eat.
 - <https://www.khanacademy.org/science/biology/crash-course-biology-ecology/crash-course-biology-science/v/crash-course-biology-103>

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 5 Title: Cell Transport and Membranes

Time: 90 - 180 (in minutes)

*Goals for Lesson

1. Design simple model that demonstrates how molecules move through diffusion.
2. Predict how the size of a cell will change and which materials can move in and out of the cell.
3. Describe substances interact with the cell.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. How do nutrients and waste move in and out of the cell?

Lesson Assessment:

- Diffusion Practice Box Problems worksheet
- Cell Membrane Diagram Model worksheet
- Osmosis Beaker Formative Assessment

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
<p>LESSON NOTE: For this unit the concept of osmosis and predicting how the water moves and its impact on the size of the cell was used as an extension for the Honors section of biology. The general biology classes did not include these components. Any materials and content concerning osmosis may be omitted for a general room without losing understanding of the bigger question concerning how vaping and nicotine impact the body.</p> <p>Prior to 1st Class - You will need to set up a couple of demos before class starts.</p> <p>Beaker Diffusion Demo</p> <ul style="list-style-type: none">● Fill three beakers with an equal amount of water.	<p>Gather and print the necessary materials:</p> <ul style="list-style-type: none">● Transport and Membranes Notes powerpoint.● Whiteboards and Dry erase markers● Three beakers filled with water<ul style="list-style-type: none">○ These will each need to be three different temperatur

- Use a hot plate to warm one beaker, put another beaker in and ice bath or refrigerator, and let the last beaker sit out to keep at room temperature.
- You will need each of these beakers to stay different temperatures for the class demo.

Osmosis with Lettuce, Potato, and unshelled Egg Demo

- Several days before this lesson you will want to place several eggs in a closed container of vinegar. After a couple of days, remove the eggs and scrape off the outer shell using your fingers. Running the egg under water sometimes help flake off the outer shell.
- You will want to place slices of potatoes, whole lettuce leaves in mixtures of pure water and some in water with salt. For the unshelled eggs you will want to place the one egg in a beaker of pure water and another in a beaker of corn syrup. These will be used to demonstrate water entering and exiting a cell.

es (hot, cold, and room temperature)

- Food coloring
- Paper for quick writes
- Balloons already blown and filled with some kind of perfume, scent, flavoring so the students can smell the substance through the balloon
- Transport and Cell Membrane Guided Notes (optional)
- Diffusion Practice Box Problems worksheet
- Cell Membrane Diagram Model worksheet
- Osmosis Beaker Review Questions worksheet
- Osmosis Beaker Formative Assessment
- Lettuce, Potatoes, salt, eggs, vinegar, and corn syrup.
- Containers of water to be used in the osmosis demo
- Vaping Has a Lead Hazard to Consider:
 - <https://www.youtube.com/watch?v=oZn6prLJ06M>
- How Water Can

	<p>Kill You - In Plain English:</p> <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=QBAPBGa5SBA ● Onion Cells Plasmolysis <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=gWkcFU-hHUK ● Osmotic Burst of Blood Cells <ul style="list-style-type: none"> ○ https://www.youtube.com/watch?v=OYoaLzobQmk
<p>Demonstrating Diffusion with Beakers of Water</p> <p>Begin class by having the students get into pairs and grabbing a whiteboard and dry erase markers. Have students split their board into three equal size columns. Tell students that you have three different beakers filled with water and what temperatures they are each at. Tell students that you are going to put three drops of food coloring into each beaker. Ask students to predict what they think will happen in each beaker.</p> <ul style="list-style-type: none"> ● Add drops to beakers of water. ● Students should correct their predictions if need be. ● Ask students to then draw what is happening to the molecules in each beaker (water and dye) and show why they think there was a difference in the rate at which the dye mixed fully. ● Check for student understanding. If time, allow students to share their pictures/models. ● Have students erase their pictures of the beakers and ask them the following prompt: <ul style="list-style-type: none"> ○ Draw a model on your whiteboard to explain how particles from the vape pen move into your lungs. 	<ul style="list-style-type: none"> ● Whiteboards and Dry erase markers ● Three beakers filled with water <ul style="list-style-type: none"> ○ These will each need to be three different temperatures (hot, cold, and room temperature)

Go through the Transport and Membranes notes powerpoint while students take notes. Students may use the Transport and Cell Membrane Guided Notes as an option to speed up lecture. You will need to stop periodically for a few activities which are noted below:

Room Demo

- After introducing the idea of how the dye moves to spread out, have the students get up and coral them to a corner of the room. Explain how they are currently in an area of high concentration. Ask the students if they want to be here and if they feel comfortable.
- Next allow the students to spread out and stand anywhere they want in the room (within reason). Explain how the students have now gone from an area of high concentration to low concentration, much like the dye in the three beakers at the beginning.

Vaping and Lead

- Show students the video clip: Vaping Has a Lead Hazard to Consider.
- Introduce students to the dangers of lead poisoning. Feel free to bring in examples of individuals exposed to lead in their drinking water.
- Have students write a summary of how lead gets into their body and lungs based on what has been discussed in class already.

Balloon Diffusion Modeling Activity

- Students will need to be in put into small groups of 2-3 and will need access to a whiteboard and dry erase markers.
- Give each student a balloon which contains a scent/perfume.
- Ask the students to guess what the scent is.
- Ask students to consider that if the scent is INSIDE the balloon and NOT on the surface, how are they able to smell it? How are the scent molecules making their way to their nose to activate their smell receptors?
- Have student groups model on their whiteboard what is happening. You will need to walk around and question students, or help clear misconceptions.
- Once students seem to have a firm grasp, pick 2-3 groups to share what they believe is going on and use their model to support their explanation.

- Transport and Membranes Notes powerpoint.
- Paper for quick writes
- Balloons already blown and filled with some kind of perfume, scent, flavoring so the students can smell the substance through the balloon
- Transport and Cell Membrane Guided Notes (optional)
- Diffusion Practice Box Problems worksheet

Diffusion Practice Box Problems worksheet

- Reinforce to students that the cell membrane is semipermeable and that some materials are blocked from going in and out of the cell.
- Explain how we will be looking at different substances at different concentrations in and outside of the cell. Students will need to determine which direction the material will move based on diffusion AND which substances will be allowed to pass through the membrane.
- You may need to model the first problem on the board for students.

Types of Cell Membrane Proteins

- Use the Transport and Membranes Notes powerpoint to introduce the different types of proteins in the membrane of the cell.

Membranes Quickwrite

This may be a good breaking point for students to stop and address how they understand vaping's connection to the concept of diffusion and why our cells are semipermeable. Have students answer the following prompts:

- What does the concept of vaping have to do with diffusion?
- Why is it important that our cells are semipermeable?

THIS MAY BE A GOOD STOPPING POINT FOR PART 1 OF THIS LESSON!

Membrane Diagram Model

- Pass out copies of the Cell Membrane Diagram Model worksheet to students.
- On the board, lead students in reviewing and drawing the types of proteins in the cell membrane along with the phospholipid bilayer.
- Stress to students what substances will be able to move through the membrane, channel proteins, and how molecules interact with the receptor proteins used in cell signalling.
 - This can be tied to the concept of addiction, release of hormones, reward pathway,

- Transport and Membranes Notes powerpoint
- Cell Membrane Diagram Model worksheet
- White Blood Cell Chases Bacteria:
 - <https://www.youtube.com/watch?v=EJnIULOjU>

<p>vaping/nicotine, how nerve cells respond to acetylcholine from vaping.</p> <p>Active vs. Passive Transport Use the Transport and Membranes Notes powerpoint to introduce the differences between active and passive transport of substances across the cell membrane.</p> <ul style="list-style-type: none"> • Show video of White Blood Cell Chases Bacteria to show an examples of endocytosis. 	<p>hSQ</p>
<p>Introduce concept of osmosis by showing students the video How Water Can Kill You In Plain English.</p> <p>Continue using the Transport and Membranes Notes powerpoint to explain the concepts of Hypertonic, Hypotonic, and Isotonic.</p> <p>Show videos as examples of how cells react when exposed to different solutions.</p> <ul style="list-style-type: none"> • Onion Cells Plasmolysis • Osmotic Burst of Blood Cells <p>Teacher should demonstrate how to answer the Osmosis Beaker Questions from the Transport and Membranes Notes powerpoint. Stress where the water will move and how this will impact the cell.</p> <ul style="list-style-type: none"> • Handout the Osmosis Beaker Review Questions worksheet to students. • Have students practice the first two rows of problems. • Check-in with class whole group or check-in with individual students as they work. <p>Osmosis with Lettuce, Potato, and unshelled Egg Demo</p> <ul style="list-style-type: none"> • Have students go to the stations previously set up for the lettuce, potato, and unshelled egg. Students can pick up and feel the difference in the materials in the solutions. Do not tell students what solution each item is in. • Have students make observations about how the lettuce, potato, and eggs are physically different. • Have students predict what kind of solution these materials are in and how the water has moved in or out of the cells for each. <p>Closing Quiz:Osmosis Beaker Formative Assessment</p> <ul style="list-style-type: none"> • Handout Osmosis Beaker Formative Assessment to students. • This can be used to see if the students fully grasp the 	<ul style="list-style-type: none"> • How Water Can Kill You In Plain English <ul style="list-style-type: none"> ◦ https://www.youtube.com/watch?v=QBAPBGa5SBA • Onion Cells Plasmolysis <ul style="list-style-type: none"> ◦ https://www.youtube.com/watch?v=gWkcFU-hHUK • Osmotic Burst of Blood Cells <ul style="list-style-type: none"> ◦ https://www.youtube.com/watch?v=OYoaLzobQmk • Lettuce, Potatoes, salt, eggs, vinegar, and corn syrup. • Containers of water to be used in the osmosis demo • Osmosis Beaker Formative Assessment

material.	
IF TIME: Students should get back in their groups from the previous class and get their Star Organizer. In their groups and using their notes they should add information about homeostasis, feedback loops, and addiction to the Science portion of their STAR.	<ul style="list-style-type: none">• Star Organizer's from previous lesson

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 6 Title: Disruption of Homeostasis at the Micro Level

Time: 90-180 (in minutes)

*Goals for Lesson

1. Identify how nicotine impacts the brain at the synaptic cleft.
2. Identify how other drugs impact the brain at the microscopic level.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

What is the pathway that nicotine takes in the brain in order to give someone a “high”?
How do other drugs impact the brain on the microscopic level?

Lesson Assessment:

- [Mouse party worksheet](#) - Note: Add a row at the end of the table for Nicotine.
- Mid models

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
<p>Class review of prior lesson</p> <ul style="list-style-type: none">● What does it mean for a cells membrane to be semi permeable? Why is it important that cells are semi permeable?● What is diffusion and how does nicotine diffuse in the body (lungs to blood)?● What type of feedback loop does nicotine follow? Give students nicotine feedback loop cut outs and have them put them in order to model positive feedback.	<p>Teacher may want to draw on whiteboard body with lungs and bloodstream to scaffold conversation about diffusion.</p> <p>Nicotine feedback loop scaffold cut outs.</p>
<p>Teacher introduces mouse party activity to students. “Now that we have learned about how the brains synapse works we are going to look at how other drugs impact the brain's normal function”</p> <ul style="list-style-type: none">● Pass out mouse party worksheet. Students will need to go to this website to do the mouse party activity:	<p>Students computers with internet access</p> <p>Mouse party worksheet</p> <p>Projection of teachers</p>

<p>https://learn.genetics.utah.edu/content/addiction/mouse/</p> <p>Before students start the mouse party activity on the web fill out the nicotine box together to scaffold how to complete worksheet. (NOTE: nicotine is not a drug on the web site so do it with students so they can complete the worksheet. Also use this conversation to review the synapse from last class.)</p> <p>If students need additional scaffolding complete another drug with students and model how it affects the synapse on the worksheet.</p>	<p>computer</p>
<p>Students work on the mouse party worksheet modeling how different drugs impact the brain's normal function.</p> <p>Teacher monitor student progress and scaffold as needed.</p> <p>Possible discussion questions to ask while students are working:</p> <ul style="list-style-type: none"> • How do drugs that give a “high” vs “depressant” work differently? • What are some of the common neurotransmitters involved in different drug actions? What does that tell you about how the drug makes someone feel? <p>Monitor time it takes students to complete the worksheet. Make sure you give enough time to complete the mid model (~30 min).</p>	
<p>With about 30-20 minutes left in class have students pause working on the mouse party activity. Students should pull out or be handed back their initial models from lesson 1. Teacher reintroduce same prompt from initial model. Have students reflect on their initial models by answering the questions under the Mid-Model: Model evaluation and revision section in the modeling packet. To help scaffold students review some of the things they have learned in this unit thus far and refer to the drawing on the teacher’s whiteboard from the beginning of class.</p> <ul style="list-style-type: none"> • Once students have answered the initial model reflection questions have them draw their mid models. To scaffold mid models drawing encourage students to build off of teacher’s drawing of lungs with blood stream along with the synapse drawing of nicotine in the brain from the mouse party worksheet. • Remind students to label their models and be sure to explain what they are showing by writing it out on their page as well. <p>Students can continue to work on mouse party once their mid models are completed.</p>	<p>Student initial models Materials to draw mid models (paper, markers, ect.)</p>

Optional: Either collect mouse party or assign it as homework.	
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Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 7 Title: Homeostasis

Time: 90-180 (in minutes)

*Goals for Lesson:

1. Connect previous learning about nicotine and vaping to body systems.
2. Show students how the body works together in a system to maintain homeostasis.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions: How do your organ systems work together to maintain homeostasis?

Lesson Assessment:

- Body system posters
- body system posters notes graphic organizer

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
Start off class by reminding students of the levels of organization they covered in a previous lesson. "Up to this point we have covered the mico levels of organization. Today we will be covering the macro levels of organization and how all these things work together to help you maintain homeostasis." Show the first slide of the macro hierarchy powerpoint that shows the levels of organization.	Macro hierarchy powerpoint
Have students add to their notes to review the six most common elements found in the human body and why carbon is the element of life. Use these topics as a way to connect micro to macro. Explain how these elements work together to ultimately build you organs, organ systems and ultimately the organism which is you.	
Next students will be making a body system poster in groups of four. (the poster paper should be body length and	Body system poster hand out with rubric.

<p>have one students from each group lay on the poster to get outlined to represent the body their organ system is in.) Each member in the group has a certain role that they must do and put onto the poster. Students will need to use the internet to gather the information from their assigned role. The four roles are.</p> <ol style="list-style-type: none"> 1) drawer of the body and organs (labeled) that make up the system they are assigned. 2) Identify the function of this body system and how it helps maintain homeostasis. 3) how does vaping and nicotine disrupt the normal function of the body system. 4) what other body system does your assigned system work with other systems to maintain homeostasis and how. <p>Remind students that each section should be detailed and legible on their poster. Eventually their classmates will be using their poster to fill out the body system poster graphic organizer on the hand out.</p> <p>Both the PPT and the hand out go over how to make the posters. The PPT also has a way to group students using uno cards and color for each job(optional). Have students write their job they had on the rubic if you chose to grade each students participation on the poster.</p>	<p>Butcher paper body length. Markers, colored pencils, ect. Students way to access the web to get info on their body system.</p>
<p>As students work on their poster scaffold them by helping them find correct info to put on their poster. The posters are also body sized so everyone should be able to write on the poster at the same time.</p>	
<p>Once students have completed their body poster they will do a gallery walk and fill out their body system graphic organizers (last page of body system poster hand out). This will be their macro hierarchy notes. Emphasize how all these systems work together to maintain homeostasis and all the different ways nicotine and vaping can impact them.</p>	
<p>Students may not be able to make the posters and fill out the graphic organizer in one 90 min time span. This day may overlap into next class where they can start off by finishing the graphic organizers.</p>	

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 8 Title: How are different parts of society are affected by the vaping industry?

Time: 90-180 (in minutes)

*Goals for Lesson

1. Identify how different aspects of society are affected by the vaping industry.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. How are different parts of society are affected by the vaping industry?

Lesson Assessment:

- Star organizer

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
If students did not finish the body system poster graphic organizer from last class finish that up at the start of class.	
Using the star organizers from the beginning of the unit review with students the four social aspects that will influence their decision on how vaping should be regulated. Students will be adding to the science point of the star next class to review for their final models. The star organizer should also have the culture point filled out from when the star was introduced earlier in the unit.	Star organizer that students started working on at the beginning of the unit.
After reviewing the all the points of the star students will be jigsawing three different articles about vaping to fill out the rest of the star. Tell students that today we will be focusing mainly on the other social aspects that have not gotten filled out yet (economy, history, politics). Hand out the three different articles (one to each student in their star's group). Each student should have a different article in the group that emphasizes a certain point of the star. Instruct students to write down important information in each point of the star that they read in their article (even if their article emphasizes economy they might have things	The three different vaping articles emphasizing history, economy, and politics.

<p>to add to politics or culture, ect.).</p>	
<p>As students read scaffold by helping them determine what point of the star pieces of information they read belongs in. If a students finishes reading their article before their group have them google some more information about the history point (when was the first e-cig invented, when did e-cig sales start to really take off, ect.). To keep track of what a student is adding to the poster have each student write in a different color so you can tell who might need help finding info in their article.</p>	<p>optional : computer for students to do additional research, different colored markers.</p>
<p>Once all groups have finished reading their articles and fill out their star have students do a whip around sharing out once piece of information from their points of the star. Start with culture and see if anyone was able to add more to that from the start of the unit. As students go around sharing out their info each group should be adding information to their star. Also remind students to listen to what other groups say not only to add it to their poster but also so they don't share out a similar piece of information when it is their groups turn.</p>	
<p>At the end of the lesson each groups star chart should be pretty filled out except for the science point. Remind students that they will be using these star charts to help them on their final project for this unit.</p>	

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 9 Title: Final models

Time: 90-180 (in minutes)

*Goals for Lesson

1. Connect science content covered in this unit together.
2. Model how nicotine travels through the body and causes addiction.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. How does nicotine travel through the body and cause addiction?

Lesson Assessment:

- Star organizer (science)
- Final models

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
Have students get their star organizers from last class. Inform students that today they will be filling out the science portion of the star chart to review for their final model.	Star chart
Students should pull out old notes and start to summarize topics that have been covered up to this point (Feedback loops, Homeostasis, Macro systems, nicotine/reward pathway, Diffusion, Brain synapses (if covered), membrane/receptors (if covered) osmosis (if covered) and any other relevant science information). As groups are filling out the science point of the star help guide students to how all these pieces are connected. Questions to ask: "Think about how all the micro parts of the hierarchy impact the macro we recently covered." "In what ways do feedback loops affect the body systems?" "In what ways does nicotine use diffusion in organ systems and the brain?" Ultimately students should start to get an idea on how all of these things are related so the can incorporate them into their final models.	Student notes on science concepts from this unit.

<p>Once each groups science point is fairly filled out have the class do a whip around to hear what other groups wrote down. While groups share out students should add to their star similar to last class.</p>	
<p>Before giving students their final models there are a few optional scaffolds that can be used if students are still struggling.</p> <ol style="list-style-type: none"> 1) Have students relook at the nicotine feedback loop cut outs and put them in order. It might make more sense to them now that they know what the endocrine system is and what it does. Use that as a way to help connect students to how nicotine causes addiction. Also with this activity have students think about what does acetylcholine release look like in the brain and on the receptors if that was covered. 2) Using the body posters that students drew have them write out or draw on whiteboards how nicotine travels through the body. For additional scaffolding, on the teachers board have a student draw a body with lungs, circulatory system, brain and nervous system. As a class track the movement of nicotine through the body and talk about the effects it has on each organ it moves through. (optional: leave that drawing on the board for students to use to help them get started on their final models. This model should be a good starting point but students should be able to connect feedback and this drawing together on their own model.) 	<p>Optional scaffolding: nicotine feedback loop cut outs. Students whiteboards and or teacher whiteboard.</p>
<p>Hand back students their initial and mid models. Have them rate their mid model (1-5) and explain why they gave their model that rating. Students should also write out what they need to revise or add to their mid model in order for it to show the movement and effects of nicotine on the body.</p>	<p>Students initial and mid models</p>
<p>Introduce students to the final model. Read through the scenario and cover the things that must be included in their final model. (optional: depending on what science topics were covered change what must be included on the final model. Overall students should be able to show how nicotine moves through the body and how it causes addiction.)</p>	<p>Final model hand out</p>
<p>Once students have finished their final models give them nicotine and the adolescent brain HW.</p>	<p>Nicotine and the adolescent brain HW.</p>

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 10 Title: Causal map and culminating activity

Time: 90-180 (in minutes)

*Goals for Lesson

1. Define how you believe vaping should be regulated and how that affects different aspects of society.
2. Create a Public service announcement about how vaping should be regulated and why.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. What impacts would vaping regulation have on different societal impacts?

Lesson Assessment:

- Causal maps
- Culminating activity

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
Have students get their star organizers from last class. At this point in the unit each point of the groups star chart should be filled out with a great amount of information. Students will be using the star chart to help them determine how their opinion of regulating e-cigs would impact different societal aspects.	Star chart
Once students are in their star organizer groups introduce them to the causal map activity. This activity can be done either individually or in their star groups. (NOTE: the hand out is made for individual causal map but can be easily modified for a group) If people in their star group have very different opinions about how vaping should be regulated students may want to find groups that more aligned with their ideas. As groups form or if done individually have students use the back side of the hand out to write out their proposal. If done in group students can draw their causal map on a large piece of	Causal map

<p>butcher paper or whiteboard. Their proposal should be how they specifically think e-cigs should be regulated. Let students make their own decision about this for as long as they can back their opinion with logic and facts from the star chart there are no right or wrong answers.</p> <p>Once the group has their plan to how e-cigs should be regulated they should draw branching bubbles off of this explaining who would be positively or negatively impacted. Have students use different colors or (+) and (-) in each of the people impacted. Example if I think e-cig should be illegal then gas stations would be negatively impacted. As groups fill out the secondary bubbles have them add on third tier bubbles explaining how each group would be impacted. Example gas stations would be negatively impacted because they would lose profit from e-cig sales. This might cause an increase in other product prices and lower employee wages. Each group or individual should try and get as much information on their causal map as possible.</p>	
<p>Once the groups have filled out as much of the causal map as possible have each member of the group take a picture of this because they will use parts of this in their culminating activity.</p>	
<p>Introduce the culminating activity (this piece was done individually). This final project focuses more on the social side of vaping rather than the scientific side that the unit test would cover. In this project student will make a PSA (public service announcement) in the form of a news article, commercial, poster, brochure, powerpoint, ect. In order to teach their peers about what vaping is and how it should be regulated. Criteria for the project are outline on the culminating activity handout along with a scoring rubric. Essentially students should state what vaping is, misconceptions about vaping with correct responses, how they feel it should be regulated with supporting facts from the star chart, and the impacts of their proposal from the causal map.</p>	Culminating activity
<p>The culminating activity with the casual map prior will take longer then just this one class period. You can have students work on their project next class (day 11) then end with a unit test over science concepts on day 12.</p>	

Homeostasis and Cell Transport Through Vaping of E-Cigarettes.

Lesson 11 Title: Culminating activity

Time: 90-180 (in minutes)

*Goals for Lesson

1. Define how you believe vaping should be regulated and how that affects different aspects of society.
2. Create a Public service announcement about how vaping should be regulated and why.

*Unit Guiding Questions:

1. How should e-cigarettes be regulated?
2. How do nicotine and e-cigarettes impact the human body?

*Lesson Guiding Questions:

1. What impacts would vaping regulation have on different societal impacts?

Lesson Assessment:

- Culminating activity

Homeostasis and Cell Transport Through Vaping of E-Cigarettes Resource Website:

Instructional Sequence	Materials/Supplies
<p>Students will be working on their culminating activity for this block. If it was not introduced last class refer to (lesson 10) on how to introduce the final project.</p> <p>Students should be using their star chart and causal map to complete this project. The rubric on the project pages states how they should be utilizing these things to make their project.</p>	<p>Culminating activity from day 10 if started last class</p> <p>Causal map day 10 Star chart day 10</p>
<p>Encourage students to think about their proposal and make sure they can back their ideas with logic and facts from the star chart.</p> <p>Extension options: have students present their projects and open it up for a Q and A afterwards so students can ask questions about each others proposal. This would also be nice for other students to see all the different opinions that came up in the class on how e-cigs should be regulated.</p>	
<p>As students finish their culminating activity hand out the study</p>	<p>Study guide</p>

guide for the test. The test goes over more of the science content that was covered in this unit. An example of a unit test that was given has been provided. Based on state standards and what optional content was covered (Brain synapse and osmosis) your test may differ from the example provided.

The test can be given next class day 12.

Test on day 12