Biology 1 Lesson Plan: A Journey into the Cell

A 4-Week Project-Based Unit for Mrvacupanda (Grade 12)

Materials & Resources Needed:

- **General Supplies:** Notebook/binder, pens, pencils, colored markers, chart paper or whiteboard.
- **Tech Access:** Computer with internet for research, videos, simulations, and creating presentations. Access to a printer is helpful but not required.
- **Project 1 (3D Cell Model):** Recyclable materials (e.g., shoebox, plastic bottles, cardboard, yarn, styrofoam balls, beads), modeling clay, paint, glue, scissors.
- **Project 2 (Cell Membrane Model):** Recyclable materials (e.g., corks, cotton swabs, pipe cleaners, beads, straws) or indigenous materials (e.g., small pebbles, twigs, seeds), a base like a piece of cardboard or a shallow box.
- **Lab/Activity Supplies:** Gummy bears or a raw potato/egg, salt, sugar, distilled water, containers/beakers, pipe cleaners (different colors), beads.

WEEK 1: The Blueprint of Life - Cell Fundamentals

Focus: This week, we will explore the discovery of cells, their fundamental structures, and the major differences between cell types. We will begin planning our first major project: the 3D cell model.

Day 1: The Cell Theory - Unlocking a Hidden World

- **Learning Objectives:**
  - Explain the three postulates of the cell theory in your own words.
  - Identify the key scientists involved and their contributions.
- **Activities (60 mins):**
  1. **Engage (10 mins): "What Are We Made Of?"** Brainstorm a list of living things. What is the smallest possible unit they all share? Discuss initial ideas.
  2. **Explore (30 mins): "Cell Theory Detective Game."** Research the contributions of Hooke, van Leeuwenhoek, Schleiden, Schwann, and Virchow. Create a "detective's board" (on paper or a digital tool like Miro) linking each scientist to their "clue" (discovery) and how it builds the Cell Theory. Watch a short video summarizing the history.
  3. **Elaborate & Evaluate (20 mins): "Tweet the Theory."** Summarize each of the three postulates of the cell theory as if it were a post on social media (e.g., a Tweet, max 280 characters). This forces concise understanding. Discuss the summaries.
- **Assessment:** The "Tweet the Theory" summaries serve as a formative check for understanding. Verbal explanation of the detective board.
- **Differentiation:** For a deeper challenge, research a modern-day exception or addition to the cell theory (e.g., viruses, endosymbiotic theory) and present a one-paragraph argument for or against its inclusion.

Day 2: Tour of the Animal Cell

- **Learning Objectives:**

    - Identify major organelles in an animal cell (nucleus, mitochondria, ribosome, ER, Golgi, etc.).
    - Describe the primary function of each organelle using an analogy.
    - Begin planning the 3D cell model project.
- **Activities (60 mins):**
    1. **Engage (5 mins): "If a Cell Were a City..."** Quick brainstorm: If a cell was a bustling city, what job would the "mayor's office" have? The "power plant"? The "post office"?
    2. **Explain (35 mins): "Organelle Speed Dating."** Create simple flashcards for 8-10 major organelles. On one side, the name; on the other, its function. Set a timer (2-3 mins per organelle). For each one, read its function, and then create a city analogy (e.g., "Mitochondria: The Power Plant - It generates all the energy!"). Sketch the organelle's shape.
    3. **Elaborate (20 mins): Project Kick-off!** Let's start designing the 3D Cell Model. Choose which cell to build (animal, plant, or bacterial). Brainstorm recyclable materials you could use for each organelle. Sketch a blueprint for the model.
- **Assessment:** Accuracy of the city analogies. The blueprint sketch for the 3D model.
- **Differentiation:** Mrvacupanda can choose the complexity of the model, deciding whether to include just the major organelles or add more detailed structures like the cytoskeleton or peroxisomes.

Day 3: The Plant Cell & Its Unique Features

- **Learning Objectives:**
    - Identify the structures unique to plant cells (cell wall, large central vacuole, chloroplasts).
    - Compare and contrast the structure and function of plant and animal cells.
- **Activities (60 mins):**
    1. **Engage (10 mins): "Why Don't Plants Flop Over?"** Pose the question and discuss initial hypotheses. This leads into the function of the cell wall and central vacuole.
    2. **Explore (30 mins): "Venn Diagram Challenge."** Using your notes from yesterday and new information about plant cells (from a short reading or video), create a large Venn diagram comparing and contrasting plant and animal cells. Focus on the "why" - why do plants need a cell wall but animals don't?
    3. **Elaborate (20 mins): "Nature's Solar Panel."** Deep dive into the chloroplast and photosynthesis. Draw a simple diagram of a chloroplast and explain how it is the ultimate source of energy for most life on Earth.
- **Assessment:** The completed Venn diagram, evaluated for accuracy and detail.
- **Differentiation:** Extension: Research the endosymbiotic theory and write a short comic strip explaining how mitochondria and chloroplasts might have become part of eukaryotic cells.

Day 4: Prokaryotes vs. Eukaryotes

- **Learning Objectives:**
    - Distinguish between prokaryotic and eukaryotic cells based on key features (nucleus, membrane-bound organelles, size, DNA structure).
    - Provide an example of each type of cell.
- **Activities (60 mins):**
    1. **Engage (5 mins): "The Simplest Life."** Look at images of bacteria. What do you notice is missing compared to the plant and animal cell diagrams we've made?
    2. **Explain (30 mins): "T-Chart Takedown."** Create a T-chart with "Prokaryote" on one side and "Eukaryote" on the other. Fill it in with key differences: genetic material location (nucleoid vs. nucleus), organelles (none vs. many), size (small vs. large), and examples (bacteria vs. protists, fungi, plants, animals).
    3. **Elaborate & Evaluate (25 mins): "Cell ID Quiz."** You will be presented with diagrams or descriptions of 5 different cells. For each, you must identify it as prokaryotic or eukaryotic and justify your answer with at least two pieces of evidence.

- **Assessment:** The T-chart and the "Cell ID Quiz."
- **Differentiation:** If the bacterial cell model was chosen for the project, this is a great day to finalize the blueprint and material list, focusing on features like the nucleoid region, flagella, and pili.

Day 5: Cell Specialization & Modifications

- **Learning Objectives:**
  - Explain why multicellular organisms need specialized cells.
  - Describe two examples of cell modifications (e.g., root hairs, microvilli, nerve cells) and relate their structure to their function.
- **Activities (60 mins):**
  1. **Engage (10 mins): "One-Size-Fits-All?"** Discuss: Would a single tool, like a hammer, be good for every job in building a house? Why not? Relate this to cells in the body.
  2. **Explore (30 mins): "Design-a-Specialized-Cell."** You are an engineer tasked with designing a cell for a specific job (e.g., absorbing nutrients, sending fast signals, fighting infection). Draw the cell and label its special modifications. Write a "spec sheet" explaining how each feature helps it perform its function.
  3. **Elaborate (20 mins): Weekly Review Game - "Cell Taboo."** Create cards with key terms from the week (e.g., Mitochondria, Cell Wall, Prokaryote, Nucleus). The goal is to get the other person (the teacher) to guess the term without using a list of "taboo" words on the card. (e.g., for Mitochondria, you can't say "power," "energy," or "ATP").
- **Assessment:** The "Design-a-Specialized-Cell" drawing and spec sheet, evaluated on the clear link between structure and function. Performance in the review game.
- **Differentiation:** The student can choose which specialized cell to design, tapping into their own interests (e.g., a muscle cell for an athlete, a photoreceptor for an artist).

WEEK 2: The Gatekeeper - Cell Membrane & Transport

Focus: This week is all about the cell's border patrol: the cell membrane. We'll explore its structure and the fascinating ways it controls what gets in and out. We will build our second model.

Day 1: The Fluid Mosaic Model

- **Learning Objectives:**
  - Describe the main components of the cell membrane (phospholipid bilayer, proteins, cholesterol, carbohydrates).
  - Explain why it's called the "Fluid Mosaic Model."
  - Begin constructing the cell membrane model.
- **Activities (60 mins):**
  1. **Engage (5 mins): "The Bubble Barrier."** Blow some soap bubbles. What properties does the bubble film have? (It's flexible, self-sealing, fluid). This is a great analogy for the cell membrane.
  2. **Explain (25 mins): "Deconstruct the Membrane."** Watch a detailed animation of the fluid mosaic model. Pause the video to sketch and label the parts: phospholipids (hydrophilic heads, hydrophobic tails), integral proteins, peripheral proteins, cholesterol, and glycoproteins/glycolipids.
  3. **Elaborate (30 mins): Project Work Time.** Using recyclable or indigenous materials, begin constructing the cell membrane model. Focus on creating the phospholipid bilayer and embedding a few proteins. Discuss the material choices and what they represent.
- **Assessment:** Labeled sketch of the cell membrane. Progress on the model.
- **Differentiation:** For an advanced take, research the specific roles of different membrane proteins (e.g., channel, carrier, receptor, enzyme) and plan to include and label these different

types in the model.

Day 2: Passive Transport - Diffusion and Osmosis

- **Learning Objectives:**
  - Define and differentiate between diffusion and osmosis.
  - Predict the movement of water in hypotonic, hypertonic, and isotonic solutions.
  - Conduct a simple osmosis experiment.
- **Activities (60 mins):**
  1. **Engage (5 mins): "The Smell of Science."** Open a bottle of vanilla extract or spray a bit of air freshener in one corner of the room. How long does it take to smell it from across the room? This is diffusion in action!
  2. **Explore & Explain (35 mins): "The Great Gummy Bear Experiment."**
     - Set up three cups: one with plain water (hypotonic), one with very salty water (hypertonic), and one with water that has a bit of salt (isotonic - harder to achieve, but aim for it).
     - Measure and record the initial size/mass of three gummy bears. Place one in each cup. Make predictions.
     - While waiting, draw diagrams illustrating what is happening at a molecular level in each cup. Define all key terms.
  3. **Evaluate (20 mins): Analyze Results.** After at least 30 minutes (or longer if possible), remove the gummy bears, re-measure, and record the results. Discuss if the predictions were correct and why. Write a short lab report conclusion.
- **Assessment:** Lab report conclusion, explaining the results using the terms hypotonic, hypertonic, and osmosis.
- **Differentiation:** The experiment can also be done with a potato or a de-shelled raw egg for a more dramatic result over 24 hours. The student can design an inquiry-based follow-up question, e.g., "What happens if I use sugar water instead of salt water?"

Day 3: Facilitated Diffusion & Active Transport

- **Learning Objectives:**
  - Compare and contrast facilitated diffusion and active transport.
  - Explain the role of ATP in active transport.
- **Activities (60 mins):**
  1. **Engage (10 mins): "VIP Entrance."** Imagine a crowded concert. Some people can just push through the crowd (simple diffusion). What if there's a special gate for ticket holders (facilitated diffusion)? What if you need to pay a security guard to let you in against the crowd (active transport)?
  2. **Explain (30 mins): "Cellular Shipping Co."** Create a fictional company called "Cellular Shipping Co." that moves molecules. Design three "services":
     - **Standard (Passive):** No energy needed, moves down the concentration gradient.
     - **Express (Facilitated):** Needs a special protein channel, but no energy.
     - **Priority Overnight (Active):** Requires energy (ATP) to move molecules against the gradient.

     For each service, draw a diagram and explain when a cell would use it.
  3. **Elaborate (20 mins): "Pump It Up!"** Focus on a specific example of active transport, like the Sodium-Potassium pump. Watch an animation and explain its importance in nerve cells.
- **Assessment:** The "Cellular Shipping Co." service descriptions and diagrams.
- **Differentiation:** Create a real-world analogy for the Sodium-Potassium pump, like a canal lock system or a revolving door that requires a push.

Day 4: Bulk Transport - Endocytosis & Exocytosis

- **Learning Objectives:**

    - Differentiate between endocytosis and exocytosis.
    - Describe two types of endocytosis: phagocytosis and pinocytosis.
- **Activities (60 mins):**
    1. **Engage (5 mins): "Big Gulps."** How does a cell "eat" something large, like a bacterium? It can't fit through a protein channel. Brainstorm ideas.
    2. **Explore (35 mins): "Stop-Motion Storyboard."** Create a storyboard for a short stop-motion animation (or a simple flipbook) that shows the process of 1) Phagocytosis ("cell eating"), 2) Pinocytosis ("cell drinking"), and 3) Exocytosis (cell "spitting out" waste). The storyboard should have sketches and captions explaining each step.
    3. **Elaborate (20 mins): Real-World Connection.** Research how a human white blood cell (macrophage) uses phagocytosis to destroy pathogens. Write a short "A Day in the Life of a Macrophage" journal entry from the cell's perspective.
- **Assessment:** The stop-motion storyboard, assessed for accuracy of the processes. The macrophage journal entry.
- **Differentiation:** If time and resources permit, create the actual stop-motion animation using clay and a smartphone app.

Day 5: Transport Review & Model Showcase

- **Learning Objectives:**
    - Synthesize all concepts of cellular transport.
    - Present and explain the cell membrane model.
- **Activities (60 mins):**
    1. **Engage (20 mins): "Cell Transport Escape Room."** Complete a digital or paper-based escape room activity. Each puzzle will require applying knowledge of a different transport mechanism to unlock the next clue.
    2. **Elaborate (20 mins): Membrane Model Presentation.** Present your finished cell membrane model.
        - Point out each component and explain its function.
        - Explain why it's a "fluid mosaic."
        - Use the model to demonstrate one type of transport mechanism (e.g., move a bead through a straw "protein channel").
    3. **Evaluate (20 mins): Concept Map.** Create a concept map linking all the key terms from this week: Cell Membrane, Phospholipid, Protein, Diffusion, Osmosis, Active Transport, ATP, Endocytosis, Exocytosis, etc.
- **Assessment:** Performance on the Escape Room. The Cell Membrane Model and verbal presentation (summative assessment for this project). The concept map.
- **Differentiation:** Mrvacupanda can choose the format of the concept map (digital or hand-drawn) and can opt to create a short video presentation of the model instead of a live one.

WEEK 3: The Cell Cycle & Mitosis

Focus: This week, we dive into the life of a cell, from its "birth" to division. We'll master the elegant process of mitosis and explore what happens when this control system breaks down.

Day 1: The Cell Cycle and Interphase

- **Learning Objectives:**
    - Characterize the phases of the cell cycle (G1, S, G2, M).
    - Explain the major events of interphase.
- **Activities (60 mins):**
    1. **Engage (10 mins): "A Cell's Life Story."** If a cell's life is a story, what are the main chapters? (e.g., Growing up, preparing for a big event, the event itself). Frame the cell

cycle as this narrative.
    2. **Explain (30 mins): "The Cell Cycle Clock."** Draw a large circle to represent the 24-hour clock. Divide it into the phases of the cell cycle, with Interphase (G1, S, G2) taking up most of the time (~23 hours) and Mitosis (M) taking a small slice (~1 hour). For each phase, write down the key event:
        - **G1:** Growth, doing its cell job.
        - **S:** Synthesis - DNA replication!
        - **G2:** Final growth and prep for division.
    3. **Elaborate (20 mins): DNA Replication Analogy.** The S phase is critical. Create a simple analogy for DNA replication. For example, it's like unzipping a jacket and creating a new matching half for each side. Sketch it out.
- **Assessment:** The labeled Cell Cycle Clock diagram. The quality of the DNA replication analogy.
- **Differentiation:** Research one of the cell cycle checkpoints (e.g., G1 checkpoint) and explain what "questions" the cell asks itself before it's allowed to proceed.

Day 2: Mitosis - The Chromosome Dance

- **Learning Objectives:**
    - Describe the stages of mitosis (Prophase, Metaphase, Anaphase, Telophase) for a cell where 2n=6.
    - Model the process using craft supplies.
- **Activities (60 mins):**
    1. **Engage (5 mins): "PMAT."** Introduce the mnemonic: Prophase, Metaphase, Anaphase, Telophase. Let's learn the dance steps!
    2. **Explore (40 mins): "Pipe Cleaner Mitosis."**
        - Use a large piece of paper as your "cell."
        - Start with 6 pipe cleaners (3 pairs of different colors) in your "nucleus" to represent the chromosomes of a 2n=6 cell.
        - **Prophase:** Condense the chromosomes (thicken them up).
        - **Metaphase:** Line them up in the Middle.
        - **Anaphase:** Pull the sister chromatids Apart to opposite poles.
        - **Telophase:** Form Two new nuclei.
        - Physically move the pipe cleaners through each stage, narrating what is happening. Take a picture of each stage.
    3. **Evaluate (15 mins): "Draw It Out."** Without looking at your model, draw and label the four stages of mitosis for a 2n=6 cell.
- **Assessment:** The pipe cleaner model photographs. The accuracy of the final drawing.
- **Differentiation:** Create a "hand dance" for mitosis, where fingers represent chromosomes, to reinforce the movements of each phase.

Day 3: Cytokinesis & Cycle Control

- **Learning Objectives:**
    - Differentiate between cytokinesis in plant and animal cells.
    - Explain how cancer is a disease of the cell cycle.
- **Activities (60 mins):**
    1. **Engage (10 mins): "Splitting the Difference."** After mitosis, you have one cell with two nuclei. How does it split into two separate cells? Compare an animal cell (soft) to a plant cell (rigid). How might their splitting process differ?
    2. **Explain (25 mins): "Cancer: A Runaway Car."** Read a short case study about a type of cancer. Identify where in the cell cycle the "brakes" (checkpoints) failed. Discuss key terms like tumor, metastasis, and carcinogens.
    3. **Elaborate (25 mins): "Public Service Announcement."** Design a one-page infographic or a 30-second PSA script about the importance of cell cycle checkpoints. The

target audience is other cells in the body, warning them about the dangers of uncontrolled division.
- **Assessment:** The PSA infographic or script, evaluated for its clear explanation of cancer as a failure of cell cycle control.
- **Differentiation:** Research a specific cancer-fighting drug (chemotherapy) and explain how it targets and disrupts the cell cycle in rapidly dividing cells.

Day 4: Applications of Mitosis

- **Learning Objectives:**
  - Explain the significance of mitosis in growth, repair, and asexual reproduction.
  - Research and present on a specific application of mitosis.
- **Activities (60 mins):**
  1. **Engage (5 mins): "How Do You Heal?"** Discuss what happens at a cellular level when you get a paper cut. The answer is mitosis!
  2. **Explore (35 mins): "Mitosis in the Real World."** Choose one of the following topics to research:
     - Skin grafting for burn victims.
     - How starfish or lizards regenerate limbs.
     - Asexual reproduction in strawberries (runners) or bacteria (binary fission).
     - Therapeutic cloning and stem cells.

     Gather information and prepare a 5-minute lightning talk to "teach the teacher."
  3. **Elaborate & Evaluate (20 mins): "Lightning Talk."** Present your findings. Be prepared to answer one or two questions about your topic.
- **Assessment:** The 5-minute lightning talk, assessed on clarity, accuracy, and engagement.
- **Differentiation:** The choice of research topic allows Mrvacupanda to follow personal interests. The presentation format could be a slide deck, a poster, or a simple verbal explanation.

Day 5: Mitosis Lab & Project Work

- **Learning Objectives:**
  - Identify the stages of mitosis in real cells.
  - Dedicate focused time to constructing the 3D cell model.
- **Activities (60 mins):**
  1. **Engage (20 mins): "Online Onion Root Tip Lab."** Use a virtual microscope activity to look at onion root tip cells. Search for and identify cells in interphase and each of the four stages of mitosis. Sketch one cell from each stage you find.
  2. **Elaborate (40 mins): "3D Model Workshop."** This is dedicated project time. Work on building and assembling the 3D cell model chosen in Week 1. This is a great time to ask clarifying questions and finalize the details and labels.
- **Assessment:** Sketches from the virtual lab. Physical progress on the 3D model.
- **Differentiation:** An extension for the lab could be to calculate the mitotic index (% of cells undergoing mitosis) from the virtual slide, a common technique in cancer research.

WEEK 4: Meiosis & Genetic Variation

Focus: In our final week, we'll tackle meiosis, the special type of cell division that creates genetic diversity. We'll explore its profound implications and wrap up our journey with the final project showcase.

Day 1: Introduction to Meiosis

- **Learning Objectives:**

    - Explain the purpose of meiosis (producing gametes).
    - Compare the overall process and outcomes of mitosis and meiosis.
- **Activities (60 mins):**
    1. **Engage (10 mins): "Why Aren't You a Clone?"** Discuss why siblings (except identical twins) look different from each other and from their parents. This introduces the idea of sexual reproduction and the need for a special cell division.
    2. **Explain (30 mins): "Mitosis vs. Meiosis Showdown."** Create a large comparison chart. Categories should include: Purpose (Growth/Repair vs. Reproduction), Number of Divisions (1 vs. 2), Number of Daughter Cells (2 vs. 4), Chromosome Number of Daughter Cells (Diploid/2n vs. Haploid/n), and Genetic Identity (Identical vs. Unique).
    3. **Elaborate (20 mins): The Big Picture.** Draw a simple diagram showing how meiosis in parents creates haploid gametes (sperm/egg), which then combine in fertilization to create a new diploid zygote.
- **Assessment:** The mitosis vs. meiosis comparison chart.
- **Differentiation:** Create a "road map" analogy. Mitosis is a "copy" machine that makes an exact duplicate map. Meiosis is a machine that takes two different maps (from parents), tears them both in half, shuffles the pieces, and makes four new, unique half-maps.

Day 2: Meiosis I & Crossing Over

- **Learning Objectives:**
    - Describe the stages of Meiosis I.
    - Explain the process and significance of crossing over.
- **Activities (60 mins):**
    1. **Engage (5 mins): "Shuffle the Deck."** Shuffling a deck of cards doesn't change the cards, but it changes the combinations. This is what crossing over does for genes.
    2. **Explore (40 mins): "Chromosome Swap Simulation."**
        - Use your 2n=6 pipe cleaner set from last week, but this time, make sure the homologous pairs are clear (e.g., a long blue and a long red pipe cleaner are a pair).
        - In Prophase I, have the homologous pairs find each other (synapsis).
        - Now, physically cross over the "arms" of two homologous chromosomes and swap a segment (e.g., cut off the tip of the blue and red pipe cleaners and tape them to the opposite one). This is crossing over!
        - Move the chromosomes through Metaphase I (pairs line up) and Anaphase I (pairs separate, not chromatids).
    3. **Evaluate (15 mins): "The Source of Variation."** In your own words, write a paragraph explaining how crossing over in Prophase I creates new combinations of genes on a single chromosome.
- **Assessment:** The paragraph on crossing over. Successful demonstration of the simulation.
- **Differentiation:** For a deeper understanding, research "independent assortment" and explain how it is another major source of genetic variation that happens during Metaphase I.

Day 3: Meiosis II & Final Outcome

- **Learning Objectives:**
    - Describe the stages of Meiosis II.
    - Draw the entire process of meiosis for a 2n=6 cell, from start to finish.
- **Activities (60 mins):**
    1. **Engage (5 mins): "Round Two!"** Remind yourself that Meiosis II is almost identical to mitosis. The goal is to separate the sister chromatids.
    2. **Explore (35 mins): "The Full Journey."** On a large piece of paper, draw the entire process of meiosis. Start with one diploid cell (2n=6). Draw Meiosis I (with crossing over), resulting in two haploid cells. Then draw both of those cells going through Meiosis II, resulting in four unique haploid cells. Use different colors to track the chromosomes.

3. **Elaborate & Evaluate (20 mins): "Quality Control."** Review your drawing with the teacher, step-by-step, correcting any mistakes. Pay close attention to the chromosome number at each stage and whether you are separating homologous pairs or sister chromatids.

- **Assessment:** The completed, corrected drawing of meiosis (2n=6). This is a key summative diagram for the unit.
- **Differentiation:** Label the drawing with the correct ploidy level (n or 2n) at each distinct stage.

Day 4: Meiosis Errors & Disorders

- **Learning Objectives:**
  - Explain what nondisjunction is.
  - Relate nondisjunction to a specific genetic disorder like Down Syndrome (Trisomy 21).
- **Activities (60 mins):**
  1. **Engage (10 mins): "When Things Go Wrong."** Using your pipe cleaner model, what would happen if in Anaphase I, one pair of homologous chromosomes failed to separate and both went to the same side? What would the resulting gametes look like? This is nondisjunction.
  2. **Explore (30 mins): "Case Study: Trisomy 21."** Research Down Syndrome. Explain that it's caused by having an extra copy of chromosome 21. Create a simple diagram showing how nondisjunction (either in Meiosis I or II) could lead to a gamete with an extra chromosome 21.
  3. **Elaborate (20 mins): "Genetic Counseling."** Imagine you are a genetic counselor. Write a short, clear, and empathetic script explaining nondisjunction and its consequences to a patient.
- **Assessment:** The case study diagram and the genetic counselor script.
- **Differentiation:** Research another disorder caused by nondisjunction, such as Klinefelter Syndrome (XXY) or Turner Syndrome (XO), and compare it to Trisomy 21.

Day 5: Final Project Showcase & Unit Review

- **Learning Objectives:**
  - Present the 3D cell model, demonstrating comprehensive knowledge of cell structures and functions.
  - Synthesize and review all major concepts from the 4-week unit.
- **Activities (60 mins):**
  1. **Elaborate & Evaluate (30 mins): "3D Cell Model Showcase."**
     - Present your final 3D model (animal, plant, or bacteria).
     - Give a "tour" of your cell, pointing out at least 8-10 organelles/structures.
     - For each structure, explain its function and why you chose the specific recyclable material to represent it.
     - Answer questions about your cell.
  2. **Review (30 mins): "Unit Jeopardy!"** Play a game of Jeopardy with categories from the last four weeks: "Cell Theory," "Organelles," "Cell Transport," "Mitosis," and "Meiosis." This serves as a fun, comprehensive review of the entire unit.
- **Assessment:**
  - **Summative:** The 3D Cell Model and presentation, graded with a rubric focusing on accuracy, completeness, creativity, and clarity of explanation.
  - **Formative:** Performance in the Jeopardy review game.
- **Differentiation:** The student can pre-record their model presentation as a video if they prefer. The Jeopardy game can be adjusted in difficulty based on performance throughout the unit.