



TeachEngineering

STEM Curriculum for K-12

Preventing the Zombie Apocalypse – Making Gene Therapy Safe!



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Preventing the Zombie
Apocalypse- Making
gene therapy safe!

Share:

- Do you know what viruses are?
- Have you ever been affected by a virus?
- How did you feel?
- Do you think viruses are bad or good?

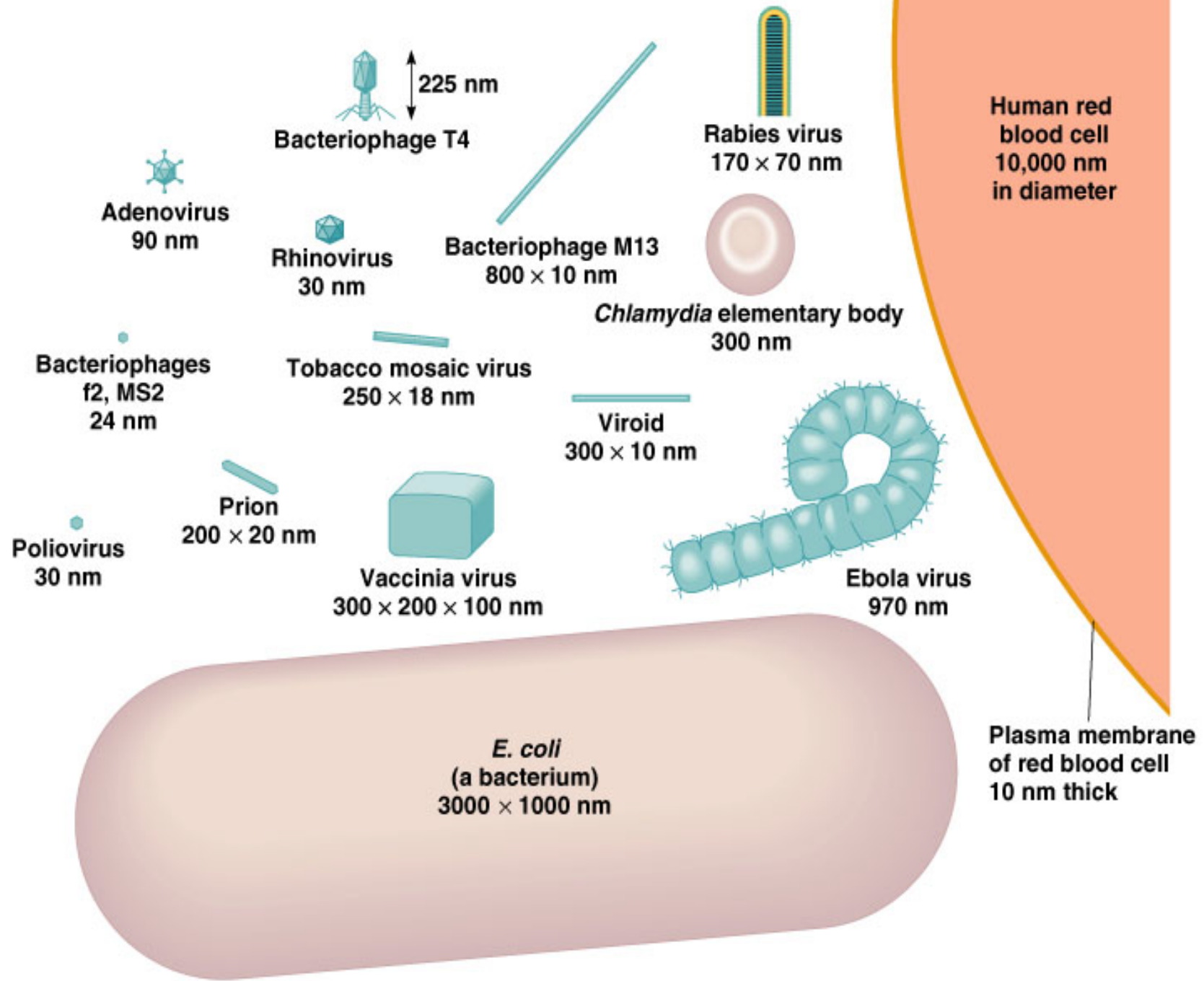


What are viruses?

An infective agent that typically consists of a nucleic acid molecule in a protein coat, is too small to be seen by light microscopy, and is able to multiply only within the living cells of a host.

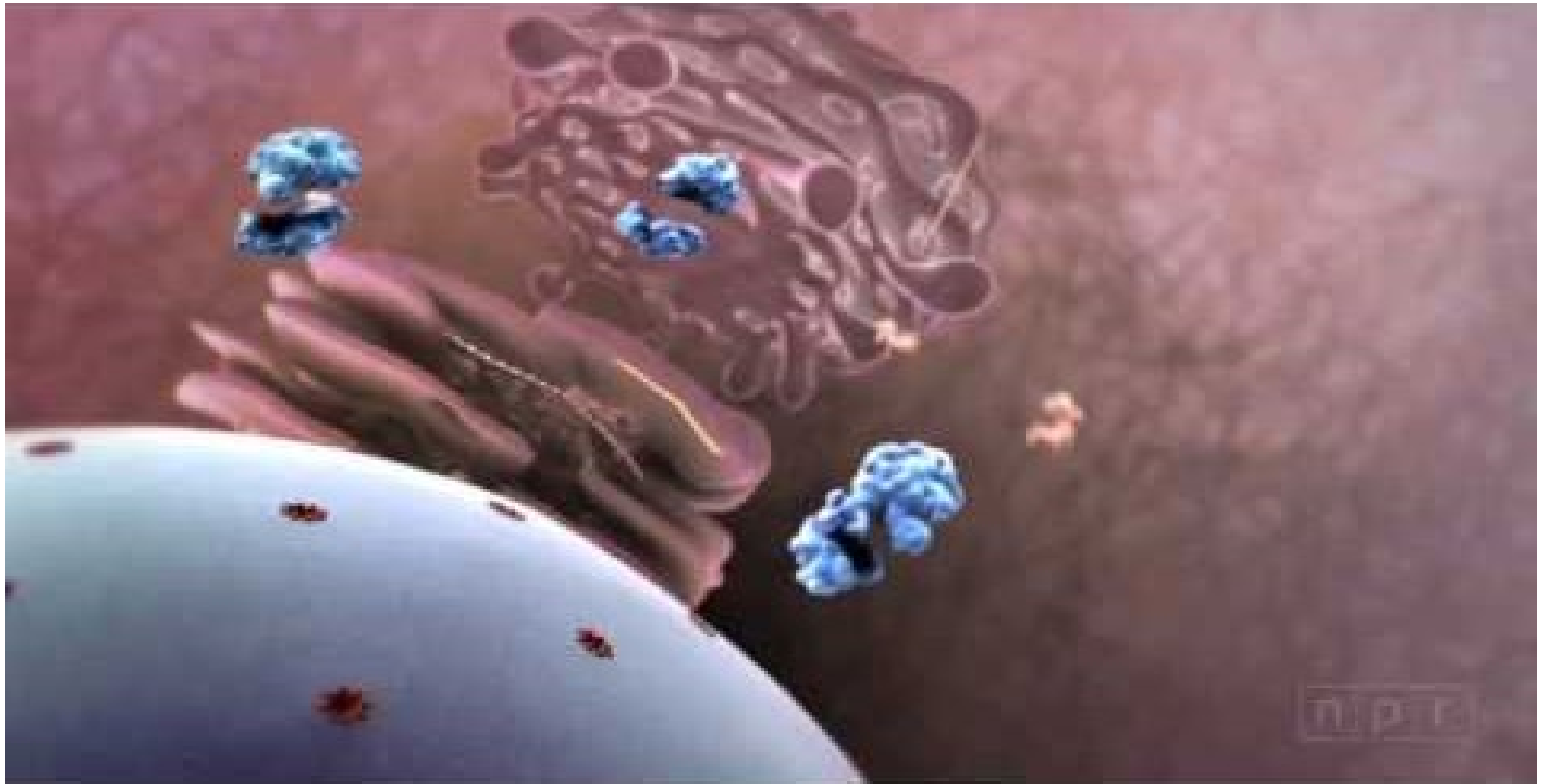


Types of viruses





How Do Viruses
Work?



<https://www.youtube.com/watch?v=Rpj0emEGShQ>

What is Gene Therapy?

Gene therapy is an experimental technique that uses genes to treat or prevent disease. In the future, this technique may allow doctors to treat a disorder by inserting a gene into a patient's cells instead of using drugs or surgery. Researchers are testing several approaches to gene therapy, including:

- Replacing a mutated gene that causes disease with a healthy copy of the gene.
- Inactivating, or “knocking out,” a mutated gene that is functioning improperly.
- Introducing a new gene into the body to help fight a disease.





How Does it
Work?


A new gene is injected into an adenovirus vector, which is used to introduce the modified DNA into a human cell. If the treatment is successful, the new gene will make a functional protein.

Gene therapy is under study to determine whether it could be used to treat disease. Current research is evaluating the safety of gene therapy; future studies will test whether it is an effective treatment option.

Several studies have already shown that this approach can have very serious health risks, such as toxicity, inflammation, and cancer.

Medical researchers, institutions, and regulatory agencies are working to ensure that gene therapy research is as safe as possible.

Is Gene Therapy Safe?



Why should we
worry?



https://www.youtube.com/watch?v=B3xY6Ffy_wE



The Project

To Do:

- You will work in groups of three! Groups of 4 must be approved by instructor.
- You will be given a virus.
- Once you have your virus start your research!
- You must include:
 - What type of virus do you have?
 - Is the virus pathogenic (dangerous)?
 - How does the virus attach to host cells?
 - Is there a specific host or cell that your virus attaches to?



1st TASK

- **Send one member of your team to walk to materials table. You will have three minutes to look at the materials provided.**
 - Hint: make a list!





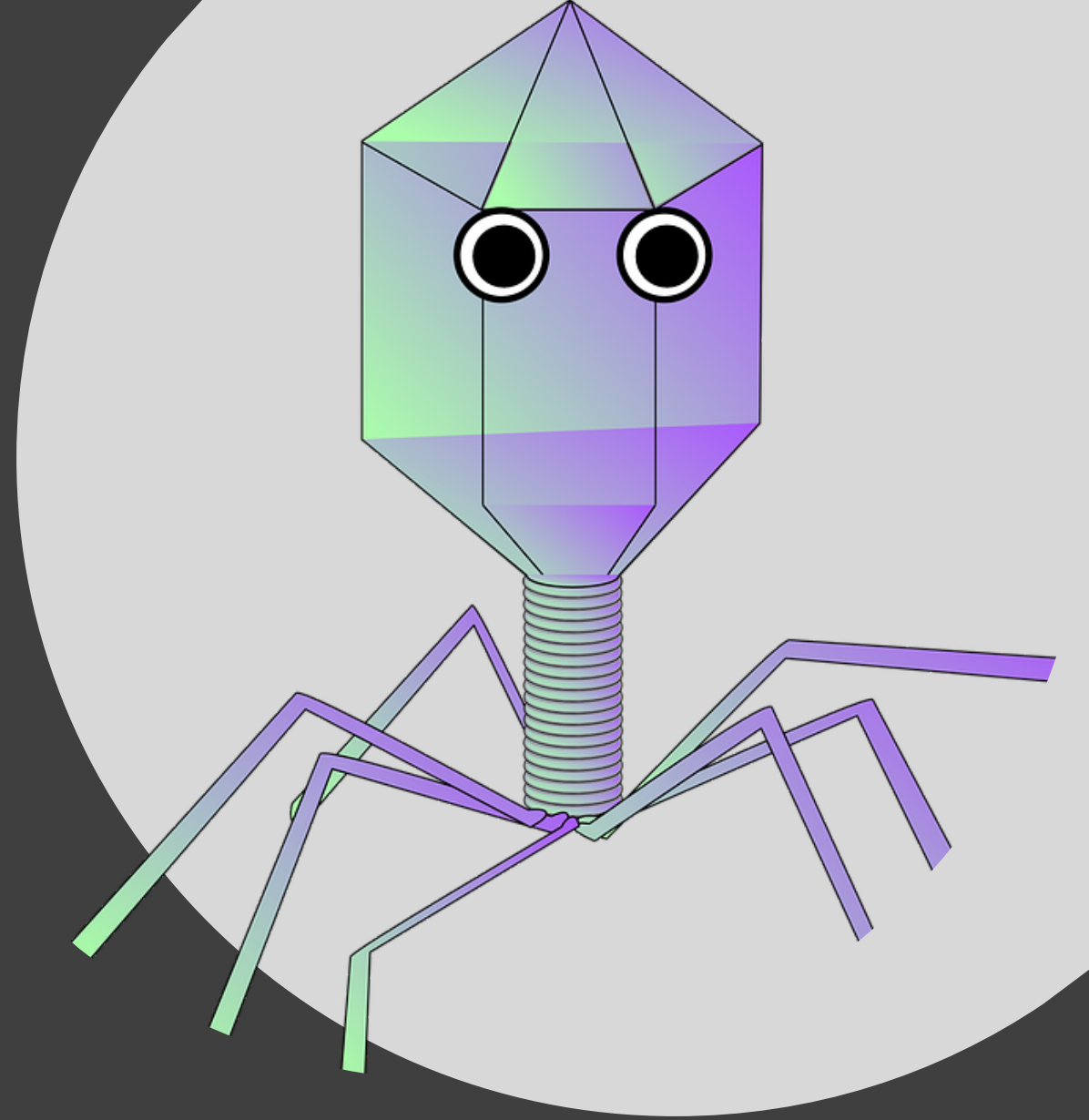
2nd Task- Planning

How can you make your specific virus attach to only one type of cell so it can be used for gene therapy.

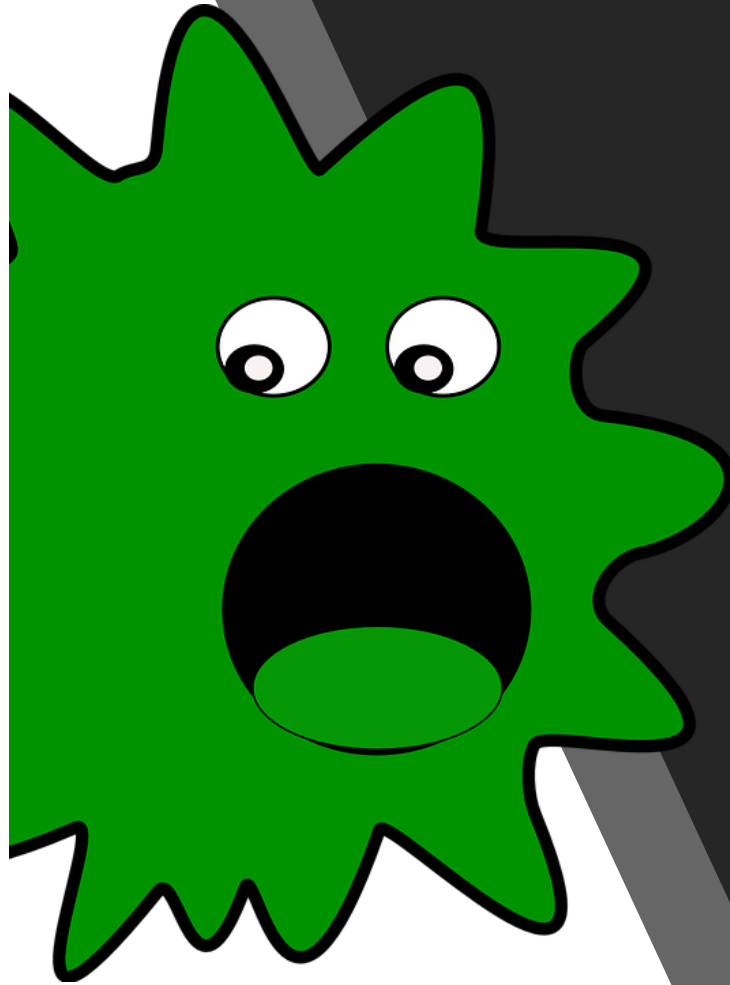
- Goal: Build a virus and demonstrate how, after “genetic” modification, the virus can attach to one cell and not another.
- Make a sketch of what you will build:
 - 3D Model of “Wild Type” virus. This is your unmodified virus
 - 2 types of cell membranes. Don’t forget that viruses are much smaller than cells
 - 3D model of modified virus which will be able to attach to one type of cell membrane but not the other.
- Using the list of materials made in Task #1, create a list of the materials that you will need. Make sure you write down the exact number of each material needed.
- **Note: before you proceed to building your model, Your plan needs to be approved by the instructor!**

3rd Task: Time to Build

- Send one of your members to pick up the materials from the materials table.
- You will have 40 minutes to build your “wild type” virus, your modified virus and the 2 cell surfaces.
 - Don't forget you will show how prior to modification, the wild type virus can attach to both cells and after modification, the virus is only able to attach to one cell.
- Show the final products to your instructor for approval.



Final touches/presentation



- Project Presentation:
 - You will select a speaker for your project.
 - Present your product through Gallery Walk, speaker will remain with project to showcase it.
 - Speaker must explain:
 - The kind of virus they are showcasing. Morphology: Parts of their virus.
 - Whether the virus is pathogenic; how do they infect cells, which cells do they usually infect (organ, humans, animals, etc).
 - How the unmodified virus attaches to both types of cell surfaces created.
 - What constitutes a modified version of virus.
 - How the modified version of the virus is able to attach to one cell and not the other.



Great Job
Engineers!