

LIGHTNING IN SPACE

Exploring the causes and affects of lightning in space

Student worksheet

You may be familiar with lightning on earth that can see during thunderstorms, but earth is not the only planet with lightning. There are currently lots of astronomers and scientists who are researching lightning in our solar system and beyond!

① Activity 1 – Introduction to lightning in space

Exercise 1

What conditions do you think are needed for lightning on a planet?

② Activity 2 – Lightning Demonstration

You will watch a demonstration showing lightning occurring. Think about the conditions for this experiment and how these might impact the formation of lightning.

Exercise 2

Sketch the set up for the experiment. Make sure to include labels of the equipment.



③ Activity 3 – Which variables effect lightning?

An important part of any scientific investigation is identifying the variables that are present in your experiment. In this activity, you will identify which variables are present in this demonstration.

Exercise 3.2

List the variables in this experiment. How does each variable relate to clouds on an exoplanet?

Experiment Variable	Exoplanet Clouds Variable

4 Activity 4 – How to make the best lightning

It is very important for astronomers to have a thorough understanding of topics such as electricity when researching lightning on exoplanets. This can be done by doing experiments here on earth, and then applying the physics learned to exoplanets. In your groups you will investigate one of the variables in this experiment. You will work as a group to develop and test a hypothesis and document your results.

Equipment

- A piece of wool material
- Polystyrene plate/ lid of a polystyrene container
- Pencil with an eraser on the end
- Thumb tack
- Foil plate/dish
- Metal fork
- Plastic fork/other shaped metal objects (optional depending on variable being changed)

Health and safety: This demonstration involves static shocks. These are small enough discharges that they do not hurt and are likely to cause no damage to and surroundings. However, in the interest of caution it is advised to remove flammable items from the vicinity of the experiment, and to not have electronics too close to the experiment as if the discharge goes directly to an electronic it has potential to damage the electronics.

Exercise 4

4.1 Which variable will your group be investigating?

4.2 How will you change your variable?

4.3 Which variables will you be keeping the same and how?

4.4 What is your hypothesis about how your chosen variable will effect this experiment?

Investigation

Use the next two pages to record the results from your experiment.
Think carefully about what data and variables you need to record and how you will record them.

Experiment Notes

Activity 5 – Present your findings to the class

Present what you have learned from your experiment to the class.

Listen to the presentations from other groups as their findings may help to reveal more about what is needed for lightning to form on a planet.

Exercise 5


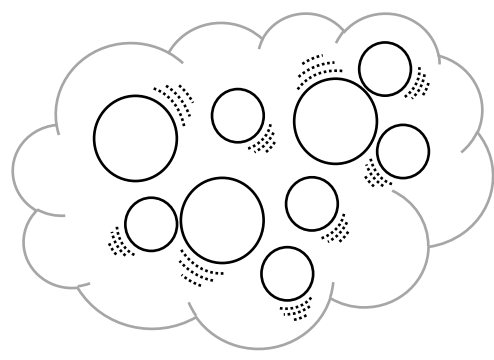
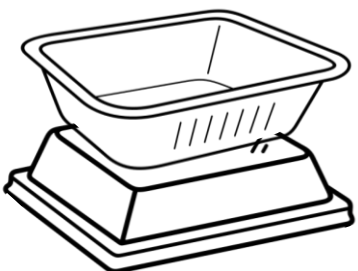
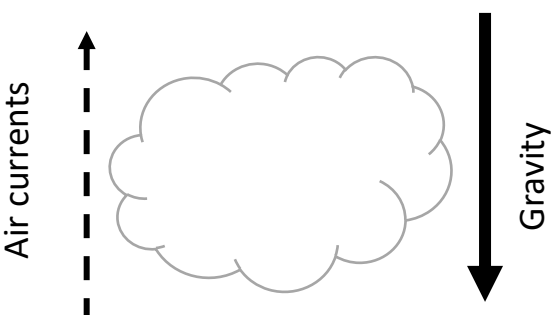


Sharing your findings with others is an important part of the scientific process. Use the space below to write a paragraph describing your findings to a student in another class.

Activity 6 – Background Science

Now that you have run your experiments, we can map the demonstration to the lightning that occurs in a planet's atmosphere. Lightning strikes are dictated by the same science regardless of which planet or astronomical body the clouds are in.

Exercise 6

Draw onto the diagrams below where the charge will move at each step in this process.

Ex.	Experiment	Exoplanet Atmosphere
6.1 Triboelectric Charging		
6.2 Separation of Charge		
6.3 Potential Difference		

Ex 6.4 In the last column of the table, draw in where lightning is most likely to occur

Exercise 6.2

Q1

Imagine you hear in the news that astronomers have found evidence of lightning on an exoplanet. From this information, what can you predict/deduce about the planet in question? Give as much detail as possible.

Q2

If you were on another planet where clouds all had particles that were exactly the same size and made of the same materials, would you expect there to be more or less lightning than if the particles were different sizes and materials? Explain your reasoning.
