**Student Worksheet: Stormy Days & Gamma Rays**

**Directions**: Answer the first set of questions as instructed by your teacher before reading the article. Then, read the online *Science News* article “[Thunderstorms churn up a ‘boiling pot’ of gamma rays](https://www.sciencenews.org/article/thunderstorms-radiation-gamma-rays)” and answer the remaining questions as directed by your teacher.

**Before Reading**1. Electromagnetic radiation (EMR) is energy that travels through the universe at the speed of light. We can see some types of EMR — called visible light — with our eyes. But the spectrum of EMR is vast and most of it invisible to human eyes. Gamma rays are one example. Read [this 16-sentence article](https://www.snexplores.org/article/scientists-say-gamma-ray-definition-pronunciation), then come up with a simple, one-sentence definition of gamma rays. Finally, use what you’ve learned to speculate what Earth might look like today if its atmosphere did not serve as a shield against this kind of energy. Explain your reasoning.

2. EMR is measured in wavelengths. For information on that, check out [this explainer](https://www.snexplores.org/article/explainer-understanding-light-and-electromagnetic-radiation). Sketch a picture to illustrate wavelength differences between three EMR types: gamma rays, radio waves and visible light. In one sentence, summarize the relationship between wavelength and energy. In your picture, point out which type of EMR has the highest energy.

**During Reading**

1. What new type of gamma-ray blast did researchers find in this study? Besides gamma-ray “glows,” what other type of gamma-ray outburst did scientists know about before conducting this study?

2. Contrast the brightness of these two previously known gamma-ray types.

3. Compare the brightness and duration of the newfound gamma-ray emissions with the two previously known types. To what did the author compare the new gamma-ray emissions?

4. After conducting the new study, what misconception did scientists correct about gamma-ray glows?

5. Describe at least one aspect of the study’s experimental design that is mentioned in the article.

6. What are electrons and what is their role in gamma-ray outbursts.

7. What evidence led scientists to conclude that past satellite data might have underestimated the frequency of some gamma-ray outbursts?

8. What fundamental electrical phenomena do scientists hope might be explained by better understanding flickering gamma-ray bursts?

**After Reading**1. Many mysteries remain to be solved when it comes to weather phenomena. Point out one example of an unsolved weather-related mystery mentioned in this story. Consider how conducting experiments to investigate weather-related phenomena might come with unique challenges. Describe two obstacles that might make studying the mystery you've described above difficult.