**Effect of Major Solar Events**

**Description of Task**

Students are given information about solar flares and then work in groups using muon count data to determine if they can recognize any possible effect of solar flares upon Earth’s atmosphere.

**Standards:**

**CLE 3202.Inq.1** Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.

**CLE 3202.Inq.3** Use appropriate tools and technology to collect precise and accurate data.

**CLE 3202.Inq.4** Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.

**CLE 3202.Inq.6** Communicate and defend scientific findings.

**Background Material**

Interaction of fundamental particles make the natural world function as it does. In this investigation, students work with existing muon count data and make a qualitative analysis about any variations they may be able to detect. Given that solar flares eject a relatively large amount of various particles which collide with our atmosphere within a few days, can we detect any effect a solar flare may have upon muon counts?

**Implementation**

For the entry event, students are shown a video clip of a solar flare event. Given a discussion of what we already know about the effect of such events upon the atmosphere of our planet, students are asked to design an investigation which would answer the question, “Is it possible for a major solar event such as the 2 July 2012 solar flare to have no effect upon our muon counting rate?

**Assessment**

Students are asked to provide a poster of their work. Posters are assessed according to the following rubric which corresponds to the grading scale:

18-20 points=100,

15-18 points=90,

12-15 points=80,

9-12 points=70.

**Investigation Rubric**

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| --- | --- | --- | --- | --- |
| **Points** | **1** | **2** | **3** | **4** |
| **Abstract** | As compared to the investigation, incorrectly describes the purpose, tools, and any conclusions. | Flawed in that any attempt to describe is incomplete. | Makes an attempt to describe purpose, tools, and any conclusions. | Clearly describes the purpose, the tools used, and any conclusions. |
| **Introduction** | As compared to the investigation, the purpose does not follow or the scientific question is not answered in the investigation. | Flawed in that information is missing such as a clear explanation of the purpose and/or the scientific question. | Makes an attempt to describe the purpose of the investigation and the scientific question. | Provides a clear understanding of the purpose of the investigation and describes the scientific question tested. |
| **Procedures** | Inaccurate in that it inaccurately describes one or more of the following: device, data, procedure. | Flawed in that it is missing mention of one or more of the following: device, data, and procedure. | Makes an unclear attempt at describing the device used, data gathered, and at least three details of the procedure. | Clearly describes the device used, data gathered, and at least three details of the procedure. |
| **Results** | Inaccurately describes what the investigation revealed. | Flawed in that it is missing an answer to the scientific question and/or missing graphical interpretation of the data. | Answers the scientific question, however contains flawed or inappropriate graphical representations of the data. | Answers the scientific question and contains at least two appropriate graphical representations of the data. |
| **Discussion & Conclusions** | Summary does not directly relate to the investigation and/or does not include mention of future attempts which would extend the investigation. | Attempts to summarize what was learned but fails to mention any future related investigations. | Provides a concise summary of what was learned and provides some indication of what could be done to extent the investigation. | Provides a concise statement of what was learned and clearly points to well-related future investigations. |