**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bl: \_\_\_\_**

**NASA’s NEW SPACE**

**TELESCOPE PROPOSAL**

Advanced technology in space telescopes have helped us see far away galaxies, identify black holes, see planets orbiting other stars and helped us see space in different electromagnetic waves. Telescopes have observed the expansion of the Universe and glimpsed the Big Bang.

As the life of the 1990 Hubble Space Telescope comes to its end, NASA (National Aeronautics and Space Administration) is hoping to replace it so that we can continue to study the mysteries of the Universe. **YOU** are the head engineer at NASA and you have been tasked to design a new and improved space telescope that will replace the Hubble.

In addition to designing this telescope, you will be writing a formal proposal to two US Congressmen (Mr. Bond & Mr. Hosford) who will be in charge of approving the budget for this new telescope. As the two Congressmen are not space scientists, it is your job to break down the science behind telescopes, mirrors and/or lenses and electromagnetic radiation in the proposal so that they will understand it. The easier it is to understand, the more likely the Congressmen will approve the project's budget.

**Inquiry Question**: How can we create a more advanced space telescope using the latest mirror and lens technology?

**Task Description:**

 *Your goal is*: to use your **thinking** skills, **research** skills, and **communication** skills to

convince US government to fund your telescope project.

 *Your role is:* Engineer for NASA

 *Your audience is:* US Congressmen (not scientists)

**PART 1 - Research**

Research the following questions to support your new telescope design. You must document your sources completely **(MLA style).**

1. What mirrors and/or lenses does the Hubble and the James Webb use. **Describe** how the path of light changes when interacting with these mirrors/lenses.
2. Using the Ray Model of Light, **draw a ray diagram** of the path of incoming light reflecting off the mirrors and/or lenses and into each telescope’s imaging instruments.

a. Hubble

b. James Webb

1. What is the electromagnetic spectrum and what does the Earth’s atmosphere do with these waves? What wavelengths do these two telescopes record for imaging?
2. What are the differences between Hubble and the James Webb Space Telescopes?

*(Primary mirror type/size, wavelength.)*

1. What are some major science goals of the James Webb Space Telescope?
2. What is the speed of light in space? How can we apply this knowledge when studying deep space?

**PART 2 - Written Proposal**

* PART A: What do you think will be the biggest scientific accomplishment of your telescope? What will your telescope be called? What is the life expectancy of the telescope? **Use your creative and critical thinking skills for this component.** *(1 paragraph minimum explanation)*
* PART B: Persuasive language to convince the government of why it is important that the telescope be placed outside the earth’s atmosphere. Must show your understanding of electromagnetic spectrum. *(1 paragraph minimum explanation)*
* PART C: Specific types of lenses and/or mirrors that will be used in creation of your telescope. You should include language that shows your thinking and understanding of lenses & mirrors and how they affect the path of light. *(1 paragraph minimum explanation)*
* PART D: What is the speed of light in space? What information can we gather when studying deep space? *(1 paragraph minimum explanation)*

**PART 3 – Illustrations Supporting Proposal**

* Minimum 1 image or sketch - showing the design of your telescope
* Minimum 1 image or sketch- that illustrates the ray of light model. This will show the path of light upon entering the telescope, following it until entering the telescope’s recording instruments.
* 1 image or sketch of the earth that illustrates which electromagnetic waves enter the earth's atmosphere and which ones are blocked (reflected or absorbed).

**Final Proposal Requirements:**

You will submit your proposal in hard copy by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Your final product should be stapled together with a cover page on the front, followed by the typed portion and the illustrations.
	+ The **cover page** should show your creativity, but must include your proposal title, names of group members, submission date, and names of government Congressmen who will be receiving your proposal (Mr. Bond and Mr. Hosford)
	+ Written requirements: Font = Arial, Size = 12, Double spaced
	+ Illustration portion requirements: these should be hand drawn by group members
	+ Works Cited page in APA format (please read attached handout for specific information)

**Criterion D: Reflecting on the impact of Science**

|  |  |  |
| --- | --- | --- |
| **IB**  | **IB Descriptors** | **Task Descriptors** |
| 87 | 1. **describe** the ways in which science is applied and used to address a specific problem or issue
2. **discuss and analyze** the implications of using science and its application to solve a specific problem or issue, interacting with a factor
3. **consistently apply** scientific language to communicate understanding **clearly and precisely**
4. document sources **completely**.
 | * **Describe** how mirrors and lenses are used to extend human vision.
* **Consistently apply** knowledge of the electromagnetic spectrum, light years and the Ray of Light Model.
* **Discuss and analyze** how the new telescope design is better.
* Sources are documented in MLA style **completely**.
 |
| 65 | 1. **summarize** the ways in which science is applied and used to address a specific problem or issue
2. **describe** the implications of using science and its application to solve a specific problem or issue, interacting with a factor
3. **usually apply** scientific language to communicate understanding **clearly and precisely**
4. **usually** document sources **correctly**.
 | * **Summarize** how mirrors and lenses are used to extend human vision.
* **Usually apply** knowledge of the electromagnetic spectrum, light years and the Ray of Light Model.
* **Describe** how the new telescope design is better.
* Sources are documented in MLA style **usually** **correct**.
 |
| 43 | 1. **outline** the ways in which science is used to address a specific problem or issue
2. **outline** the implications of using science to solve a specific problem or issue, interacting with a factor
3. **sometimes apply** scientific language to communicate understanding
4. **sometimes** document sources **correctly**.
 | * **Outline** how mirrors and lenses are used to extend human vision.
* **Sometime apply** knowledge of the electromagnetic spectrum, light years
* **Outline** how the new telescope design is better.
* Sources are **sometimes** documented **correctly**.
 |
| 21 | 1. **state** the ways in which science is used to address a specific problem or issue
2. **state** the implications of the use of science to solve a specific problem or issue, interacting with a factor
3. **apply** scientific language to communicate understanding but does so **with limited success**
4. document sources, **with limited success**.
 | * **State** how mirrors and lenses are used to extend human vision.
* **Apply with limited success** ofknowledge of the electromagnetic spectrum, light years
* **State** how the new telescope design is better.
* Sources are documented, **with limited success.**
 |
| 0 | * The student has not reached a standard described by any of the descriptors given above
 | * Work is missing, or has not reached a standard described above
 |
|  | Teacher Comment |

Command Terms:

**Analyze:** breakdown in order to bring out essential elements of structure. (To identify parts and relationships and to interpret information and reach conclusions

**Describe:** Give a detailed account or picture of a situation, event, pattern or process

**Outline:** Give a brief account

**Discuss:** Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence

**Evaluate:** Make an appraisal by weighing the strengths and limitations

**Factors**: social, economic, political, environmental, ethical, moral,

**Summarize:** Abstract a general theme or major point(s)

**State:** Give a specific name, value or other brief answer without explanation or calculation

**Information to Cite your sources (APA Format)**

**(Required: minimum of 2 sources)**

Information taken from: Perdue Online Writing Lab (OWL)

Secondary Students: Invention for Research Writing by Lauren Huebsch & Allen Brizee

<https://owl.english.purdue.edu/owl/resource/677/05/>

**APA Formatting and Style Guide**

**1)** **Basic in-text citation rules:**

- When using APA format, follow the author-date method of in-text citation. This means that the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998), and a complete reference should appear in the reference list at the end of the paper.

- If you are directly quoting from a work, you will need to include the author, year of publication, and the page number for the reference (preceded by "p.").

- Examples: (**BC SCIENCE 8 TEXTBOOK**)

a) Sandner (2006) stated that "a compound light microscope uses two convex lenses" (p. 217).

b) It is said that two convex lenses are needed for a compound light microscope (Sandner, 2006).

**2)** **APA Works Cited Page: Basic Format**

- Begin your Works Cited page on a separate page at the end of your research paper.

- Label the page Works Cited (do not italicize the words Works Cited or put them in quotation marks) and center the words Works Cited at the top of the page.

- Double space all citations, but do not skip spaces between entries.

- Indent the second and subsequent lines of citations to create a hanging indent.

- Reference list entries should be alphabetized by the last name of the first author of each work.

**3)** **APA Works Cited: Book, Online Journal, and Website**

*a)* *APA Works Cited: Basic Book Format*

- The basic form for a book citation is: Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle*. Location: Publisher.

o **Example:** Sandner, Lionel. (2006) *BC Science 8.* Toronto: McGraw-Hill Ryerson

*b)* *APA Works Cited: Electronic Journal Sources (Web Publications)*

- An Article in an Online Scholarly Journal citation is: Author, A. A., & Author, B. B. (Date of publication). Title of article. *Title of Journal, volume number*. Retrieved from URL.

o **Example:** C.I. Onah, C.M Ogudo. (2014). Design and construction of a refracting telescope. *The International Journal of Astrophysics and Space Science,* vol. 2. Retrieved from http://article.sciencepublishinggroup.com/pdf/10.11648.j.ijass.20140204.11.pdf

*c)* *APA Works Cited: Entire Website (Web Publications)*

o To cite a website you will use: Author, A. A., & Author, B. B. (Date of publication). *Title of document*. Retrieved from http://Web address

o ***Example****:* Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderlund, L., & Brizee, A. *(2010, May 5). General format. Retrieved from http://owl.english.purdue.edu/owl/resource/560/01/*

**EXAMPLE of works cited page format:**

Angeli, E., Wagner, J., Lawrick, E., Moore, K., Anderson, M., Soderlund, L., & Brizee, A.(2010, May

5). *General format.* Retrieved from http://owl.english.purdue.edu/owl/resource/560/01/

C.I. Onah, C.M Ogudo. (2014). Design and construction of a refracting telescope. *The International*

*Journal of Astrophysics and Space Science,* vol. 2. Retrieved from <http://article.sciencepublishinggroup.com/pdf/10.11648.j.ijass.20140204.11.pdf>

Sandner, Lionel. (2006) *BC Science 8.* Toronto: McGraw-Hill Ryerson.