

Exoplanet Project (Version A)

Due:

Purpose of this project:

This unit we have developed our background knowledge related to the different types of stars and planets that exist in the Universe and their characteristics. We now know based on current scientific evidence the characteristics of exoplanets and their host stars that would make them more or less likely to be potentially habitable. For this project, imagine that you belong to a committee of scientists that has been asked to explore the universe for an Earth-like exoplanet that may be habitable by humans. Your task is to convince the scientific community that the exoplanet you've identified is worth the funding necessary to investigate it further.

Mastery Assessment:

Based on current scientific evidence, which exoplanet in the NASA Exoplanet Catalog has a high probability of being habitable by humans and should be investigated further? Consider your knowledge of relevant scientific concepts including the characteristics of habitable exoplanets, their host stars, and orbits that help to prove your claim.

Mastery Skills & Rubrics:

- **Visual Interpretation:** I can identify, interpret, apply and synthesize relevant information presented visually.
- **Claim & Evidence:** I can state a detailed claim to answer a scientific question and provide relevant and sufficient scientific evidence to support that claim.
- **Scientific Communication:** I can clearly, accurately, and completely communicate scientific ideas using scientific language.
- **Habits for Success** - I can meet deadlines and assignment expectations.

Checklist	Project Section
	<u>Part 1. Exoplanet Data</u> - Choose the exoplanet for your project and collect important information about your exoplanet
	<u>Part 2. Exoplanet Claim & Evidence</u> - Answer the project's scientific question with a scientific claim & evidence writing assessment
	<u>Part 3. Exoplanet Slide Presentation</u> - Create an informative slide to share why your chosen exoplanet is likely to be habitable using information from NASA

Part 1. Exoplanet Data

Guiding Questions:

- *What methods do NASA use to identify exoplanets in other solar systems?*
- *Which type(s) of star(s) would be the best candidates for having habitable, Earth-like planets orbiting them?*
- *How does orbit shape and location affect if an exoplanet can be habitable?*
- *Which characteristics of exoplanets make them more or less suitable to life?*

Directions:

1. **Examine** the information in the Exoplanet Candidates data table below **carefully**.
2. Each **row** contains important **data** (information) about **one** of the thousands of **exoplanets** that NASA has detected in the universe.
 - a. '*Light Years (distance) from Earth*' tells us how far away the exoplanet is from Earth. It doesn't affect whether the exoplanet is habitable or not, but could be something interesting to consider. For reference, 1 [light year](#) is equal to approximately 6 trillion miles (or 9 trillion kilometers).

- Based on your interpretation of the data, determine which exoplanet in the chart you believe has a **high probability of being habitable**. (There is no 'correct' answer! You could make a strong claim & evidence for all of these exoplanets.)
- Indicate which exoplanet you have chosen to use for your project by copying the data for your chosen exoplanet into the empty Exoplanet Data Table below.

Exoplanet Candidates

Exoplanet Name	Planet type	Planet mass	Star name	Star type <i>main sequence</i>	Star color	Star temperature	Star luminosity	Orbital shape <i>Eccentricity</i>	In host star's habitable zone?	Light Years <i>(distance)</i> from Earth
TOI-700 d	Super Earth	1.57 Earths	TOI-700	red dwarf (M-type)	red	~3,500K	~ 0.020	slightly elliptical 0.14	yes	101
Kepler-442 b	Super Earth	2.36 Earths	Kepler-442	orange dwarf (K-type)	orange	~4,400K	~ 0.100	circular 0.04	yes	1,115
Proxima Centauri b	Super Earth	1.27 Earths	Proxima Centauri	red dwarf (M-type)	red	~3,000K	~ 0.002	slightly elliptical 0.35	yes	4
Kepler-452 b	Super Earth	3.29 Earths	Kepler-452	yellow dwarf (G-type)	yellow	~5,800K	1.200	circle 0.0	yes	1,829
TRAPPIST-1 f	Super Earth	1.34 Earths	TRAPPIST-1	red dwarf (M-type)	red	~2,500K	~ 0.001	circular <0.06	yes	41
Kepler-186 f	Super Earth	1.71 Earths	Kepler-186	red dwarf (M-type)	red	~3,800K	0.055	circular 0.04	yes	561

Exoplanet Data Table

Your Chosen Exoplanet's Name	Planet type	Planet mass	Star name	Star type	Star color	Star temperature	Star luminosity	Orbital shape <i>Eccentricity</i>	In host star's habitable zone?	Light Years <i>(distance)</i> from Earth

Part 2. Exoplanet Claim & Evidence

Directions:

1. Review the scientific question that you are answering for your project.
2. Use your knowledge of the characteristics of habitable exoplanets and your [Exoplanet Data Table](#) to answer the scientific question with a detailed claim, then support your claim with evidence and connect your evidence to your claim using scientific reasoning.
3. Scientific Reasoning: You should explain important scientific concepts in your writing to help connect your evidence to your claim. For example, you should explain the concept of a habitable zone and why it is important if one of your pieces of evidence is that the exoplanet you've chosen is located in its host star's habitable zone.
4. ALL of your writing must be in your own words, you should not use any direct quotations of sentences or statements. Cite the sources for ALL of your scientific information that doesn't come from your own brain. You can cite your sources by either using sentence starters such as *"According to the Edpuzzle video 'Types of Stars', ..."* or *"Based on the Newsela article 'Article Title,' ..."* or by including the name of the source in parentheses after the summarized information such as *(Edpuzzle Video 'Types of Stars')*. Sources that you should use for your project include:
 - a. Assigned Edpuzzle videos
 - b. Assigned Newsela articles
 - c. Class slides/discussions
 - d. Exoplanet Data Table
 - e. Other outside sources, as necessary, but not encouraged
5. BEFORE CLICKING "TURN IN" on this assignment, go to the menu above and click:
 - a. **Tools** → **Spelling and grammar** → **Spelling and grammar check**

- b. After checking the spelling and grammar, re-read your sentences for punctuation, capitalization and to make sure your ideas are clear and free of errors.

Guiding Questions for your Claim & Evidence:

- What is the name of your chosen exoplanet?
- Why do you believe this exoplanet has a high probability of being habitable?
- What information does NASA know about the exoplanet?
- How are the exoplanet's characteristics similar to and/or different from Earth's characteristics?
- What kind of star does the exoplanet orbit?
- How is the host star similar to or different from the Sun?
- How does the exoplanet orbit its host star?
- Is the exoplanet in the habitable zone for its host star? What does this tell us about the exoplanet?

***Scientific Question:* Based on current scientific evidence, which exoplanet in the NASA Exoplanet Catalog has a high probability of being habitable by humans and should be investigated further? Consider your knowledge of relevant scientific concepts including the characteristics of habitable exoplanets, their host stars, and orbits that help to prove your claim.**

Your response:

Resources:

- [Class Website \(Class Recordings, Slides, and Resources\)](#)
- [NASA's Exoplanet Glossary](#)
- [NASA's Frequently Asked Questions about Exoplanets](#)
- Your recent assignments in your [Google Classroom](#)

Part 3. Exoplanet Slide Presentation

Directions:

1. Open the **Exoplanet Project_Slide** attached to this assignment in Google Classroom.
 2. Create an informative & visually appealing slide to share why your chosen exoplanet is likely to be habitable and what you know about it.
 3. You should summarize the most important information from your [Exoplanet Data Table](#) and [Claim & Evidence paragraphs](#) in bullet points.
 4. You can find illustrations of your exoplanet by searching for it in the [NASA Exoplanet Catalog](#) or by doing a [Google search](#).
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Mastery Skill Rubrics

Visual Interpretation I can identify, interpret, apply and synthesize relevant information presented visually.			
<i>Professional (4)</i>	<i>Practitioner (3)</i>	<i>Apprentice (2)</i>	<i>Novice (1)</i>
I can synthesize the relevant information with outside knowledge to address a question or solve a problem.	I can accurately identify, interpret and apply relevant information presented visually (in a chart, graph, diagram, image, etc.)	I can identify relevant information and make basic interpretations of the relevant information presented visually (in a chart, graph, diagram, image, etc.)	I can identify relevant information related to a question or problem.

Claim & Evidence I can state a detailed claim to answer a scientific question and provide relevant and sufficient scientific evidence to support that claim.			
<i>Professional (4)</i>	<i>Practitioner (3)</i>	<i>Apprentice (2)</i>	<i>Novice (1)</i>

States specific, detailed claim regarding complex relationships that accurately and completely answers the scientific question. AND Supports claim with extensive relevant and varied scientific evidence.	States detailed claim that accurately and completely answers the scientific question. AND Supports claim with sufficient relevant scientific evidence.	States basic claim that answers the scientific question. AND Supports claim with some appropriate, but insufficient scientific evidence; may include some inappropriate evidence.	States basic claim that answers part of the scientific question; may provide non-scientific or unrelated evidence.
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Scientific Communication I can clearly, accurately, and completely communicate scientific ideas using scientific language.			
Professional (4)	Practitioner (3)	Apprentice (2)	Novice (1)
Fluently and accurately communicates complex scientific information or ideas in a professional manner with consistent scientific language.	Clearly and accurately communicates detailed scientific information or ideas with consistent scientific language.	Communicates mostly accurate scientific information or ideas with some minor errors in scientific language.	Communicates general scientific ideas that are mostly accurate.

Habits for Success - I can meet deadlines and assignment expectations.			
Professional (4)	Practitioner (3)	Apprentice (2)	Novice (1)
I can submit my work by the assignment deadline according to the assignment directions. My submitted work is detailed and free of spelling errors (use spell check!). My work is complete and meets the assignment's expectations.	I can submit my work by the assignment deadline according to the assignment directions. My submitted work is detailed and mostly free of spelling errors (use spell check!). My work is complete and mostly meets the assignment's expectations.	I can submit my work by the assignment deadline according to the assignment directions. My submitted work is somewhat detailed and free of spelling errors (use spell check!). My work is complete and somewhat meets the assignment's expectations.	I can submit my work after the assignment deadline according to the assignment directions. My submitted work is somewhat detailed and free of spelling errors (use spell check!). My work is mostly complete and somewhat meets the assignment's expectations.