

Length: 2–3 pages (12pt, double-spaced) + figures

Sources: ≥ 2 non-AI sources with in-text citations and reference list

AI Log: brief list of prompts used.

Overview

This assignment emphasizes conceptual explanations and historical context, with light use of generative AI as a brainstorming tool. You must support your answers with references and in-text citations. Provide a reference list at the end in a consistent style.

Part A — Black Holes

A1. Measuring Mass

Explain how astronomers determine the mass of a black hole (e.g., stellar motions, accretion disks, gravitational waves).

A2. Mergers

- (a) How many black hole collisions have been detected by LIGO/VIRGO (cite a recent source)?
- (b) Provide one example of the before and after masses.

A3. The Sun's Fate

Will the Sun ever become a black hole? Explain why or why not in language accessible to a non-scientist.

AI brainstorm (allowed): “List observational methods for estimating black hole mass,” “Explain in plain words what gravitational waves reveal about mergers.”

Part B — Gravitational Slingshots

B1. In Popular Media

Identify 5 different examples of gravitational slingshots in movies (excluding *Interstellar*). Give a short description of each scene.

B2. In Space Missions

List 5 recent missions that used gravitational slingshots for interplanetary travel. Identify the spacecraft, planets used, and purpose.

AI brainstorm (allowed): “List films that feature gravity assists,” “Outline planetary flybys in recent NASA/ESA missions.” Verify independently.

Part C — Telescopes

C1. Early Telescopes and Observers

Write a short history of early telescopes, from Galileo Galilei and Isaac Newton through William and Caroline Herschel. Include at least two other significant contributors.

C2. Large Ground-Based Telescopes

Compare more than one landmark instrument (e.g., Leviathan of Parsonstown, Hooker, Hale, Keck). What were their scientific achievements and limitations?

C3. Radio Astronomy

What is radio astronomy? Describe contributions of Karl Jansky, Jocelyn Bell Burnell, Russell Hulse and Joseph Taylor, and others. What major discoveries did they make?

C4. Space Telescopes

Describe the Hubble Space Telescope, James Webb Space Telescope, and Vera Rubin Observatory. Compare their designs and scientific contributions noting their place in history.

AI brainstorm (allowed): “Create a timeline of telescope milestones 1600s–today,” “List key discoveries from radio astronomy,” “Compare the missions of Hubble vs JWST.”

Formatting & Integrity

- Clear title, good grammar, and paragraph structure.
- Figures modestly sized, labeled, and captioned; reference them in text.
- In-text citations required; include a properly formatted reference list.
- **AI Log:** list prompts used, tool/date, and 1–2 lines on usefulness/limits.