

Life cycle of a star 5 E's

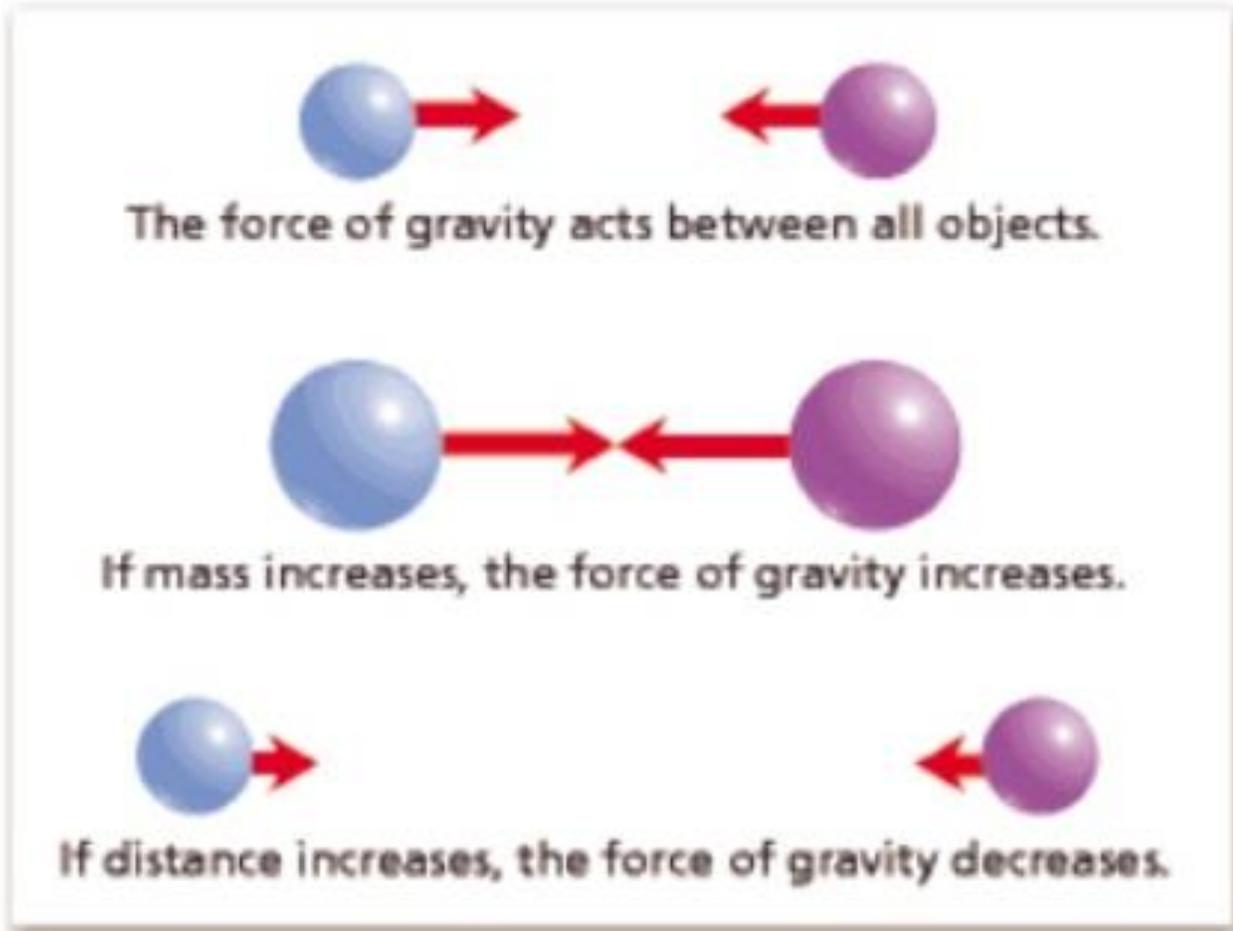
# Gravity simulation

- **Gravity**-the force that attracts a body toward the center of the earth, or toward any other physical body having mass.
- What variables affect gravity?
  1. Mass
  2. Distance

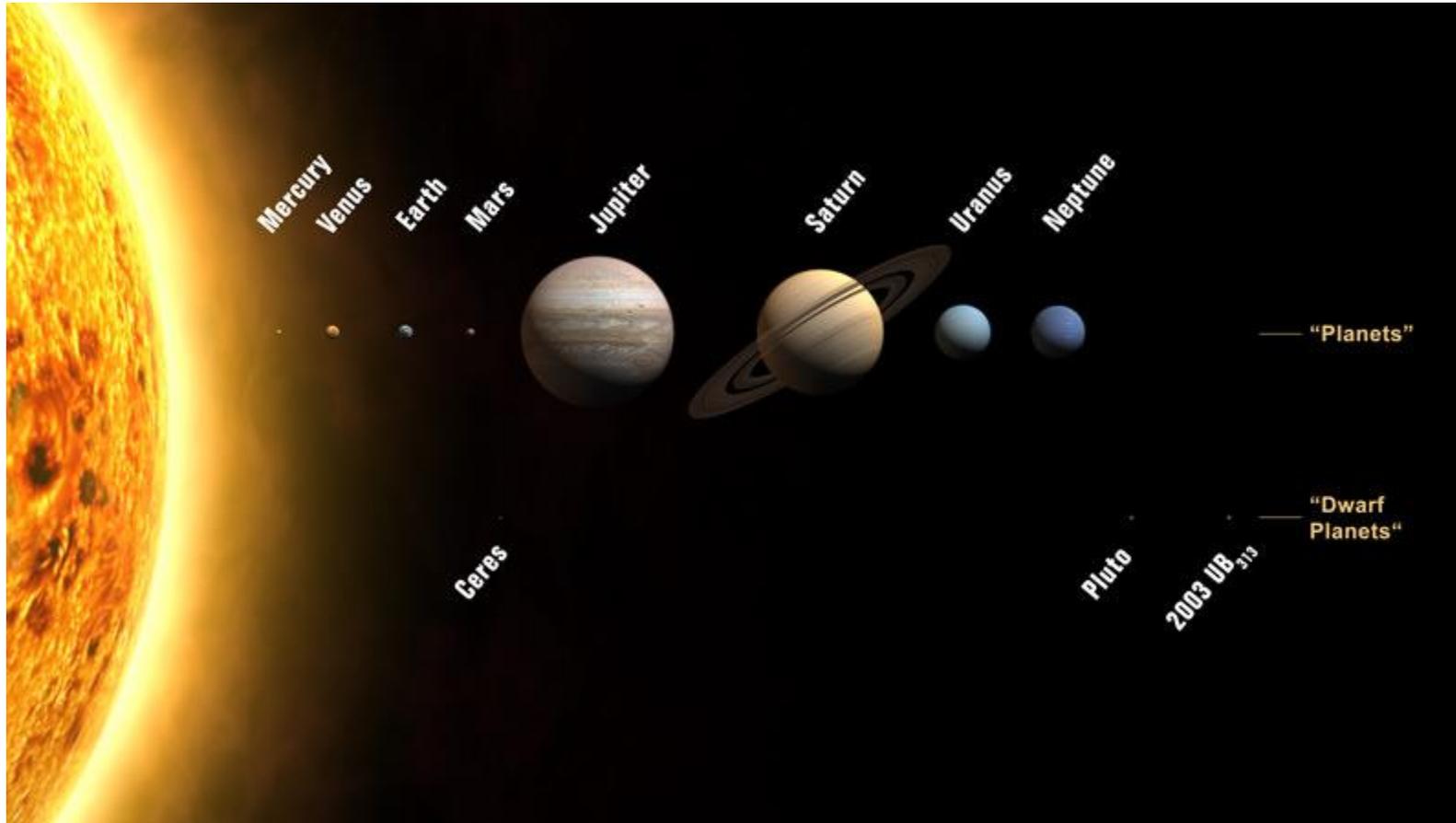
Complete the simulation and questions and complete the graph on google sheets for HW and answer the question, please print graph

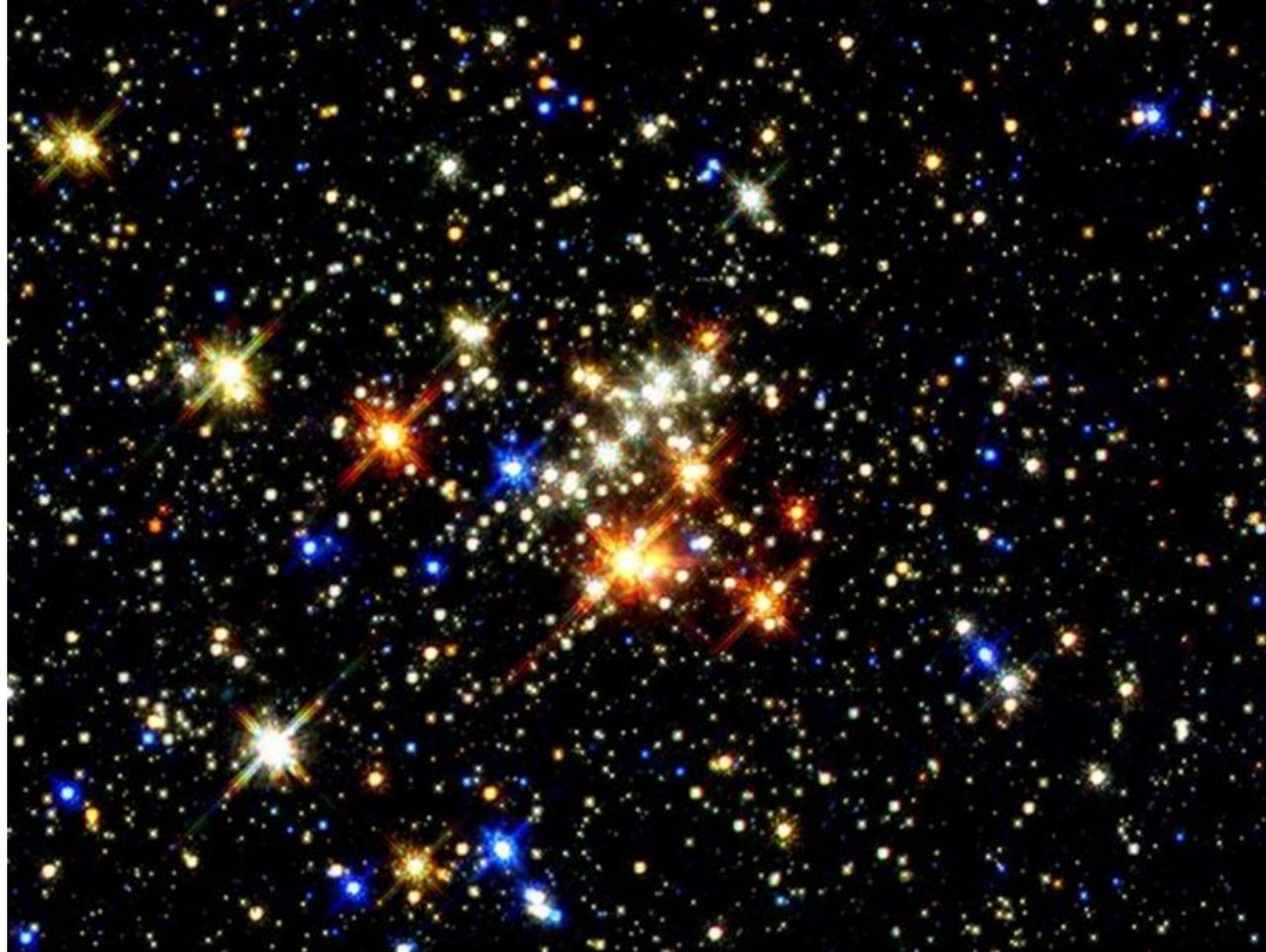
# Gravity, Mass and Distance

LET'S SUMMARIZE



# Why do Jupiter and Saturn have more gravitation force than the other planets?





Examine the image of stars and jot down 1-3 observations. For each observation, write your ideas for what you think explains that observation and any questions you have about that observation

<b>See</b>	<b>Think</b>	<b>Wonder</b>
What did you observe?	What does each observation make you think?	What questions do you have about each observation?

# Explore 1

- Star in a Box simulator and student guide.
- <https://starinabox.lco.global/>
- Looking for relationships between the following variables.
- Mass and time since the star was born
- Initial mass of star and its lifespan
- Initial mass and stages of its life cycle
  
- Students should work in pairs.

# Explore 1 continued..

- Questions you will be asked and should be able to answer during the lab.
- What are the variables we are testing?
- What trends are you seeing in how the mass of a star changes over time? Are there differences in how the mass changes over time when you compare stars with different initial masses?
- What trends are you seeing in how the size/radius of a star changes over time? Are there differences in how the size/radius changes over time when you compare stars with different initial masses?
- What trends are you seeing in lifespan of stars? Are there differences in the lifespan of a star when you compare stars with different initial masses?

# Explore 1 continued

- Graph data on google sheets and answer questions.

You will graph the following: Please print graphs

- Mass vs. total life(Myrs)
- Mass vs. max radius ( $R_{\text{sun}}$ )
- Mass vs. Max luminosity ( $L_{\text{sun}}$ )

# The Life Cycle Depends on Starting Mass

## Small Mass

Protostar  
Main Sequence  
White Dwarf  
Black Dwarf

## Medium Mass

Protostar  
Main Sequence  
Red Giant  
White Dwarf  
Black Dwarf

## Large Mass

Protostar  
Main Sequence  
Super Giant  
Supernova

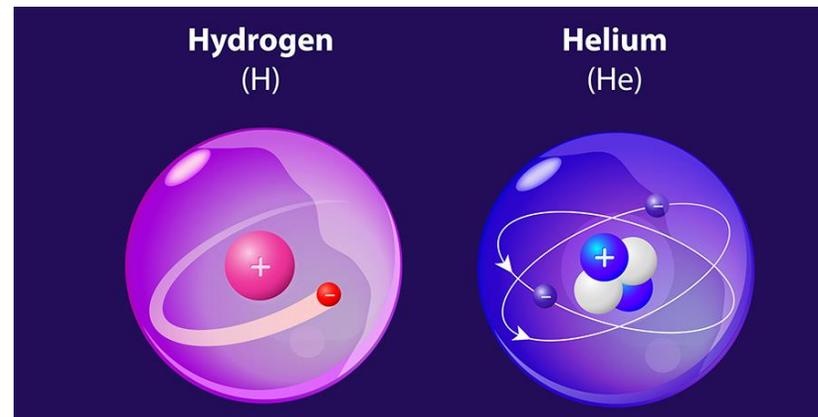
neutron star

black hole

Q:What elements make up most stars  
(especially at the beginning of their life)?



A: Stars are mostly Hydrogen and Helium,  
Hydrogen is the fuel for stars



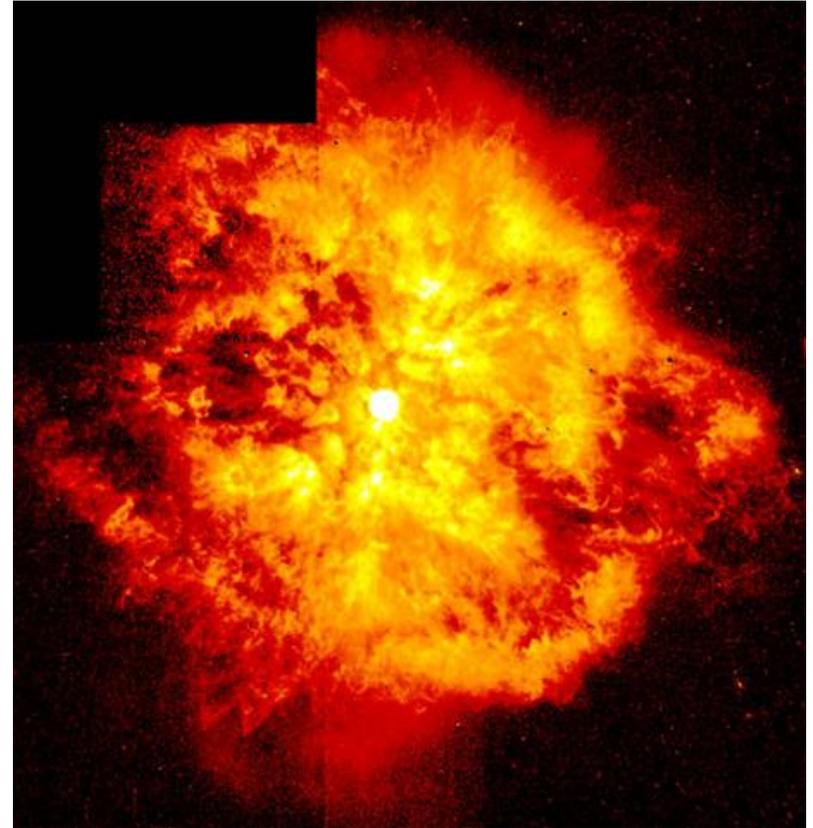
Explain 1- Where does the sun get its energy?

- Ask students to think about this while they watch the video and **take notes**.
- What is nuclear fusion, and what happens to the total mass and energy of two protons (hydrogens) as a result of nuclear fusion between them?
- Watch the first 3 minutes of the video .
- <https://www.youtube.com/watch?v=Ux33-5k8cjg>

- How does nuclear fusion benefit us on Earth? What type of energy is the sun giving off?
  - Nuclear Fusion from the sun gives us visible light, heat (infrared) and Ultraviolet rays, without it we could not survive. The heat keeps us warm, the light allows plants to perform photosynthesis, which gives us oxygen.
- How does the energy produced from the sun compare to energy produced by burning log, energy from food, or photosynthesis?

# What is a star?

- A cloud of gas, mainly hydrogen and helium
- It is pulled together by gravity, and that gives off energy as a result of **NUCLEAR FUSION**.
- Nuclear fusion- when two atoms bond together to make one heavier atom. The process releases large amounts of **energy**.



# Explain Read Article: Forces within a star

- Please read article, annotate and answer questions.

# Review Forces within a Star worksheet

- While I check homework, start reading “Stellar Evolution” packet. Annotate, answer questions 1-6. This will help you with tomorrow task in class.

# Stars form when a molecular cloud collapses.

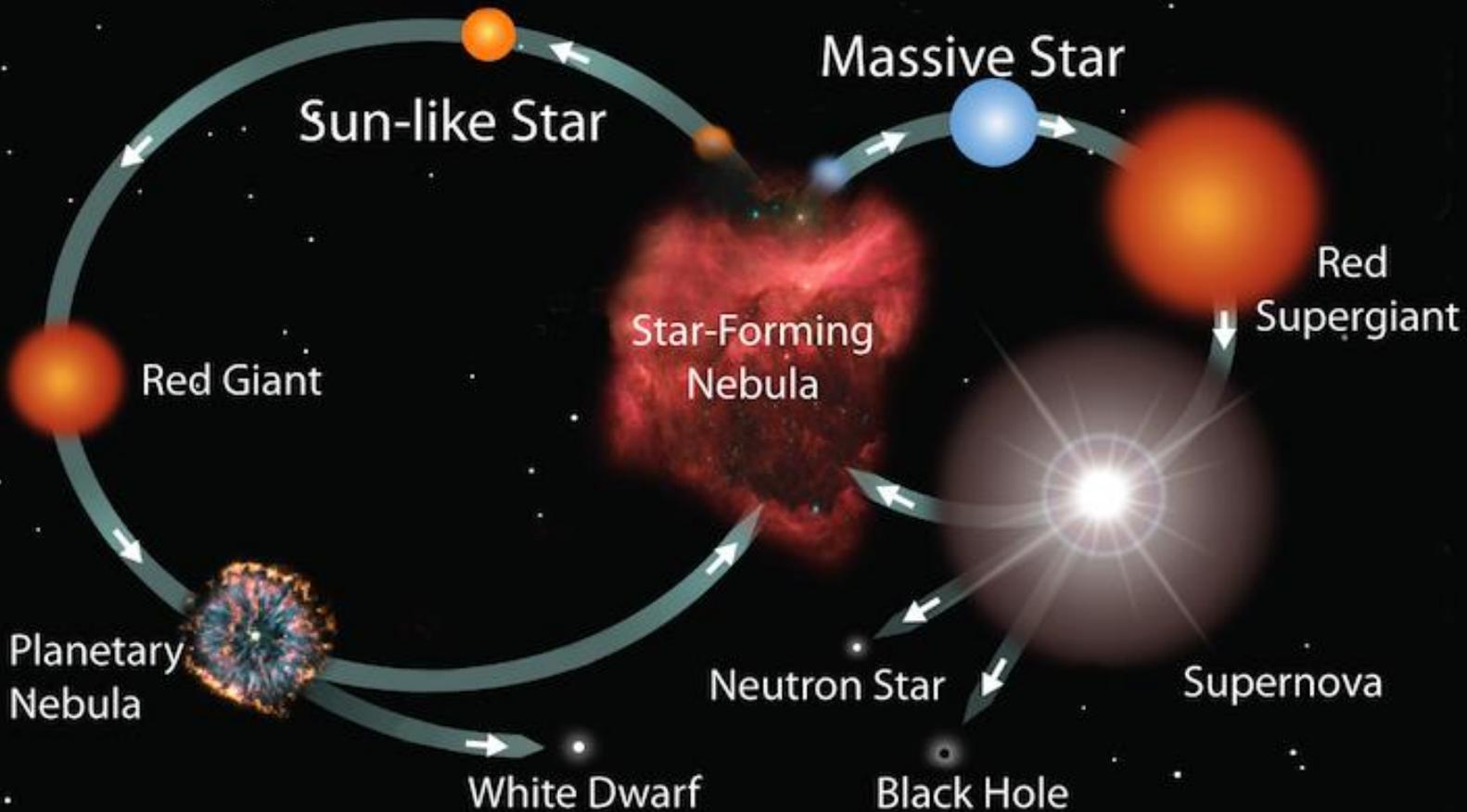
Stars form in cold, dense regions of space called molecular clouds. When the force of gravity pulling in on the cloud is greater than the strength of internal pressure pushing out, the cloud collapses into a protostar (a baby star).

Animation: Nebula beginning to form a star

Why do a star's size change over time?

Please record your observations in your notebook.

# THE LIFE CYCLE OF STARS



[Video: What is a supernova? \(3min\)](#)

[Afterschool Universe: Life Cycle of Large Star - Forces explained \(3min\)](#)

[Life cycle of sun \(5 min\)](#)

[Video: Stars life cycle \(12min\)](#)

Complete Explain 1 Guide - version 1 (1 solar mass) and 2 (40 solar mass)

# Review Sun Force Diagram and Graph

- Why does a star's mass decrease over time?
  - Why does a star's size change over time?

## Explore 2-

- Review the spectra

<http://laserstars.org/data/elements/>

- Remember this is how scientist figured out that stars are mostly made out of Hydrogen.
- Launch Fe26 game- **Modeling Nuclear Fusion in a Star**

<http://dimit.me/Fe26/>

On a piece of paper answer the following based on the nuclear fusion game.

- How do stars elements change over time, how can we detect changes in the composition of a star and determine movement of stars from Earth?