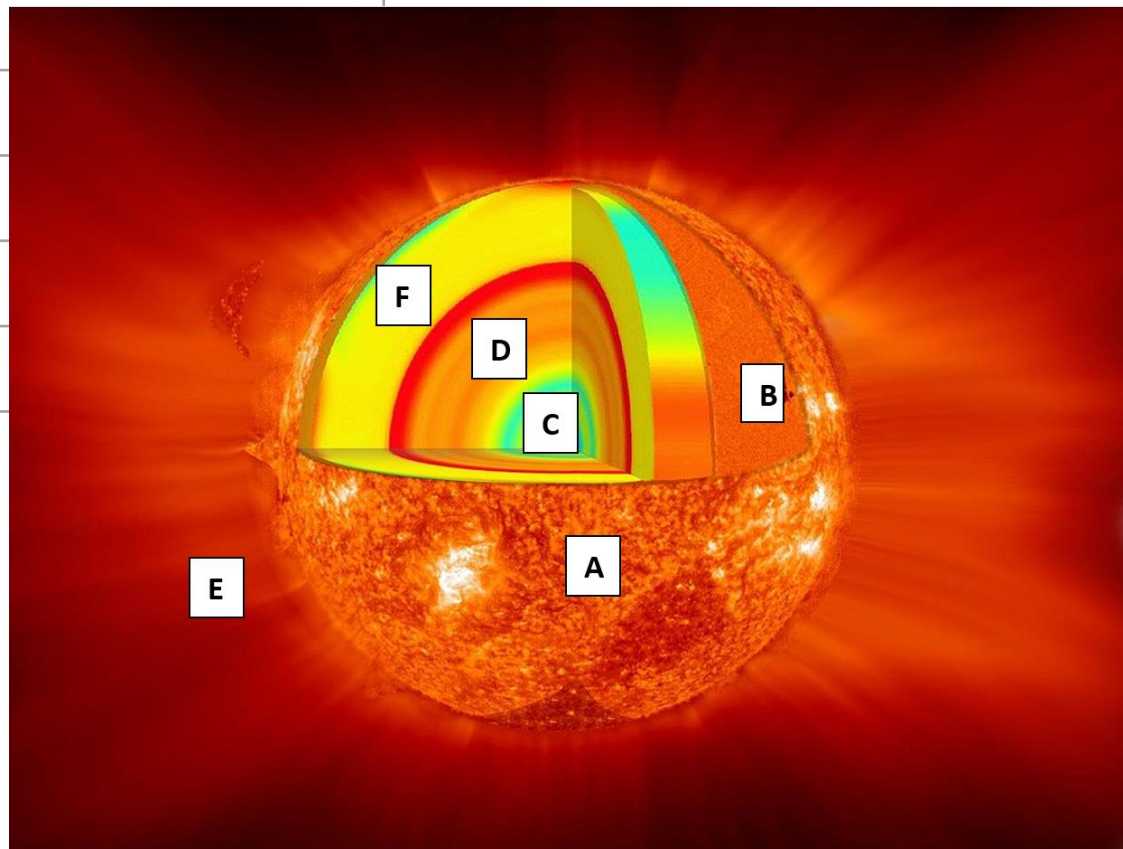
The Life Cycle of a Star

Happy Tuesday! 2-4-2020

Bell Ringer:

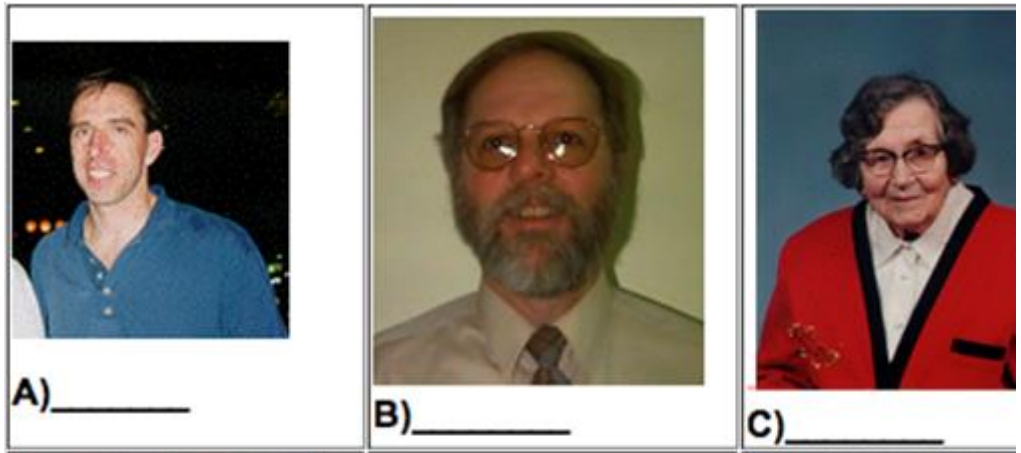
Label the layers of the sun on the diagram and describe what you know about each layer

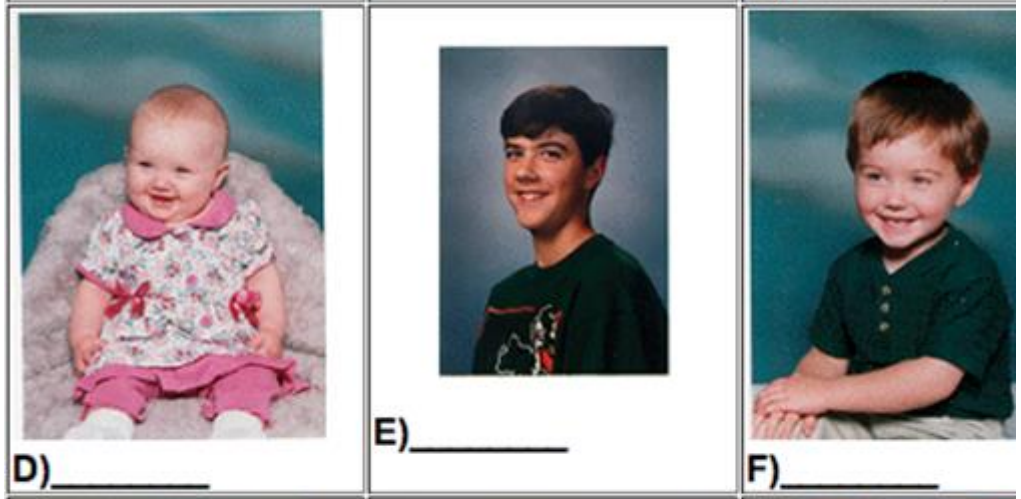
Letter	Name	What you know about it
	Core	
	Radiation Zone	
	Convection Zone	
	Photosphere	
	Chromosphere	
	Corona	



2-4-2020

- Today's Agenda:
  - Bell Ringer
  - Finish Sun Model and Questions (20 minutes)
  - Grade Model together (7 minutes)
  - Stellar Evolution- Questions and Article
  - Exit Questions



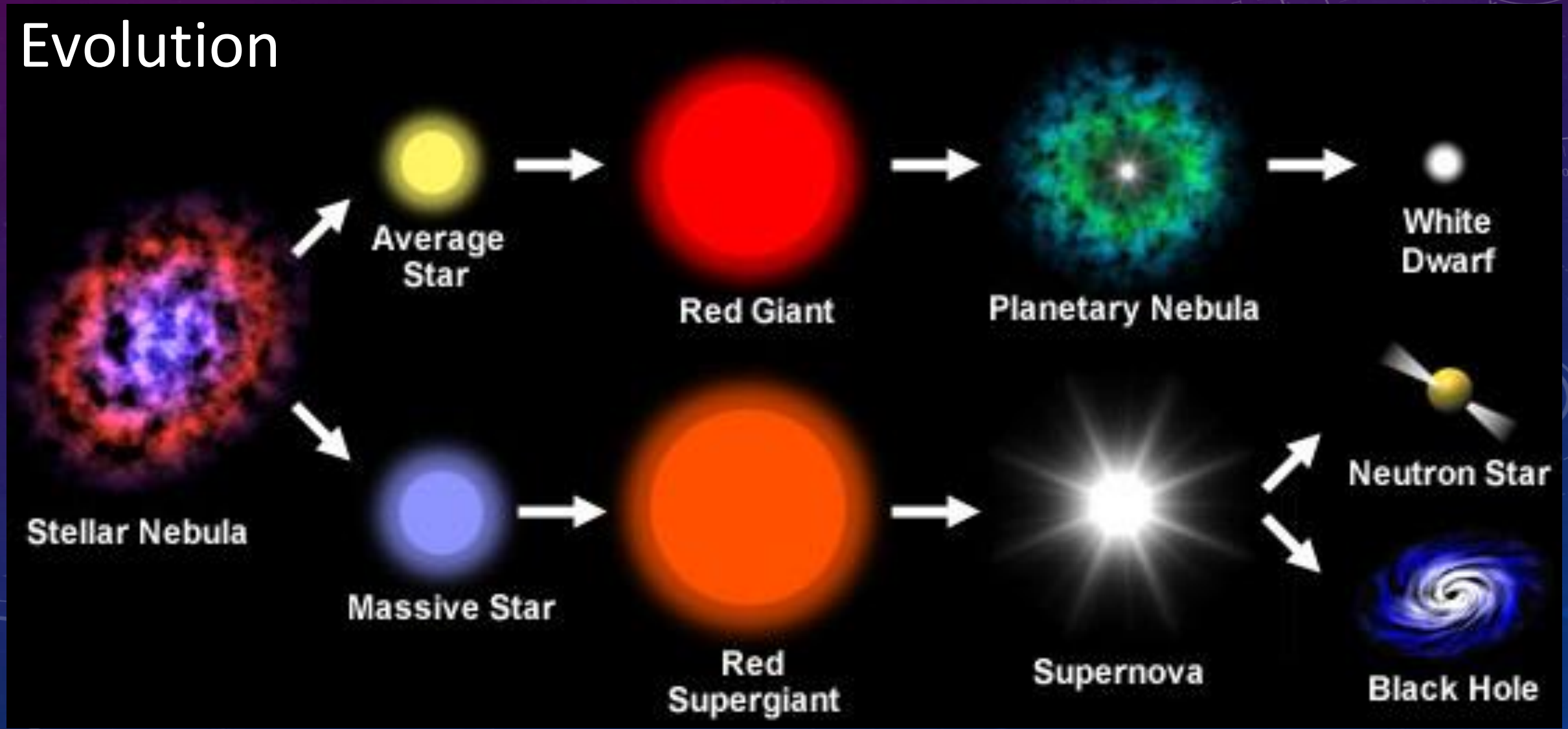


Imagine you are an alien visiting Earth, can you tell the life cycle of humans?

- Which stage do humans spend the most amount of time?
  - How do you know?
- Which stage comes first?
  - How do you know?
- Which is last?
  - How do you know?

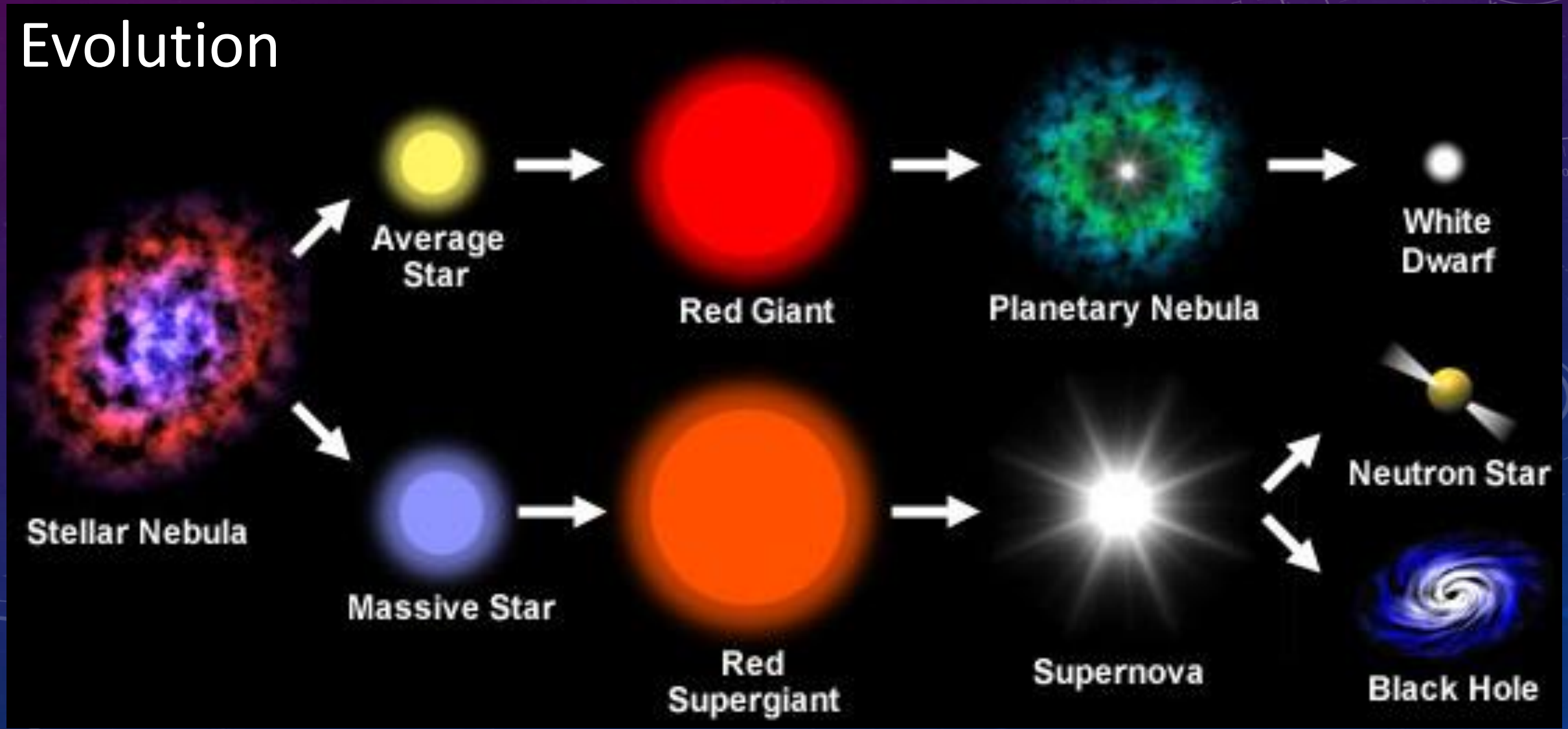
Life Cycle of Stars – Stellar Evolution

What are 5 questions you have about this diagram? Write them down with your table partners on the sticky notes, they should all be filled!



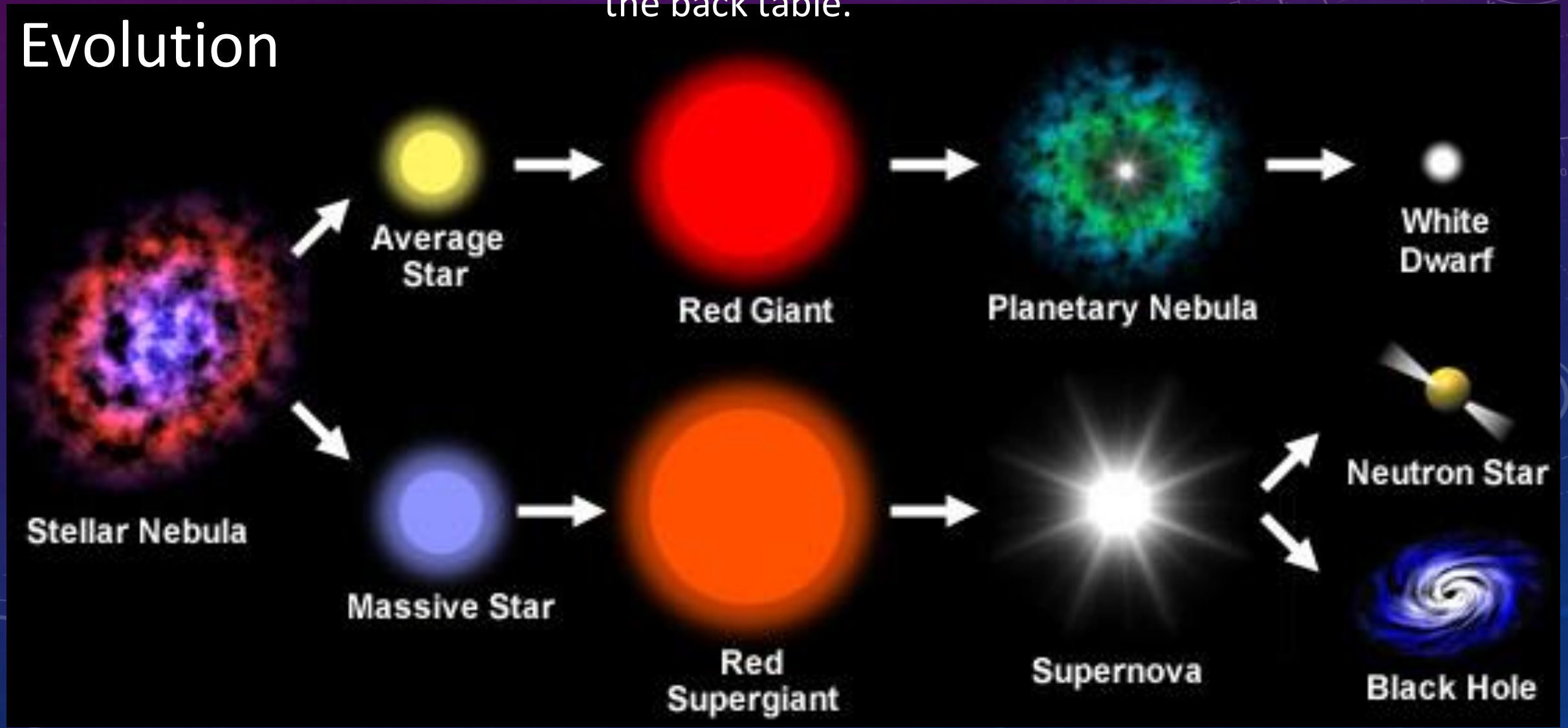
Life Cycle of Stars – Stellar Evolution

Rotate tables with your group, read the next groups questions, which are the top two questions. Put the other 3 questions on the table in the back.



Life Cycle of Stars – Stellar Evolution

Last rotation, which question do you think is the most important question? Send one person to write the main question on the board, the other piece of paper goes on the back table.



EXIT QUESTION

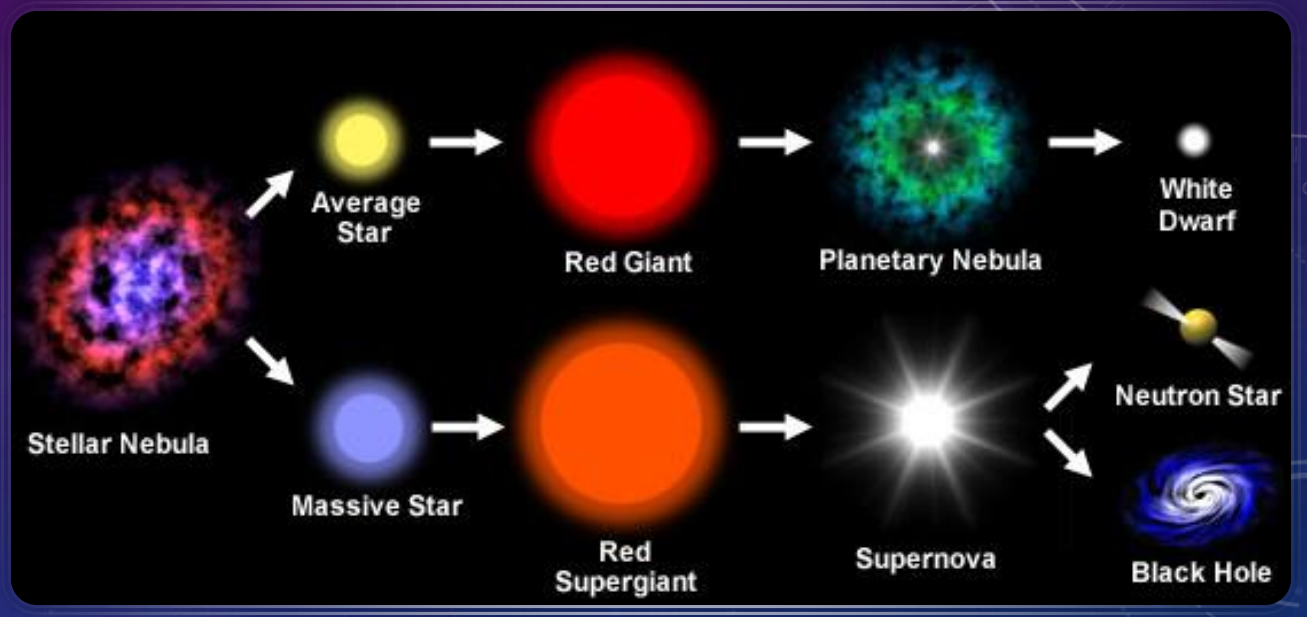
- On one more sticky note write down the stage you think our star is currently at in its life cycle.

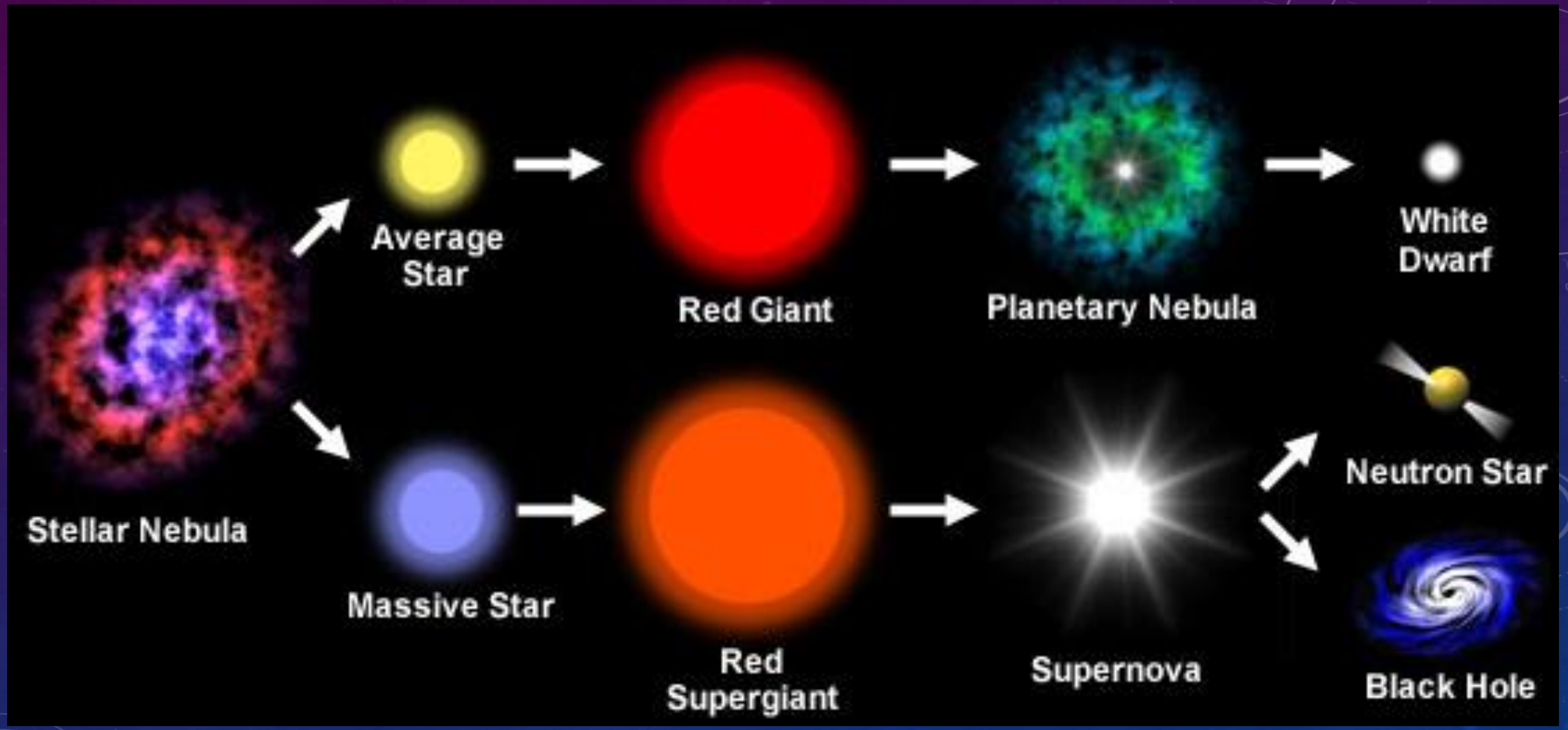
- "Always." -Mrs. G when asked if it must be in a full sentence.

WEDNESDAY! 2-5-2020

- Bell Ringer: Use the diagram to the right, what is the first stage of a star's life? What will our star become next?

- Today's Agenda:
  - Bell Ringer
  - How Stars form and evolve article
  - Notes
  - Exit Question

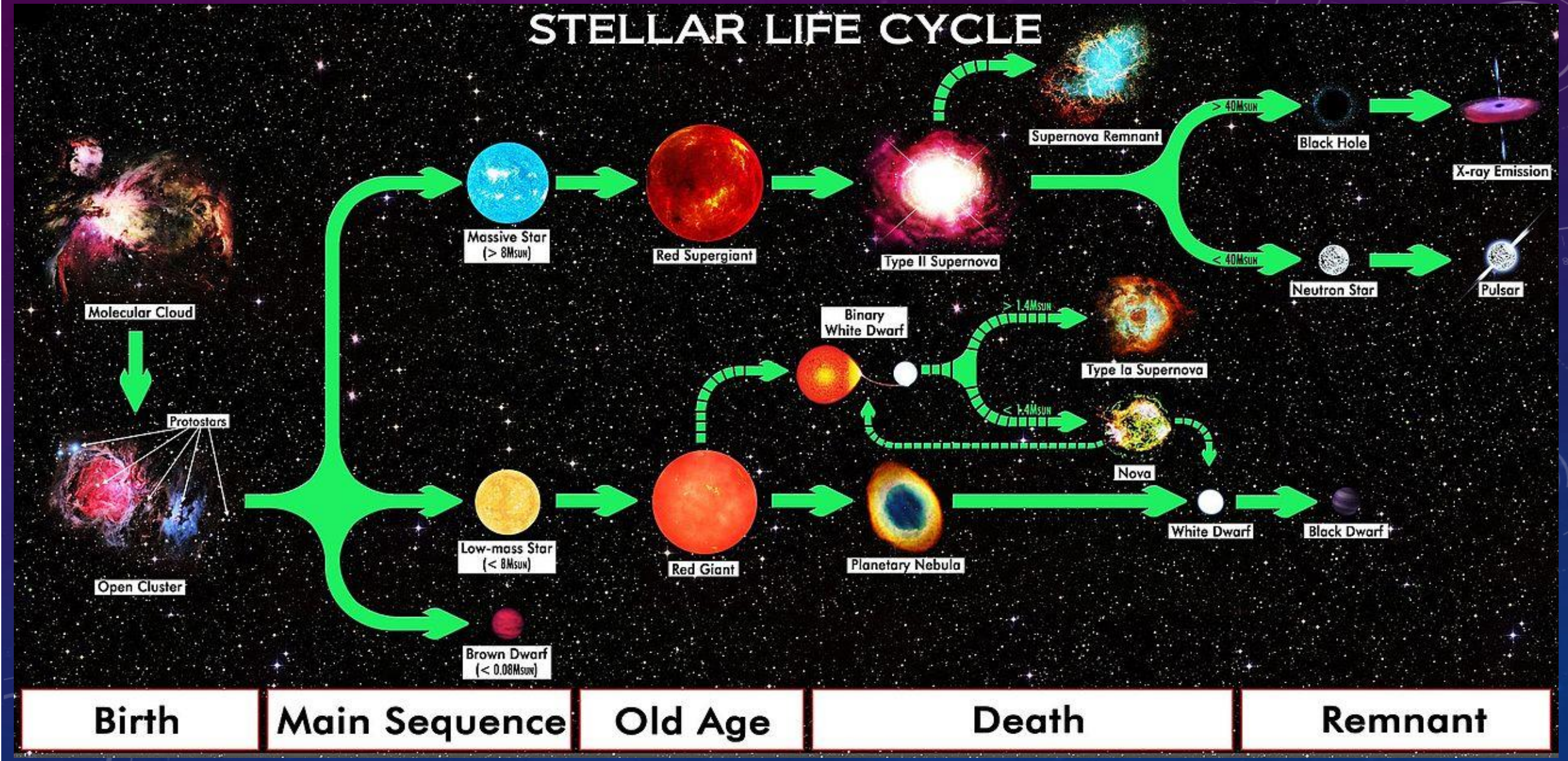



Stellar Nebula
Average Star
Red Giant
Planetary Nebula
White Dwarf
Massive Star
Red Supergiant
Supernova
Neutron Star
Black Hole

IT'S ALMOST FRIDAY!
2-6-2020

- Bell Ringer: How does a star form?
- Today's Agenda:
  - Bell Ringer
  - Finish Article Notes/Mrs. G talks about stars
  - Prep our H-R Diagrams on Paper
- Learning Objective:
  - I can model the life cycle of stars

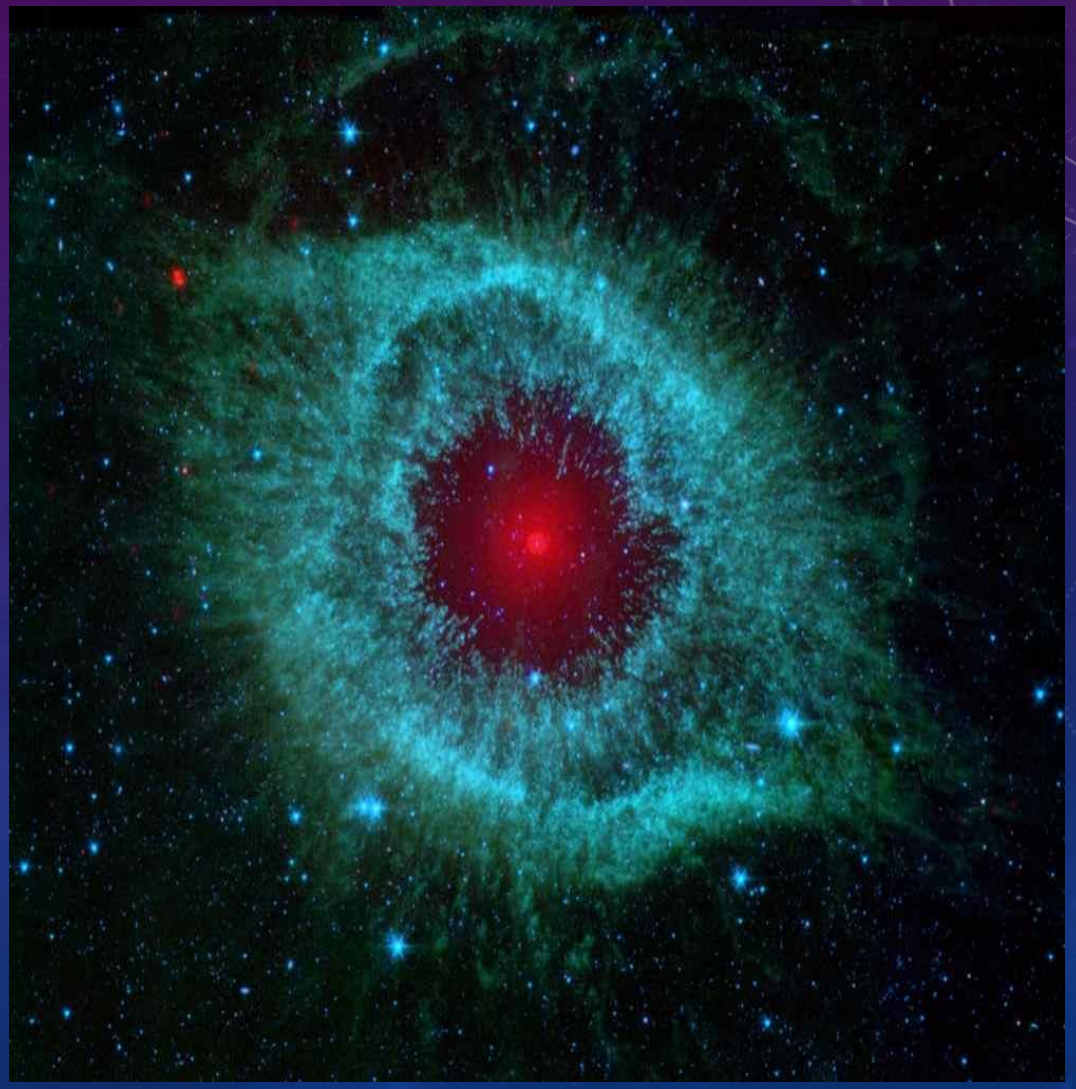
MORE DETAIL!


STELLAR LIFE CYCLE
Molecular Cloud
Protostars
Open Cluster
Massive Star (> 8MSUN)
Red Supergiant
Type II Supernova
Supernova Remnant
> 40MSUN
Black Hole
X-ray Emission
< 40MSUN
Neutron Star
Pulsar
Binary White Dwarf
> 1.4MSUN
Type Ia Supernova
< 1.4MSUN
Nova
Low-mass Star (< 8MSUN)
Red Giant
Planetary Nebula
White Dwarf
Black Dwarf
Brown Dwarf (< 0.08MSUN)
Birth
Main Sequence
Old Age
Death
Remnant

STELLAR NEBULA

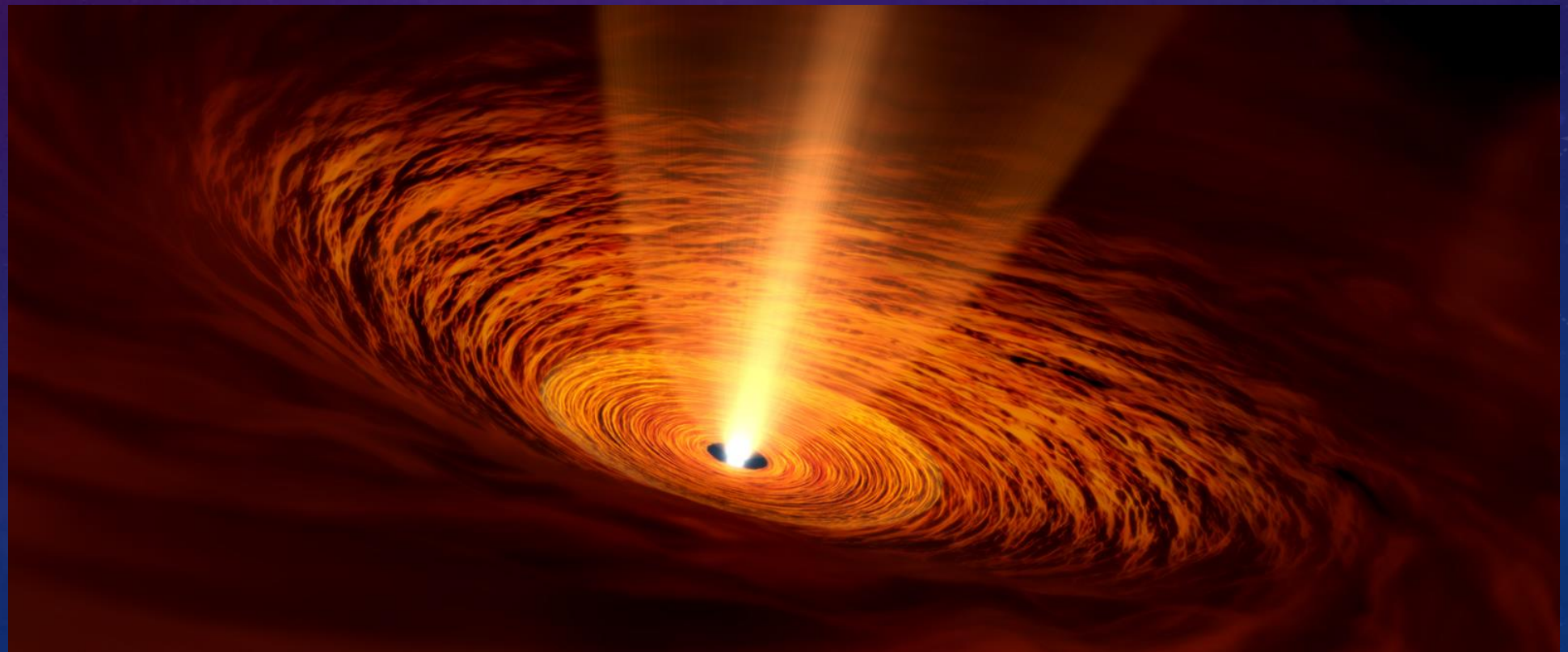
- Stars are born from a Nebula (a cloud of gas and dust).

- The nebula eventually contracts & the temperature rises, until it emits energy as long wavelength red light. This is the protostar stage.

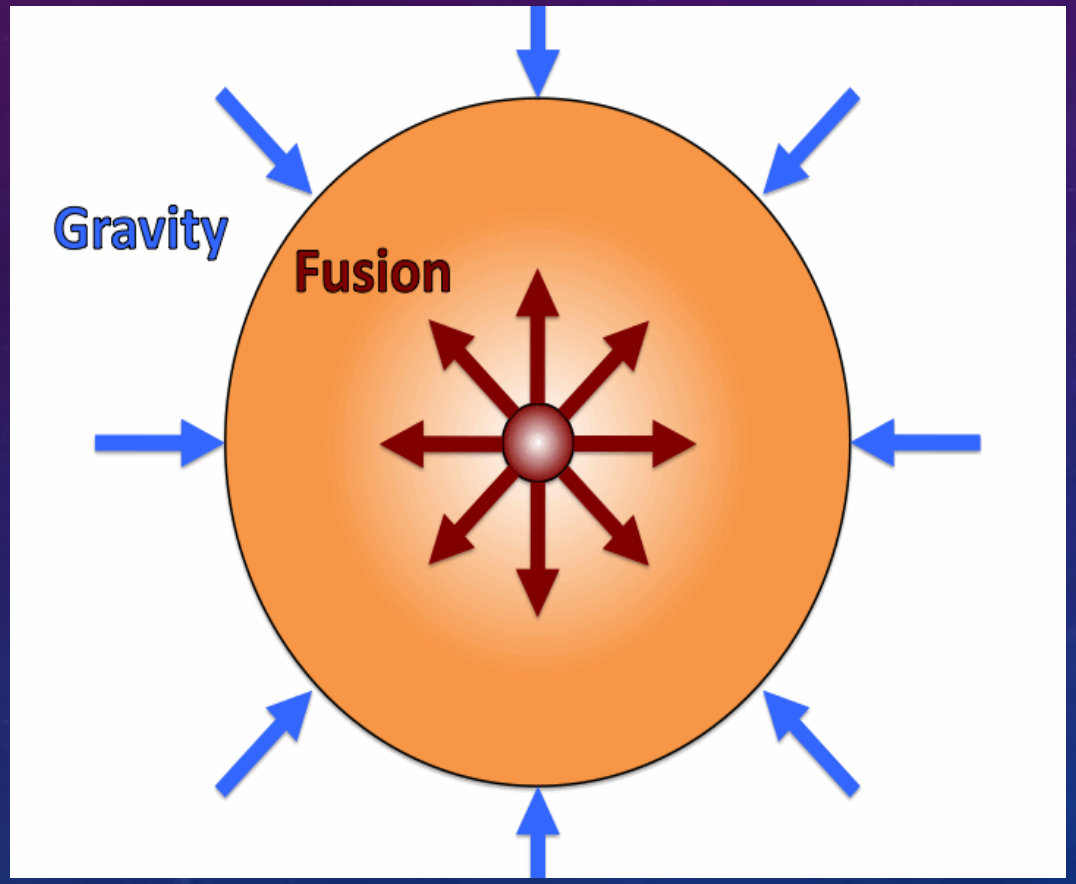


PROTOSTAR

When the core of a protostar reaches 10 million K, the pressure is so great that nuclear fusion begins & a star is born.



MAIN SEQUENCE STAGE

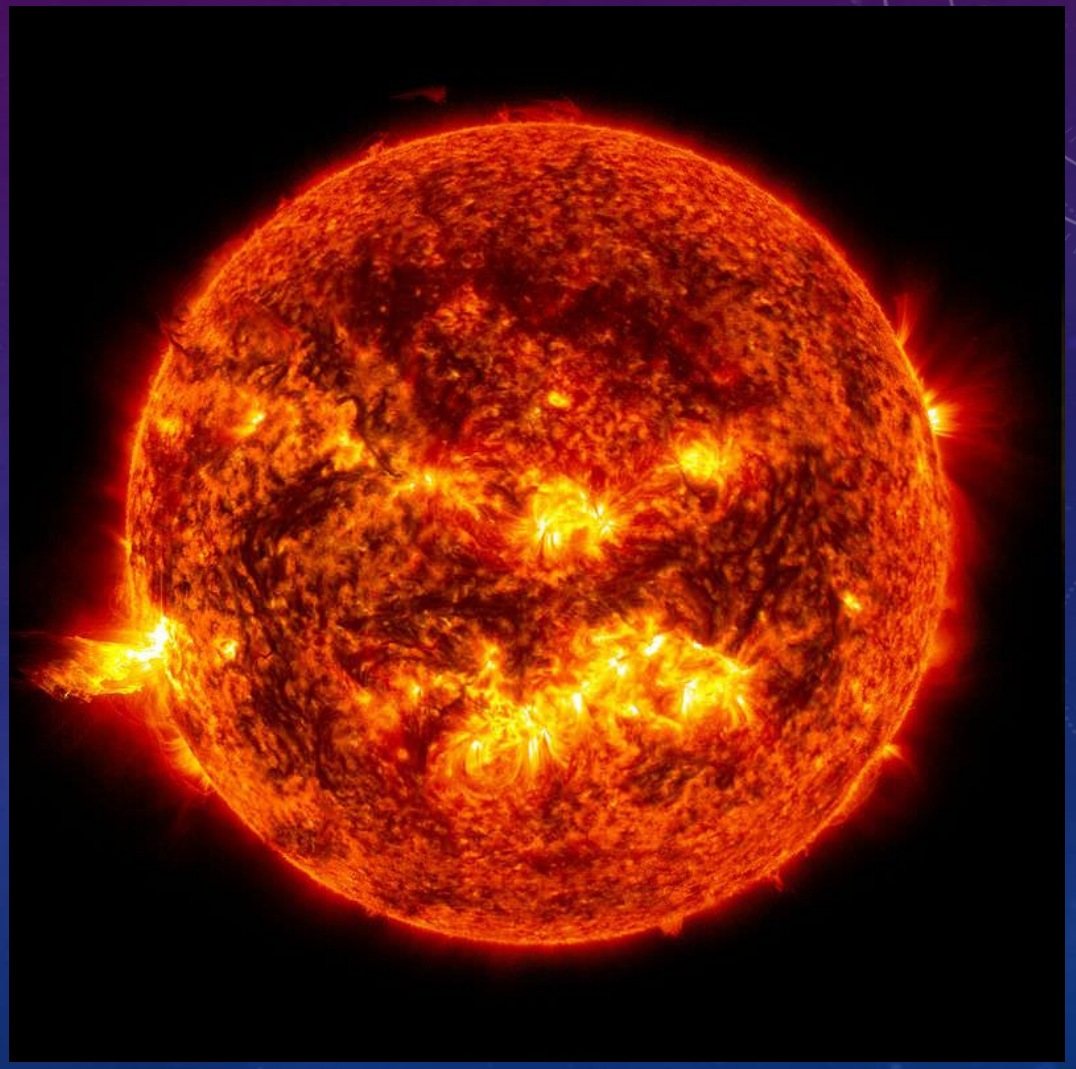


A star becomes a Main Sequence Star when it becomes stable, achieving:

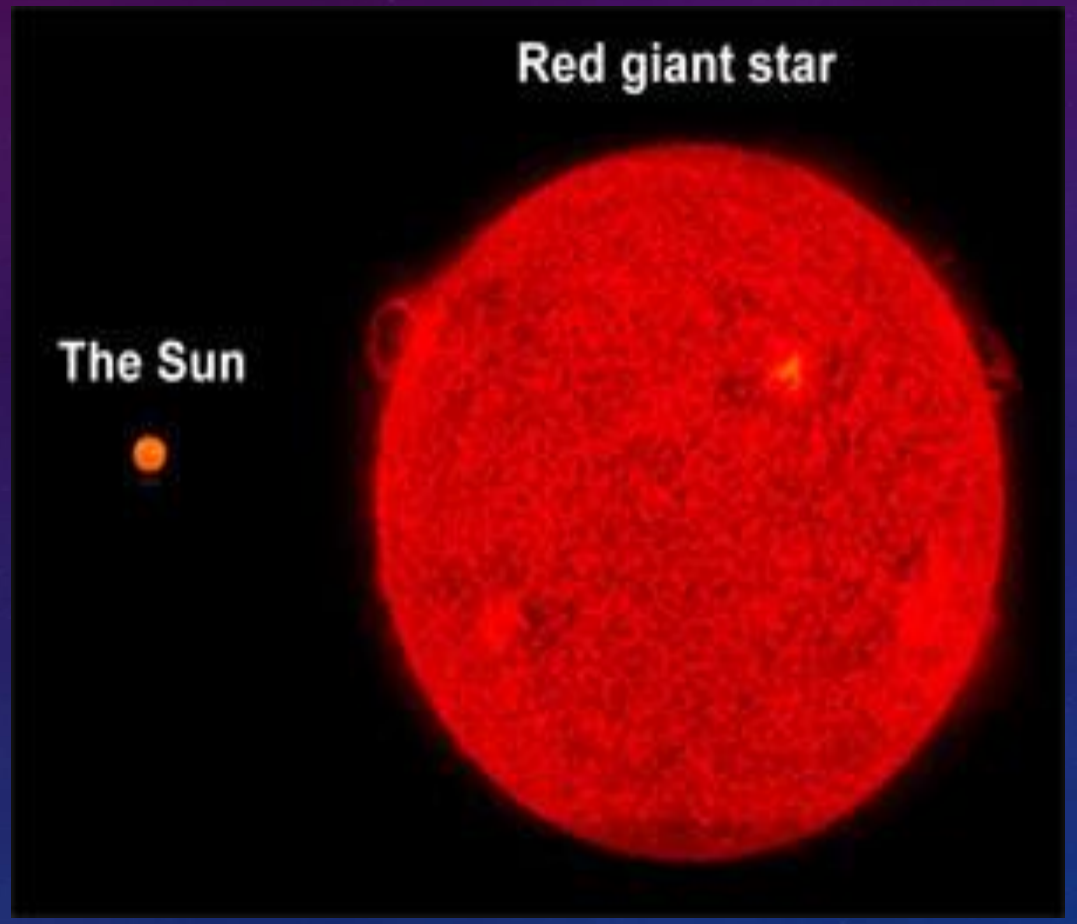
- Hydrostatic Equilibrium – the force of nuclear fusion pushing out equals the force of gravity pushing in.

MAIN SEQUENCE STAGE

- 90% of a star's life
- The hotter the star the shorter its life span.
  - Hot Blue stars average a few million years.
  - Cooler Red hundreds of billions of years.
  - Medium Yellow (Sun) around 10 billion



RED GIANT STAGE

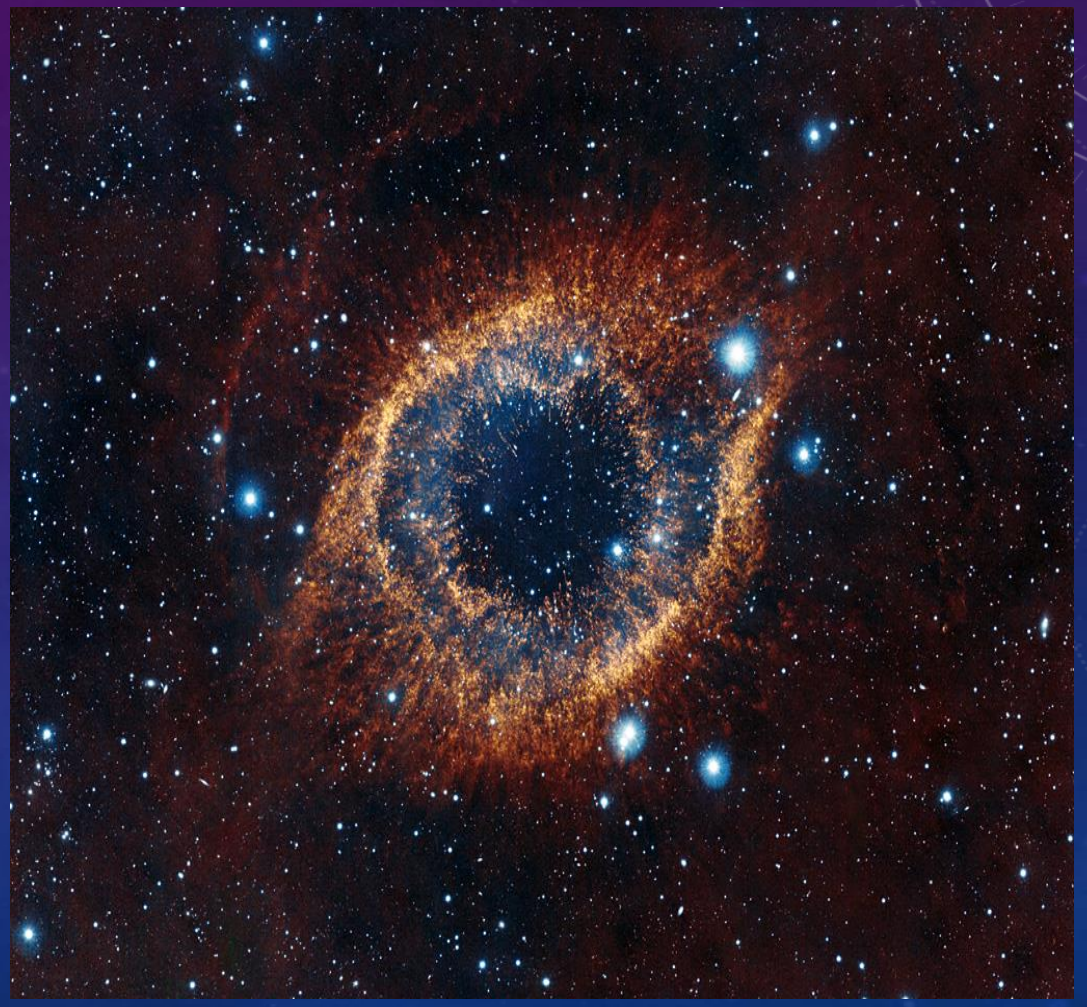


- Zone of Hydrogen Fusion moves outward leaving behind a helium core.
- Core begins to collapse & outer shell cools (turns red) & expands.
- Eventually, hydrogen is consumed, helium is converted to carbon & energy is produced.

https://www.youtube.com/watch?v=wlHQV52fJ1A

PLANETARY NEBULA

- All stars eventually run out of fuel & collapse due to gravity.
- On their way to becoming a White Dwarf, Low/Medium mass stars eject their outer layer & become a cloud of gas called a Planetary Nebula.



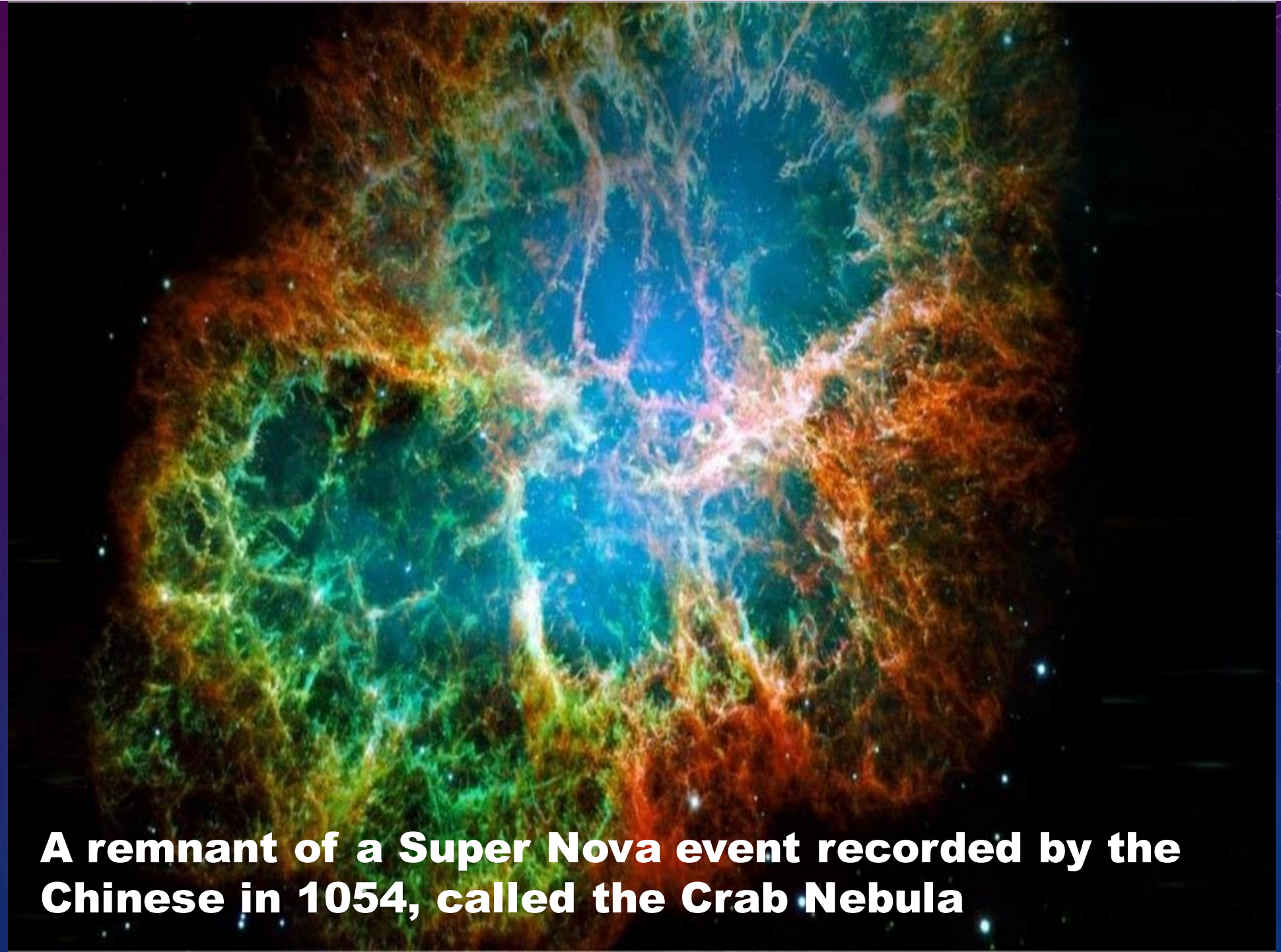
WHITE DWARFS

- The final stage for most low/medium mass stars.
- Matter contracts into a high density, cooler & dimmer star.

BURNOUT & DEATH

- Massive stars collapse & end in a brilliant explosion called a Super Nova

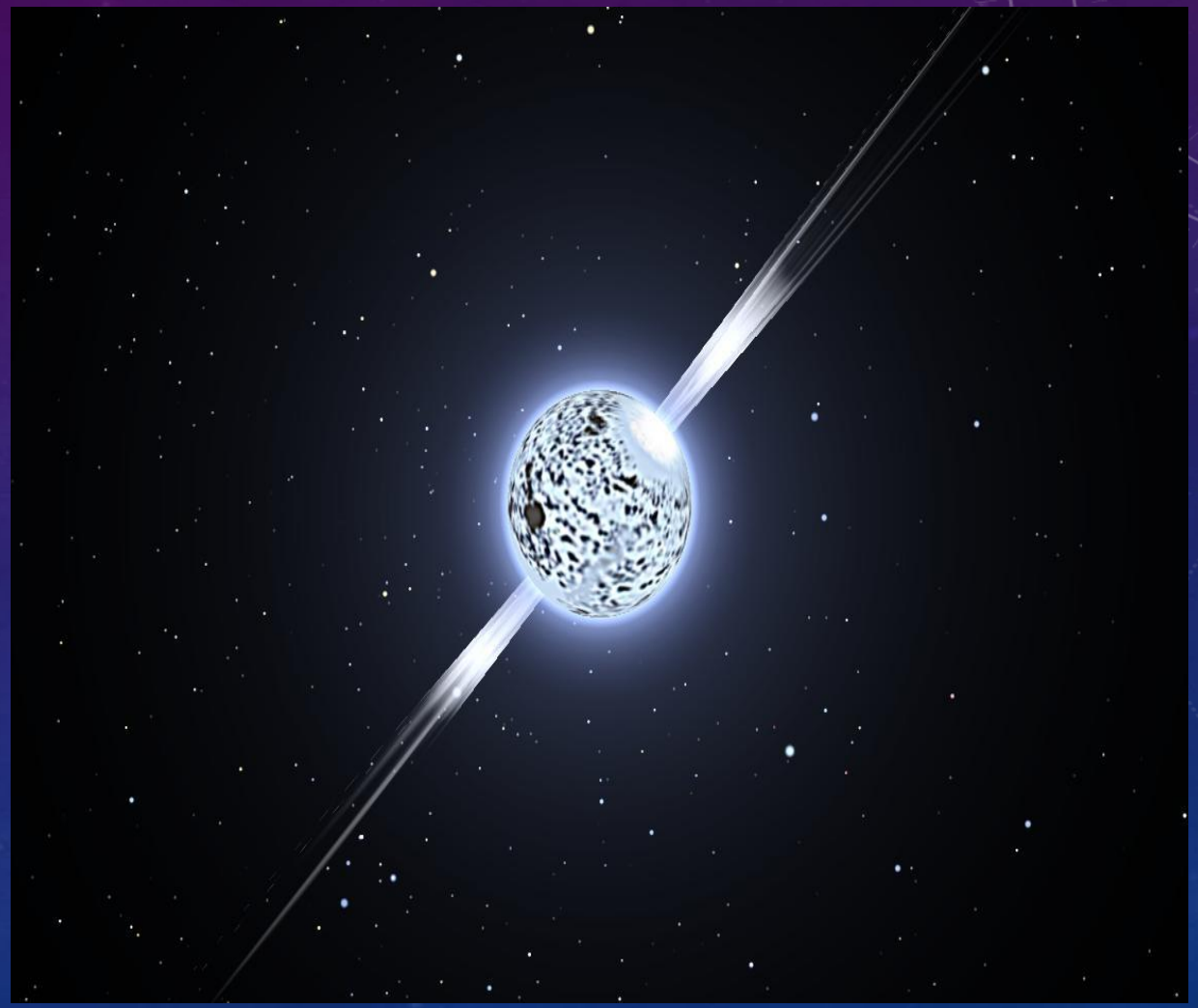
https://www.youtube.com/watch?v=YIKXvDlf8_0



A remnant of a Super Nova event recorded by the Chinese in 1054, called the Crab Nebula

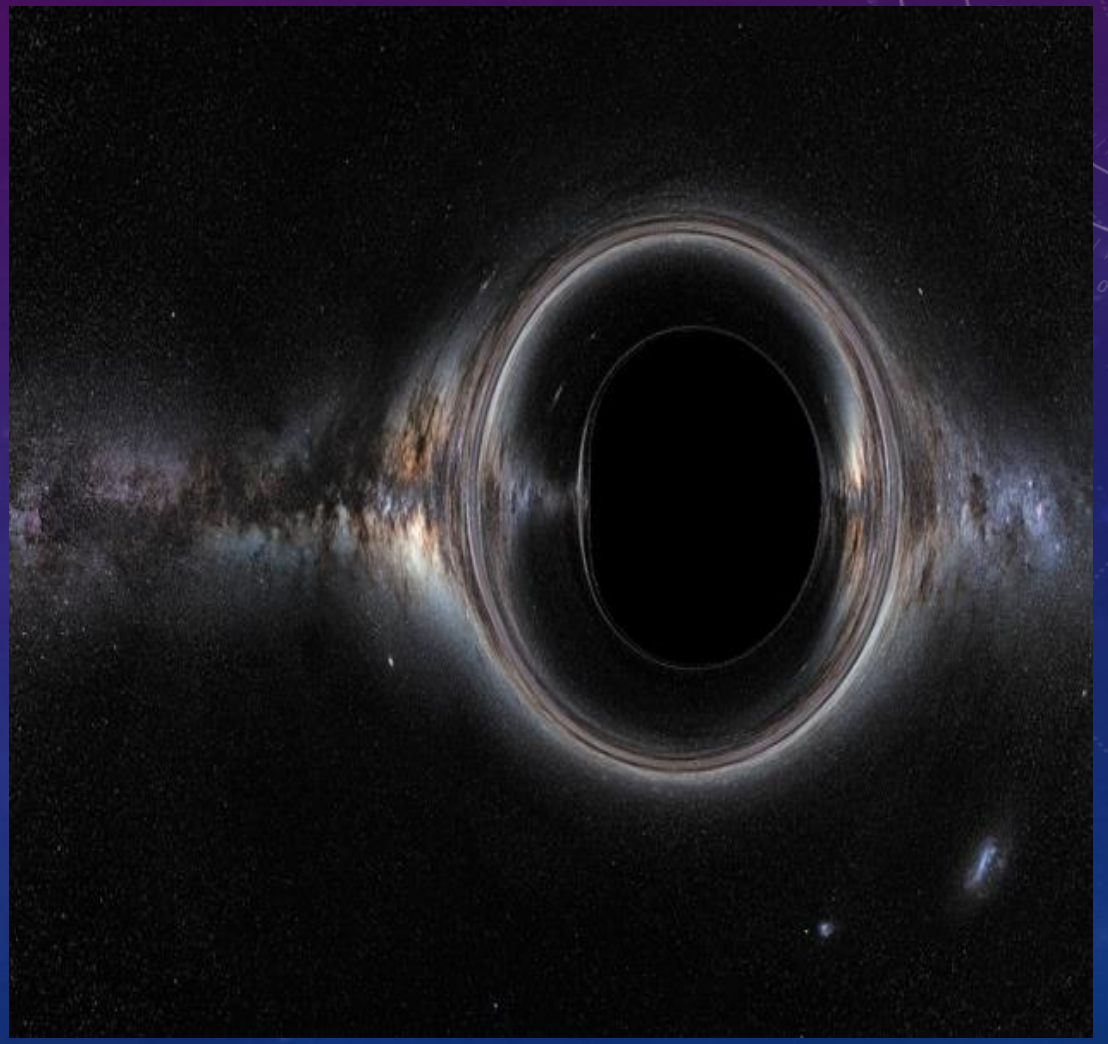
NEUTRON STARS

- Remnants of Super Nova events
- An extremely high density celestial object with a collection of tightly packed neutrons and a small radius.



BLACK HOLES

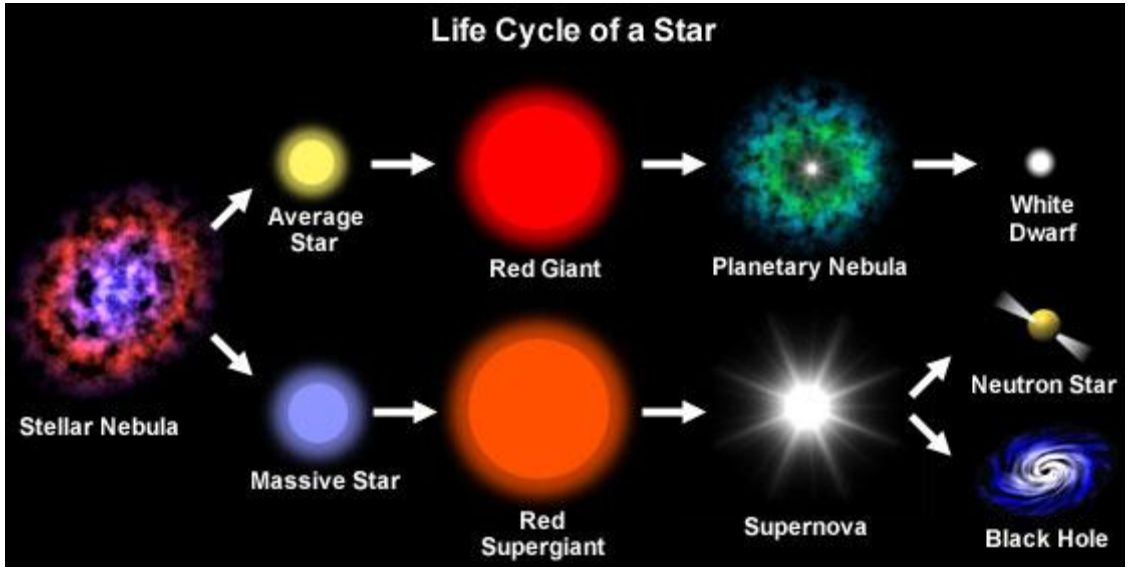
- A collapsed massive star with gravity so strong that all matter & energy can't escape it.
- Produced by a Super Nova event of a star 20 times more massive than the sun, which collapses into an object smaller than a neutron star.
- Scientists look for matter being rapidly swept into a region of apparent nothingness.

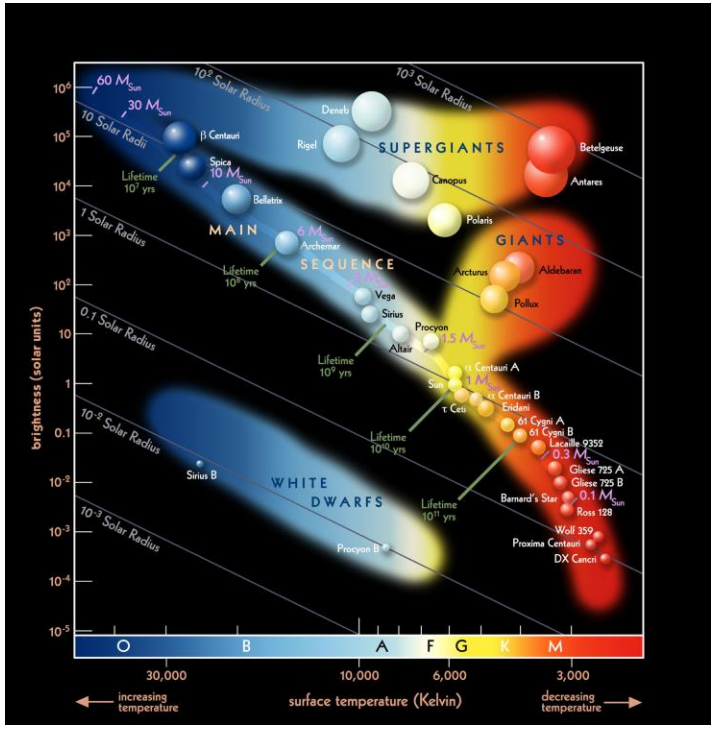


https://www.youtube.com/watch?v=e-P5IFTqB98

HAPPY FRIDAY! 2-7-2020

- Bell Ringer: What causes the solar weather? For example what causes solar flares?
  - (Hint: Think about what creates the structure of the Corona)
- Today's Agenda:
  - H-R Diagram with group
    - EVERYONE needs to write their answers down!!
  - Exit Question
- Learning Objective:
  - I can categorize and analyze stars based on temperature and brightness.





2-10-2020
BELL RINGER

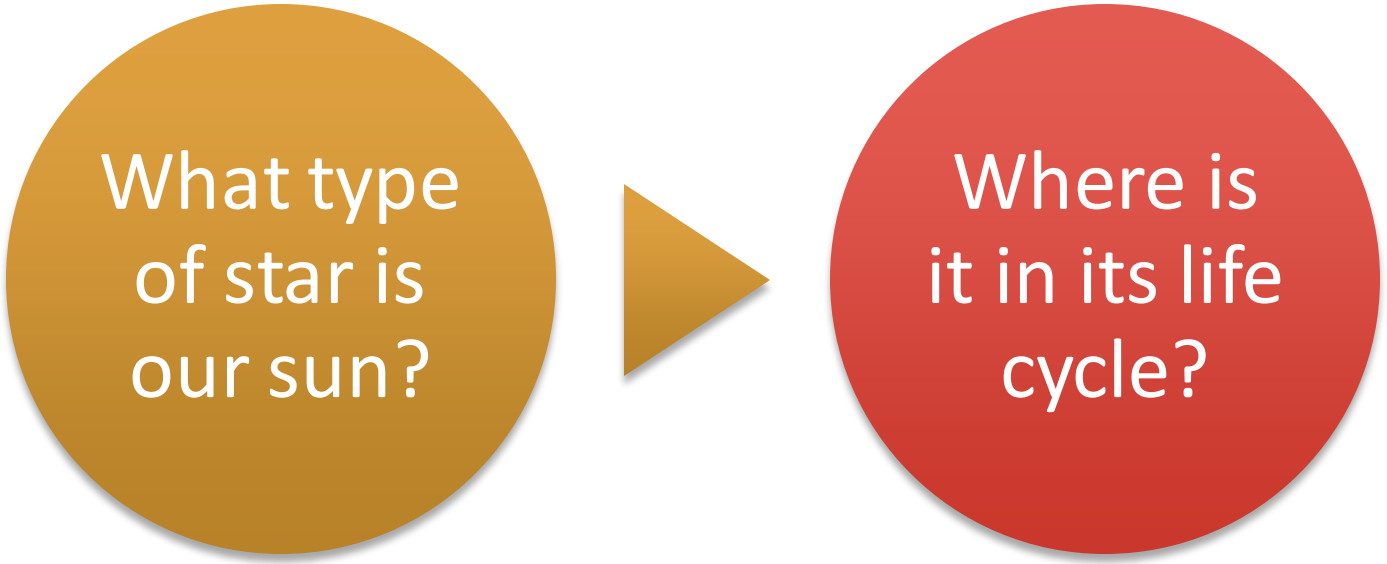
- Explain how a star like our sun would move to different locations on the H-R diagram throughout its life cycle.
- Describe its temperature and brightness at each stage.
- Use complete sentences and include 3 different stages of its life cycle.

- 1. As a main sequence star the temperature and brightness are average.
- 2. As a Red Giant the temperature decreases and the brightness increases.
- 3. As a White Dwarf the temperature increases and the brightness decreases.

MONDAY, FEBRUARY 10, 2020

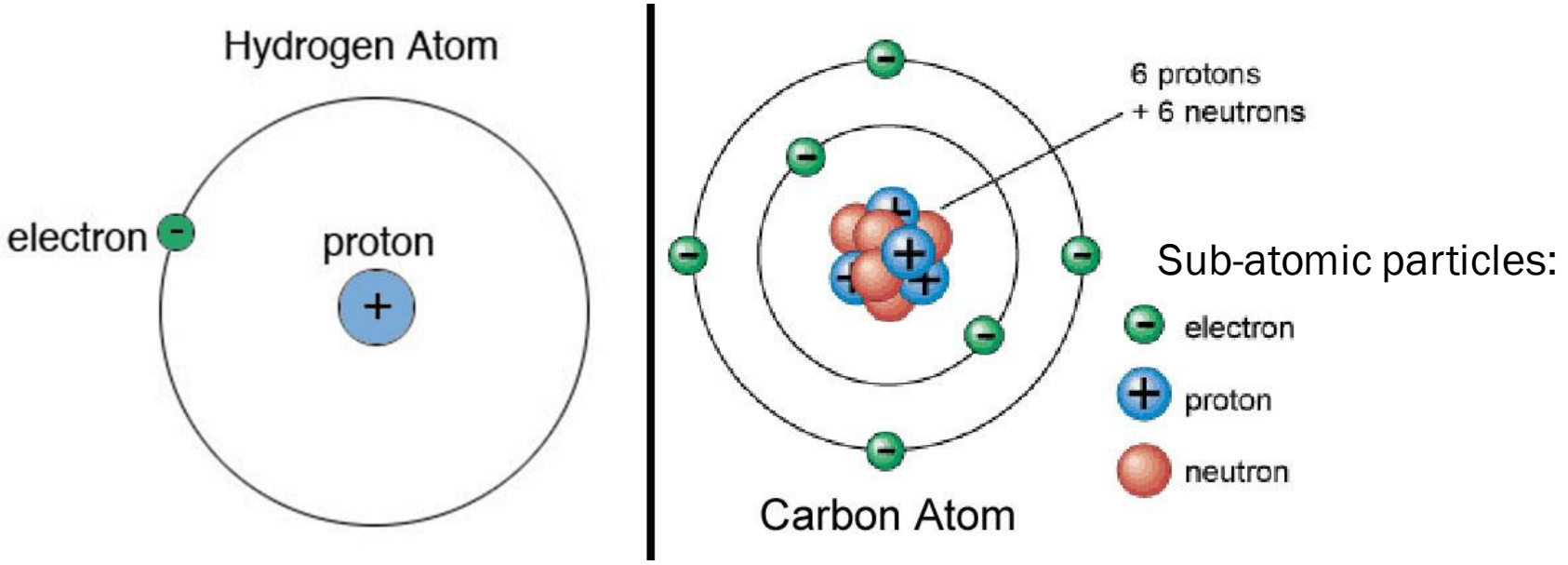
- Today's Agenda:
  - Bell Ringer
  - Finish H-R Diagram Questions and grade them
  - Period Table Review
- Learning Objective:
  - I can model the life cycle of our Sun
  - I can model nuclear fusion (start today, end tomorrow)

EXIT TICKET



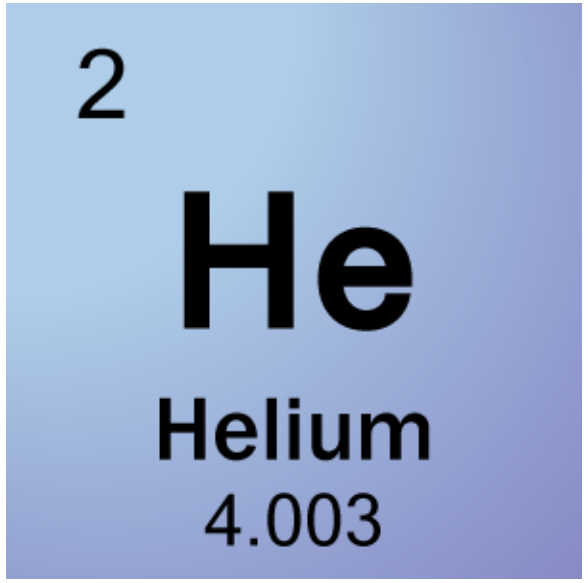
HAPPY TUESDAY 2-11-2020

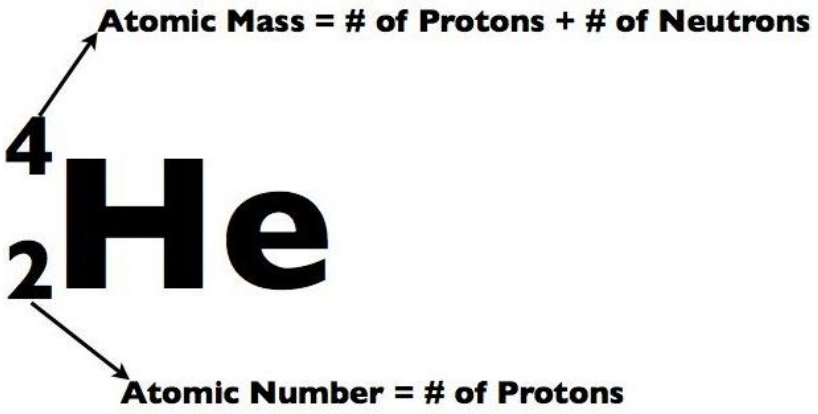
- Bell Ringer: What is solar weather and how long is the cycle it goes through?
  - Answer the question after we watch this video as a class: https://www.bbc.com/news/science-environment-51420402
- Today's Agenda:
  - Bell Ringer
  - 10 minutes to finish H-R Diagram
  - Atomic Review and Nuclear Fusion
  - Exit Question
- Learning Objective: I can explain nuclear fusion in our sun's core.

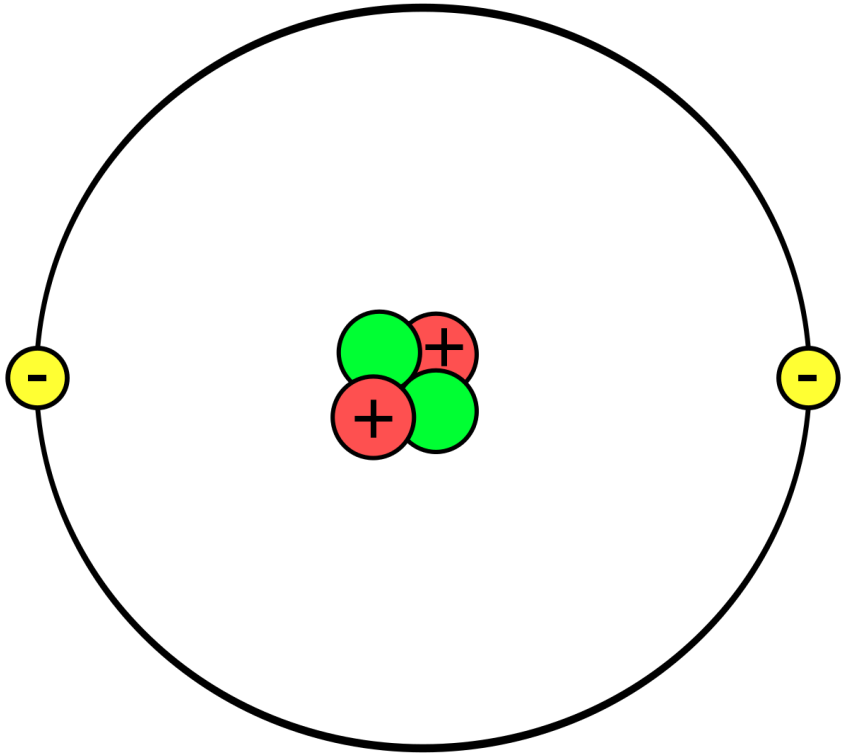


ATOMS: THE SMALLEST "PIECE" OF ANY SUBSTANCE MADE UP OF A PROTON(+), NEUTRON, ELECTRON (-)

ATOMS NOTES

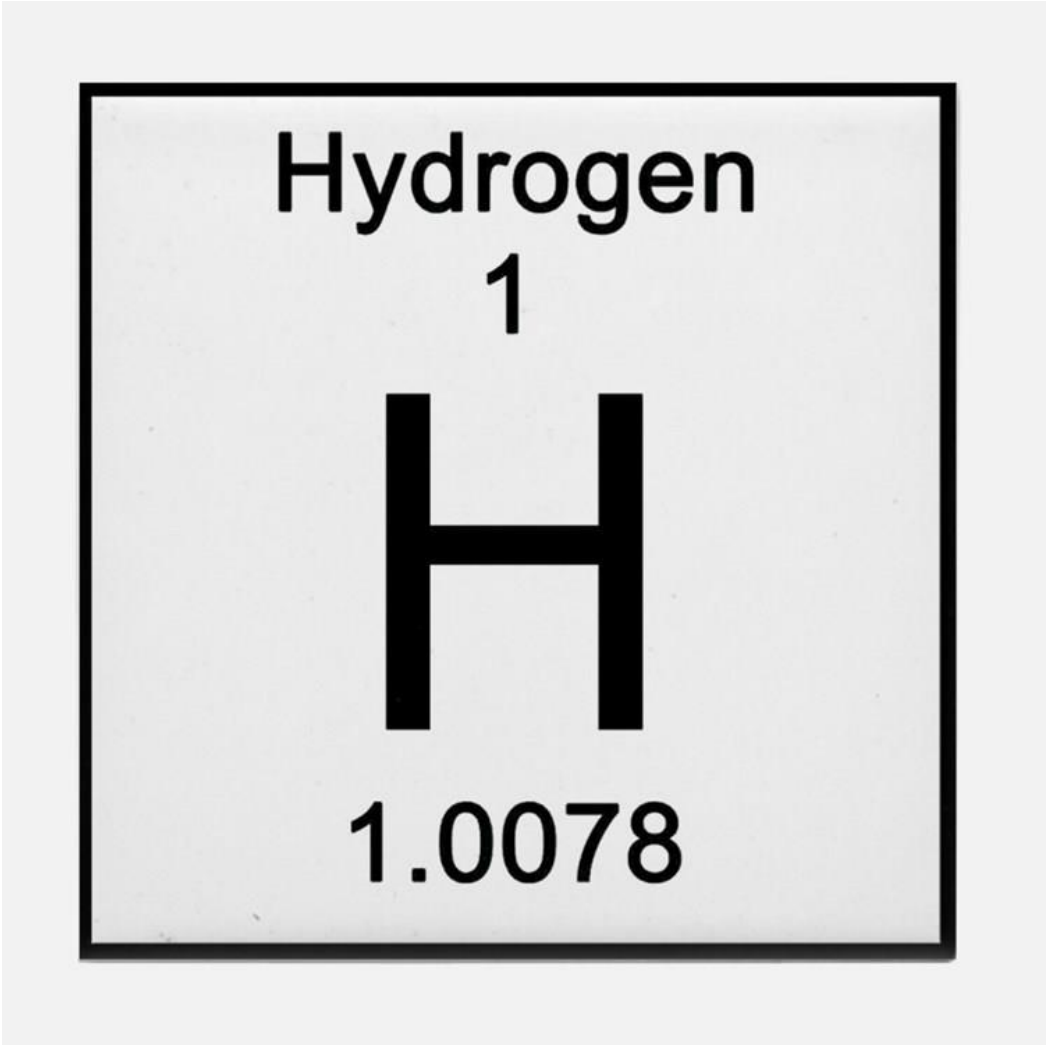

2
He
Helium
4.003


Atomic Mass = # of Protons + # of Neutrons
4
2
He
Atomic Number = # of Protons

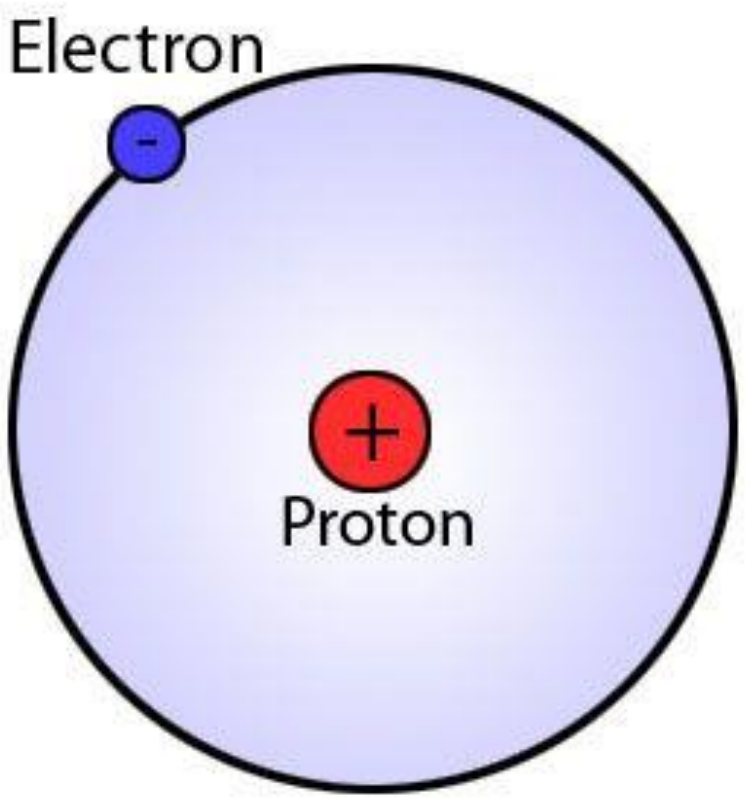

-
+
+
-

ELEMENT PRACTICE

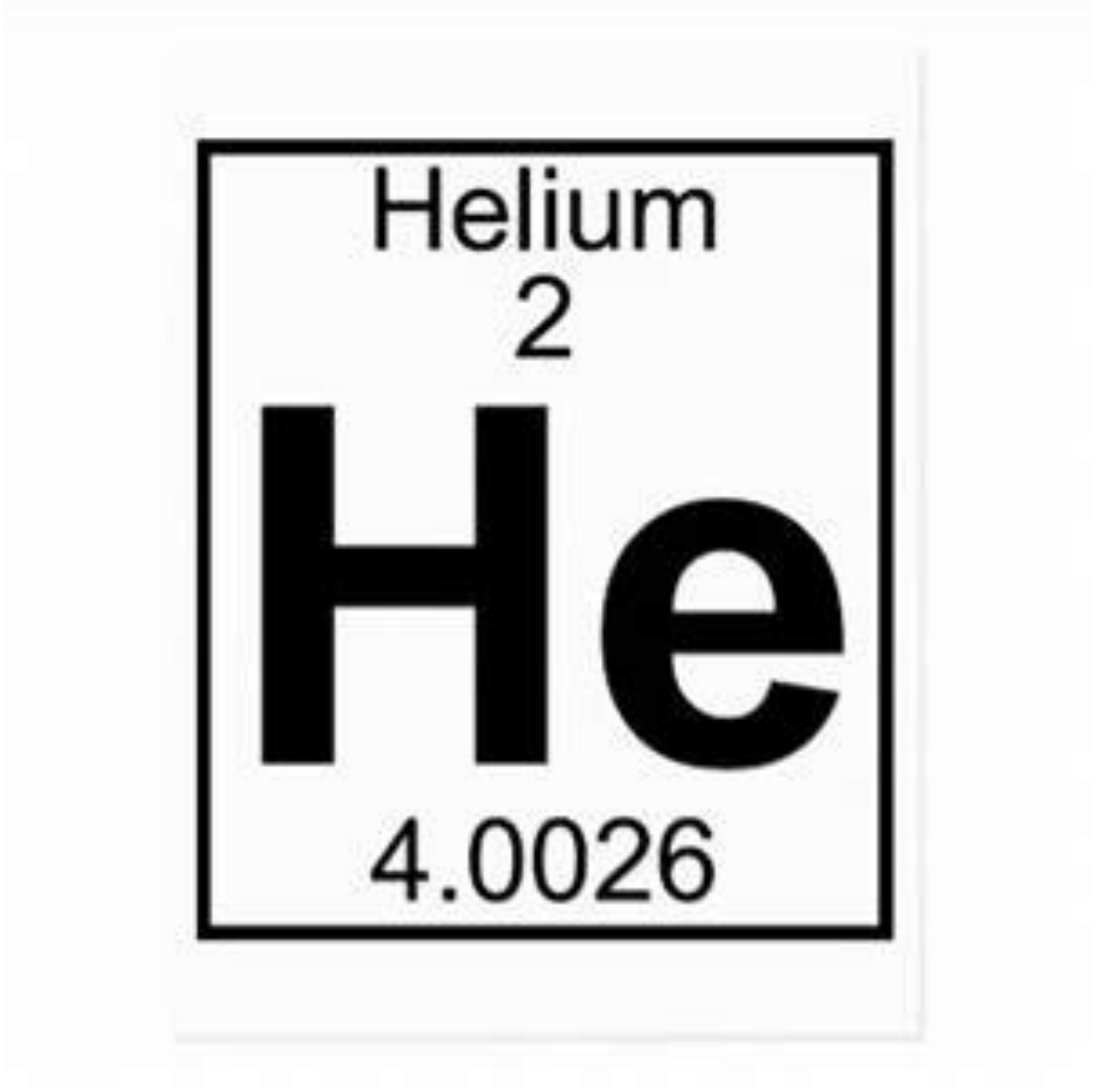
- Draw a model of a hydrogen atom based on the information provided:

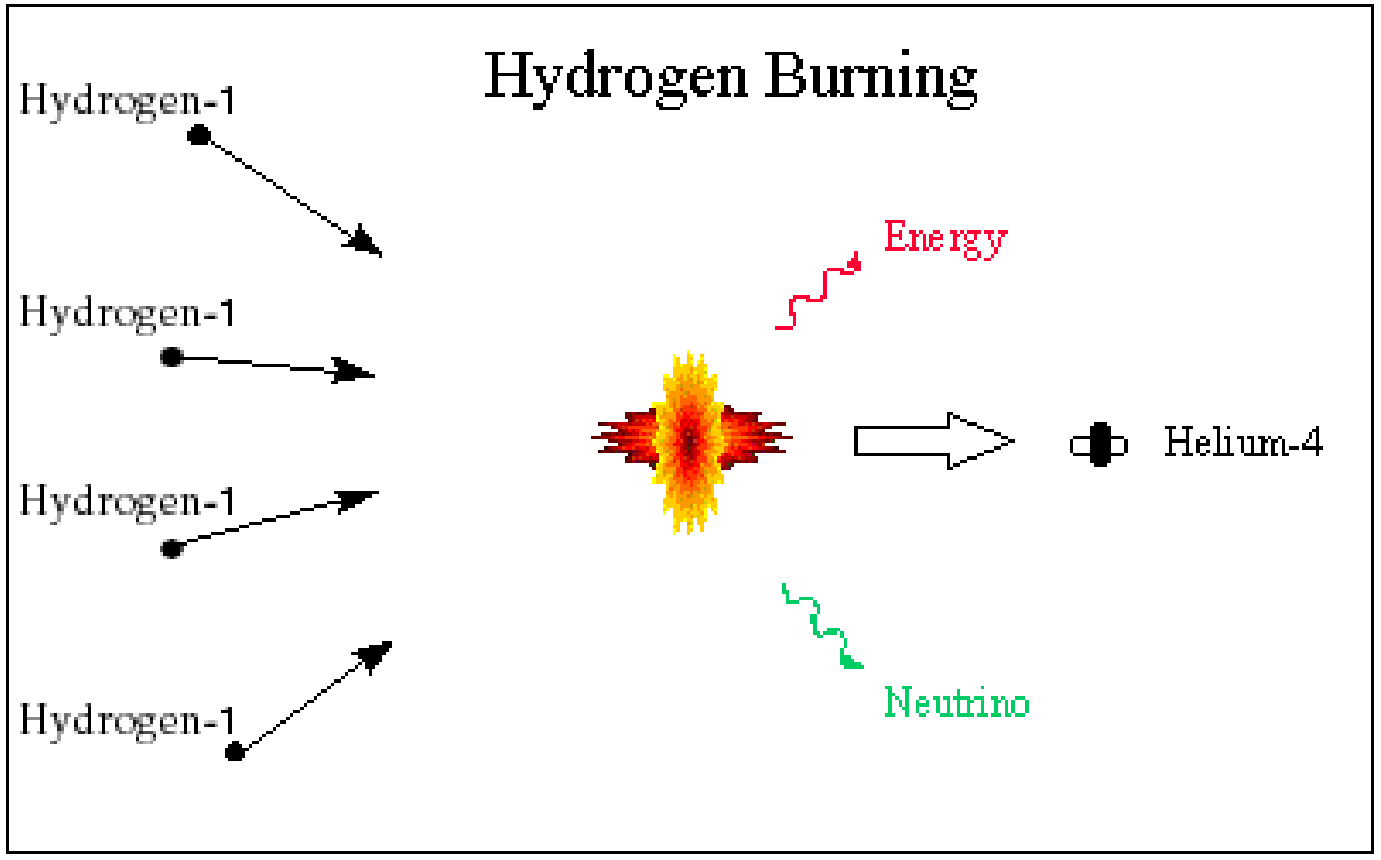


Hydrogen
1
H
1.0078

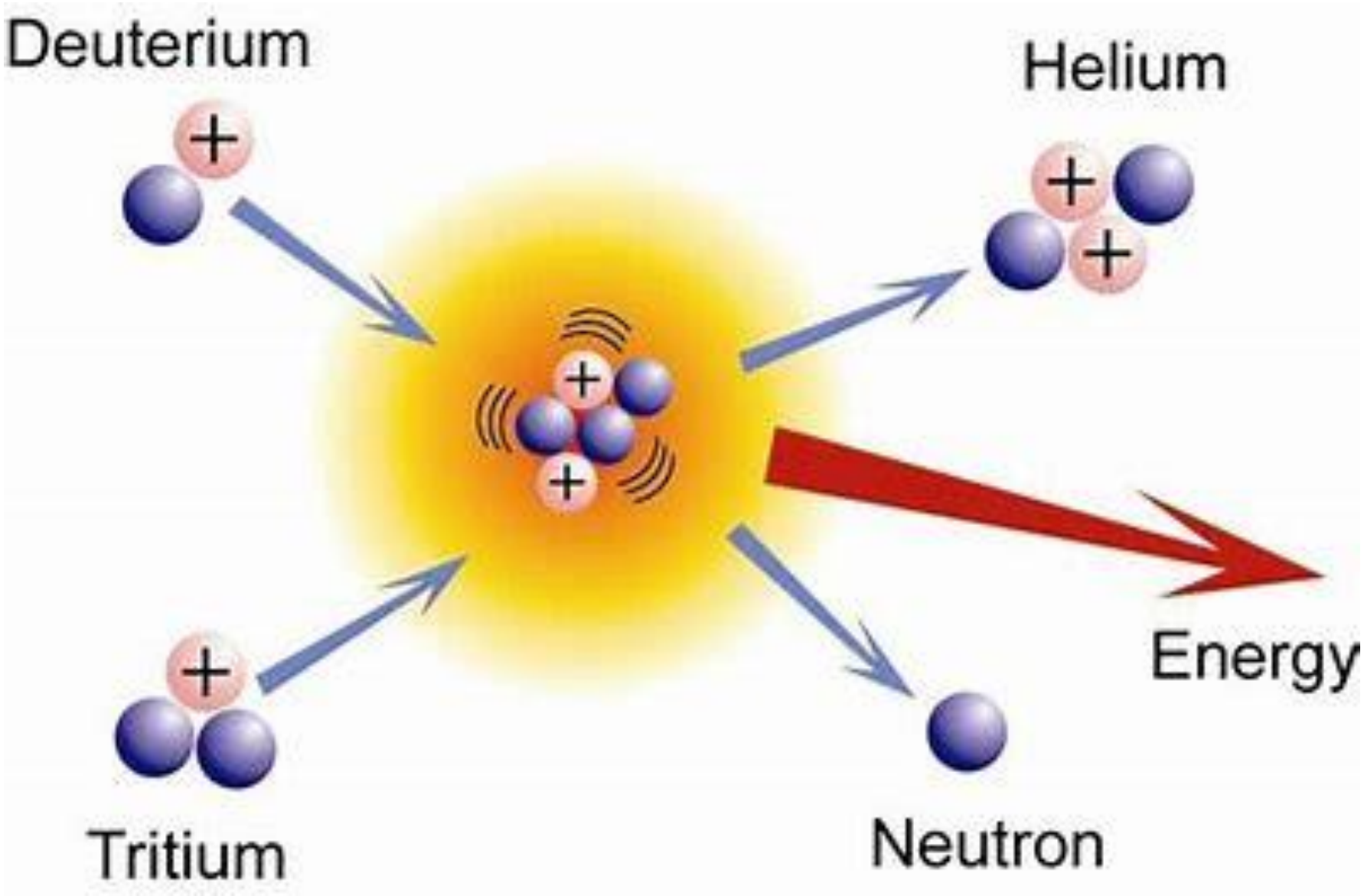


DRAW A HELIUM ATOM

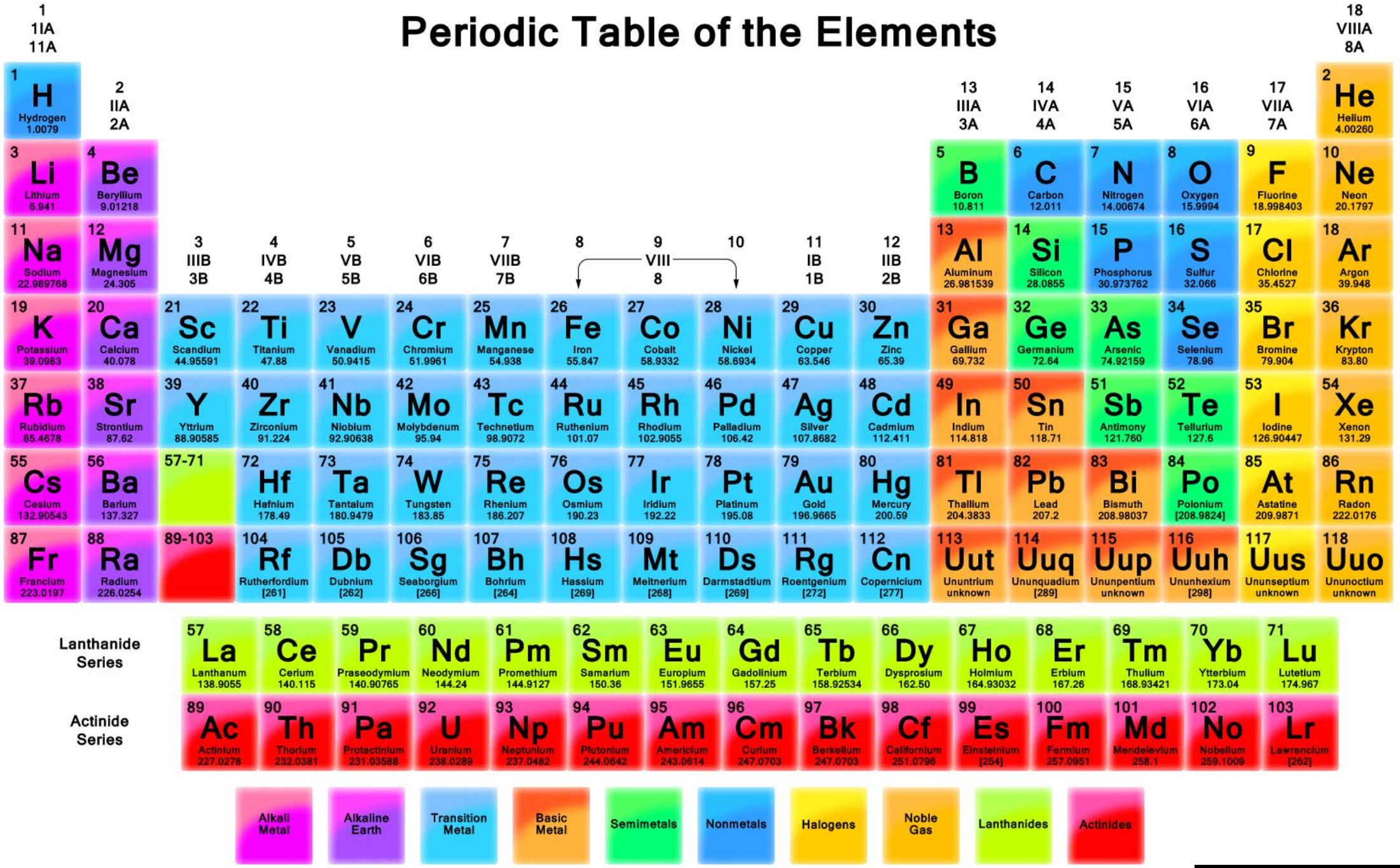


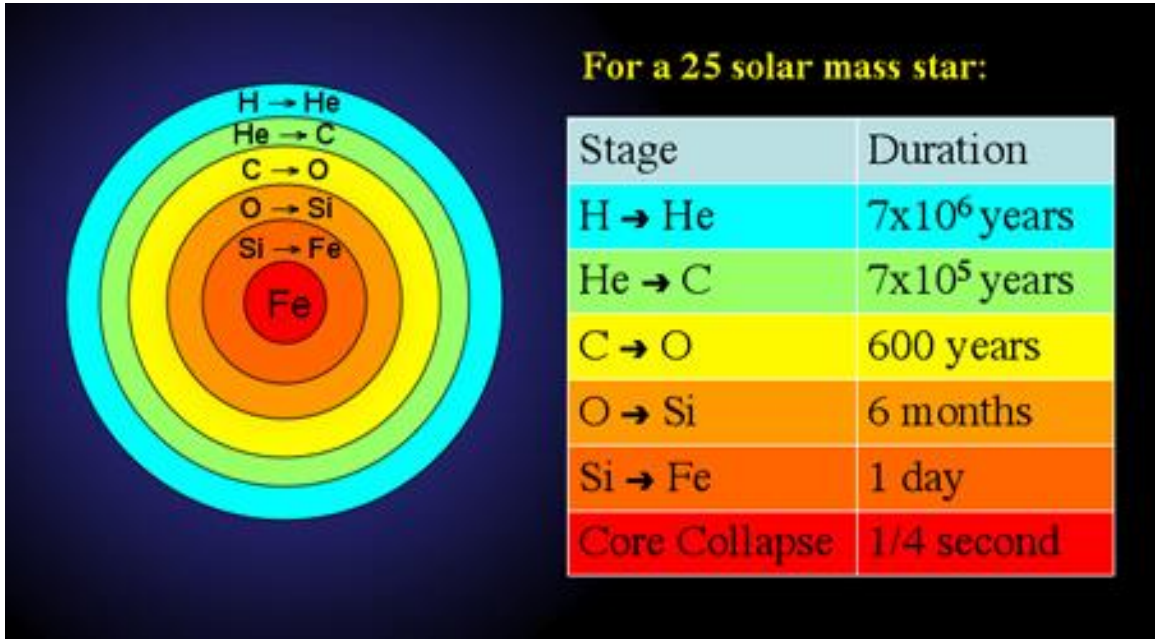


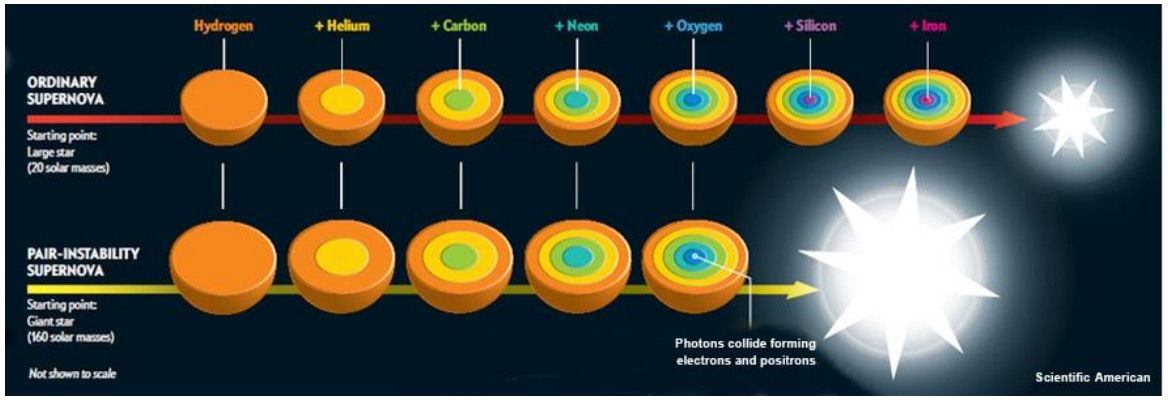
NUCLEAR FUSION IN THE SUN


Deuterium
Helium
Energy
Tritium
Neutron

Periodic Table of the Elements







SIZE OF THE STAR DETERMINES HOW BIG OF ELEMENTS ARE MADE

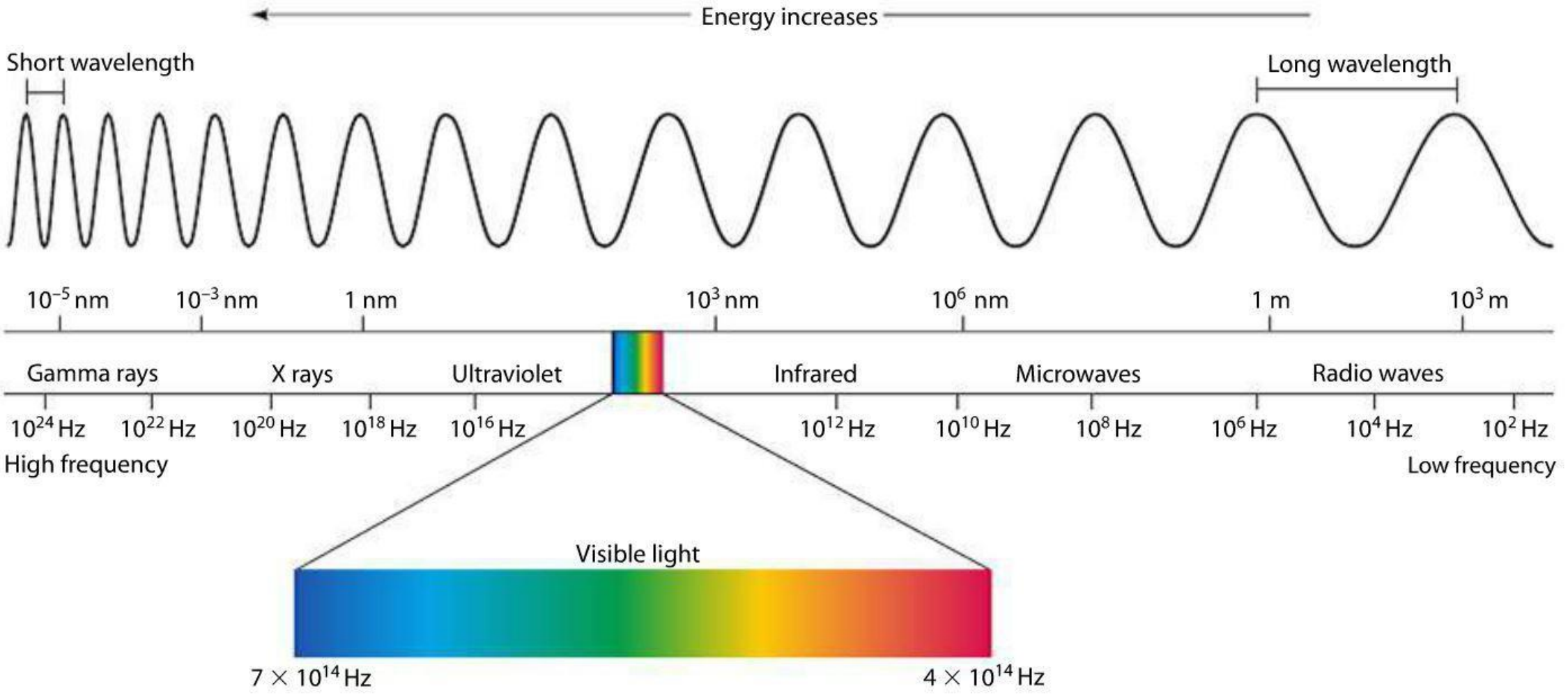
WEDNESDAY 2-12-2020

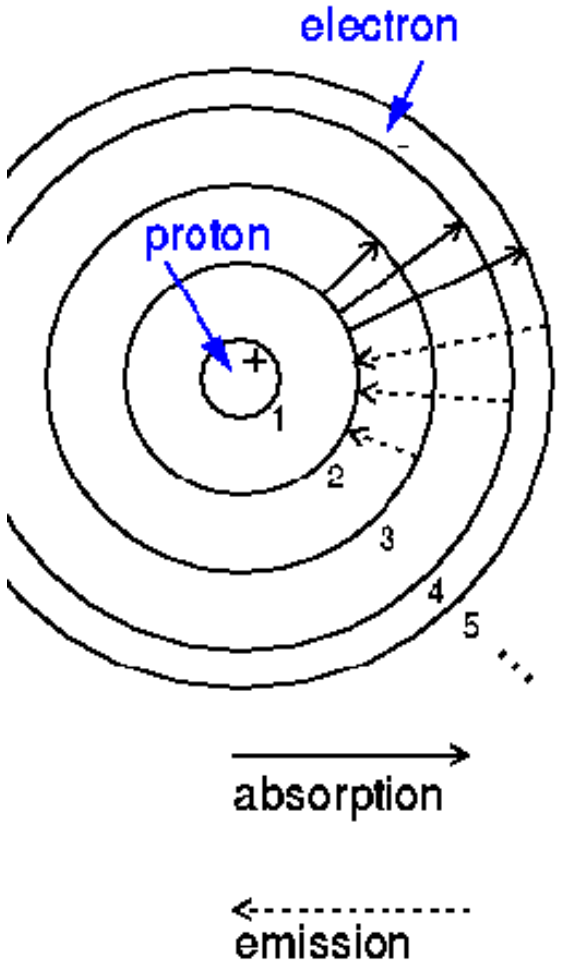
- Bell Ringer: In 2 sentences or more describe nuclear fusion and how stars make different elements.

- Today's Agenda:
  - Bell Ringer
  - Electromagnetic Radiation (Mini lecture)
  - Spectroscopy Lab (open in One Note)

- Learning Objective: I can explain where larger elements come from.

ELECTROMAGNETIC RADIATION IS ALL THE WAVELENGTHS OF ENERGY EMITTED BY A STAR. WE CAN ONLY SEE A SMALL PORTION, OR THESE WAVELENGTHS CALLED THE VISIBLE SPECTRUM.





Bohr Model of Hydrogen Atom

Ground State: Electron is in lowest energy level.

Absorption Spectrum: Electron absorbs light photons and jumps up to an excited state of higher energy .

Emission Spectrum: Electron emits light photon as it jumps down to a state of lower energy .

DIFFERENT GASSES PRODUCE DIFFERENT EMISSION SPECTRA