

Gravitation Effects

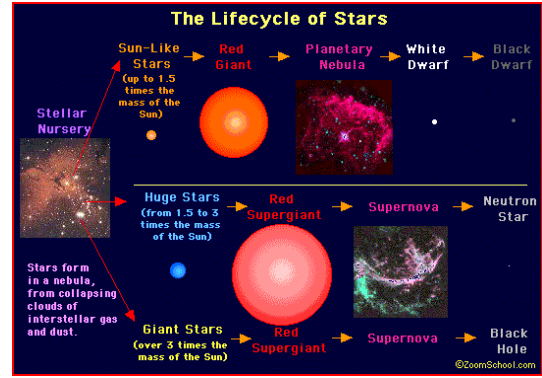
Gravitation Effects

Objectives

Understand how black holes are formed.

Identify the A_g inside the Earth's surface.

Describe how gravity affects tides on Earth.



Black Hole Formation

Massive Red SuperGiant

Large star "dies"

Star core collapses
Temperature of core rises



Size of Star
Size of Earth's Orbit
Size of Jupiter's Orbit

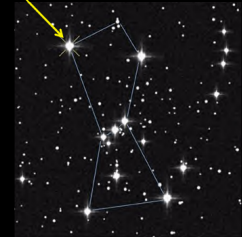
Black Hole Formation

Massive Red SuperGiant

Betelgeuse in constellation Orion

Large star "dies"

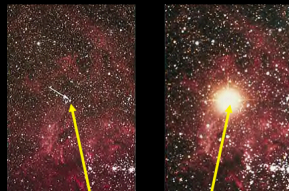
Star core collapses
Temperature of core rises



Black Hole Formation

Supernova

Energy from core overloads outer star
Outer star explodes



Before After
Supernova 1987A


Black Hole Formation

Black Hole

Artist's drawing of black hole & orbiting satellites

Outer star collapses
Gravitational pull increases
Black hole formation begins

Black Hole Formation



Black Hole

Outer star collapses

Gravitational pull increases

Black hole formation begins

Black Hole Formation

Massive Red SuperGiant

→

Supernova

→

Black Hole

Large star "dies"

Star core collapses

Temperature of core rises

Energy from core overloads outer star

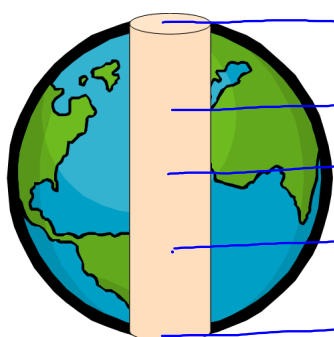
Outer star explodes

Outer star collapses

Gravitational pull increases

Black hole formation begins

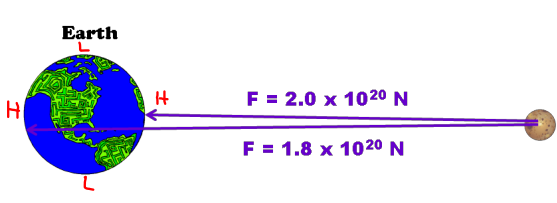
Gravity inside a Planet



Handwritten labels for gravity strength:

- Surface: 10 m/s^2
- Inner shell: 5 m/s^2
- Center: 0 m/s^2
- Inner shell: 5 m/s^2
- Surface: 10 m/s^2

Tides & Gravity



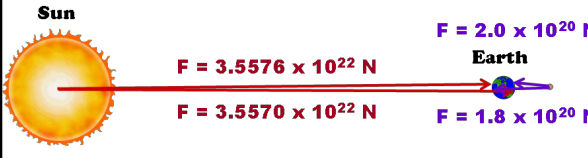
Labels: Earth, H (High tide), L (Low tide)

Force from Moon: $F = 2.0 \times 10^{20} \text{ N}$

Force from Earth: $F = 1.8 \times 10^{20} \text{ N}$

Note: Distances not to scale!

Tides & Gravity



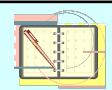
Labels: Sun, Earth

Force from Sun: $F = 3.5576 \times 10^{22} \text{ N}$

Force from Earth: $F = 1.8 \times 10^{20} \text{ N}$

Note: Distances not to scale!

Assignments . . .



- Begin Chapter 12 Homework #1 - 7

