February 10, 2010

Exam key posted sometime today. Scores on egradebook.

Reading, Sections 6.4, 6.5. Sections 1.2, 2.1, 2.4, 2.5 for background.

Manos office hours changed to T, Th 2:00 - 3:30

Astronomy in the News? Solar satellite to be launched this week.

Pic of the Day - volcano erupting in Japan

Exam Pool Results:

Everyone in favor of “discussion points” but some confusion over “discussion points” versus “one-minute exams.” I’ll ask again about discussion points so please think about them.

Most people were not disturbed by laptops or texting, but a significant fraction 10 - 20% were.

Laptops are more of an issue than texting.

I am concerned about bothering people around you.

Many mentioned “disrespect” for the professor.

Facebook was mentioned in many of the complaints.

Remember everyone sitting behind you is reading your laptop screen.

Sky Watch Objects

Lyra - Ring Nebula, planetary nebula in Lyra

Cat's Eye Nebula, planetary nebula in constellation Draco

Sirius - massive blue main sequence star with white dwarf companion

Vega - massive blue main sequence star in Lyra

Antares - red giant in Scorpius

Betelgeuse - Orion, Red Supergiant due to explode "soon" 15 solar masses

Rigel - Orion, Blue Supergiant due to explode later, 17 solar masses

Aldebaran - Bright Red Supergiant in Taurus, 2.5 solar masses (WD not SN)

Castor, Rigel - massive blue main sequence stars

Capella, Procyon - on their way to becoming red giants

U Sco - Scorpius, recurrent nova

SN 1006 - Lupus/Centaurus (difficult this time of year)

SN 1054 Crab Nebula - Taurus

SN 1572 Tycho - Cassiopeia

SN 1604 Kepler - Ophiuchus

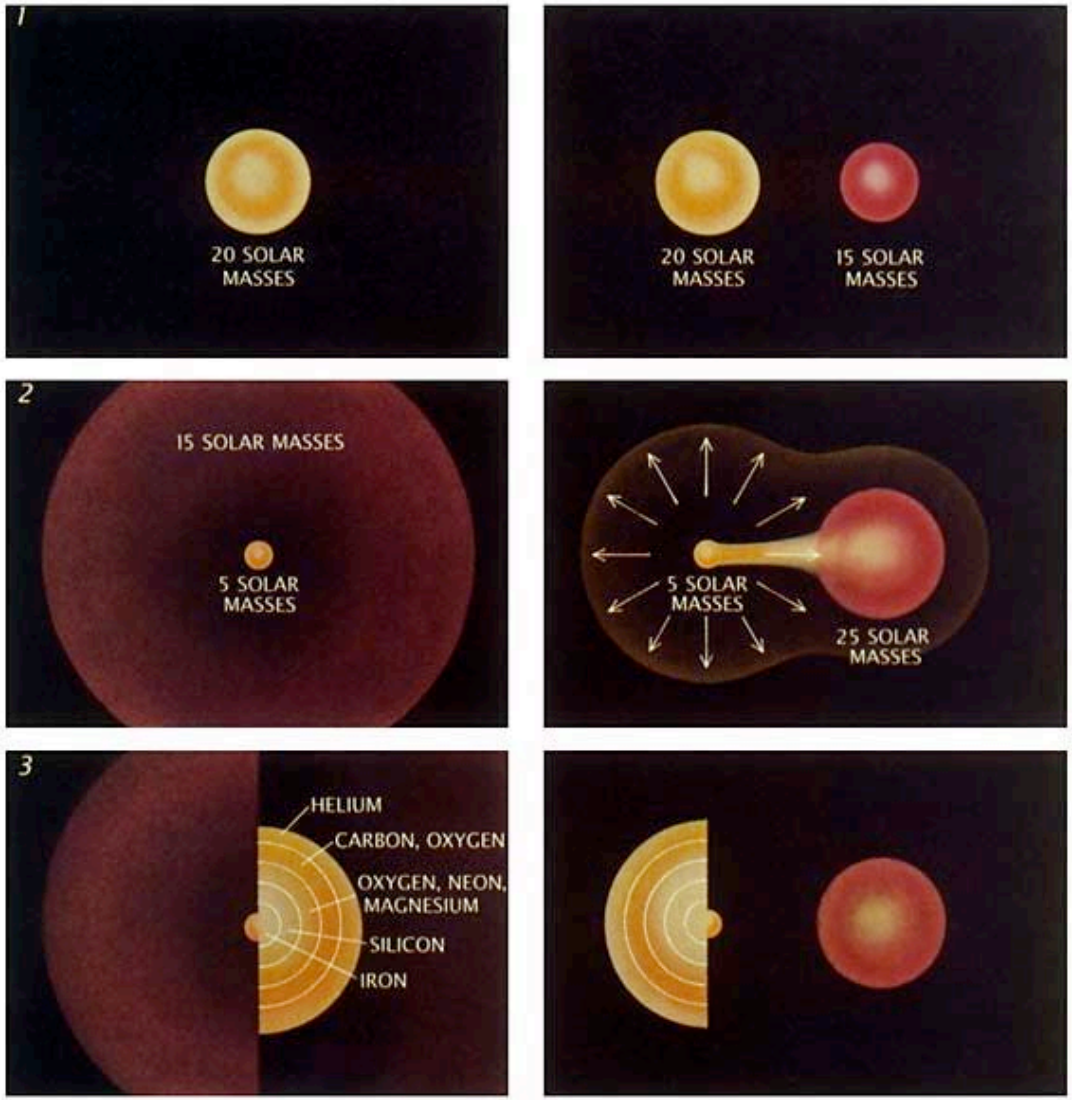
Cassiopeia A - Cassiopeia

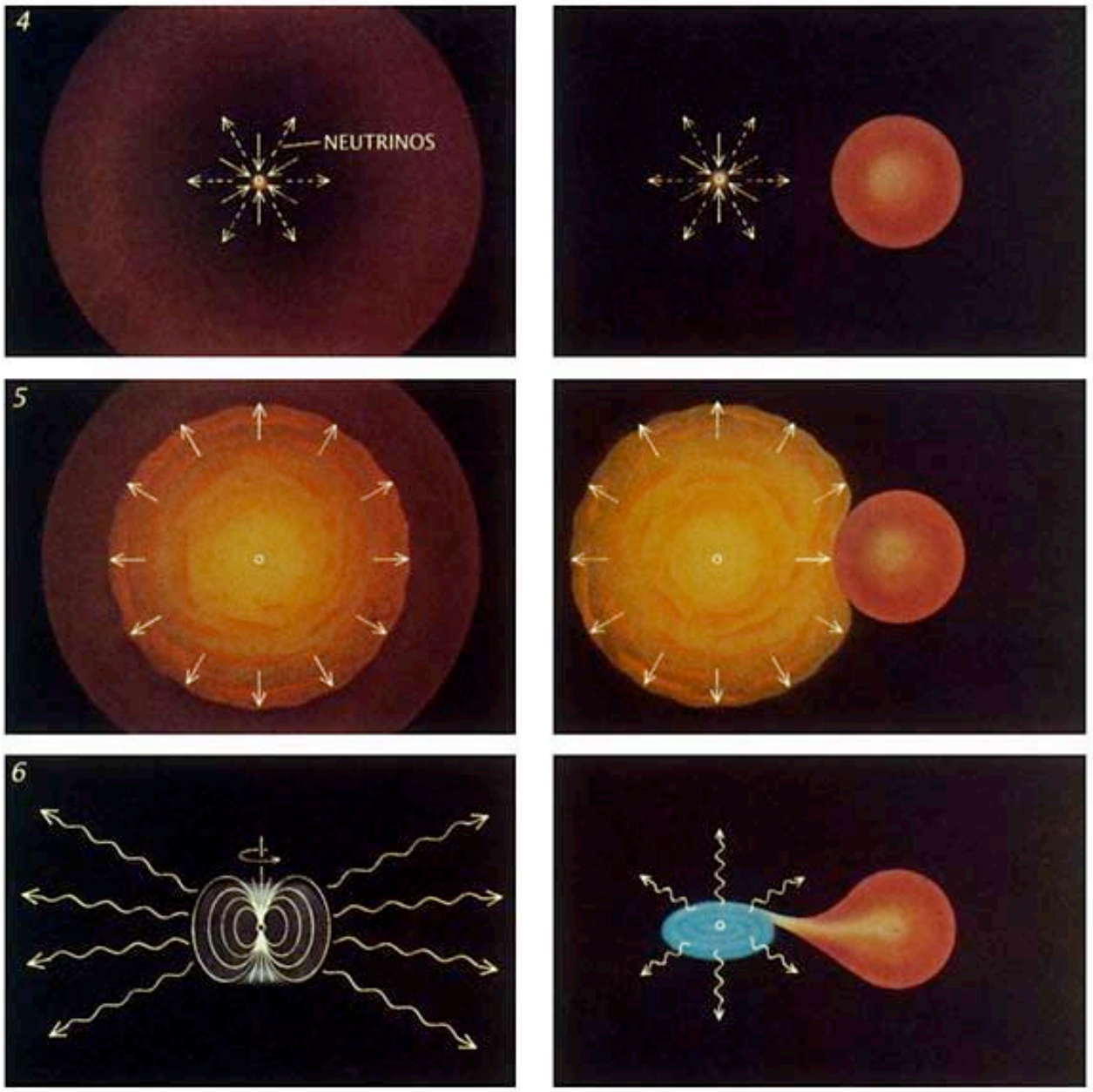
Vela supernova - Vela (not this time of year)

Single star: Type II

Same star in binary: Type Ib/c

Same evolution inside star, thermal pressure, regulated burning, shells of heavier elements, whether envelope there or not





Rotating, magnetic radio pulsar.

Neutron star in binary system, X-ray source

One minute exam

Why do you have to heat a nuclear fuel to make it burn?

 Charge repulsion keeps nuclei apart

 The strong nuclear force keeps nuclei apart

 To overcome the loss of neutrinos

 To make protons

Iron core of massive star absorbs energy, collapses in about 1 second to form a ***neutron star***.

Essentially all protons and electrons are converted to neutrons with the emission of a ***neutrino***, tiny mass, no electrical charge, interacts little with normal matter, only through weak nuclear force (Chapter 1.2)

Neutron Star - mass of Sun, but size of small city, ~ 10 kilometers in radius, density of atomic nucleus.

Huge gravity - surface is now ***much closer*** to the center!

One minute exam

What is the importance of iron in massive stars?

 It produces a great deal of energy

 It absorbs energy

 It produces neutrinos

 It combines with oxygen and produces rust

When a neutron star forms, get huge energy from dropping from size of Earth or White Dwarf to size of Austin.

100 times more energy than is needed to explode off the outer layers of the massive star.

That does not guarantee an explosion!

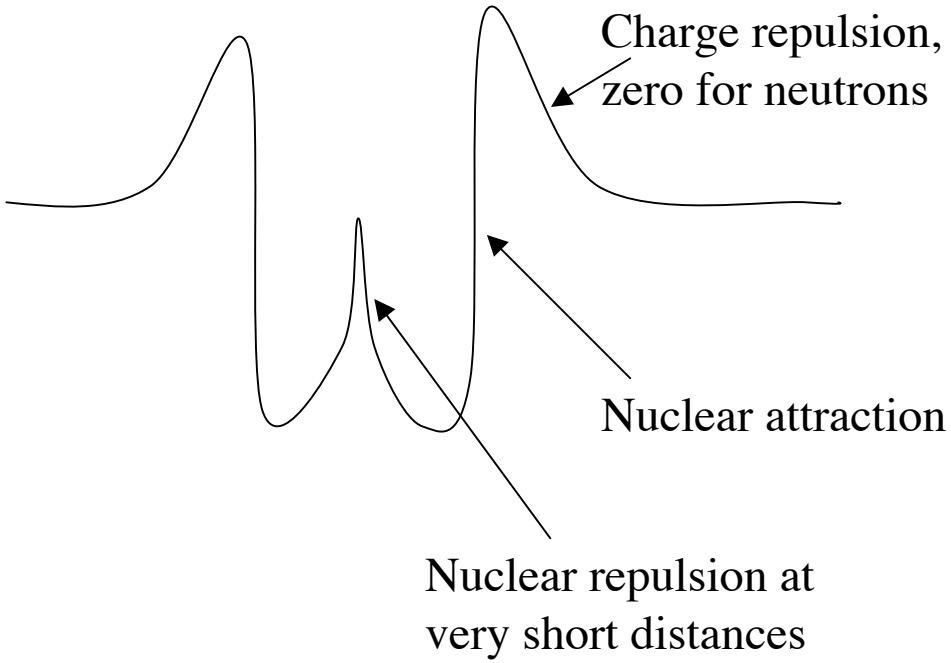
The outer parts of the star, beyond the neutron star, are ***transparent to the neutrinos***, the neutrinos flood out freely and carry off most of the energy.

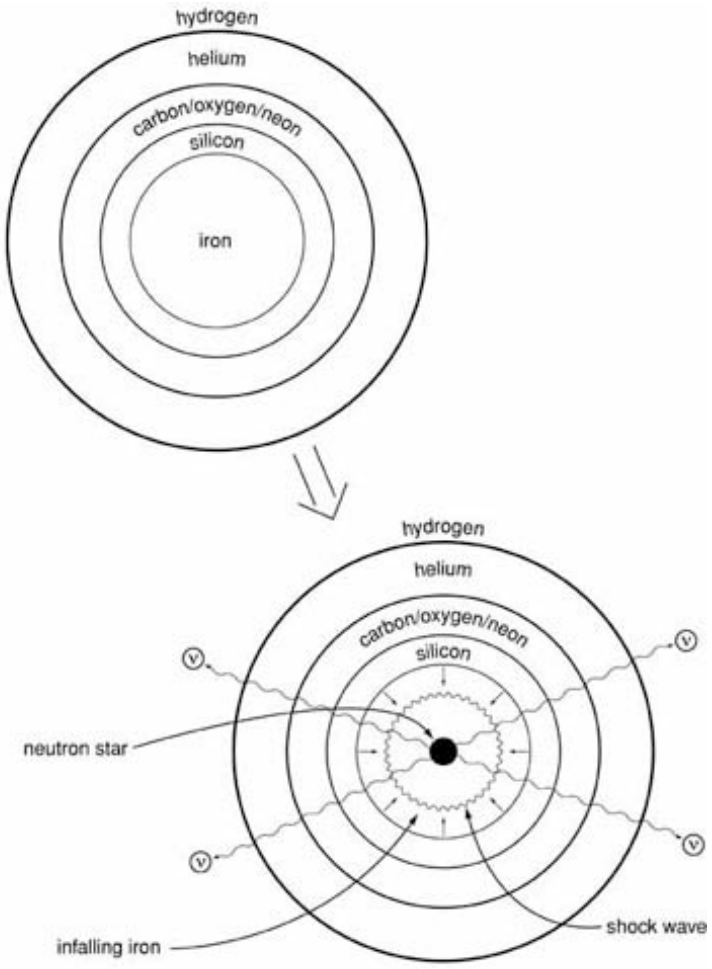
Is 1% of the neutrino energy left behind to cause the explosion?

Tough problem! 1.5% is plenty, 0.5% is too little.

Fig 6.1

Collapse is halted by the repulsive nuclear force (somewhat uncertain) + quantum pressure of neutrons

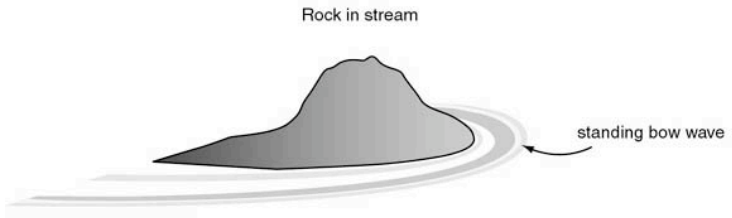




Maximum mass of a neutron star is 1.5 to 2 solar masses

New-born neutron star over compresses and rebounds - potential mechanism for explosion,

DOES NOT WORK!



Form ***standing shock***, and outer material just continues to fall in, pass through shock front and settle onto the neutron star.