2/6/2008

# Exam 1: Friday [First Sky Watch Reports Monday]

***Chapter 5, portions of chapters 1 - 4, 40 multiple-choice questions***

Review sheet posted on web site

Review session TOMORROW 5 PM  RLM 15.216B

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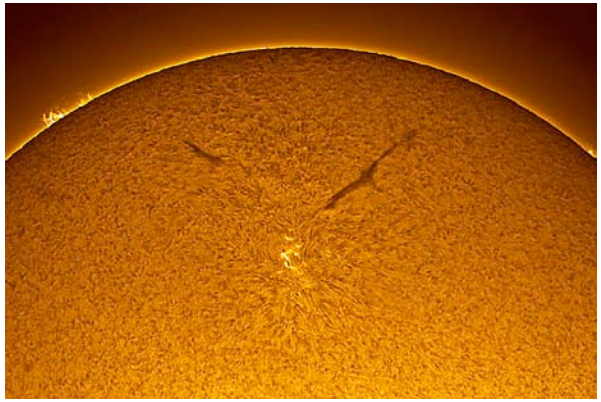
Astronomy in the news? Shuttle launch to International Space Station Thursday

Pic of Day - new solar cycle



***Type Ia***
no Hydrogen or Helium
intermediate mass elements early on, iron later
avoid spiral arms, occur in elliptical galaxies
peaked light curve
***all consistent with explosion in white dwarf, total disruption***

Type II
Hydrogen early on, Oxygen, Magnesium, Calcium later
explode in spiral arms, never in elliptical galaxies
"plateau" light curve
***consistent with massive, short-lived star that has an explosion deep within a Hydrogen Red Giant envelope by core collapse to leave behind a neutron star (or maybe a black hole).***

One minute exam

A supernova explodes in an elliptical galaxy. Near peak light what element do you expect to see in the spectrum?

A) Hydrogen

B) Helium

C) Silicon

D) Iron

New Types, blurring the old categories, identified in the 1980's, defined by elements observed in the ***spectrum***.

Type Ib: no Hydrogen, but Helium early, near maximum brightness; Oxygen, Magnesium, Calcium later on

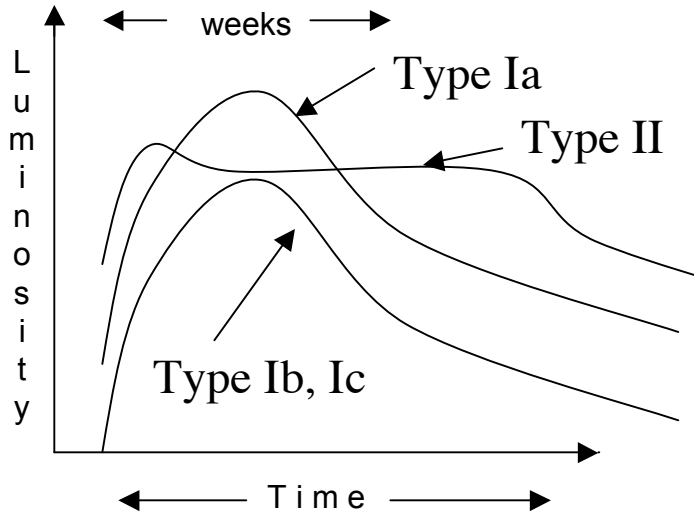
Type Ic: no Hydrogen no (or *very* little) Helium early, near maximum brightness;
Oxygen, Magnesium, Calcium later on

Explode in the spiral arms of spiral galaxies ⇒ massive stars,
Never in elliptical galaxies expect neutron star
or black hole

Like Type II, but have somehow lost their outer layers of Hydrogen or even Helium ⇒ wind (§2.2) or binary mass transfer

***Type Ib, Type Ic Light Curve***

Similar to a Type Ia, usually, but not always, dimmer, consistent with a star that has lost its outer, Hydrogen envelope (or even Helium for a Type Ic) [will explain why dimmer later]




Crab might have had a light curve like this, but probably too much Hydrogen to qualify as a Type Ib

Cas A seems to have been dim at explosion, might have been a Type Ib, despite some evidence for a little Hydrogen in the remnant now

One Minute Exam

A supernova that explodes within the spiral arm of a spiral galaxy and shows no evidence for hydrogen or helium in its spectrum is probably a

A Type II supernova

B Type Ia supernova

C Type Ib supernova

D Type Ic supernova

***Type Ia***:  No Hydrogen, oxygen, magnesium, silicon, sulfur, calcium early, Iron later.

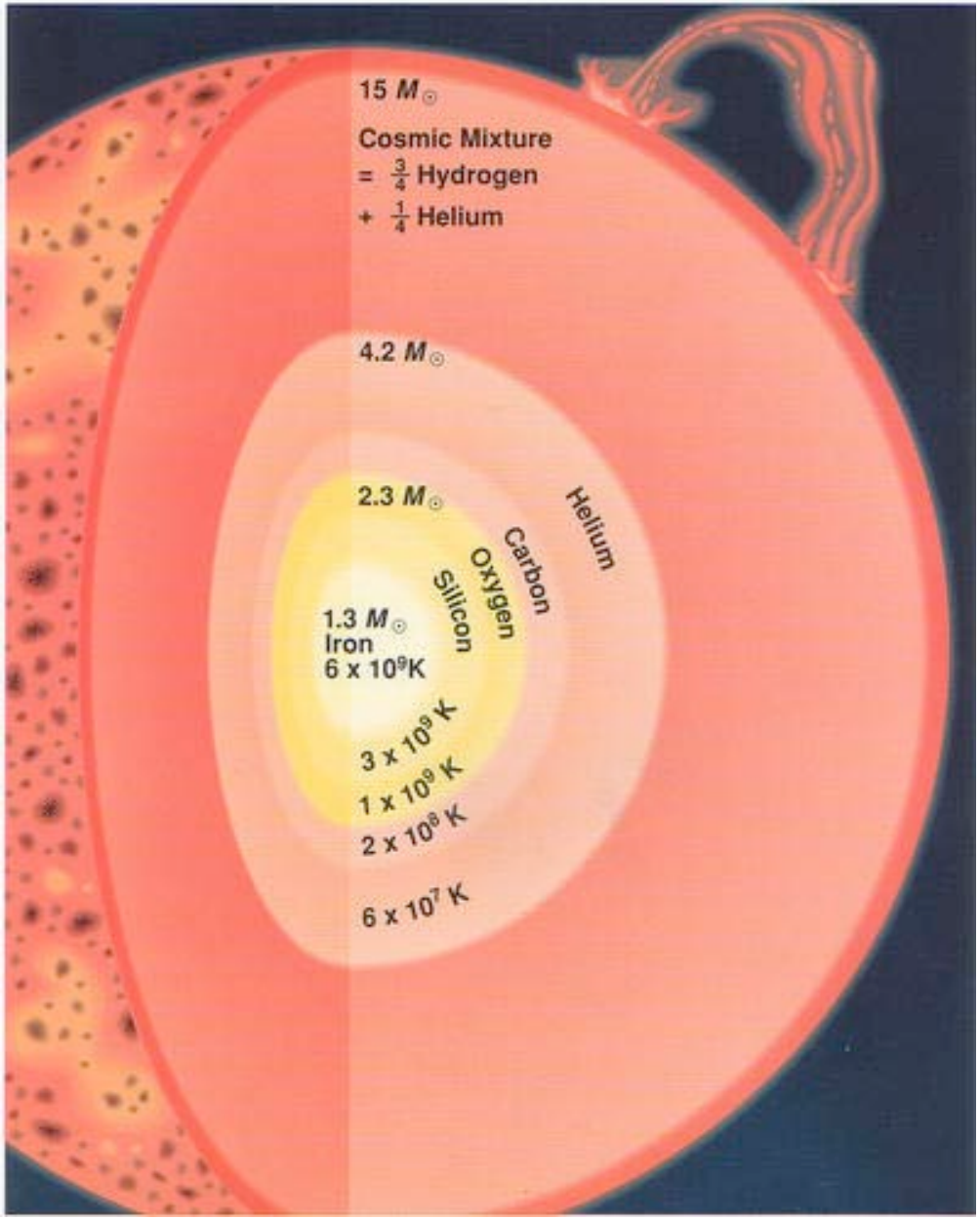
Not in spiral arms, do occur in elliptical galaxies -> old when blow -> white dwarfs, total disruption, no neutron star.
***Original mass on the main sequence M < 8 solar masses***

***Type II***: Hydrogen early, Oxygen, Magnesium, Calcium, later.

***Type Ib***: no Hydrogen, but Helium early,  Oxygen, Magnesium, Calcium later. ***H envelope lost, wind or binary transfer.***

***Type Ic***: no Hydrogen no (or *very* little) Helium early, Oxygen, Magnesium, Calcium later. ***Even more mass loss, wind or transfer.***

In spiral arms, never in elliptical galaxies -> short lived -> massive star -> expect core collapse, neutron star or black hole.
***Original mass on the main sequence M > 8 solar masses***




Origin of Type II, Ib. Ic

How does a massive star get from hydrogen to iron, and why iron, and what then?

Evolution - gravity vs. charge repulsion
§ 2.1

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

H → He → C → O
more protons, more charge repulsion, must get ever hotter to burn ever "heavier" fuel

Just what massive stars do!
Support by thermal pressure.
When fuel runs out, core tries to cool but gravity squeezes, core contracts and HEATS UP
overcomes higher charge repulsion, burns new, heavier fuel, ***until get to iron***

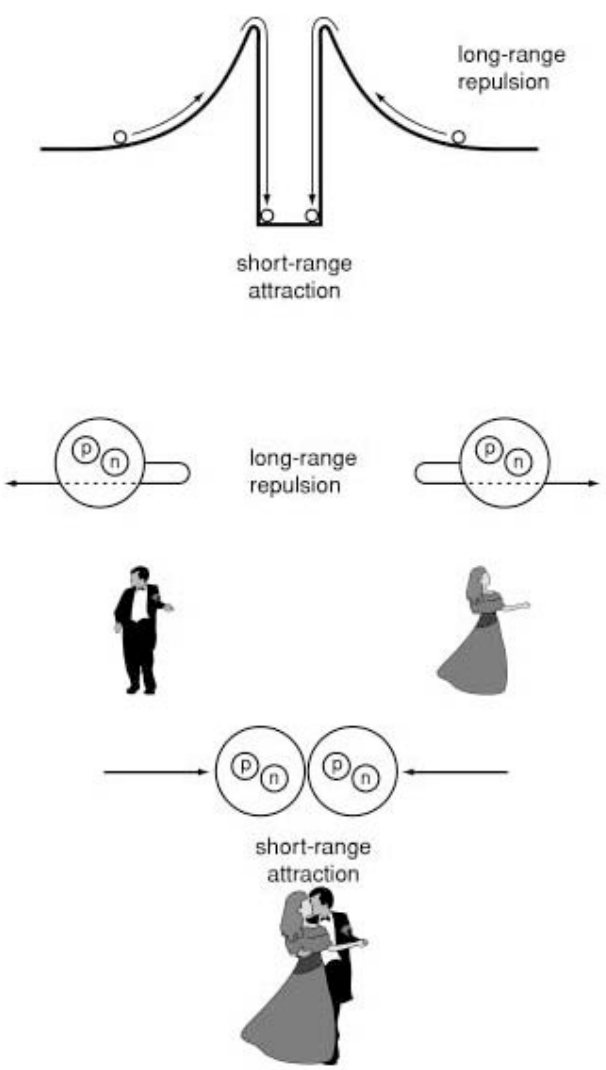



Figure 2.1