Quiz 2: ASTR-2 Fall 2019

$E=mc^2$ in units of ergs if "m" is in grams and "c"=$3x10^{10}$ cm/sec; Mass of the Sun: 2 x 10^{33}grams; Luminosity of the Sun: 4 x 10^{33} ergs/sec

1. **Which of the following best describes the technique used to determine the radius of a star (check one):**

___ measure the apparent size of the star then make a $(1/d^2)$ correction for the distance

___ measure the wavelength at which the radiation from the star is the greatest and use the parallax for the distance measurement

_X__ measure the surface temperature and luminosity of the star then use Stephan's law for radiation per unit surface area

___ measure the apparent brightness of the star and use the luminosity to solve for the area of the star then divide by 2π.

2. **Star A has a trigonometric parallax angle twice as large and the same apparent brightness as Star B (assume no dust toward either star).**

a) What is the relative distance of the two stars?

Star A is at ½ the distance of star B (one point for getting A, one more for the ½)

b) What is the relative luminosity of the two stars?

Star B must have 4x the luminosity of Star A to compensate for the factor of two in distance.

3. **The Sun will eventually go through which of the following phases (check all that are correct)?**

_**x**__ planetary nebula

_x__ red-giant branch

__x_ main sequence

__x_ white dwarf

4. **Why is there a lower mass limit of ~0.08M_{Sun} for stars (select best answer)?**

___ because of radiation pressure and the "Eddington Limit"

___ because this is the smallest mass for a gas cloud that can collapse under gravity to form a star

__x__ because objects below this mass do not reach a core temperature of at least 10^7K

___ because electron degeneracy pressure prevents hydrogen fusion below this mass

5. **Which of the following are True (T), which False (F)?**

_**T**__ The Sun and other main-sequence stars generate their luminosity through fusion reactions

_T__ The Sun is losing mass every day

_T__ The fraction of the Sun composed of He is larger now than it was 1 billion years ago

_F__ The luminosity of the Sun decreases a small amount every day as it uses up its hydrogen fuel

6. **Which of the following are used in measuring stellar masses (check any that are)? (SCORE 0 through 4, i.e treat it as true/false with no check=false)**

____ Proper motion measurements of nearby star

__x__ Radial velocity measurements of stars in binary systems

____ Red Giants that are within 100pc of the Sun

__x__ Newton's Laws of gravity

7. **"Hydrostatic" models for the Sun or other stars are based on (check any that are correct):**

____ Gas pressure compressing stars to the point just before they become liquid

_x___ Balancing the force of gravity and gas (thermal) pressure at every radius

____ The laws of physics governing the fusion of the elements

____ Static electricity providing support against gravitational collapse

8. **Which of the following are true (T) for the evolution of a star with 10 times the mass of the Sun?**

__**T**__ A $10M_{Sun}$ star will fuse elements up to the mass of Fe in its core

____ A $10M_{Sun}$ star will end its life as a much more massive white dwarf compared to the white dwarf the Sun will eventually become

__T__ A $10M_{Sun}$ star will explode as a SNII (Type II supernova)

____ $10M_{Sun}$ stars are much more common in the Galaxy than stars like the Sun

9. **Which of the following support the theory of SN II: core-collapse supernovae?**

__X__ SN II are always seen near regions of star formation

_X__ The supernova remnants in the Galaxy show evidence of heavy element enhancements

_X___ There are pulsars (rotating neutron stars) at the centers of some SN II remnants

____ They have luminosities similar to red giant stars

10. **How long will a star with 0.5 times the mass of the Sun and 0.1 times the luminosity of the Sun spend on the Main Sequence of the H-R Diagram (the Sun's lifetime is $10x10^9$ years)?**

Lifetime=(mass/luminosity)x10 billion years = ½ x 1/10 x $10x10^9$ =0.5×10^{11} years

Full credit for writing (0.5/0.1) x 10 x 10^9 years