

25. The pulsed nature of the radiation at all wavelengths that is seen to come from the pulsar in the Crab Nebula is produced by \_\_\_\_\_.
- A) the mutual orbiting and eclipsing of two very hot star in a close binary (double star) system
  - B) the rapid pulsation in size and, therefore, brightness of a small white dwarf star
  - C) the rapid rotation of a neutron "star" which is producing two oppositely-directed beams of radiation from its polar regions
  - D) extremely hot matter that is rapidly orbiting a black hole just prior to descending into it
  - E) an effect caused by the Earth's rotation on its axis
26. The silicon fusion stage in the core of a massive star supports the star against \_\_\_\_\_ for a period of approximately \_\_\_\_\_. The subsequent, actual, explosive supernova event lasts on the order of \_\_\_\_\_.
- A) electromagnetic repulsion in the core, 600 years, a few hours
  - B) electromagnetic repulsion in the core, one day, 1% of its entire lifetime
  - C) evolution off the Main Sequence, 10% of its entire lifetime, a few hours
  - D) gravitational collapse, one day, seconds
  - E) gravitational collapse, 600 years, seconds
27. The phrase "Schwarzschild radius" refers to \_\_\_\_\_ and the designation "pulsar" refers to \_\_\_\_\_.
- A) the distance to which gas is first ejected in a planetary nebula, the rotation period of a white dwarf
  - B) half the diameter of a neutron "star", the period during which the neutron star is eclipsed by its companion star
  - C) half the diameter of the singularity in a typical stellar black hole, a neutron star
  - D) the distance from the center of a black hole to where the escape velocity is equal to the speed of light, the remnant core from the death of a middleweight ( $8 M_{\odot}$ - $20 M_{\odot}$ ) star
  - E) the distance from the event horizon to the accretion disk of a black hole, the remnant core from the death of a very massive ( $>33 M_{\odot}$ ) star
28. The intense x-ray flux emitted by a suspected black hole is generated by \_\_\_\_\_.
- A) the deceleration of matter as it stops abruptly at the event horizon of the black hole
  - B) frictional and compressional heating in captured material as it moves around just outside the black hole
  - C) light which is emitted by jets of hot gas becomes extremely blueshifted into the X-ray region of the electromagnetic spectrum
  - D) the excitation of atoms and molecules caused by the extreme gravitational field of the black hole
  - E) matter-antimatter annihilation occurring just inside the black hole
29. What is actually, physically, visually located right at the event horizon of every black hole?
- A) nothing
  - B) a projected image of the singularity
  - C) an elongated astronaut
  - D) a very thin film of stretched-out Dark Matter
  - E) an HI (pronounced "H-one") region
30. What happens to the **radius** of the black hole if you triple the mass of the singularity of the black hole?
- A) Nothing happens; the radius is constant.
  - B) The black hole shrinks to 1/3 of its previous size.
  - C) The radius becomes three times longer.
  - D) The black hole shrinks to 1/9 of its previous size.
  - E) the radius becomes 9 times longer.