

**Star formation happens \_\_\_\_\_.** (GMC= giant molecular cloud) (ISM = interstellar medium)

- a. in GMCs
- b. in H I regions
- c. in the coronal gas in the ISM
- d. just after a planetary nebula forms
- e. just before the Helium Flash

**The dimming of the visible light from distant stars is caused primarily by \_\_\_\_\_.**

- a. hydrogen atoms
- b. dust particles
- c. molecules such as carbon monoxide
- d. ice crystals (clouds)
- e. the blocking of the distant stars by foreground stars

**The bright red emission nebulas known as H II regions form \_\_\_\_\_.**

- a. around stars like the Sun
- b. in regions where you typically find planets
- c. around binary star systems
- d. around massive, hot stars
- e. around every protostar we have seen

**Which of the following statements about the initial chemical composition of Main Sequence stars is correct?**

- a. Most are composed primarily of hydrogen and oxygen
- b. Most are composed of hydrogen and helium
- c. Most are composed of nitrogen and oxygen
- d. Massive stars are composed primarily of hydrogen and carbon
- e. Low mass stars are pure hydrogen gas spheres

**A Reflection Nebula requires the presence of which of the following?**

- a. carbon and water
- b. a brown dwarf and hydrogen gas
- c. dust and a massive star (an O or B star)
- d. dust and a planetary nebula
- e. hydrogen and helium gas

**Which relationship concerning the mass of protostars is false?**

- a. The more massive protostars reach the main sequence first.
- b. The most massive protostars will be the hottest and most luminous stars.
- c. The more massive protostars will be made of the heaviest elements.
- d. The more massive protostars will become hot enough to produce H II regions.

**Photons with energies slightly lower than the energies of visible light photons are**

- a) infrared photons.
- b) radio photons.
- c) ultraviolet photons.
- d) x-ray photons.
- e) photon torpedoes.

**Rigel has an apparent magnitude of 0.1 and Polaris has an apparent magnitude of 2.1. What is the ratio of the fluxes from these two stars?**

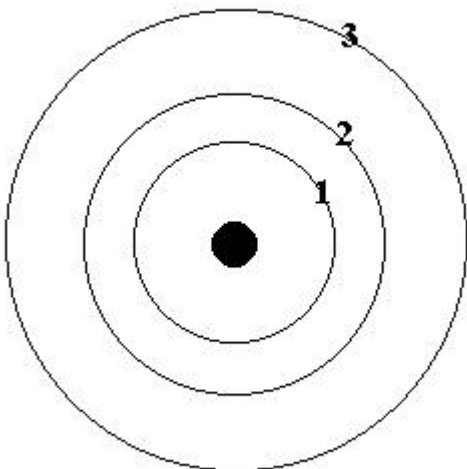
- a) 2.0
- b) 2.512
- c) 5.024
- d) 6.31
- e) 100

**The temperature of an object is a measure of**

- a) its total energy content.
- b) the average amount of energy per gram.
- c) the average amount of energy per particle.
- d) the total energy contained in the motions of all of the particles.

**A star with a surface temperature of 6000 K will emit a blackbody spectrum which peaks at what wavelength?**

- a) 6000 m
- b)  $5 \times 10^{-7}$  nm
- c) 18 nm
- d)  $5 \times 10^{-7}$  m
- e)  $1.8 \times 10^{-7}$  nm



In the above sketch, the Bohr model of an atom is represented with a black nucleus and three acceptable electron orbits. If an electron in this atom were initially in state 2 and moved to state 1, this would result in

- a) the emission of a light photon whose energy is equal to the energy of state 1.
- b) the absorption of a light photon whose energy is equal to the difference in energy between states 1 and 2.
- c) the emission of a light photon whose energy is equal to the difference in energy between states 1 and 2.
- d) the emission of a light photon whose energy is equal to the energy of state 2.
- e) the absorption of a light photon whose energy is equal to the energy of state 2.

**Still referring to the above sketch, which electronic transition would produce the shortest wavelength photon?**

- a) the transition from state 2 to state 1
- b) the transition from state 3 to state 1
- c) the transition from state 3 to state 2
- d) the transition from state 1 to state 3
- e) the ionization of the electron from state 1

**One of the primary differences between elliptical and spiral galaxies is that**

- a) elliptical galaxies do not have black holes at their centers.
- b) spiral galaxies do not have globular clusters.
- c) elliptical galaxies don't have as much dust as spirals.
- d) spiral galaxies are smaller than ellipticals.
- e) elliptical galaxies are older than spirals.

**Why can we see the center of our galaxy in infrared light, but not in visible light?**

- a) The center of our galaxy doesn't emit visible light.
- b) Because infrared photons have a lower energy than visible photons, stars emit more infrared light than visible light.
- c) Because infrared photons have a longer wavelength than visible light, infrared light can travel through the obscuring dust between here and the galactic center.
- d) Because infrared photons have a higher frequency than optical photons, they travel faster through the interstellar medium.
- e) The black hole at the center of our galaxy absorbs all of the light emitted in the galactic center region.

**When photons are emitted from a region of strong gravity such as the surface of a neutron star, their wavelengths change as they move outward because of**

- a) the doppler effect.
- b) the Hubble law.
- c) neutron degeneracy.
- d) the gravitational redshift.
- e) electron degeneracy.

**You measure the flux from two stars, star #1 in cluster Gak-6, and star #2 in cluster Bip-4. Based on their colors, you conclude that both stars have the same surface temperature. You also notice that star #1 has a higher flux than star #2. Based on this information, what can you conclude?**

- a) The two clusters are at the same distance.
- b) Cluster Gak-6 is closer to us than cluster Bip-4.
- c) Cluster Gak-6 is farther from us than cluster Bip-4.
- d) You don't have enough information to determine which cluster is closer.

**The surface temperature of a star can be determined from its**

- a) absolute magnitude.
- b) apparent magnitude.
- c) bolometric magnitude.
- d) color index.
- e) total luminosity.

**Main Sequence stars are supported against gravitational collapse by**

- a) thermal pressure from fusion in their cores.
- b) atomic pressure.
- c) electron degeneracy pressure.
- d) neutron degeneracy pressure.
- e) gravitational pressure.

**Which of the following is evidence for the presence of dark matter in the outer reaches of our galaxy?**

- a) Absorption of light from distant galaxies.
- b) Hydrogen spin-flip emission from the outer reaches of the galaxy.
- c) The high rotation velocity of material in the outer reaches of the galaxy.
- d) The small number of stars seen in the outer reaches of our galaxy.

The reason stars less than one-fortieth as massive as the sun are not found is that

- A)** the internal fission reactions use up all the fuel very quickly.
- B)** they are so small that they fall into black holes.
- C)** the gravitational forces in such a small star would not hold it together against the pressure produced by the nuclear reactions in its interior.
- D)** gravity cannot squeeze the matter sufficiently to produce the temperatures necessary for nuclear fusion reactions.