Astro 130, Homework on Chapter 18, Fall 2014
Name: _____ Date: Due on Oct 2, 2014

1. We see an emission nebula predominantly in
   A) blue light, originally emitted by stars within the nebula but scattered by dust.
   B) light emitted over a wide range of wavelengths by dust grains that have been heated by radiation from embedded stars.
   C) light emitted by molecules in the dense clouds of gas surrounding the stars in the nebula.
   D) the Balmer H_α red line, from recombination of electrons with nuclei in ionized hydrogen.

2. What radiation ionizes the hydrogen in an H II region?
   A) ultraviolet radiation from O and B stars
   B) X-rays from the coronas of solar-type stars
   C) intense infrared radiation from pre–main-sequence stars
   D) gamma rays from neutron stars embedded in the nebula

3. The distinct blue color of the nebulosity around stars in young clusters, such as the Pleiades, is caused by
   A) light emitted by very hot gas which has been heated by collisions in the interstellar gas.
   B) preferential scattering of blue starlight by small dust grains in the interstellar material.
   C) atoms of gas emitting light by fluorescence, having been excited by ultraviolet radiation from hot stars.
   D) halos caused by refraction of starlight in ice crystals in the nebula, similar to halos seen occasionally in Earth's atmosphere.

4. The effect of interstellar dust on starlight is
   A) to dim and redden distant stars by preferentially scattering their blue light.
   B) to scatter the red light from stars preferentially, making them appear more blue than expected.
   C) almost nonexistent, because light does not interact with dust.
   D) to make stars appear less bright than expected by absorbing light about equally at all wavelengths.

5. New stars are formed
   A) in huge, cool dust and gas clouds.
   B) from free space, out of pure energy.
   C) within supernova remnants.
   D) by condensation of gas near black holes in the centers of galaxies.

6. Protostars, when they *first* form from the interstellar medium, are usually
   A) detected easily because their light ionizes the surrounding interstellar gas, forming H II regions.
   B) very bright in ultraviolet light due to numerous flares (like solar flares but hotter and brighter).
   C) hidden from sight by dust clouds that emit infrared radiation.
   D) detected by emission lines in their visible spectra, emitted by gas being blown off their surfaces into space.

7. What determines whether a particular region of an interstellar cloud can collapse and form a star?
   A) only the temperature, because higher temperatures act to prevent collapse
   B) the relative concentration of dust to hydrogen gas in the cloud, because the dust is the major trigger that initiates collapse
   C) the amount of gravity pulling inward compared to gas pressure pushing outward
   D) the amount of mass in the cloud alone, because this determines the strength of gravity, which will act unopposed on the cloud

8. The major source of energy in the pre–main-sequence life of the Sun was
   A) gravitational.
   B) nuclear fusion.
   C) chemical burning of carbon atoms.
   D) nuclear fission.

9. The main factor which determines the rate at which a protostar evolves is its
   A) initial mass, smaller masses evolving faster.
   B) initial mass, larger masses evolving faster.
   C) initial composition.
   D) environment, protostars with binary companions evolving much faster.

10. It is believed that protoplanetary disks form around
    A) all stars.
    B) only the smallest stars with masses below about 0.4 solar masses.
    C) stars of small and intermediate size, with masses below about 3 solar masses.
    D) only the most massive stars, with masses above about 4 solar masses.

11. If we plot the stars in a *young* star cluster on a Hertzsprung-Russell diagram, we would expect to see
    A) the more massive stars above the main sequence and the less massive stars on the main sequence.
    B) all of the stars above the main sequence because none have evolved to the main-sequence stage.
    C) all stars on the main sequence.
    D) the more massive stars on the main sequence and the less massive stars above the main sequence.

12. What is the ultimate fate of an open cluster (or galactic cluster) of stars?
    A) It is torn apart by collisions with giant molecular clouds.
    B) Its stars finish their lives and explode as supernovae, until eventually there are no stars left.
    C) It gradually becomes more compact until the stars in it merge and collapse to become a supermassive black hole.
    D) Its stars escape one by one until the cluster no longer exists.

13. Giant molecular clouds of H_2 and CO gas are found in which regions of our galaxy?
    A) They appear to be uniformly spread throughout the galaxy, both in the spiral arms and above and below them.
    B) above and below the plane of the spiral arms, over the galactic poles
    C) at the center of the galaxy
    D) along the spiral arms

14. At what wavelengths have astronomers mapped and studied the distribution of the giant molecular clouds in space?
    A) long radio wavelengths, greater than 20 cm, because molecules are very efficient radio emitters
    B) visible light, using photography
    C) UV, because molecules are efficient UV emitters and the clouds are hot
    D) millimeter wavelengths, using radio telescopes