Given (a.k.a. `First') Name(s): ____________________ Family (a.k.a. `Last') name: ______________________________

ON YOUR PARSCORE: `Bubble' your name, your student I.D. number, and your multiple-choice answers.
I will keep the Parscore forms.

ON THIS TEST PACKET: Write your name. Circle your multiple-choice answers on this packet, so that you can check them when we go over the test in class.
I will hand this packet back to you when we go over the test, and you'll keep it.

Astronomy 10 Test #2 Practice Version

True/False

Indicate whether the statement is true or false. (3 pts. each)

1. Each giant molecular cloud is likely to form only one star when the cloud collapses.

2. The key to measuring the masses of stars is to observe and measure the mutual orbits of eclipsing binary stars.

3. One of the important `ingredients' for the Sun's magnetic field is the fact that there's a layer of gas in the Sun that circulates by *convection*.

4. If we look at the light of a star as seen through the interstellar medium, we'll see a very narrow absorption line, since the ISM is very cold and thin.

5. The red color of a red-giant star is due to the fact that the star is much hotter than most other stars.

Matching (4 pts. each)

For each question below, choose the item from a-e that fits best. (Note: Items from a through e can be used more than once.)

a. Coronal gas
b. Giant molecular clouds
c. HII region
d. Interstellar dust
e. 21-cm radiation

6. Microscopic grains ejected `exhaled' by aging stars

7. Star-forming region that can be recognized by its pink-glowing gas

8. Regions where stars form, and which contain H_2 and CO.

9. Million-degree gas that makes up parts of the interstellar medium

Multiple Choice - General Knowledge

Choose the ONE best answer and mark it on your Parscore form. (5 pts. each)

10. Which of these is a portion of the electromagnetic spectrum that can go through the Earth's atmosphere?
    a. X-ray `light'
    b. Ultraviolet light
    c. Gamma-ray `light'
    d. Visible-wavelength light

11. The ____ of a star is a measure of the total energy radiated by the star in one second.
    a. apparent magnitude
    b. luminosity
    c. absolute magnitude
    d. spectral type

12. How can dying stars cause new stars to form from giant molecular clouds?
    a. The `dying' stars don't actually die; instead they gravitationally suck material out of the GMCs and become re-energized.
    b. The old stars may move into the GMCs, and act as `seeds' for new star formation.
    c. Astronomers don't know how this could happen, because no stars have yet reached the ends of their lifetimes; the universe isn't old enough for that to have happened yet.
    d. When large stars end their lives as supernovae, the resulting shock waves can trigger the collapse of GMCs.

13. Which of these stars has a COOLER surface temperature than a star of spectral type B?
    a. A type M star
    b. A type G star
    c. A type O star
    d. Both a and b

14. In what part of the Hertzsprung-Russell diagram would you find the brightest, hottest main-sequence stars?
    a. The upper-left part of the diagram
    b. Along the right-hand edge of the diagram
    c. The lower-right part of the diagram
    d. Along the lower edge of the diagram

15. If you wanted to determine the composition of the interstellar medium, which of the following techniques would be the most effective?
    a. Send a spacecraft into Earth orbit to collect samples of this material.
    b. Look at light from the ISM that is reflected off the surfaces of nearby stars.
    c. Observe stars through the ISM, and look at absorption lines in the stars' spectra.
    d. Look at places where the Milky Way's ISM can be seen behind other galaxies.

16. What is the Sun made of?
    a. Mostly oxygen, with a small amount of hydrogen and helium.
    b. Mostly hydrogen, with a little helium, and a very small proportion of heavier elements.
    c. Mostly helium, with the rest being mostly various heavy elements, and a very small proportion of hydrogen.
    d. Mostly iron, similar to the hot iron core of the Earth, with a little bit of helium and some heavier elements.

17. On a clear autumn night, you spend some time examining the glowing *HII regions* in the galaxy M33, using a large reflecting telescope. If you were IN the galaxy M33, looking at these same objects, what would be another name for them?
    a. Eclipsing binary stars
    b. Type K stars
    c. Globular star clusters
    d. Emission nebulae

18. In a star like the Sun, high temperatures are required to get H (hydrogen) nuclei to fuse because they ____ one another, due to their ____ electric charges.
    a. repel, positive
    b. attract, positive
    c. repel, negative
    d. attract, negative

Multiple Choice - Deeper Thought

These questions are just like the other multiple-choice questions, just a little harder. As before, choose the ONE best answer and mark it on your Parscore form.
(8 pts. each)

19. Imagine we're measuring the brightness of two stars, one of which is relatively hot, and the other one relatively cool. For each star, we use two filters: A red one and a blue one. Which of the following statements is most accurate?
    a. The hot star will look brighter through the red filter than it does through the blue filter.
    b. The two stars will look equally bright through all filters.
    c. The hot star will look brighter through the blue filter than it does through the red filter.
    d. The hot star should really be measured through an infrared filter, since it only emits heat radiation.

20. Imagine you're an astronomer who has found a new type of distant astronomical object. You tell your fellow astronomers that every one of these objects has the same luminosity. If you're right, why is this a useful discovery?
    a. By knowing these objects' luminosities, you'll automatically be able to figure out how big they are.
    b. The overall luminosity of an object is the key to figuring out its mass.
    c. Since you know how bright each of these objects really is, you can measure their apparent brightnesses and calculate how far away they really are.
    d. Knowing the true brightness of an object is the most important thing you'll need if you want to figure out how it generates energy.

21. How could we be fooled if we look at a main-sequence star through a cloud of interstellar dust?
    a. We could think it's lower on the main sequence than it really is, because its light is reddened by the dust.
    b. We could think it's higher on the main sequence than it really is, because blue light (scattered from other nearby stars) gets added to its light.
    c. We might think the star is much more massive than it really is.
    d. The dimming effect of the dust could make us think the star is actually much closer than it really is.

22. Let's say you could magically transform the Sun into a red dwarf star. What would happen to the peak wavelength of it's blackbody spectrum?
    a. The peak wavelength would increase, into the ultraviolet or X-ray.
    b. The peak wavelength would increase, into the infrared.
    c. The peak wavelength would decrease, into the ultraviolet.
    d. The peak wavelength would stay the same, in the far infrared.

23. **Extra Credit:** Which of the following things does NOT help heat the gas in the core of the Sun, as part of the process of nuclear fusion?

a. The electrical repulsion of newly-created nuclei, which fly apart from each other at high speed.

b. The release of neutrinos when protons combine to form deuterium nuclei

c. The production of gamma ray photons, which collide with charged particles in the gas.

d. The release of two protons when two helium-three nuclei combine.

e. The annihilation of posistrons (antielectrons) when they collide with ordinary matter and turn into gamma rays, which then collide with charged particles

For each slide: Q1=3pts, Q2,3=6pts, Q4=8pts

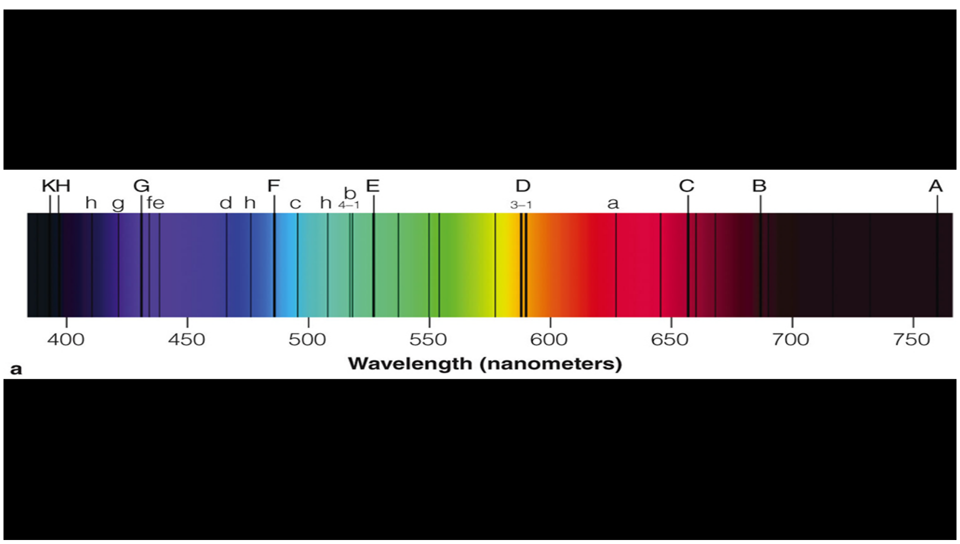
Slide Section

24. **(T/F)** The glowing orange gas in this picture is an example of an emission nebula.

25. Notice the bright star just above and to the left of the center of this image. Above it in the image, we see finger-like portions of the nebula. What are these likely to be?
    a. Star-formation pillars, like the `Pillars of Creation' in the Eagle nebula.
    b. Dead stars that have evaporated in the intense light from the bright star.
    c. Planets that have been ejected from another star's solar system, and are heading towards the bright star.
    d. Each finger-like structure is an individual giant molecular cloud.

26. Notice the bright star just above and to the left of the center of this image. Around it, we see nebulosity that is colored bluish-white. Which type of nebulosity is this?
   a. A cluster of distance galaxies, which are actually far behind the nebula.
   b. Emission nebulosity, caused by excitation of interstellar dust grains from the star's intense stellar wind.
   c. Reflection nebulosity, where light from the star bounces off of tiny dust grains.
   d. Absorption nebulosity, in which the star's light is dimmed and made redder by shining through clouds of interstellar dust.

27. Notice the cluster of bluish-white stars near the brightest part of this nebula. If you took spectra of these stars, and found that they are an `OB association', what would this tell you about the star cluster?
   a. The star cluster must be moving very fast, since O and B stars are only formed in high-velocity molecular clouds.
   b. The star cluster is very close to our solar system, since O and B stars are very faint.
   c. It must be young, because O and B stars don't live long.
   d. The star cluster must be old, since O and B stars were all formed over 10 billion years ago.

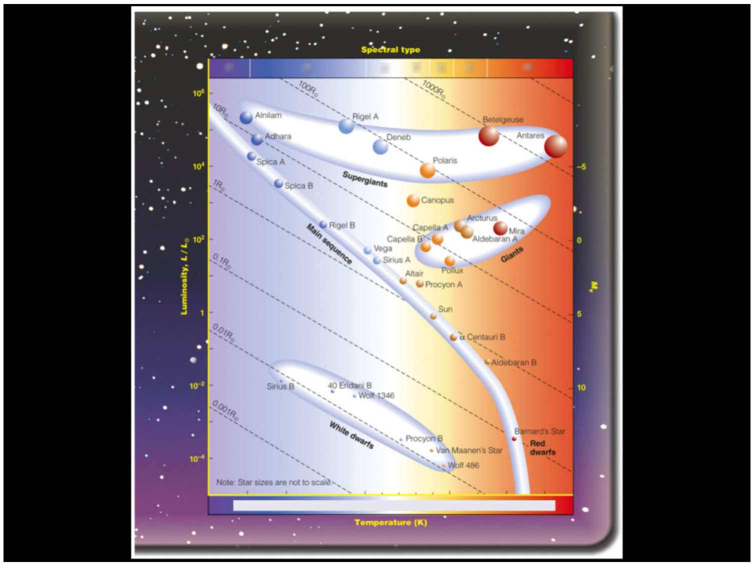


28. **(T/F)** This is a typical spectrum produced when the atoms in a thin gas get `excited' by a source of energy, such as a nearby star that's putting out a lot of ultraviolet photons.

29. What produces the dark lines in this spectrum?
    a. Emission of light at specific wavelengths by `excited' atoms in a nebula
    b. A problem in the telescope, in which different colors of light get focused at different distances from the objective lens.
    c. Blocking of light by small objects inside the telescope, such as the metal struts that hold the secondary mirror in place
    d. Absorption of particular colors of light by specific chemical elements

30. At the sub-atomic level, what's happening when one of the dark lines in this spectrum is formed?
    a. A photon of light hits an atoms and knocks one of its atoms down to a lower energy level.
    b. A photon of light hits an atom and boosts one of its atoms to a higher energy level.
    c. When a photon of light hits an atom, it changes the nucleus of the atom, causing the nucleus to have fewer electrons.
    d. An atom of one element can be changed into an atom of another element when a photon of light hits it.

31. Imagine that this spectrum comes from the Sun. If we took a spectrum of a star with the same surface temperature as the Sun, but which was a giant star, what would look different about the dark spectral lines?
    a. They would be wider.
    b. They would be shifted to the right a long way.
    c. They would be narrower.
    d. They would be shifted to the left a long way.



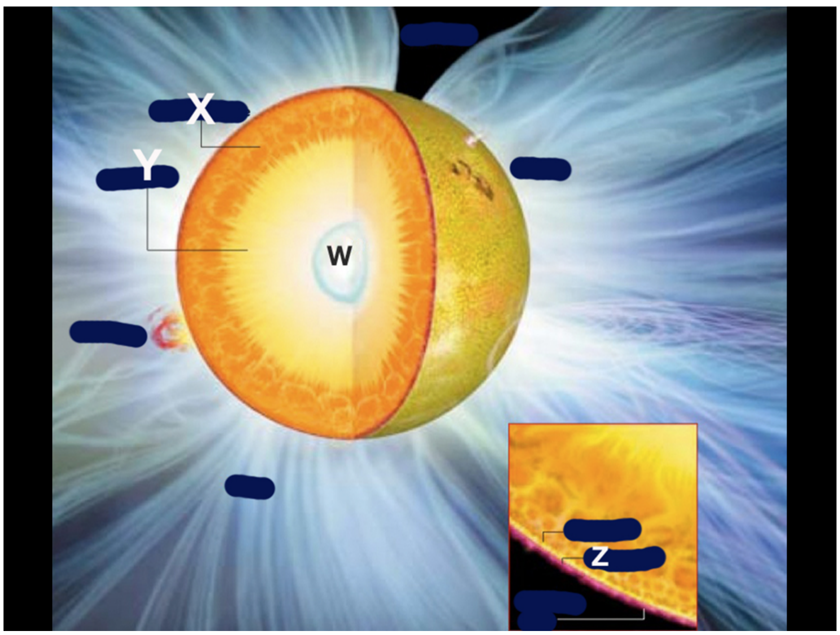
32. On this Hertzsprung-Russell diagram, the hot stars are on the left side of the image, and the cooler stars are on the right.

33. In which part of this diagram would we find stars that emit the largest amount of energy from each square meter of their surface, as compared to other stars?
   a. Along the bottom of the diagram
   b. Along the main sequence
   c. Along the right-hand edge of the diagram
   d. Along the left-hand edge of the diagram

34. Notice that along the top edge of this graph, the letter names of the spectral classes have been blurred out. What is the correct order of the spectral classes, from left to right?
   a. MGAKFOB
   b. OBAGKMF
   c. ABCFGKM
   d. OBAFGKM

35. Imagine that you compared the spectra of two stars that had the same horizontal coordinate on this diagram. An example would be one star on the main sequence, and another star above it, but with the same color, such as up in the giant or supergiant region. What would be similar (and different) about the spectra of these two stars?

   a. The larger star would have narrow spectral absorption lines.
   b. The spectrum of the more-luminous star would be located in the infrared portion of the diagram, whereas the spectrum of the less-luminous star would be in the ultraviolet portion of the diagram.
   c. The smaller, less luminous star would show an emission spectrum, whereas the larger, more luminous star would show an absorption spectrum.
   d. The hotter star would show more absorption lines, while the cooler star would show fewer absorption lines.



36. **(T/F)** The Sun generates energy in the layer marked X.

37. How is energy transported outward in region Y?

   a. By hot gas rising, cooling off, and then sinking, a process called convection
   b. By the Sun's magnetic field, which is generated in region W.
   c. By photons of electromagnetic energy bouncing from one atom or electron to another
   d. By hydrogen atoms fusing into helium atoms

38. What do we call the thin red layer marked Z?
    a. The solar corona
    b. The photosphere
    c. The solar core
    d. The chromosphere

39. The Earth and Sun wouldn't seem to be very similar, but there are at least one or two similarities between them. Which of the following best describes how the Earth is like the Sun?
    a. Layer W is a lot like the Earth's core, since they are both mdae of iron at very high temperatures.
    b. Layer X is like the Earth's liquid iron outer core; it's where the magnetic field is generated.
    c. Layers like Z are like the Earth's crust, since they are at the outer edges of both bodies, and in both cases are made of rocky material.
    d. Both objects shine brightly with the light that they each generate.

Astronomy 10

Answer key for Test #2 PRACTICE VERSION

1	F		21	A	
2	T		22	B	
3	T		23	~~D~~ B	
4	T		24	T	
5	F		25	A	
6	D		26	C	
7	C		27	C	
8	B		28	F	
9	A		29	D	
10	D		30	B	
11	B		31	C	
12	D		32	~~F~~ T	
13	D		33	D	
14	A		34	D	
15	C		35	A	
16	B		36	F	
17	D		37	C	
18	A		38	D	
19	C		39	B	
20	C				