Introductory Astronomy **NAME:**

Homework 8: The Sun: Homeworks and solutions are posted on the course web site. Homeworks are **NOT** handed in and **NOT** marked. But many homework problems ($\sim$ 50–70 %) will turn up on tests.

Answer Table

	a	b	c	d	e
1.	O	O	O	O	O
2.	O	O	O	O	O
3.	O	O	O	O	O
4.	O	O	O	O	O
5.	O	O	O	O	O
6.	O	O	O	O	O
7.	O	O	O	O	O
8.	O	O	O	O	O
9.	O	O	O	O	O
10.	O	O	O	O	O
11.	O	O	O	O	O
12.	O	O	O	O	O
13.	O	O	O	O	O
14.	O	O	O	O	O
15.	O	O	O	O	O
16.	O	O	O	O	O
17.	O	O	O	O	O
18.	O	O	O	O	O
19.	O	O	O	O	O
20.	O	O	O	O	O
21.	O	O	O	O	O
22.	O	O	O	O	O
23.	O	O	O	O	O
24.	O	O	O	O	O
25.	O	O	O	O	O
26.	O	O	O	O	O
27.	O	O	O	O	O
28.	O	O	O	O	O
29.	O	O	O	O	O
30.	O	O	O	O	O
31.	O	O	O	O	O
32.	O	O	O	O	O
33.	O	O	O	O	O
34.	O	O	O	O	O
35.	O	O	O	O	O
36.	O	O	O	O	O

Name:

	a	b	c	d	e
37.	O	O	O	O	O
38.	O	O	O	O	O
39.	O	O	O	O	O
40.	O	O	O	O	O
41.	O	O	O	O	O
42.	O	O	O	O	O
43.	O	O	O	O	O
44.	O	O	O	O	O
45.	O	O	O	O	O
46.	O	O	O	O	O
47.	O	O	O	O	O
48.	O	O	O	O	O
49.	O	O	O	O	O
50.	O	O	O	O	O
51.	O	O	O	O	O
52.	O	O	O	O	O
53.	O	O	O	O	O
54.	O	O	O	O	O
55.	O	O	O	O	O
56.	O	O	O	O	O
57.	O	O	O	O	O
58.	O	O	O	O	O
59.	O	O	O	O	O
60.	O	O	O	O	O
61.	O	O	O	O	O
62.	O	O	O	O	O
63.	O	O	O	O	O
64.	O	O	O	O	O
65.	O	O	O	O	O
66.	O	O	O	O	O
67.	O	O	O	O	O
68.	O	O	O	O	O
69.	O	O	O	O	O
70.	O	O	O	O	O
71.	O	O	O	O	O
72.	O	O	O	O	O

1. Did you complete reading the Introductory Astronomy Lecture before the **SECOND DAY** on which the lecture was lectured on in class?

   a) YYYessss!   b) Jawohl!   c) Da!   d) Sí, sí.   e) OMG no!

2. The diameter of the Sun is about:

   a) 1 Earth diameter.   b) 30 Earth diameters.   c) 109 Earth diameters.   d) 1 astronomical unit.   e) 1 light-year.

3. The solar luminosity is $L_\odot$ is:

   a) 100 W.   b) 3.846×10^{-26} W.   c) 3.846×10^{26} W.   d) 1.496×10^{11} m.   e) 6.9599×10^{8} m.

4. The temperature of the solar photosphere is about:

   a) 300 K.   b) 600 K.   c) 273 K.   d) 40000 K.   e) 6000 K.

5. "Let's play *Jeopardy*! For $100, the answer is: It is the electromagnetic radiation energy per unit time per unit area from the Sun at 1 astronomical unit from the Sun."

   What is the solar ____________, Alex?

   a) wind   b) variable   c) eclipse   d) constant   e) Sun

6. The solar constant (i.e., the electromagnetic radiation energy per unit time per unit area from the Sun at 1 astronomical unit from the Sun) is:

   a) 1367.6 W/m^2.   b) 1000.00 W/m^2.   c) 0.   d) -1367.6 W/m^2.   e) infinite.

7. The solar constant (i.e., the electromagnetic radiation energy per unit time per unit area from the Sun at 1 astronomical unit from the Sun) is about 1367.6 watts per square meter. If you were at 1 astronomical unit from the Sun in space and had a square kilometer of solar panels (of 100 % efficiency), how many 100 watt light bulbs could you run on solar power?

   a) 100 watts.   b) 1000.   c) 1367.6.   d) 1.3676×10^{11}.   e) 1.3676×10^{7}.

8. "Let's play *Jeopardy*! For $100, the answer is: This astrophysical body has three main interior layers: 1) a core (in which thermonuclear reactions occur) that extents out to about 25 % of the body's radius; 2) a radiative transfer zone which extends **OUT** to about 71 % of the body's radius; 3) a convective zone that extends **FROM** about 71 % of the body's radius to the body's surface."

   What is ____________, Alex.

   a) the Moon   b) Venus   c) the Milky Way   d) the Earth   e) the Sun

9. Out to about 71 % of the Sun's radius, the dominant energy transfer mechanism is:

   a) electron conduction.   b) neutrino transfer.   c) radiative transfer (i.e., transfer by electromagnetic radiation).   d) convection.   e) an explosive shock wave.

10. Why can't we see deeper into the Sun than the photosphere?

    a) Line spectra overlap too severely at deeper layers.
    b) The question is absurd. We see right through the photosphere to the bottom of the convection layer.
    c) The question is absurd. Solar flares prevent any observation deeper than the chromosphere.
    d) Radiation from deeper layers escapes too easily.
    e) Radiation from deeper layers is absorbed before it can escape the Sun.

11. A granule is:

    a) a kind of cereal.
    b) a grain of dust.
    c) the top of a rising current of **HOT** gas in the Sun. Granules are seen in the solar photosphere. They last about 10 minutes and then lose their identity with their surroundings. The risen gas **COOLS** and then sinks.

d) the top of a rising current of **COLD** gas in the Sun. Granules are seen in the solar photosphere. They last about 10 minutes and then lose their identity with their surroundings. The risen gas **HEATS** up and then sinks.
e) a solar flare by another name.

12. The five outermost layers of the Sun (defining layers of the Sun generously) can be labeled:

a) convection zone, photon, chromosome, coronation street, and solar sail.
b) convection zone, photosphere, chromosphere, corona, and solar sail.
c) convection zone, photosphere, chromosphere, corona, and solar wind.
d) convection zone, photon, chromosome, corona, and glabron.
e) construction zone, photosphere, chromosphere, corona, and glabron.

13. Two of the five outermost layers of the Sun (defining layers of the Sun generously) are:

a) photosphere and chromosphere. b) carnation and corona. c) corona and paloma. d) rio and sands. e) chromosphere and Asteroid Belt.

14. The corona of the Sun is only visible to the naked eye:

a) at sunset. b) when the Moon is a crescent in the western sky. c) during partial solar eclipses. d) during total solar eclipses. e) when the Sun is below the horizon.

15. The solar corona has no sharp boundary, but it has been traced out to about 30 solar radii. The Sun's equatorial radius is 6.96342×10^8 m and the astronomical unit in meters is $1.49597870700 \times 10^{11}$ m. How far has the corona been traced out in astronomical units and does this trace of the corona reach to the orbit of Mercury which has a mean radius of 0.38709893 AU?

a) 0.387 AU and yes. b) 0.14 AU and yes. c) 0.14 AU and no. d) 0.387 AU and no. e) 1 AU and yes/no.

16. The solar wind is:

a) the air that blows off the northern hemisphere oceans during geomagnetic storms.
b) the plasma gas that cools the Sun's photosphere.
c) an optical illusion in the corona that causes the corona to look like fluffy orange clouds.
d) the plasma gas that streams from the Sun out into **INTERSTELLAR SPACE**.
e) the plasma gas that streams from the Sun out into **INTERGALACTIC SPACE**.

17. The solar wind is a stream of particles that moves approximately along radial paths outward from the Sun: inward is the negative direction and positive is the outward direction. The solar wind near the Earth is typically moving at a radial velocity of about:

a) -200 km/s. b) -200 m/s. c) -200 cm/s. d) 400 to 500 km/s. e) 400 to 500 km.

18. The Sun loses mass at a rate of about 2×10^9 kg/s. Convert this rate into solar masses per year to the same number of significant figures as given. **NOTE:** The mass of the Sun is $M_\odot = 1.9885 \times 10^{30}$ kg and the length of a year in seconds to 0.5 % accuracy is $\pi \times 10^7$ s.

a) 2×10^{30} kg/yr. b) $2 \times 10^{-30}\, M_\odot$/yr. c) $2 \times 10^9\, M_\odot$/yr. d) $3 \times 10^{14}\, M_\odot$/yr. e) $3 \times 10^{-14}\, M_\odot$/yr.