

assignment 9: meteorites, asteroids, comets.. NAME \_\_\_\_\_

part I: Internet research

2) In 1987 a supernova was witnessed by astronomers. Wikipedia SN1987A  
The remnants of the supernova is found it the outskirts of the \_\_\_\_\_ nebula in the \_\_\_\_\_  
\_\_\_\_\_, w nearby \_\_\_\_\_ galaxy from our local group. It happened close enough to earth that  
is was visible to the \_\_\_\_\_ but only in the \_\_\_\_\_.  
It was the first supernova observed since 1604 that occurred in our own \_\_\_\_\_ and was observed  
by Kepler ! (also called Kepler's supernova, you can google sky it).

3) (use sky google) The supergiant Betelgeuse will become a supernova. In which constellation  
Betelgeuse is ? (you can sky google it). Draw the constellation below:

4) go <http://www.deepastronomy.com/apophis-asteroid-could-hit-earth.html>

What's the name of the asteroid that might hit us in 2036 ?

What's the odd now ?

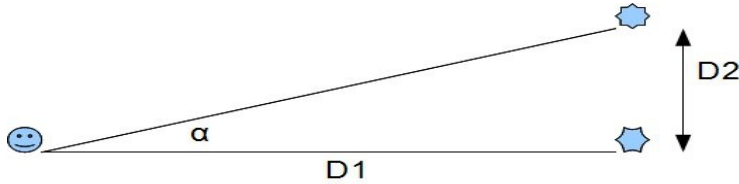
-----  
part II: some Math (try without hint)

1.  
p.212 problem 1  
hint: suppose the speed is 11km/s. This is the minimum speed you need to escape the gravity of the  
earth. So it make senses that the speed a meteorite under the influence of gravity has at least this speed.  
Then it's a proportion. 11Km is 1 second  
100 km is ?  
cross multiply and divide. If you get a number larger than 60s, convert to minutes.

2.  
p.212 problem 2  
hint: 1km = 1000m  
Find the volume of the big meteorite =  $(4 \times 3.14 \times (1000)^3) / 3 =$  \_\_\_\_\_  $m^3$   
Find the volume of the small piece =  $4 \times 3.14 \times 1 =$  \_\_\_\_\_  $m^3$   
Find how many small volumes can fit into the large volume = divide large by small = \_\_\_\_\_

3.

Suppose a really spectacular comet approaches the Earth, with a coma of  $D_2=1.5$  million km in diameter. At closest approach, it is  $D_1=0.9$  AU from the Earth. What is the angular size  $A$  of the Comet ?



Hint: angular size in arc seconds =  $(206,265 D_2) / D_1$  (see index card from website for details)  
 with  $D_2=1.5$  million km and  $D_1 = 0.9 \text{ AU} = 0.9 \times 150$  million km  
 so  $D_2/D_1 = 1.5 / (0.9 \times 150)$  because the million cancel out.  
 Then multiply by 206,265 to get arcseconds. -Then divide by 60 to get arcminutes.

4.

What is the angular size  $A$  of a  $D_2=1$ km diameter asteroid in the asteroid belt (at  $D_1=3\text{AU}$ ) ?

Hint: small angle formula. Same idea.

$$D_1=3 \times 150 \text{ million km} = 3 \times 150 \times 1,000,000 = \underline{\hspace{2cm}} \text{ km}$$

$$A = 206,265 \times D_2 \text{ (km)} / D_1 \text{ (km)} = \underline{\hspace{2cm}} \text{ arc seconds.}$$

5.

Sirius is the brightest star in the night sky.

A) sky google it and find the constellation it is in

B) It is actually a binary system. We know the relationship between temperature of a star  $T$ , its radius  $R$  (size) and its luminosity  $L$ .  $L = 4 \pi R^2 \sigma T^4$

If  $L_s$  is the luminosity of the Sun,  $R_s$  the radius of the sun and  $T_s$  the temperature of the Sun we have :

$$(L/L_s) = (R/R_s)^2 (T/T_s)^4$$

So compute the radius of Sirius  $R_s$  given :

$$L=26 L_s \text{ (luminosity of Sirius compared to Sun's )}$$

$$T=10,000 \text{ K} = 1.72 T_s$$

hint:  $(L/L_s) = (R/R_s)^2 (T/T_s)^4$  means  $(26) = (R/R_s)^2 (1.72)^4$  solve for  $R/R_s$

$R/R_s = \sqrt{26 / (1.72^4)}$  (that means take the square root of the ratio  $(26 / (1.72^4))$ )

find  $R/R_s$  so  $R = \underline{\hspace{2cm}} R_s$ . Basic math.

C) Do the same computation for Sirius B

$$L = 0.0024 L_s$$

$$T=15,000 \text{ kelvin} = 2.59 T_{sun}$$

find  $R$