

ASTR 220 Homework #1
Spring 2004
Due Tuesday, February 8, 2005, at the beginning of lecture.

Please neatly write or type your homework.

Be aware of potential plagiarism: make sure to put the answer into your own words. Feel free to discuss the questions with your classmates, but write up the answers yourself - do not copy.

Make sure to show your work for any calculations - answers that appear like magic will receive no credit.

1. Review of scientific notation.

(a) Write the following numbers in scientific notation.

- i. 503
- ii. -2000
- iii. 0.00017
- iv. -0.000000095
- v. 12,300,000

(b) Write the following numbers in decimal format (not in scientific notation).

- i. 10^3
- ii. 3.14×10^1
- iii. -1.5×10^6
- iv. -7.17×10^{-4}
- v. 9.99×10^9

2. The speed of light is $3 \times 10^8 m/s$.

- (a) How many meters are there in one light-second?
- (b) How many meters are there in one light-hour?
- (c) How many meters are there in one light-year?

Be sure to explicitly show your work, including unit conversions.

3. *ECP*, Ch. 1, Does It Make Sense #16.

4. *ECP*, Ch. 4, Does It Make Sense #22.

5. *ECP*, Ch. 4, Does It Make Sense #27.

6. Imagine that there is a meteoroid out in space on a collision course with the Earth. The meteoroid has a mass of 1000 kg and a radius of 0.5 m.

- (a) When the meteoroid is at a distance of 1 AU ($1.5 \times 10^{11} m$), what is the gravitational force between the Earth and the meteoroid? (The Earth's mass is $5.97 \times 10^{24} kg$.)
- (b) As the Earth and meteoroid get closer together, the meteoroid accelerates from the force of gravity until it is traveling at 100 km/s ($1 \times 10^5 m/s$) when it hits the Earth's surface.
 - i. What is the kinetic energy of the meteor when it impacts?
 - ii. Compare this energy to Table 4.1 in *ECP*. What is the closest comparison?
 - iii. Do you think the crater produced will be simple or complex? Explain.
 - iv. If the mass of the meteoroid was doubled, how would the kinetic energy be changed? (Explain in words; no calculation is necessary.)

7. *NCC*: Considering the discussion in the Prologue, why has the sudden extinction of the dinosaurs at the end of the Cretaceous period been so hard to explain? In your answer, explain two reasons why.
8. *NCC*:
 - (a) What is the K-T boundary?
 - (b) What is the usual appearance of the K-T boundary in the ground?
 - (c) When was the K-T boundary formed?
9. *NCC*:
 - (a) What is iridium?
 - (b) Why is it rare on the Earth's surface?
 - (c) Why do meteorites have more (or do they)?
10. *NCC*: Explain three reasons why geologists resisted the Alvarez Theory of dinosaur extinction. You may include personal and practical as well as scientific reasons.