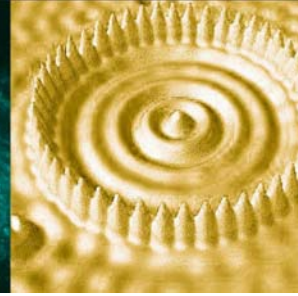
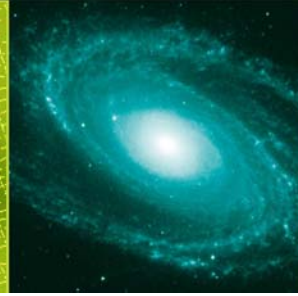
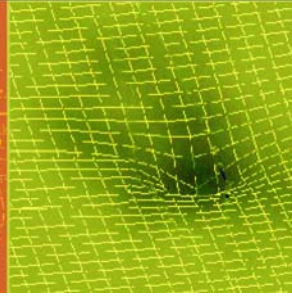
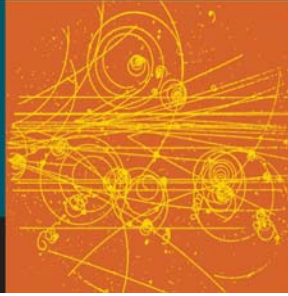


$$\left(\beta mc^2 + \sum_{k=1}^3 \alpha_k p_k c \right) \psi(\mathbf{x}, t) = i\hbar \frac{\partial \psi}{\partial t}(\mathbf{x}, t)$$



Fermi Quiz

Aim: To estimate the order-of-magnitude values of various quantities.

Materials: None - except an imaginative, innovative mind.

Method: For each of the 10 questions listed on the attached sheets, estimate the order of magnitude of the answer in the units requested. The answer does not have to be exact, we are looking for correct order of magnitude estimate.

For example, if your answer is 7×10^3 , the order of magnitude answer is 10^4 , and you should enter 4.

When you have completed the quiz, hand your answer sheet to the person in room SPL-57.

Conditions: The answers must be in the units specified.

Time Limit: Your answers must be handed in by the end of your scheduled time period - 12:20 or 12:55.

Ranking: The ranking order will be determined the sum of your marks on all of the questions. The **LOWEST** sum gets the highest ranking, etc.

[If your answer is the correct order of magnitude you get 1 point. If it is off by a factor of 10 in either direction you get 2 points etc, up to a maximum of 5 points per question]

Fermi Questions

- 1) At the earth's distance from the sun (and ignoring atmospheric absorption), solar radiation provides about $1,400 \text{ W per m}^2$. How much energy does the sun radiate per second (in Joules)?
- 2) Assuming they are 10% efficient, how many square meters of solar panels would be needed to provide the (instantaneous, daytime) electrical power used by the city of New Haven (pop. 125,000)?
- 3) What fraction is this of the land area occupied by the city of New Haven?
- 4) How many times does the average human heart beat in its owner's lifetime?
- 5) How far (in meters) does light travel in a nanosecond?
- 6) The nearest star, alpha Centauri, is 4.4 light years from sun. How many years would it take to travel there, assuming you are moving the I-95 speed limit of 65 MPH and don't need to stop for gas, food or sleep
- 7) How many 200mL bottles of water would it take to fill an Olympic sized swimming pool?
- 8) If \$700 billion one dollar bills were laid on top of each other, how high would the stack be in kilometers?
- 9) How many protons and neutrons does the human body contain?
- 10) What is the weight (in tons) of food and drink eaten by the average person during the course of a year?

Fermi Answers

Team Name: _____

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____