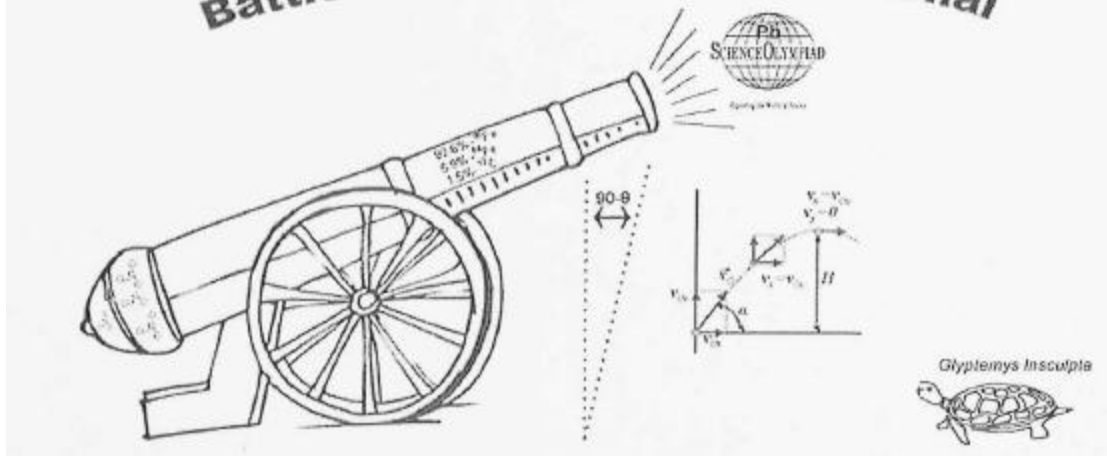


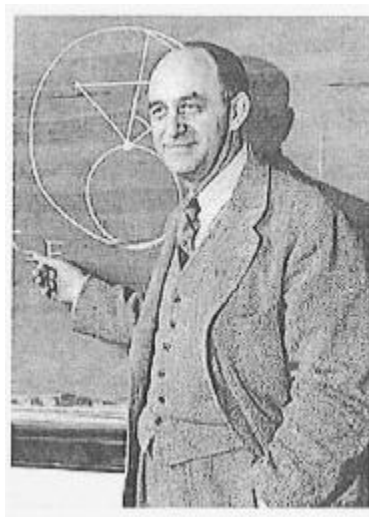
Conestoga High School Battle at Valley Forge Invitational



FERMI QUESTIONS EXAM

Division C

January 14, 2012



SCHOOL NAME _____ TEAM NUMBER _____

INSTRUCTIONS

A. As per the Science Olympiad Division C Rules Manual, page C7, “calculators, computers, slide rules, reference sheets, etc. are not allowed.”

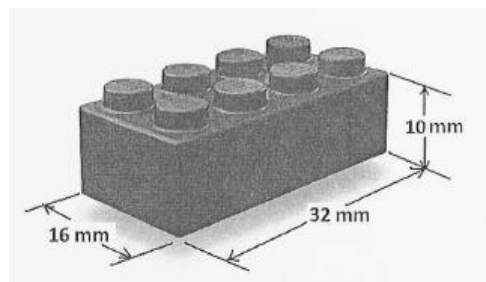
B. ALL ANSWERS ARE TO BE WRITTEN TO THE CORRECT POWER OF 10. For example, if a calculation yields the number 6.334E7, the correct answer is 8. Not E8, not 10^8 , not 10^8 . Just 8.

C. If the response is equal to the accepted value, the earned score is 5 points. If the response is ± 1 of the accepted value, the earned score is 3 points. If the response is ± 2 of the accepted value, the earned score is 1 point.

D. The test consists of 30 questions. The maximum score is 150 points.

E. In the event of a tie score, the first tiebreaker is the highest number of 5-point answers. Time taken to complete the exam is the second tiebreaker.

1. What is the frequency of an FM radio signal, in cycles per second?
2. What is the wavelength of an FM radio signal, in meters?
3. Forrest Gump ran from the coast of Maine to Los Angeles. How many steps did he take?
4. Consider the dimensions of the standard 2 x 4 LEGO block shown below. How many stacked LEGO blocks would it take to reach the height of the Empire state Building?
5. I'd like to make an actual-size replica of the Empire state Building. Now how many standard 2x4 LEGO blocks would I need?



6. How long, in hours, does it take for a beam of light to traverse the continental us?
7. How old is the Earth, in seconds?
8. How many nanometers span the entire range of visible light?
9. How many nanometers are in a megaparsec?
10. How many liters of air are in this room?
11. How many milliliters of blood does the American Red Cross collect in the US in a given year?
12. How many atoms of lead would make a ton of lead?
13. How many paperclips would I need to make a chain long enough to reach the moon from the Earth?
14. How many drops of water are in a full bathtub?
15. How many bones are in the human body?
16. What is the Dow Jones Industrial Average?

17. How many miles of highway make up the US Interstate Highway system?
18. Estimate the mass in grams of all the fans at a home Phillies game.
19. How many days would it take you to count to a million?
20. How many electrons pass through a 100 watt light bulb in a minute?
21. How many dollars would a quadrillionaire have?
21. What is $7e^7$?
23. What is $7e'$?
24. How many leaves are on a mature, healthy oak tree?
25. What is the area (in cm^2) of the leaves on a mature, healthy oak tree?
26. Assuming each leaf gets full sunlight, how much energy (watts) does it get from the sun in one year?
27. I bought a 2 terabyte hard drive. How many bytes of information can it hold?
28. How many light-years is the distance from the Earth to the Sun?
29. What is $[\ln(2)]^{30}$?
30. Two people stand on opposite sides of the Earth. What is the gravitational force between them?

Battle of Valley Forge Invitational 1/14/2012

Fermi Questions Answer Key

1. 8
2. 0
3. 7
4. 4
5. 11
6. -6
7. 17
8. 2
9. 31
10. 5
11. 10
12. 27
13. 10
14. $\frac{6}{7}$
15. 2
16. 4
17. 4
18. 9
19. 1
20. 22
21. 15
22. 8
23. 4
24. 5
25. 7
26. 8
27. 12
28. -5
29. -5
30. -21