



Minnesota
Science
Olympiad


FERMI QUESTIONS
WAYZATA INVITATIONAL
by Michael D. Huberty
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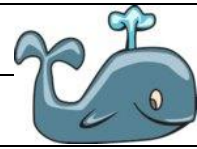
ANSWER KEY









For each item, answer the quantity as the nearest integral power of ten. For example, if the number is 1.4×10^6 , you record 6 as your answer. If it is 8.6×10^3 , you record 4.

No calculators or resources allowed.

SCORING: If the response is = to the accepted value, then it receives 5 points. If the response is ± 1 of the accepted value, then it receives 3 points. If the response is ± 2 of the accepted value, then it receives 1 points. Ties are broken by counting the highest number of answers which received 5 points (then 3 points if still a tie).

	Ans	Points		
1. What is the value of 10^{-10} ?	-10	5 -10	3 -11,-9	1 -12,-8
2. What is the value of 10^{0-10} ?	0	5 0	3 -1,1	1 -2,2
3. What is the value of $10^{0^{0-10}}$?	1	5 1	3 0,2	1 -1,3
4. What is the value of $10^{0^{0^{0-10}}}$?	10	5 10	3 9,11	1 8,12
5. What is the value of $\frac{1}{10 + \frac{1}{10 + \frac{1}{10 + \frac{1}{10 + \frac{1}{10 + \dots}}}}}$?	-1	5 -1	3 -2,0	1 -3,1
6. What is the value of $\sqrt{10 + \sqrt{10 + \sqrt{10 + \sqrt{10 + \sqrt{10 + \sqrt{10 + \sqrt{10 + \dots}}}}}}}$?	0	5 0	3 -1,1	1 -2,2
7. How many bones are in the human body?	2	5 2	3 1,3	1 0,4
 8. If a human could jump the same proportional height as a flea, how many feet could you jump?	3	5 3	3 2,4	1 1,5
9. How long, in μm , are the longest cells in the human body – motor neurons?	6	5 6	3 5,7	1 4,8
10. At what decibel level does the blue whale “sing”?	2	5 2	3 1,3	1 0,4
11. What is the mass of a blue whale at birth, in kg?	3	5 3	3 2,4	1 1,5



	Ans	Points		
12. If you stretch a standard Slinky out flat, how many inches long would it be?	3	5 3	3 2,4	1 1,5
13. What is the average velocity of the Earth traveling around the sun, in km/hour?	5	5 5	3 4,6	1 3,7
14. How many times does the average human blink in a year? 	6	5 6	3 5,7	1 4,8
 15. What is the Fahrenheit temperature of a bolt of lightning?	5	5 5	3 4,6	1 3,7
16. What is the Fahrenheit temperature of the center of the sun? 	7	5 7	3 6,8	1 5,9
17. The average human produces how many liters of saliva in a lifetime?	4	5 4	3 3,5	1 2,6
18. How many blood cells are produced and destroyed in the human body every day?	8	5 8	3 7,9	1 6,10
19. How many kilometers of blood vessels are in the average human?	5	5 5	3 4,6	1 3,7
20. What proportion of the atmosphere is ozone?	-6	5 -6	3 -7,-5	1 -8,-4
 21. What is the mass, in grams, of oxygen in a soccer ball filled with air?	0	5 0	3 -1,1	1 -2,2
22. How many soccer balls would fit on a soccer field (no stacking)?	5	5 5	3 4,6	1 3,7
23. How many trucks are needed to transport the soccer balls in problem 22?	2	5 2	3 1,3	1 0,4
24. If you made a piece of toast for each of Earth's humans today, how many feet tall would the "tower-o'-toast" be? 	8	5 8	3 7,9	1 6,10
25. What is the probability that two randomly selected people have the same birthday? 	-3	5 -3	3 -4,-2	1 -5,-1
26. What is the probability that among 10 randomly selected people, at least two people have the same birthday?	-1	5 -1	3 -2,0	1 -3,1
27. The Mariana Trench in the Pacific Ocean is the deepest part of the ocean. How many feet deep is it?	4	5 4	3 3,5	1 2,6
28. What is the water pressure at the deepest part of the ocean, in psi (pounds/inch ²)?	4	5 4	3 3,5	1 2,6
29. What proportion of sterling silver is copper?	-1	5 -1	3 -2,0	1 -3,1
 30. How many kilograms is the mass of Earth?	25	5 25	3 24,26	1 23,27
31. An inch of dry, powdery snow is equivalent to how many inches of rain water?	-1	5 -1	3 -2,0	1 -3,1
32. How many gallons of fuel does a Boeing 707 jet use in its take-off climb? 	3	5 3	3 2,4	1 1,5
33. How many teams are competing in today's Wayzata Invitational Science Olympiad?	1	5 1	3 0,2	1 -1,3