Problem Set: Measurement

*Complete all the problems in this set in an organized fashion, showing ALL necessary WORK. Problems with only answers may be considered incorrect and lower your grade. Clearly indicate your answers by underlining or circling the final answer to each problem.*

1. Express the following quantities in scientific notation:

 a. 5800 m b. 450 000 m c. 302 000 000 m d. 86 000 000 000 m

2. Express the following quantities in scientific notation:

 a. 0.000 508 kg b. 0.000 000 45 kg c. 0.0003600 kg d. 0.004 kg

3. Express the following quantities in scientific notation:

 a. 300 000 s b. 186 000 s c. 93 000 000 s

4. Convert each of the following length measurements as directed:

 a. 1.1 cm to m b. 76.2 pm to mm c. 2.1 km to m d. 2.278 x 1011 m to km

5. Convert each of the following mass measurements to its equivalent in kilograms:

 a. 147 g b. 11 Mg c. 7.23 μg d. 478 mg

**Solve the following problems. Write your answers in scientific notation.**

6. a. 5 x 10-7 kg + 3 x 10-7 kg c. 1.66 x 10-19 kg + 2.30 x 10-19 kg

 b. 4 x 10-3 kg + 3 x 10-3 kg d. 7.2 x 10-12 kg - 2.6 x 10-12 kg

7. a. 6 x 10-8 m2 - 4 x 10-8 m2 c. 5.8 x 10-9 m2 - 2.8 x 10-9 m2

 b. 3.8 x 10-12 m2 - 1.90 x 10-11 m2 d. 2.26 x 10-18 m2 - 1.8 x 10-18 m2

8. a. 5.0 x 10-7 mg + 4 x 10-8 mg c. 3.0 x 10-2 pg - 2 x 10-6 ng

 b. 6.0 x 10-3 mg + 2 x 10-3 mg d. 8.2 km - 3 x 102 m

**Determine the value of each of the following quantities.**

9. a. (2 x 104 m)(4 x 108 m) c. (6 x 10-4 m)(5 x 10-8 m)

 b. (3 x 104 m)(2 x 106 m) d. (2.5 x 10-7 m)(2.5 x 1016 m)

10. a. 6 x 108 kg c. 6 x 10-8 m

 2 x 104 m3 2 x 104 s

 b. 6 x 108 kg d. 6 x 10-8 m

 2 x 10-4 m3 2 x 10-4 s

11. a. (3 x 104 kg)(4 x 104 m) b. (2.5 x 106 kg)(6 x 104 m)

 6 x 104 s 5 x 10-2 s2

12. a. (4 x 103 mg)(5 x 104 kg)

 b. (6.5 x 10-2 m)(4.0 x 103 km) c. (2 x 103 ms)(5 x 10-2 ns)

13. a. 2.8 x 10-2 mg b. (6 x 102 kg)(9 x 103 m)

 2.0 x 104 g (2 x 104 s)(3 x 106 ms)

14. (7 x 10-3 m) + (5 x 10-3 m)

 (9 x 107 km) + (3 x 107 km)

**Write the number of significant digits in each measurement.**

15. a. 2804 m d. 0.003 068 m

 b. 2.84 km e. 4.6 x 105 m

 c. 0.0029 m f. 4.06 x 10-5 m

16. a. 75 m d. 1.87 x 106 mL

 b. 75.00 m e. 1.008 x 108 m

 c. 0.007 060 kg f. 1.20 x 10-4 m

**Solve the following addition, subtraction, multiplication and division problems.**

17. a. 6.201 cm, 7.4 cm, 0.68 cm, and 12.0 cm b. 1.6 km, 1.62 m, and 1200 cm

18. a. 8.264 g from 10.8 g b. 0.4168 m from 475 m

19. a. 131 cm X 2.3 cm b. 3.2145 km X 4.23 km c. 5.761 N X 6.20 m

20. a. 20.2 cm ÷ 7.41 s c. 13.78 g ÷ 11.3 mg

 b. 3.1416 cm ÷ 12.4 s d. 18.21 g ÷ 4.4 cm3

21. The total distance a lab cart travels during specified lengths of time is given in the following data table.

|  |  |
| --- | --- |
| **Time (s)** | **Distance (m)** |
| 0.0 | 0.00 |
| 1.0 | 0.32 |
| 2.0 | 0.60 |
| 3.0 | 0.95 |
| 4.0 | 1.18 |
| 5.0 | 1.45 |

a. Plot distance versus time from the values given in the table and draw the curve that best fits all points.

b. Describe the resulting curve.

c. According to the graph, what type of relationship exists between the total distance traveled by the lab cart and the time?

d. What is the slope of this graph?

e. Write an equation relating distance and time for this data.

Chapter Review Problems

30. Express the following numbers in scientific notation:

 a. 5 000 000 000 000 m c. 2 003 000 000 m

 b. 0.000 000 000 166 m d. 0.000 000 103 0 m

31. Convert each of the following measurements to meters:

 a. 42.3 cm c. 21 km e. 214 μm

 b. 6.2 pm d. 0.023 mm f. 570 nm

32. Add or subtract as indicated.

 a. 5.80 x 109 s + 3.2 x 108 s c. 3.14 x 10-5 kg + 9.36 x 10-5 kg

 b. 4.87 x 10-6 m - 1.93 x 10-6 m d. 8.12 x 107 g - 6.20 x 106 g

33. Rank the following mass measurements from smallest to largest:

 11.6 mg 1021 μg 0.000 006 kg 0.31 mg

34. State the number of significant digits in each of the following measurements:

 a. 0.000 03 m c. 80.001 m

 b. 64.01 fm d. 0.720 μg

35. State the number of significant digits in each of the following measurements:

 a. 2.40 x 106 kg b. 6 x 108 kg c. 4.07 x 1016 m

36. Add or subtract as indicated:

 a. 16.2 m + 5.008 m + 13.48 m c. 78.05 cm2 - 32.046 cm2

 b. 5.006 m + 12.0077 m + 8.0084 m d. 15.07 kg - 12.0 kg

37. Multiply or divide as indicated:

 a. (6.2 x 1018 m)(4.7 x 10-10 m) c. (8.1 x 10-4 km)(1.6 x 10-3 km)

 b. (5.6 x 10-7 m)/(2.8 x 10-12 s) d. (6.5 x 105 kg)/(3.4 x 103 m3)

38. Using a calculator, Bertha obtained the following results. Give the answer to each operation using the correct number of significant digits.

 a. 5.32 mm + 2.1 mm = 7.42000000 mm

 b. 13.597 m X 3.65 m = 49.62905 m2 c. 83.2 kg - 12.804 kg = 70.3960000 kg

39. A rectangular floor has a length of 15.72 m and a width of 4.40 m. Calculate the area of the floor with the correct number of significant digits.

40. A water tank has a mass of 3.64 kg when it is empty and a mass of 51.8 kg when it is filled to a certain level. What is the mass of the water in the tank?

41. A lawn is 33.21 m long and 17.6 wide. a) What length of fence must be purchased to enclose the entire lawn? b) What area must be covered if the lawn is to be fertilized?

42. The length of a room is 16.40 m, its width is 4.5 m and its height is 3.26 m. What volume does the room enclose? (*Write your answer in scientific notation*.)

43. The sides of a quadrangular plot of land are 132.68 m, 48.3 m, 132.736 m, and 48.37 m. What is the perimeter of the plot with the correct number of significant digits?

44. The chart below shows the mass of three substances for volumes between 0 and 60 cm3.

 a. What is the mass of 30 cm3 of each substance?

 b. If you had 100 g of each substance, what would their volumes be?

 c. Describe the meaning of the steepness of the lines in this graph.



45. During an experiment, a student measured the mass of 10.0 cm3 of alcohol. The student then measured the mass of 20.0 cm3 of alcohol. In this way, the data in the table below was collected.

|  |  |
| --- | --- |
| **Volume (cm3)** | **Mass (g)** |
| 10.0 | 7.9 |
| 20.0 | 15.8 |
| 30.0 | 23.7 |
| 40.0 | 31.6 |
| 50.0 | 39.6 |

 a. Plot the values given in the table and draw the curve that best fits all points.

 b. Describe the resulting curve.

 c. Use the graph to write an equation relating the volume to the mass of alcohol.

 d. Find the units of the slope of the graph. What is the name given to this quantity?

**Appendix B Extra Practice Problems Chapter 2**

11. A cube has an edge of length 5.2 cm. a) Find its surface area; b) Find its volume.

HONORS

13. The density of gold is 19.3 g/cm3. A gold washer has an outside radius of 4.3 cm and an inside radius of 2.1 cm. Its thickness is 0.14 cm. What is the mass of the washer?