Sample Problems

1a. 7.1×10^{-8} → change to common exponent, multiply # by #; since this is addition, leave superscript

1b. 7.3×10^{-2} → since each number has a common exponent, subtract the # from #, leave superscript

2. 3.0×10^{4} → when multiplying numbers, multiply # by # and ADD superscripts (applies to denominator); when dividing numbers, divide # by # and SUBTRACT superscripts (applies to overall problem);

3. % error = 2 % → (Accepted – Observed)/Accepted x 100 % → (2.00 m – 2.04 m)/2.00 m x 100%

Answers

4. **a.** 4 **c.** 2
b. 4 **d.** 5

5. **a.** 3 **c.** 4
b. 2 **d.** 4

6. **a.** 8.71×10^{1} m
b. 4.36×10^{8} m
c. 1.55×10^{-2} m
d. 9.01×10^{3} m
e. 1.78×10^{-3} m
f. 6.30×10^{2} m

7. **a.** 9×10^{1} m
b. 4×10^{8} m
c. 2×10^{-2} m
d. 9×10^{3} m
e. 2×10^{-3} m
f. 6×10^{2} m

Answers

8. **a.** 79.2 m **c.** 11.53 m
b. 7.33 m **d.** 17.3 m

9. 23.8 g

10. **a.** 1.8×10^{1} m^2
b. 6.75×10^{2} m
c. 5.87×10^{-1} min

11. 1.3×10^{3} m^3

Lesson Check Answers

12. Write the number as a product of two numbers: a coefficient greater than or equal to one and less than ten, and 10 raised to an integer power.

13. Accuracy compares the measured value to the correct value. Precision compares more than one measurement.

14. The significant figures in a calculated answer depend on the number of significant figures of the measurements and the mathematical operation used in the calculation.

15. error = –1.6°C; percent error = 1.3%

16. **a.** unlimited **b.** 5 **c.** 3 **d.** 2 **e.** 3 **f.** unlimited

17. **a.** 6.6×10^{4} **b.** 4.0×10^{-7} **c.** 10^{7} **d.** 8.65×10^{-1} **e.** 1.9×10^{14}

18. **BIG**IDEA Accuracy compares a measured value to an accepted value of the measurement; precision compares a measured value to a set of measurements made under similar conditions; and error is the difference between the measured and accepted values.

Sample Problems

19. melting point = 1234 K → 960.8 C + 273 K

    boiling point = 2485 K → 2212 C + 273 K

20. -196 C → 77.2 K – 273

21. density = 2.50 g/cm^3 → d = m/v = 612 g / 245 cm^3;

    The metal is NOT aluminum (d = 2.7 g/cm^3)

22. 10.5 g/cm^3 → d = m/v = 612 g / 6.48 cm^3 → d = m/v = 68.0 g / 6.48 cm^3

Lesson Check Answers

23. All metric units are based on multiples of 10, which makes them easy to use.

24. the degree Celsius and the kelvin

25. Density is an intensive property that depends only on the composition of a substance, not on the size of the sample. Density = mass/volume

26. mass, kilogram (kg); length, meter (m); volume, cubic meter (m^3); temperature, kelvin (K)

27. **a.** m; 10^{-3} of the unit
b. n; 10^{-9} of the unit
c. d; 10^{-1} of the unit
d. c; 10^{-2} of the unit

28. m^3, L, dL, cL, mL, µL

29. 8.8×10^2 cm^3

30. Mass is a measure of the amount of matter in an object. Weight is a measure of the force of gravity on an object.

31. 443 K

32. 1.7×10^{-1} g/L

33. All the densities are equal.

34. Li, Na, and K are less dense than water.

35. Density generally decreases when temperature increases.

Sample Problems

36. 1.0080×10^4 min → 1 week x 7 days/week x 24 hrs/day x 60 min/hr

37. 1.44000×10^5 s → 40 hr x 60 min/hr x 60 s/min

38. 67 students → 570 cm x 1 student/8.5 cm

39. 86.4 F → 48.0 C x 1.8 F/1 C

40. 1.53×10^{22} atoms → 5.00 g x 1 atom/3.271×10^{-22} g

Answers

41. **a.** 44 m
b. 4.6×10^{-3} g
c. 10.7 cg

42. **a.** 1.5×10^{-2} L
b. 7.38×10^{-3} kg
c. 6.7×10^3 ms
d. 9.45×10^7 µg

43. **a.** 6.32 cm^3 **b.** 0.342 cm^3

44. See answers for Problem 43.

45. 47.5 g

Answers

46. 2.27×10^{-8} cm
47. 1.3×10^{8} dm
48. 1.93×10^{4} kg/m^3
49. 7.0×10^{12} RBC/L

Sample Problems

45. d = m/v … therefore, m = d v → 50.0 cm3 x 0.950 g/cm3 = 47.5 g

46. 0.227 nm x 1 m / 10 9 nm x 10 2 cm / 1 m = 2.27 x 10 -8 cm

47. 1.3 x 10 4 km x 10 3 m / 1 km x 10 1 dm / 1 m = 1.3 x 10 8 dm

48. 19.3 g/cm3 x 1 kg/10 3 g x [10 2 cm/1 m] 3 = 19.3 g/cm3 x 1 kg/10 3 x 10 6 cm3 /1 m3 = = 19.3 x 10 3 kg/1 m3 = 1.93 x 10 4 kg/m3

49. 7.0 x 10 6 RBC/mm3

    mm3 to Liters = [10 1 mm = 1 cm] 3 = 10 3 mm3 = 1 cm3 and 1 cm3 = 1 ml and 1 L = 10 3 ml = therefore, 1 L = 10 3 [10 3 mm3] = 7.0 x 10 6 x 10 6 RBC/L = 7.0 x 10 12 RBC/L

Lesson Check Answers

50. The numerical value (and the unit) changes; the actual size does not change.
51. conversion problems
52. **a.** 1 hour / 60 min
b. 10^3 mg / 1 g
c. 10^3 mL / 1 dm^3

53. **a.** 1.48×10^{7} µg
b. 3.72×10^{-3} kg
c. 6.63×10^{4} cm^3
d. 7.5×10^{1} kJ
e. 3.9×10^{3} dg
f. 2.1×10^{1} µL
54. 9.52 kg
55. 1.08×10^{9} km/h