

Chapter 3

End-of-Chapter Questions

1. What is the difference between accuracy and precision?
2. What is the difference between a random error and a systematic error?
3. Name the SI unit for each of the following:
(a) length (b) time (c) light intensity.
4. Name the SI unit for each of the following:
(a) mass (b) temperature (c) pressure.
5. Which metric prefixes have the following values:
(a) 10^6 (b) 10^{-1} (c) 10^{-9}
6. What are the values of the following metric prefixes:
(a) kilo (b) micro (c) pico
7. An object is known to have a mass of 3.145 g. A student makes three different measurements of the mass and obtains values of 3.102 g, 3.105 g, and 3.101 g. Are the measurements accurate or precise?
8. A rock has a mass of 12.650 g. A student makes three different measurements of the mass and obtains values of 13.650 g, 11.650 g, and 12.650 g. Are the measurements accurate or precise?
9. How many significant figures are there in:
(a) 25.0 (b) 0.2050 (c) 0.0270 (d) 0.04
10. How many significant figures are there in:
(a) 5.0320 (b) 0.018 (c) 0.0100 (d) 0.000 01
11. Write the following numbers in scientific notation with the correct number of significant figures:
(a) 0.000 810 (b) 58.36 (c) 100.00
12. Write the following numbers in scientific notation with the correct number of significant figures:
(a) 2000.0 (b) 0.40 (c) 0.000 000 081

13. In scientific notation, will the exponent be positive or negative when the number is:
(a) less than 1 (b) greater than 10
14. When converting to decimal notation from scientific notation, which way is the decimal point moved if the exponent is:
(a) positive (b) negative
15. Convert the following numbers from scientific notation to decimal notation with the correct number of significant figures:
(a) 4.030×10^{-2} (b) 1.624×10^2 (c) 3.98×10^{-5}
16. Convert the following numbers from scientific notation to decimal notation with the correct number of significant figures:
(a) 5.987×10^3 (b) 4×10^{-6} (c) 8.112×10^{-1}
17. Round-off the following numbers to two significant figures:
(a) 2.851 (b) 1.5449
18. Round-off the following numbers to three significant figures:
(a) 0.2599 (b) 87.4278
19. Re-express the following measurements by replacing the exponent by the most appropriate prefix:
(a) 4.28×10^{-11} g (b) 2.5×10^{-6} L (c) 5.101×10^4 m
20. Re-express the following measurements by replacing the exponent by the most appropriate prefix:
(a) 9.27×10^7 g (b) 6.62×10^{-8} L (c) 9.002×10^{-7} m
21. Give your answer to each of the following calculations in scientific notation to the correct number of significant figures:
(a) 4.18×0.005196
(b) $0.50 \div 4.12$
(c) $(3.30 \times 10^{-2}) \times (4.162 \times 10^2)$
(d) $(1.981 \times 10^2) \div (2.5 \times 10^{-2}) \times (5.51 \times 10^{-7})$
22. Give your answer to each of the following calculations in scientific notation to the correct number of significant figures:
(a) $(5.4 \times 10^2) \times (3.09 \times 10^{-4})$

- (b) $0.6170 \div 8.0$
(c) $(4.4 \times 10^{-8}) \times (7.561 \times 10^9)$
(d) $(8.641 \times 10^2) \times (9.32 \times 10^{-2}) \div (1.120 \times 10^{-3})$
23. Give your answer to each of the following calculations in scientific notation to the correct number of significant figures:
(a) $4.49 + 0.597 + 10.0$
(b) $12.25 - 6.184 - 5.47$
(c) $9.25 + 4.10 - 2.05$
24. Give your answer to each of the following calculations in scientific notation to the correct number of significant figures:
(a) $0.21 + 4.33 + 0.008$
(b) $134.8 + 2.05 - 13$
(c) $14.896 - 2.42 + 4.60$
25. A solution of sodium chloride (common salt) is prepared by dissolving 2.596 g of the compound in 100.72 g of water in a beaker of mass 42.10 g. What is the total mass of salt, water, and beaker, to the correct number of significant figures?
26. A beaker and its contents had a mass of 125.879 g. If the empty beaker has a mass of 87.8 g, what is the mass of the contents, to the correct number of significant figures?
27. Perform the following conversions and give your answer in decimal notation:
(a) 154 mL to L (b) 0.0680 kg to g
28. Perform the following conversions and give your answer in scientific notation:
(a) 5.47×10^{-8} g to ng (b) 4.971×10^{-5} L to μL
29. An airtight cylinder with a piston contains litre of water and a litre of air. The piston is pulled back until the volume inside the cylinder is doubled. What happened to the mass, volume, and density of:
(a) the water (b) the air.
30. Would the density of a rock be the same on the Moon as on Earth? Explain briefly.
31. The density of gold is $19.3 \text{ g}\cdot\text{cm}^{-3}$. What would be the mass in kilograms of a bar of gold that is 10.0 cm long, 5.0 cm across, and 2.0 cm thick? (volume = length \times width \times height).

32. Water-beds (water-filled mattresses) were once popular. A typical king-size bed would be 1.83 m long, 1.83 m wide, and 0.305 m deep. As water has a density of $1.00 \times 10^3 \text{ kg} \cdot \text{m}^{-3}$, what will be the mass of water in the bed, in tonnes (1 tonne = 1 Mg = 1000 kg).
33. The mass of a 50.0 mL graduated cylinder is 124.60 g. A liquid is poured into the cylinder up to the 50.0 mL mark. The combined mass of cylinder and liquid is 187.95 g. What is the density of the liquid in $\text{g} \cdot \text{mL}^{-1}$.
34. A volume of 50.0 mL of a liquid is placed in a 100 mL graduated cylinder. A solid of mass 93.86 g is placed carefully in the cylinder and the top of the liquid reaches 88.7 mL. What is the density of the solid in $\text{g} \cdot \text{cm}^{-3}$.