(**Q1**) Give an example for each of the following terms:
(a) matter:
(b) substance:
(c) mixture:

(**Q2**) Give an example of an element and a compound. How do elements and compounds differ?

(**Q3**) Give an example of a homogeneous mixture and an example of a heterogeneous mixture.

(**Q4**) Classify each of the following substances as an element or a compound:
(a) hydrogen: element
(b) water: compound
(c) gold: element
(d) sugar: compound

(**Q5**) Classify each of the following as an element, a compound, a homogeneous mixture, or a heterogeneous mixture:
(a) seawater:
Sea water is the mixture of many salts, water and other many impurities. Apart from these many gases are also dissolved in sea water.
Homogeneous: mixture of salts and water only.
Heterogeneous: contains salts, water, mud, decayed plant, etc.
(b) helium gas: element
(c) sodium chloride (table salt): compound
(d) a bottle of soft drink: homogeneous mixture
(e) a milkshake: heterogeneous mixture
(f) air in a bottle: homogeneous mixture
(g) concrete: heterogeneous mixture

(**Q6**) Using examples, explain the difference between a physical property and a chemical property.
Physical properties: can be observed without changing a substance into another substance.
Chemical properties: can only be observed when a substance is changed into another substance.

(**Q7**) How does an intensive property differ from an extensive property? Which of the following properties are intensive and which are extensive?
Intensive properties: are independent of the amount of the substance that is present.
Extensive properties: depend upon the amount of the substance present.
(a) length: extensive
(b) volume: extensive
(c) temperature: intensive
(d) mass: extensive

(**Q8**) Name the **SI base** units that are important in chemistry.
Length (m), mass (kg), time (s), electrical current (A), temperature (K), amount of substance (mol), luminous intensity (cd)

(**Q9**) Give the SI units for expressing the following:
(a) length: m
(b) speed: $m\ s^{-1}$
(c) volume: m^3
(d) mass: kg
(e) time: s
(f) energy: J ($kg\ m^2\ s^{-2}$)
(g) temperature: K

(**Q10**) The SI units are
(a) “kg” for mass & “atm” for pressure
(b) “Pa” for pressure & “K” for temperature
(c) “^{o}C” for temperature & “L” for volume
(d) “s” for time & “mmHg” for pressure

(**Q11**) Which of the following is an **SI derived** unit:
(a) Liter “L” for volume
(b) Pascal “Pa” for pressure
(c) Kilogram “kg” for quantity
(d) Kilometer per hour “km/h” for speed

(**Q12**) The density of ethanol, a colorless liquid that is commonly known as grain alcohol, is 0.798 g/mL. Calculate the mass of 17.4 mL of the liquid.
13.9g

(**Q13**) How many significant figures are there in each of the following?
(a) 0.006 L: one
(b) 0.0605 dm: three
(c) 60.5 mg: three
(d) 605.5 cm^2: four
(e) 960 x 10^{-3} g: two or three
(f) 6 kg: one
(g) 60 m: one or two

(**Q14**) Carry out the following operations as if they were calculations of experimental results, and express each answer in the correct units with the correct number of significant figures:
(a) 7.310 km ÷ 5.70 km: 1.28
(b) (3.26 x 10^{-3} mg) – (7.88 x 10^{-5} mg): 3.18 x 10^{-3}mg
(c) (4.02 x 10^{6} dm) + (7.74 x 10^{7} dm): 8.14 x 10^{7} dm
(d) (7.8 m – 0.34 m) / (1.15 s + 0.82 s): 3.8 m/s

(**Q15**) Three apprentice tailors (X, Y, and Z) are assigned the task of measuring the seam of a pair of trousers. Each one makes three measurements. The results in inches are:
X (31.5, 31.6, 31.4);
Y (32.8, 32.3, 32,7);
Z (31.9, 32.2, 32.1).
The true length is 32.0 in. Comment on the precision and the accuracy of each tailor's measurements.
Tailor X's measurements are the most precise
Tailor Z's measurements are the most accurate
Tailor Y's measurements are the least precise and least accurate

(**Q16**) Carry out the following conversions:
(1 lb = 454 g)
(a) 242 lb to mg: 1.10×10^{8} mg
(b) 68.3 cm^3 to cubic meters: 6.83×10^{-5} m^3
(c) 7.2 m^3 to liters: 7.2×10^{3} L
(d) 28.3 µg to pounds: 6.24×10^{-8} lb

(**Q17**) How many seconds are there in a solar year (365.24 days)?

$$365.24 \text{ day} \times \frac{24 \text{ h}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ h}} \times \frac{60 \text{ s}}{1 \text{ min}} =$$

3.1557×10^{7} s

(**Q18**) How many minutes does it take light from the sun to reach Earth?
(The distance from the sun to Earth is 93 million mi; 1 mi = 1609 m; the speed of light = 3.00×10^{8} m/s).

$$93{,}000{,}000 \text{ mi} \times \frac{1609 \text{ m}}{1 \text{ mi}} \times \frac{s}{3x10^{8}\text{m}} \times \frac{1 \text{ min}}{60 \text{ s}} =$$

8.3 min

speed = length / time

(**Q19**) At 20°C, the speed of sound is 343 m/s;
Calculate the speed sound in km/h
1235 km/h

(**Q20**) A slow jogger runs a mile in 13 min.
(1 mi = 1609 m; 1 in = 2.54 cm).
Calculate the speed in
(a) in/s: 81.2 in/s

$$\frac{1\ \text{mi}}{13\ \text{min}} \times \frac{1609\ \text{m}}{1\ \text{mi}} \times \frac{100\ \text{cm}}{1\ \text{m}} \times \frac{1\ \text{in}}{2.54\ \text{cm}} \times \frac{1\ \text{min}}{60\ \text{s}}$$

(b) m/min: 1.2×10^2 m/min
(c) km/h: 7.4 km/h

(**Q21**) The current speed limit in some states in the United States is 0.0152 miles per second. What is the speed limit in kilometers per hour?
88 km/h

(**Q22**) The density of ammonia gas under certain conditions is 0.625 g/L. Calculate its density in g/cm^3.
6.25×10^{-4} g/cm^3