

Chapter 1 (exercises)

Q1. A balance has a precision of ± 0.001 g. A sample that has a mass of about 25 g is placed in this balance. How many significant figures should be reported for this measurement?

Answer: $25 - 0.001 = 24.995$ or $25 + 0.001 = 25.001$

It is five significant figures. Uncertainty in the third decimal place

Q2. How many significant figures are in each the following measurements? a) 3.549 g, b) 2.3×10^4 cm, c) 0.00134 m^3 .

Answer:

- a) 3.549 g four significant figures
- b) 2.3×10^4 cm two significant figures
- c) 0.00134 m^3 three significant figures

Q3. The width, length, and height of a small box are 15.5 cm, 27.3 cm, and 5.4 cm, respectively.

Calculate the volume of the box, using correct number of significant figures in your answer.

Answer: Volume = width x length x height

$$= (15.5 \text{ cm}) \times (27.3 \text{ cm}) \times (5.4 \text{ cm}) = 2285.01$$

$$= 2.3 \times 10^3 \text{ cm}^3 \quad \text{two significant figures}$$

Q4. It takes 10.5 s for the sprinter to run 100.00 m. Calculate the average speed of the sprinter in meters per second, and express the result to the correct number of significant figures.

Answer:

$$\text{Speed average} = 100.00 / 10.5 = 9.52301 \text{ m/s}$$

$$= 9.52 \quad \text{three significant figures}$$

Because the number (10.5 two significant figures)

Q5. A gas at 25 °C fills a container whose volume is $1.05 \times 10^3 \text{ cm}^3$. The container plus gas have a mass of 837.6 g. The container, when emptied of all gas has a mass of 836.2 g. What is the density of the gas.

Answer:

$$\text{Mass of the gas is } 837.6 - 836.2 = 1.4 \text{ g}$$

$$\text{Density} = \text{mass} / \text{volume} = 1.4 \text{ g} / 1.05 \times 10^3 = 1.3 \times 10^{-3} \text{ g} / \text{cm}^3$$

The number has two significant figures (because 1.4 two significant figures)

Q6. If a woman has a mass of 115 lb. What is her mass in grams?

Answer: 1 lb = 453.6 g

Given unit \times desired unit / given unit = desired unit

$$\text{Mass in grams} = (115 \text{ lb})(453.6 \text{ g} / 1 \text{ lb}) = 5.22 \times 10^4 \text{ g}$$

The number has three significant figures

Q.8 A car travels 28 mi per gallon of gasoline. How many kilometer per liter will it go?

Answer:

$$1 \text{ mi} = 1.6093 \text{ km} \quad \text{and} \quad 1 \text{ L} = 0.2642 \text{ gallon}$$

The speed of the car = (28 mi / 28 mi) (1.6093 km) (0.2642 gallon / 1 L)

$$= 12 \text{ km} / \text{L}$$

Q.1.25 page 32

Make the following conversions:

- a) 62 F to C, b) 216.7 C to F, d) 223 C to K, d) 315 K to F and e) 2500 F to K.

Answer:

a) $C = 5/9 (F-32) = 5/9 (62 - 32) = 17 \text{ C}$

b) $F = 9/5 (C) + 32 = 9/5 \times 216.7 + 32 = 244.1 \text{ F}$

c) $223 + 273 = 496 \text{ K}$

d) $315 - 273 = 42 \text{ C}$

$F = 9/5 (C) + 32 = 9/5 \times 42 + 32 = 108$

Q. 1.35 page

What is the number of significant figures in each of the following measured quantities?

- a) 358 kg, b) 0.056 s, c) 6.3050 cm, d) 0.0105 L, e) $7.0500 \times 10^{-3} \text{ m}^3$

Answer:

a) 358 kg three significant figures

b) 0.056 s two significant figures

c) 6.3050 five significant figures

- d) 0.0105 L three significant figures
 e) $7.0500 \times 10^{-3} \text{ m}^3$ five significant figures

Q. 1.37 page 32

Round each of the following numbers four significant figures, and express the results in standard exponential notation. a) 102.53070, b) 656,980, c) 0.008543210, d) 0.000257870 e) -0.0357202

Answer:

Change all the numbers to four significant figures

- a) 1.023×10^2 b) 6.570×10^5 c) 8.543×10^{-3} d) 2.579×10^{-4} e) -3.572×10^{-2}

Q.1.39 page 33

Carry out the following operations, and express the answer with the appropriate number of significant figures.

- a) $12.0550 + 9.05$
 b) $257.2 - 19.789$
 c) $(6.21 \times 10^3)(0.1050)$
 d) $0.0577 / 0.743$

Answer:

- a) 21.11 (because the number 9.05 has two digits after the decimal)
 b) 237.4 (because the number 257.2 has one digit after the decimal)
 c) 652 (because the number 6.21 has three significant figures)
 d) 7.66×10^{-2} (because the number 0.743 has three significant figures)

Q. 1.49 page 33

The density of air at ordinary atmospheric pressure and 25 C is 1.19 g/L. What is the mass in kg of the air in a room that measure 12.5 x 15.5 x 8.0 ft?

Answer:

$$\text{Ft}^3 = 12.5 \times 15.5 \times 8.0 = 1550$$

$$1 \text{ ft}^3 = 28.3168 \text{ L}$$

$$\text{Volume L} = (1550 \text{ ft}^3 / 1 \text{ ft}^3)(28.3168 \text{ L}) = 43891.01 \text{ L}$$

$$\text{Mass g} = (43891.01 \text{ L} / 1 \text{ L}) (1.19 \text{ g}) = 52230.3376 \text{ g}$$

$$= 52 \text{ kg} \quad (\text{two significant figures because } 8.0 \text{ is two significant figures})$$