Physics, Foundation Programme – Problem Solving Exercises 8

SI Units

1. Which of the following units are NOT base (fundamental) units:

cd	cm	J	m	N	second	A	hour	K	mol	gram
	x	x		x			x			x

kg	V	Ω	T
	x	x	x

2. How many megahertz (MHz) is 750 kilohertz(kHz)?

   A: 750 kHz = 0.750 MHz

3. Convert 5021 centimeters to kilometers.

   A: 5021 cm = 0.05021 km

4. How many seconds are in a leap year?

   A: 366 day * 24 hour/day * 60 min/hour * 60 s/min = 31,622,400 s

5. Convert the speed 5.30 m/s to km/h.

   A: 19.08 km/h

6. The liquid measure milliliter, mL, is the same as 1 cm^3. How many milliliters of liquid can be held in a 2.5-m^3 container?

   A: 2.5 m^3 = $2.5 \cdot 10^6$ ml = 2,500,000 ml

7. Use an appropriate prefix of units so that the amount of units is a number larger than or equal to 1 and smaller than 1000 :
   a. $1.0 \cdot 10^{15}\ \mathrm{nm}$ a: $1.0\,\mathrm{Mm}$

b. $5.0 \cdot 10^{9}\,\mathrm{as}$ a: $5.0\,\mathrm{ns}$

c. $7.0 \cdot 10^{-30}\,\mathrm{PHz}$ a: $7.0\,\mathrm{fHz}$

d. $9.0 \cdot 10^{-12}\,\mathrm{Zs}$ a: $9.0\,\mathrm{Gs}$

e. $3.0 \cdot 10^{-29}\,\mathrm{Ys}$ a: $30\,\mu\mathrm{s}$

8. The micrometer (1 μm) is often called the micron. (a) How many microns make up 1.0 km? (b) What fraction of a centimeter equals 1.0 μm? (c) How many microns are in 1.0 yd? (use 1.094 yd = 1 m)

a: a) $1.0 \cdot 10^{9}\,\mu\mathrm{m}$, b) $1.0 \cdot 10^{-4}\,\mathrm{cm} = 1.0\,\mu\mathrm{m}$ c) $1.0\,\mathrm{yd} = 9.14 \cdot 10^{5}\,\mu\mathrm{m}$

9. In the following exercise we will abbreviate liter as L, which is common in chemistry (in physics you will usually use l for liters). The volume of 1L is equal to 1.0 dm^3 SI units.
   a. Convert 1L to m^3

      a: $1.0\,\mathrm{L} = 1.0 \cdot 10^{-3}\,\mathrm{m}^3$
   b. Convert 50 mL to to cm^3.

      a: $50\,\mathrm{mL} = 50\,\mathrm{cm}^3$
   c. Convert 25 μL to m^3

      a: $25\,\mu\mathrm{L} = 2.5 \cdot 10^{-8}\,\mathrm{m}^3$

10. If F is a constant force, exerted in the direction in which the object is moving, then work, W, is the product of the force and the object's displacement d. ($W=F \cdot d$). Express the unit of work (joule) using the base units.

A: $\mathrm{kg} \cdot \frac{\mathrm{m}^2}{\mathrm{s}^2}$