Metric conversions

CHARLES STURT UNIVERSITY

Learning Skills

Introduction:

It is necessary to ensure that units of measurement are consistent when carrying out medication calculations. This may require units to be converted.

This sheet will teach you to:

- Understand powers of ten
- Multiply decimal numbers by powers of ten
- Divide decimal numbers by powers of ten
- Convert larger units to smaller units
- Convert smaller units to larger units

1. Powers of ten

Powers of 10 such as 10, 100 or 1000 are special numbers in our number system. Short cuts can be taken when we are multiplying or dividing by these powers of 10.

2. Multiplying decimals by powers of ten

Rule: To multiply move the decimal point to the <u>right</u> the same number of places as the number of noughts in the power of ten. (You may need to add some spare noughts at the <u>end</u> of the decimal to have the places to move to)

Examples:

a) $3.2 \times 10 \quad = \underset{\rightarrow\uparrow}{3\,2\,.} = 32$

b) $0.585 \times 10 \quad = 5.85$

c) $3.721 \times 1000 \quad = \underset{\rightarrow\rightarrow\rightarrow\uparrow}{3\,7\,2\,1\,\cdot} = 3721$

d) 2.3×1000

$2.3 \times 1000 = 2.300 \times 1000 = \underset{\rightarrow\rightarrow\rightarrow\uparrow}{2\,3\,0\,0\,.} = 2300$

Note

We need to move the decimal point 3 places to the right.
To create the places to move to add some noughts after the last decimal place- two 0's are enough

e) 56×100

Note

1. **Make the number a decimal number: 56.0**
2. Add another nought to make sufficient places: 56.00

$$56.00 \times 100 = 56\underset{\rightarrow\rightarrow\uparrow}{0\,0\,.} = 5600$$

3. Dividing by powers of ten

Rule: To divide move the decimal point to the left the same number of places as the number of noughts in the power of ten. (You may need to add some spare noughts at the front of the number to have the places to move to)

Examples:

a) $900.3 \div 10$

$$= 90\underset{\uparrow\leftarrow}{.\,0}\,3 = 90.03$$

b) $852 \div 1000$

$$= 852.0 \div 1000 = \underset{\uparrow\leftarrow\leftarrow\leftarrow}{.\,8\,5\,2} = 0.852$$

Note

1. make the number a decimal: 852.0
2. the answer .852 is written as 0.852

c) $56.04 \div 1000$

$$= 056.04 \div 1000 = .05604 = 0.05604$$

Note

Add another 0 to the front to make sufficient places

4. Using these rules to convert measurements

The most commonly used units of measurement in nursing are the following

Mass: kilogram, gram, milligram and microgram

Liquid volume: litre and millilitre

Length: centimetre

The following table of conversions needs to be remembered:

1 kilogram (kg) = 1000 grams (g) 1 gram (g) = 1000 milligrams (mg) 1 milligram = 1000 micrograms (mcg or µg) 1 litre (L) = 1000 millilitres (mL)

Rule: To convert from one unit to another either divide by 1000 or multiply by 1000

5. Converting to a smaller unit of measurement

As seen in the table each smaller unit has 1000 of them to equate to the larger unit. For instance 1 g is equivalent to 1000mg. **To convert to a smaller unit you need more of them so multiply.**

Examples

a. 5.2 g to mg

   5.2×1000=5.200×1000=5200. = 5200 mg

b. 0.2 L to mL

   0.2×1000=0.200×1000=200. = 200mL

c. 0.087mg to mcg

   0.087×1000=087. = 87mcg

d. 15.3kg to g

   15.3× 1000 = 15.300×1000=15300. = 15 300g

e. 8g to mg

   8×1000=8.000×1000=8000. = 8000mg

6. Converting to a larger unit

When converting to a larger unit there will be less of them so divide.

Examples

a. 640mL to L

640.0 ÷1000 = .640 = 0.64L

b. 1563g to kg

1563. 0 ÷ 1000 = 1.5630 = 1.563kg

c. 49mcg to mg

049.0 ÷ 1000 = .0490 = 0.049mg

7. Working with medications

For drug calculations make sure that the units of measurement are the same before you start.

For example:

A patient is ordered 0.25 mg of digoxin. The digoxin available is in tablets containing 125 micrograms. How many such tablets are required?

The two measurements used here are in different units - milligrams and micrograms.

Convert 0.25 mg to micrograms:
0.25 x 1000 = 0.250×1000=0250.0=250 micrograms

Each tablet contains 125 micrograms. We want 250 micrograms so the patient requires 2 tablets.

Note

Where possible convert to the smaller unit as this will give you whole numbers to work with rather than decimal numbers

8. Some exercises to try

Exercise set 1

1) 2.5×10
2) 13.8×10
3) 6.524×10
4) 6.4×100
5) 7.026×100
6) 0.12×100
7) 56.1×100
8) 0.1234×1000
9) 2.256×1000
10) 3.61×1000

Exercise set 2

1) $3.2 \div 10$
2) $0.3 \div 10$
3) $103 \div 10$
4) $213.3 \div 100$
5) $82.5 \div 100$
6) $0.4 \div 100$
7) $800 \div 1000$
8) $2586 \div 1000$
9) $200.6 \div 1000$
10) $60.52 \div 1000$

Exercise set 3

Convert the measurements to the unit specified

1) 5000 mg to g
2) 852 micrograms to mg
3) 2.35 kg to g
4) 0.47 mg to mcg
5) 600 mL to L
6) 200 mg to g
7) 703 mcg to mg
8) 32 mg to mcg
9) 1.7 L to mL
10) 0.05 mg to mcg
11) 12 345 mL to L
12) 6.587 g to mg
13) 0.045 L to mL
14) 92 mcg to mg

Solutions

Set 1

1) 25	2) 138	3) 65.24	4) 640	5) 702.6	6) 12
7) 5610	8) 123.4	9) 2 256	10) 3 610		

Set 2

2) 0.03	3) 10.3	4) 2.133	5) 0.825	6) 0.004
8) 2.586	9) 0.2006	10) 0.06052		

Set 3

1) 5 g	2) 0.852 mg	3) 2 350 g	4) 470 mcg	5) 0.6 L	6) 0.2 g
7) 0.703 mg	8) 32 000 mcg	9) 1 700 mL	10) 50 mcg	11) 12.345 L	12) 6 587 mg
13) 45 mL	14) 0.092 mg				

9. For more information

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