**DRUG CALCULATIONS**

When calculating how much of a drug is required, working with the formula helps the accuracy of the calculation.

Always remember this formula:

<table>
<thead>
<tr>
<th>What you want</th>
<th>X</th>
<th>Quantity it comes in</th>
</tr>
</thead>
<tbody>
<tr>
<td>What you have</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

It’s OK to use a calculator!

1. A patient requires 4 mg of Morphine IVI. Morphine is available as 10mg/ml. How many mls will you draw up?

2. Gentamycin 360 mg is prescribed. Gentamycin is available as 80mg/2ml. How many mls will you draw up?

3. Haloperidol 3 mg IVI is charted. Haloperidol is available as 5mg/ml. How many mls is required?

4. Frusemide 70mg IVI is charted. Stock dose is 20mg/ml. How many ml would you give?
METRIC CONVERSIONS

Metric weights and measurements involve a step-by-step conversion from one unit to another.

With weight we often convert to smaller (and more numerous units) thus:
Kg → gm → mg → mcg
grams milligrams micrograms

Each of these steps involves the heavier unit being multiplied by 1000 to bring up the number of the smaller units for the same weight.

\[
\begin{align*}
kg & \rightarrow g & 1kg \times 1000 = 1000g \\
g & \rightarrow mg & 1g \times 1000 = 1000mg \\
mg & \rightarrow mcg & 1mg \times 1000 = 1000mcg
\end{align*}
\]

When we multiply by 1000 we move the “decimal point” three places to the right

\[
0.5g = \text{?? mg} \quad 0.5 \times 1000 = 500mg \\
1 \text{ place} = 5 \\
2 \text{ places} = 50 \\
3 \text{ places} = 500
\]

If we are converting from a lighter unit to a heavier unit we move the decimal point three places to the left for each conversion. Another way of putting it is we divide by 1000.

\[
\begin{align*}
mcg & \rightarrow mg & 1000mcg \div 1000 = 1mg \\
mg & \rightarrow gm & 1000mg \div 1000 = 1gm \\
gm & \rightarrow kg & 1000gm \div 1000 = 1kg
\end{align*}
\]

\[
500mg = \text{?? gm} \quad 500 \div 1000 = 0.5mg \\
1 \text{ place} = 50 \\
2 \text{ places} = 5 \\
3 \text{ places} = 0.5
\]
Try these:

5. Atropine 0.6 mg = ?mcg
   
   \[0.6 \times 1000 = 600\text{mcg}\]

6. 0.01 gm = ? mg
   
   \[0.01 \times 1000 = 10\text{ mg}\]

7. Gentamycin 360 mg = ? gm
   
   \[360 \div 1000 = 0.36\text{gm}\]

8. Digoxin 125 mcg = ? mg
   
   \[125 \div 1000 = 0.125\text{mg}\]

If we are moving across two conversions we repeat the process twice. For example from grams to micrograms:

3 gm converted to micrograms
   
   \[
   \begin{align*}
   \text{Step one:} & \quad 3 \times 1000 = 3000\text{mg} \\
   \text{Step two:} & \quad 3000\text{mg} \times 1000 = 3,000,000\text{mcg}
   \end{align*}
   \]

9. Augmentin 1.2 gm = ? mcg
   
   \[
   \begin{align*}
   1.2 \times 1000 & = 1200\text{mg} \\
   1200 \times 1000 & = 1,200,000\text{mcg}
   \end{align*}
   \]

10. Digoxin 125 mcg = ? gm

    \[
    \begin{align*}
    125 \div 1000 & = 0.125\text{mg} \\
    0.125 \div 1000 & = 0.000125\text{gm}
    \end{align*}
    \]

Memory Tip:

“Heavy to light – three places to the right”
Try these:

Convert

11. 1.2 mg to mcg
12. 1.3g to mg
13. 500mcg to mg
14. 0.04 mg to mcg
15. 20mcg to mg
16. 600mcg to g
17. 2g to mcg

When we are converting **volumes** the process is the same.

<table>
<thead>
<tr>
<th>Litres</th>
<th>→</th>
<th>ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Litre</td>
<td>1000ml</td>
<td></td>
</tr>
<tr>
<td>0.25L</td>
<td>250ml</td>
<td></td>
</tr>
<tr>
<td>375ml</td>
<td>0.375L</td>
<td></td>
</tr>
</tbody>
</table>

Try these:

Convert

18. 450ml to L
19. 64 ml to L
20. 4.3L to ml
MG/KG DOSE CONVERSION

Often we need to check the dose of a drug or solution that is based on the patient’s weight. 
We multiply the prescribed mg dose by the kg weight of the patient

Prescribed dose - 25mg per kg  
Patient’s weight - 66kg  
What is the dose required?

\[25mg \times 66kg = 1650mg\]  
\[= 1.65g\]

21. Prescribed dose – 50 mg/kg  
Patient’s weight – 79 kg  
What is the dose required?

22. The patient is charted 15mg/kg/day. The patient weighs 75kg.  
a) How much is the total dose per 24 hours?

b) How much will the patient receive every 8 hours?

ROUNDING OFF the decimal point

Rounding up if greater than 5, round up  
\[\text{eg } 166.66 = 167\]

Rounding down if less than 5, round down  
\[\text{eg } 33.33 = 33\]
**INFUSION FLOW RATES**

To obtain the hourly rate, divide the volume of fluid to be infused by the number of hours fluid to be infused over.

\[
\frac{1000}{12} = 83.3 \text{ml/hr} \quad \text{rounded down to 83ml/hr}
\]

23. A 1L bag is to be infused over 6 hours. Calculate how many mls per hour the patient will receive.

24. How many ml/hr would a patient receive if they were to have 500ml of fluid infused over 6 hours?

Fluids are infused using a giving set, requiring a “drop per minute” rate. The giving sets are:

- **Standard** Metriset = delivers 20 drops per ml.
- **Micro giving set** (Buretrol) = delivers 60 drops per ml.

Always ensure you use the appropriate calibration in your calculations.
DROP PER MINUTE Infusion Calculation

<table>
<thead>
<tr>
<th>Total fluid in mls</th>
<th>x giving set calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hours x 60 mins</td>
<td>1</td>
</tr>
</tbody>
</table>

A patient is prescribed Sodium Chloride 1000ml to be infused over an 8-hour period. A standard giving set is being used.

*Calculate the drops per minute.*

\[
\frac{1000}{8 \times 60} \times 20 = \text{? drops per minute}
\]

25. Your patient is prescribed a 1000ml infusion of Sodium Chloride 0.9% with 40 mmols of Potassium to be given over 6 hours. Using a buretrol giving set, calculate the drops per minutes he will receive.
DRUG CALCULATIONS

1. A patient requires 4 mg of Morphine IVI. Morphine is available as 10mg/ml. How many mls will you draw up?

   0.4 mls

2. Gentamicin 360 mg is prescribed. Gentamicin is available as 80mg/2ml. How many mls will you draw up?

   9 mls

3. Haloperidol 3 mg IVI is charted. Haloperidol is available as 5mg/ml. How many mls is required?

   0.6 mls

4. Frusemide 70mg IVI is charted. Stock dose is 20mg/ml. How many ml would you give?

   3.5 mls

METRIC CONVERSIONS

5. Atropine 0.6 mg = ?mcg

   0.6 x 1000 = 600mcg

6. 0.01gm = ? mg

   0.01 x 1000 = 10 mg

7. Gentamicin 360mg = ?gm

   360 ÷ 1000 = 0.36gm

8. Digoxin 125mcg = ? mg

   125 ÷ 1000 = 0.125mg
9. Augmentin 1.2gm = ?mcg
   
   \[
   1.2 \times 1000 = 1200\text{mg}
   \]
   
   \[
   1200 \times 1000 = 1,200,000\text{mcg}
   \]

10. Digoxin 125mcg = ? gm
    
    \[
    125 \div 1000 = 0.125\text{mg}
    \]
    
    \[
    0.125 \div 1000 = 0.000125\text{gm}
    \]

11. 1.2 mg to mcg 1200 mcg

12. 1.3g to mg 1300 mg

13. 500mcg to mg 0.5 mg

14. 0.04 mg to mcg 40 mcg

15. 20mcg to mg 0.02 mg

16. 600mcg to g 0.0006 gm

17. 2g to mcg 2,000,000 mcg

18. 450ml to L 0.45 L

19. 64 ml to L 0.064 L

20. 4.3L to ml 4,300 mls

**MG/KG DOSE CONVERSION**

21. Prescribed dose – 50 mg/kg Patient’s weight – 79 kg
    
    What is the dose required?
    
    **3950 mg**

22. The patient is charted 15mg/kg/day. The patient weighs 75kg.
    
    a) How much is the **total dose per 24 hours**?
1125 mgs

b) How much will the patient receive every 8 hours?

375 mgs

Rounding off the decimal point

Infusion Flow Rates

23. A 1L bag is to be infused over 6 hours. Calculate how many mls per hour the patient will receive.

166.6 mls → 167 mls rounded

24. How many ml/hr would a patient receive if they were to have 500ml of fluid infused over 6 hours?

83.3 mls [ ] 83 mls rounded

25. Your patient is prescribed a 1000ml infusion of Sodium Chloride 0.9% with 40 mmols of Potassium to be given over 6 hours. Using a buretrol giving set, calculate the drops per minutes he will receive.

\[
\frac{1000}{360} \times \frac{60}{1} = 166.6 \text{ drops per minutes rounded}
\]

Remember all these calculations are based on clinical practice. Safety and accuracy are nursing priorities.

References:


Christchurch Hospital Department of Nursing Drug Calculation Prompt Card (15/06/00)