Dimensional Analysis

A simple approach to dosage calculation

The dimensions must be analyzed in order to solve the problem.

Dimensions are units of measure.

This simple technique enables you to eliminate unwanted units of measure.

Once this is mastered, you will be able to calculate drug dosages quickly and safely.

Determine the following:

 1. the known quantity

 2. the quantity you want to find

Problem: How many days are there in 3 weeks?

 1. the known quantity – 3 weeks

 2. the quantity you want to find –the number of days

 3. the equivalence between them –there are 7 days in 1 week

Let's set up the problem

days = 3 weeks X 7 days = 21 days

Let's try one more

 The baby is 18 months old. What is his age in years?

 1. known quantity - 18 months

 2. quantity you want to find - years

 3. equivalence between them – 1 year = 12 months

Set up the problem

Years = 18 months X 1 year/ 12 months

Cross cancel months to eliminate them.

This leaves only the wanted unit –years. Now, 18 X 1 year = 1.5 years

Let’s Try a Medication Problem:

 The doctor has ordered Tylenol 600mg. You have available Tylenol tablets, 300mg each. How many tablets will you give?

LET’S ANALYZE THE AVAILABLE INFORMATION

 The known quantity is 600mg

 The unit you are solving for is table

Now, set up the problem:

The known quantity is 600mg
The unit you are solving for is tablet
Now, set up the problem:

Tabs/1 = 600mg/1 x 1 tab/300mg

Cross cancel the mg’s to eliminate them.

Tabs/1 = 600~~mg~~/1 x 1 tab/300~~mg~~

This leaves only the unit you are solving for.
You now have only one unit left –tablets. This is the unit you are solving for.

Reduce 600 and 300 by eliminating 2 zeroes from each
Tab = 6/1 x 1 tab/3 = 6 tab/3 = 2 tabs

Or set it up like this :
X Tabs = 600mg
300mg/1 tablet = 600mg/X tablet

Multiply through by X tab/300mg:
X tab/300mg x 300mg/1 tab = X tab/300mg x 600mg/X tab

Cross cancel the tabs; the 300mg on the left side and the Xtab and the mg on the ride side.
X ~~tab~~/~~300mg~~ x ~~300mg~~/1 ~~tab~~ = ~~X tab~~/300~~mg~~ x 600~~mg~~/~~X tab~~
X = 600/300 = 2

Does the answer make logical sense?
Never consider a problem solved until you think about whether or not the answer makes sense. The order was for 600mg. Each tablet contains 300mg. Does the patient need more than 1 tablet or less? The patient needs more than 1 tablet because he needs more than 300mg.

NP#1 Worksheet # 1

1. Order: 50mg Codeine po

Available: 1 gm Codeine per ml

Give _____ ml

2. Order: 600mg Mannitol IV

Available: Mannitol vial contains 12.5g in 50ml

Give_____ _ml

3. Order: .75mg Digoxin po

Available: .150mg Digoxin tablets

Give_____ tab

4. Order: Phenobarbital 15mg tablets po

Available: Phenobarbital 30mg tablets

Give_____ tab

5. Order: Demerol 50mg IM

Available: Demerol 75mg per ml

Give_____ ml

6. Order: Colace 100mg po

Available: 1 oz bottle contains 10mg per ml

Give_____ ml

7. Order: Dilantin 300mg po

Available: Dilantin susp. 30ml bottle contains 60mg per ml

Give_____ ml

Worksheet # 1 answers

1. 0.5 ml

2. 1.2 ml

3. 0.5 tabs

4. 0.5 or ½ tab

5. 0.66 rounded up to 0.7 ml

6.10 ml

7. 5 ml

Worksheet # 2

1. Order: Synthroid 0.15mg po

Available: Synthroid 75 mcg tablets

Give_____ tabs

2. Order: Tagament 300mg po

Available: Tagament 1 oz = 150mg

Give_____ ml

3. Order: Benadryl 60mg po

Available: 1 oz = 60mg

Give_____ ml

4. Ordered: Trilafon 4mg 1M

Available: Trilafon 5mg/ml

Give_____ ml

5. Ordered: MS 10mg IM

Available: MS 15mg per ml

Give_____ ml

6. Ordered: Phenergan 30mg IM

Available: Phenergan 50mg per 2.5ml

Give_____ ml

7. Ordered: Phenobarbital 150mg IM

Available: Phenobarbital 130mg per ml

Give_____ ml

Worksheet # 2 answers

1. 2 tabs

2. 60 ml

3. 30 ml

4. 0.8 ml

5. 0.66 rounded up to o.7 ml

6. 1.5 ml

7. 1.15 rounded up to 1.2

Worksheet # 3

1. Ordered: Elixophyllin susp. 500mg po

Available: Elixophyllin susp. 125mg per 4ml

Give_____ _ml

2. Ordered: Vasotec 10mg po

Available: Vasotec 5mg / tab scored in half

Give_____ tab(s)

3. Ordered: Pepcid 30mg po

Available: Pepcid 20mg tablets scored in half

Give_____ tab(s)

4. Ordered: Halcion 0.125mg po

Available: Halcion 250mcg tablets scored in half

Give_____ tab(s)

5. Ordered: K-Dur 30mEq po

Available: K-Dur 20mEq/15ml

Give_____ ml

6. The physician's order is for Staphicillin 350,000 U IM b.i.d. The directions on the 5g vial of Staphicillin are: "Add 18ml sterile water and shake well. 2.2ml per 500,000 units."

How many milliliters will you draw up to administer the correct dose?

Give_____ ml

7. Ordered: Versed 4mg IM

Available: Versed 2mg/1.5ml

Give_____ ml

Worksheet # 3 answers

1. 16 ml

2. 2 tabs

3. 1.5 tabs

4. 0.5 or ½ tab

5. 22.5 ml

6. 1.5 ml

7. 3 ml

Worksheet # 4

1. The doctor has ordered Ampicillin 0.25Gm, po, tid. You have available 125mg capsules. How many capsules will you give for each dose?

2. The order is for Chloral Hydrate 500mg po, q h.s. You have available 1Gm scored tablets. How many tablets will you give?

3. The order is for Synthroid 0.25mg po, QD. You have available 250mcg tablets. How many tablets will you give?

4. The doctor has ordered 45mEq of Potassium Chloride (KCL) po. You have available KCL 15mEq/5ml. How many ml will you administer?

5. The order is for 30mg of Phenobarbital po, QD. You have available 0.03Gm tablets. How many tablets will you give?

6. The order is for Sudafed 60mg po, QD. You have available 30mg tablets. How many tablets will you give?

7. Codeine 15mg IM is ordered to be given now. The vial is labeled codeine 60mg/ml. How many ml will you give?

8. Erythromycin 250mg IM is ordered. It is available as 500mg/10ml. How many ml will you give?

9. You are to administer Carbenicillin 2Gm IM, q6h. The vial is labeled 5Gm/10ml. How many ml will you give?

10. Chlorthiazide 750mg is ordered. The concentration is 500mg/10ml. How many ml will you administer?

11. Penicillin 1,000,000 Units is ordered to be given IM. The label on the vial reads Penicillin 500,000 Units per 1 ml. How many ml will you give?

12. The order reads Oxacillin 500mg IM, q6h. When 2.8 ml of diluents are added to the 500mg vial, the concentration is 250mg/1.5ml. How much will you administer?

13. The doctor ordered Atropine 0.2mg. You have available Atropine 0.4 mg per ml. How many ml will you give?

14. Mannitol 2Gm per Kg of body weight is ordered. The patient weighs 170 lbs. How many Gm's will you give?

15. The order is for Lanoxin 0.25mg IM, QD. The vial is labeled Lanoxin 0.5mg/2ml. How much will you administer?

16. Lasix elixir 60mg po is ordered. You have available 10mg/1ml. How many ml will you give?

17. The order is for Carafate suspension 0.25Gm per G-tube. The bottle is marked 1000mg/30ml. How many ml will you give?

18. The patient weighs 185 pounds. He is to receive 20mg of Ethambutol per Kg of body weight. How many mg will you administer?

19. Lanoxin 0.375mg has been ordered. You have available 0.05/1ml. How many ml will you give?

Worksheet # 4 Answer Key

1. 2 capsules

2. 0.5 tablets

3. 1 tablet

4. 15 ml

5. 1 tablet

6. 2 tablets

7. 0.3 ml

8. 5 ml

9. 4 ml

10. 15 ml

11. 2 ml

12. 3 ml

13. 0.5 ml

14. 154 Gms.

15. 1 ml

16. 6 ml

17. 7.5 ml

18. 1680 mg

19. 7.5 ml

Worksheet # 5

Test #1

1. You are running an IV of 500ml D/W without a pump. The tubing yields 18gtts/ml. The IV is to run @

50ml/hr. What is the flow rate?

2. You have an IV infusing @ 75ml/hr. How much will the patient get on your 12-hour shift?

3. You hang an IV of 1000 ml RL @ 0700. You set the pump at 40ml/hr. What time will the bag be empty?

4. You are to give 60 mg. of Dilantin mixed in 100ml of NS. Dilantin is supplied as 100mg/2 ml. How much

Dilantin will you add to the bag?

5. An IV med is diluted in 50ml and is to infuse in 15 min. How will you set the pump?

6. A client has had the following IV meds/fluid on your 12-hour shift:

Vancomycin 500mg in 150ml NS, over 30 min

Levaquin 100mg in 50ml D/W, over 15 min

IV D5RL @ 80ml/hr

The pump doesn't run these solutions simultaneously. What is the client's intake?

7. You are to give 100ml of 25% Albumin IV by gravity drip. The tubing yields 20gtts/ml. The infusion needs to run for 1 hour. How many gtts/min will you set the drip?

8. The order is for Kefzol 1 Gm in 50ml D5W. The rate on the pump is 150ml/hr. How long will the med take to infuse?

9. Your patient is on a Nitroglycerine drip with the concentration of 100mg in 1000ml D5W. Orders are to infuse it at 6mcg/min. What will the flow rate be on the pump?

10. The patient weighs 107 Kg. He is to receive Dopamine at a rate of 7mcg/kg/min. The concentration is 400mg in 250ml of solution.

What is the flow rate on the pump?

11. The Lidocaine drip is infusing on a pump set at 18ml/hr. The solution is 2 Gm in 500ml D5W. How many mg/min is your patient receiving? The literature says you cannot run Lidocaine faster than 4 Mg/min. Is this a safe dose?

12. The Heparin drip is running at 15ml/hr. The concentration is 20,000 units in 500ml D5W. How much

Heparin is the patient getting per hour? Is this within the therapeutic range?

13. The physician prescribes a continuous Cardizem drip at 12mg/hr. The Cardizem is mixed as 125mg in 100 ml of NS. How will you set the pump?

14. A PCA of Duramorph is ordered with a basal rate of 0.9 mg/hr. The concentration is 10mg in 50ml of NS.

How many mg of the basal dose will the patient receive on your 12-hour shift? How many ml of fluid will he receive on your shift?

15. Infuse 3 mcg/kg/min of Dopamine. It is mixed as 500mg in 250ml of D5W. The patient weighs 194 pounds.

What is the flow rate on the pump?

Worksheet # 5 ANSWERS

1. 15gtts/min

2. 900ml

3. 0800 (next day)

4. 1.2ml

5. 200ml/hr

6. 1,100ml

7. 33gtts/min

8. 20 min

9. 3.6ml/hr

10. 28ml/hr

11. 1.2mg/min

yes

12. 600units/hr

no

13. 9.6ml/hr

14. 10.8mg

4.5ml/hr

54ml

15. 7.9ml/hr

Worksheet # 6

1. You are running an IV of 500 ml N/S without a pump. The tubing has a drop factor of 60gtts/ml. The physician orders the IV to infuse at 80 ml/hr.

What is the flow rate you will set?

2. You are keeping the vein open with an IV flow rate of 30 ml/hr. How much will the patient get in 24 hrs.?

3. You hang 1000 ml of 5%D/W at 1500. You set the pump at 50 ml/hr.

What time will the bag be empty?

4. You are to administer 60 mg of Dilantin mixed in 50 ml of N/S. The Dilantin is supplied as 100 mg/2 ml. How much will you add to the piggyback bag?

5. An IV medication is diluted in 50 ml and is to infuse over 40 min. You will run it on a pump. How will you set the pump?

6. A patient has the following IV medication/fluid on your 12 hour shift:

Vancomycin 750 mg in 300 ml N/S – piggyback over 90 min.

Levaquin 150 mg in 100 ml D5W – piggyback over 15 min.

IV D5RL at 80 ml/hr.

The pump doesn't run these simultaneously. What is the IV intake for your shift?

7. You are to give 125 ml of 25% Albumin IV per gravity drip. The tubing has a drop factor of 15 gtts/ml. The infusion needs to run for 30 min. How many gtts/min will you set the drip?

8. The order is for Kefzol 0.5 gram in 50 ml D5W. The rate on the pump is 200 ml/hr. How long will the medication take to infuse?

9. Your patient is on a nitroglycerin drip with a concentration of 50 mg in 250 ml D5W. The order is to infuse at 6 mcg/min. What will the flow rate be on the pump?

10. The patient weighs 88.5 kg. He is to receive Dopamine at a rate of 3 mcg/kg/min. The concentration is 800 mg in 500 ml. What is the flow rate on the pump?

11. The lidocaine drip is infusing on a pump at 12 ml/hr. The solution is 1 gram in 250 ml D5W. How many mg/min is he receiving?

The literature says you can't run lidocaine faster than 4 mg/min. Is this patient getting a safe dose?

12. The patient's heparin drip is running at 20 ml/hr. The concentration is 10,000 units in 250 ml D5W. How much heparin is the patient getting per hour? Is this within the therapeutic range?

13. The physician prescribes a cardizem drip at 8 mg/hr. The drug is mixed as 175 mg in 100 ml of N/S. How fast will you run it on the pump?

14. A PCA of Duramorph is ordered at a basal rate of 0.6 mg/hr. The concentration is 20 mg in 100 ml of N/S. How many mg of the basal dose will the patient receive on your 12-hour shift?

How many ml's of fluid will he have received on your shift?

15. Infuse 3 mcg/kg/min of dopamine. It is mixed as 1000 mg in 500 ml of D5W. The patient weighs 243 pounds. What is the flowrate on the pump?

Worksheet # 6 Answers

1. 80 gtts/min

2. 720 ml

3. 1100

4. 1.2 ml

5. 75 ml/hr

6. 1,220 ml

7. 63 gtts/min

8. 15 min

9. 1.8 ml/hr

10. 10 ml/hr

11. 0.8 mg/min; yes

12. 800 u/hr; no

13. 4.6 ml/hr

14. 7.2 mg; 36 ml's

15. 9.9 ml/hr

Worksheet # 7

1. You are running the following IV: 1000ml D5W without a pump. The tubing you have chosen is as follows:

Basic IV Infusion Set = 20 gtts/ml

The physician orders the IV to infuse at 75 ml/hr. What is the flow rate you will set? _____

How much fluid will the patient get in 16 hours? _____

3. You hang 1000ml D5RL at 0900. You set the pump for 40ml/hr. What time will the bag be empty? _____

4. You are to administer 80mg of Dilantin mixed in 100ml of NS. The Dilantin is supplied as 100mg/2ml. How much will you add to the piggyback bag? _____

5. An IV medication is diluted in 100ml and is to infuse in 20 min. You will run it on a volumetric pump. What setting will you run the pump? _____

6. A client has had the following IV medication and fluid on your 8-hour shift:

Vancomycin 500mg in 250ml NS over 1 hour

Levaquin 100mg in 50ml D5W over 1 hour

IV D5RL at 125ml/hr

The pump does run these solutions simultaneously. What is the IV intake for your shift?_____

What if the pump did not run them simultaneously? _____

7. You are to give 100ml of 25% Albumin IV per gravity drip. The tubing has a drop factor of 60gtts/ml. The infusion needs to run for 1 hour. How many drops/min will you set the drip? _____

8. The order is written for Kefzol 1 Gram in 75ml D5W. The rate on the pump is 100ml/hr. How long will the medication take to complete? _____

9. Your patient is on a nitroglycerine drip with the concentration of 50mg in 500ml of D5W. Orders are to infuse at 8mcg/min. What will the flow rate be on the pump? _____

10. A patient weighs 90 kg. He is to receive Dopamine at a rate of 7mcg/kg/min.

The concentration is 400mg/250ml of solution. What is the flow rate on the pump? _____

11. The Lidocaine drip is infusing on a pump set at 15ml/hr. The solution is 2Gm/250ml D5W. How many mg/min is the patient receiving? _____

The literature says you cannot run Lidocaine faster than 4mg/min.

Is the patient getting a safe dose? _____

12. You find the patient's heparin drip running at a rate of 30ml/hr. The concentration is 20,000 units in 500ml of D5W. How much heparin is the patient getting per hour? _____

Is this dose therapeutic? _____

13. The physician prescribes a continuous Cardizem drip at 10mg/hr. The cardizem is mixed as 125mg in 250ml of NS. How fast will you run it on a pump?_____

14. A PCA of Duramorph is ordered with a basal rate of 18mg/hr. The concentration is 10mg in 60ml of NS. How many mg's of the basal dose will the patient receive on your 8-hour shift?_____

15. How many ml's of fluid will he have received on your shift?

Worksheet # 7 ANSWERS

1. 25 gtts/min

2. 320ml

3. 10am, the following day

4. 1.6ml

5. 300ml/hr

6. 1300ml/1050ml

7. 100 gtts/min

8. 45 min

9. 4.8ml

10. 23.6ml/hr

11. 2mg/min; yes

12. 1200 units/hr; yes

13. 20ml/hr

14. 144mg; 864ml