

CONVERSIONS/DOSE/DRIP RATES/TITRATION

A. Practice Problems:

1. 2.5 liters to milliliters
2. 7.5 grams to milligrams
3. 10 milligrams to micrograms
4. 500 milligrams to grams
5. 7500 micrograms to milligrams
6. 2800 milliliters to liters
7. 165 pounds to kilograms
8. 80 kilograms to pounds

B. Practice Problems: calculate the amount to give.

1. Order-Dexamethasone 1 mg
Drug available-Dexamethasone 0.5 mg per tablet
2. Order-Tagamet 0.6 gm
Drug available-Tagamet 300 mg per tablet
3. Order-Phenobarbital 60 mg
Drug available-Phenobarbital 15 mg per tablet
4. Order-Ampicillin 0.5 gm
Drug available-Ampicillin 250 mg per 5 ml
5. Order-Dicloxacillin 125 mg
Drug Available-Dicloxacillin 62.5 mg per 5 ml
6. Order-Medrol 75 mg IM
Drug Available-Medrol 125 mg per 2 ml
7. Order-Lidocaine 1 mg per kg
Patient's weight is 152 pounds
8. Order- 520 mg of a medication in a 24 hour period. The drug is ordered every 6 hours.
How many milligrams will be given for each dose?

C. Practice Problems:

- | | |
|------------------------------|-------------------|
| 1. Order-1000 ml over 6 hrs | IV set 15 gtts/ml |
| 2. Order-500 ml over 4 hrs | IV set 10 gtts/ml |
| 3. Order-100 ml over 20 min. | IV set 15 gtts/ml |

D. Practice Problems:

1. Dopamine 400 mg in 250 cc D₅W to infuse at 5 mcg/kg/min. The patient's weight is 200 pounds. How many cc/hour would this be on an infusion pump?

2. A Dopamine drip (400mg in 250 cc of IV fluid) is infusing on your 80 kg patient at 20 cc/hour. How many mcg/kg/min are infusing for this patient?
3. A Nitroglycerin drip is ordered for your patient to control his chest pain. The concentration is 100 mg in 250 cc D₅W. The order is to begin the infusion at 20 mcg/min. What is the rate you would begin the infusion on the infusion pump?
4. A Nitroglycerin drip (100mg in 250 cc D₅W) is infusing on your patient at 28 cc/hour on the infusion pump. How many mcg/min is your patient receiving?
5. A procainamide drip is ordered (2gms in 250 cc D₅W) to infuse at 4 mg/min. The patient weighs 165 pounds. Calculate the drip rate in cc/hour for which the infusion pump will be set at.
6. A Lidocaine drip is infusion on your 90 kg patient at 22 cc/hour. The Lidocaine concentration is 2 grams in 250 cc of D₅W. How many mg/min is your patient receiving?

Answers to Practice Problems

A. Practice Problems

1. 2500 mL
2. 7500 mg
3. 10,000 mcg
4. 0.5 gm
5. 7.5 mg
6. 2.8 L
7. 75 kg
8. 176 lbs

B. Practice Problems

1. 2 tablets
2. 2 tablets
3. 4 tablets
4. 10 mL
5. 10 mL
6. 1.2 mL
7. 69 kg = 69 mg
8. 130 mg for 4 doses

C. Practice Problems

1. 41.6 (42)
2. 20.8 (21)
3. 75

D. Practice Problems

1. 17 cc/hr
2. 6.65 mcg/kg/min
3. 3 cc
4. 186.5 mcg/min
5. 30 cc/hr
6. 3 mg/min

Module: TITRATION OF IV MEDICATIONS

TITRATION OF IV MEDICATIONS

KEY POINTS:

- With titration problems, the nurse usually needs to calculate the number of mL / hr to set on the IV pump. Occasionally, the nurse must calculate the amount of medication infusing per hour.
- Information needed to solve titration problems includes the total drug, the total volume of IV fluid, and the amount of drug ordered to infuse hourly.
- Titration orders can be written as a dosage range or as a single dose of medication.

Titration in Common Clinical Practice

Solve the following titration problems.

1. Heparin 25,000 units in 250 mL D5W is sent up from the pharmacy. The order is to administer heparin at 1000 units / hr. How many mL / hr will the nurse set on the IV pump?
2. The pharmacy sends an IV of 125 mg diltiazem HCl in 500 mL D5W. The physician has ordered diltiazem HCl 5 mg / hr. Calculate the mL / hr.
3. One gram of aminophylline is added to 500 mL NS. The order is to infuse the IV over 10 hours. Calculate the mg / hr that the patient will receive.
4. The doctor writes an order for heparin 1400 units / hr. The pharmacy sends an IV of 500 mL D5W with 20,000 units of heparin. What rate will the nurse set on the IV pump?

5. The physician orders IV morphine sulfate 2 – 5 mg / hr for pain management. The pharmacy sends an IV of 250 mg of morphine sulfate in 500 mL D5W. What rate will the nurse set on the IV pump to administer 3 mg / hr?

6a. A patient with severe asthma who weighs 55 kg is started on an IV theophylline drip in the emergency room. An IV of 250 mg theophylline ethylenediamine in 500 mL NS is started at 1300. The order is to start the IV infusion at 0.5 mg / kg / hr. The dose to be increased as needed by 0.1 mg / kg / hr q.30 min, up to a maximum of 0.7 mg / kg / hr. Calculate the mL / hr that the nurse will set on the infusion pump at 1300.

b. If the theophylline drip is increased as ordered at 1330, what rate will be set on the IV pump?

Complex Titration Problems in Critical Care

Solve the following titration problems.

1. Ordered: IV dobutamine 100 mcg / min
Available: dobutamine 250 mg in 250 mL D5W
The nurse is told in the morning report that the patient is receiving 5 mL / hr via IV pump.
 - a. Calculate the mg / hr.
 - b. Calculate the mL / hr.
 - c. Is the set rate correct?

2. Ordered: 1 mg lidocaine / min IV
Available: 2 g lidocaine in 500 mL D5W
 - a. Calculate the mg / hr. _____
 - b. Calculate the mL / hr. _____
 - c. If the lidocaine is increased to 2 mg / min, calculate the mL / hr. _____
3. Ordered: IV lidocaine 4 mg / min
Available: 1 g lidocaine in 500 mL D5W
 - a. Calculate the mL / hr. _____
 - b. If the rate is reduced to 2 mg / min, calculate the mL / hr. _____
4. The pharmacy sends an IV of magnesium sulfate 22 gram in 500 mL D5W. The order is for 50 mg / min. Calculate the mL / hr. _____
5. A patient with ventricular ectopic beats has stat orders for a lidocaine infusion at a rate of 30 mL / hr. The IV contains 1 g lidocaine in 500 mL D5W. Calculate the mg / hr that the patient will receive. _____
6. Pronestyl[®] 1 gram in 250 mL NS is ordered for a patient with frequent PVCs, to run at 1 mL / min. Calculate the mg / min that the patient is receiving. _____

7. The order is for IV dopamine HCl 400 mg in 500 mL NS. The patient is to receive 750 mcg / min. What rate will the nurse set on the IV pump? _____
8. Ordered: Nitroglycerine 10 mcg / min IV
Available: Nitroglycerine 50 mg in 250 mL NS
What rate will the nurse set on the IV pump? _____
9. The order is for IV dopamine HCl 400 mg / 500 mL NS. The patient is to receive 500 - 750 mcg / min. What rate will the nurse set on the IV pump to administer the lowest dosage of dopamine HCl? _____
10. The order is for IV NTG 5 - 100 mcg / min to relieve chest pain. NTG 50 mg in 250 mL NS is available. What rate will the nurse set on the IV pump to deliver the highest dosage? _____
11. The physician orders dopamine 20 mcg / kg / min for a patient who weighs 80 kg. The pharmacy sends an IV of 400 mg of dopamine in 500 mL D5W. What rate will the nurse set on the IV pump? _____
12. The physician orders milrinone lactate 0.5 - 0.75 mcg / kg / min IV for a patient with CHF who weighs 121 lb. The pharmacy sends an IV of 20 mg of milrinone lactate in 150 mL D5W. What rate will the nurse set on the IV pump to administer the lowest dosage? _____

13. The physician orders propranolol 1 mg / hr. The pharmacy sends an IV of 15 mg propranolol in 500 mL NS. Calculate the mL / hr.

14a. The patient has a dopamine drip running at 45 mL / hr. The order is for 400 mg dopamine HCl in 500 mL D5W to run at 5 - 15 mcg / kg / min. The dopamine is started at 8 mcg / kg / min. The patient weighs 165 pounds. Is the correct rate set on the IV pump?

b. If the rate is increased to 9 mcg / kg / min, what rate should be set on the IV pump?

Exercise: FOCUS ON SAFETY
Making Clinical Judgments in Working With Titration Medication

- Read each situation, and then make a clinical judgment.
- Provide a rationale for your decision or action.

Date	Physician's Order	Patient's ID #
7/10	Start D5W/500 mL with 20,000 units heparin. Heparin to infuse at 100 units every hour.	12345678

SITUATION:
 To carry out this order safely, the nurse would (select all that apply):

- a. set the infusion rate at _____ mL / hr.
- b. set the infusion rate at _____ gtt / min.
- c. use a minibag IV tubing for gravity flow infusion.
- d. set up the IV using an infusion pump.
- e. discontinue the IV once the 500 mL have infused.

Rationale / Discussion:

Module: TITRATION OF IV MEDICATIONS

Titration Problems in Common Clinical Practice

(pp. 108 - 109)

1. 10 mL/hr
2. 20 mL/hr
3. 100 mg/hr
4. 35 mL/hr
5. 6 mL/hr
- 6a. 55 mL/hr
- b. 66 mL/hr

Complex Titration Problems in Critical Care

(pp. 109 - 112)

1. a. 6 mg/hr
- b. 6 mL/hr
- c. No
2. a. 60 mg/hr
- b. 15 mL/hr
- c. 30 mL/hr
3. a. 120 mL/hr
- b. 60 mL/hr
4. 68 mL/hr
5. 60 mg/hr
6. 4 mg/min
7. 56 mL/hr
8. 3 mL/hr
9. 38 mL/hr
10. 30 mL/hr
11. 120 mL/hr
12. 12 mL/hr
13. 33 mL/hr
14. a. Yes
- b. 51 mL/hr

Exercise: FOCUS ON SAFETY Making Clinical Judgments in Working With Titration (p. 113)

- a. Set the infusion rate at 28 mL/hr.

CORRECT: After calculating, the nurse will infuse the heparin at 28 mL/hr.

- d. Set-up the IV using an infusion pump.

CORRECT: The nurse will infuse the heparin at 28 mL/hr using an infusion pump.

INCORRECT:

- b. set the infusion rate at _____ gtt/min.

Heparin is a high alert drug. It is safer to administer this drug through an infusion pump (mL/hr).

c. use a mindrop IV tubing for gravity flow infusion. Heparin is a high alert drug. Therefore, every effort must be made to ensure accuracy in the administration of the ordered dose. An infusion pump accurately delivers the set rate.

e. discontinue the IV once the 500 mL have infused. This is a continuous infusion and should not be discontinued without the physician's order.

74 Section 6 Intravenous Calculations

32. Pronestyl 2 g in 500 mL of D5W is to infuse at 3 mg/min.
A microdrip is used. mL/hr flow rate _____
33. A 250 mL of D5W solution with 1 mg Isuprel is to be infused at
5 mcg/min. mL/hr flow rate _____
34. A 4 mcg/min maintenance dosage of Isuprel is ordered. The
solution is 250 mL of D5W with 8 mg Isuprel. mL/hr flow rate _____
35. Pronestyl 2 g in 500 mL of D5W is ordered to infuse at a rate of
6 mg/min. mL/hr flow rate _____
36. A 2 g in 500 mL of D5W solution of Pronestyl is ordered to infuse
at 4 mg/min. mL/hr flow rate _____
37. A 12 mcg/min dosage of Levophed from an 8 mg in 250 mL of
D5W solution is ordered. mL/hr flow rate _____
38. A 40 mg/hr dosage of Trandate from a 100 mg in 100 mL of D5W
solution is ordered. mL/hr flow rate _____
39. The order is to infuse Isuprel 4 mcg/min from a 250 mL solution
of D5W containing 1 mg of Isuprel. mL/hr flow rate _____
40. Cardizem 10 mg/hr from a 125 mg/100 mL of D5W solution has
been ordered. mL/hr flow rate _____

Answers

- | | | | |
|--|--|---|---------------------------------|
| 1. 452.4 mcg/min;
14 mL/hr | 11. 1200 mcg/min; 72 mg/hr | 24. 485.5-971 mcg/min;
12-23 mL/hr;
708.3 mcg/min | 30. 15-60 mL/hr
31. 19 mL/hr |
| 2. 52.7 mcg/min; 16 mL/hr | 12. 60 mL/hr | 25. 308.6-1012 mcg/min;
9-30 mL/hr;
766.7 mcg/min | 32. 45 mL/hr |
| 3. 41.2-57.7 mg/hr;
82-115 mL/hr;
37.5 mg/hr | 13. 6232 mcg/min; 37 mL/hr | 26. 466.7 mcg/min | 33. 75 mL/hr |
| 4. 533.3 mcg/min | 14. 8 mL/hr | 27. 398-796 mcg/min;
10-19 mL/hr;
500 mcg/min | 34. 8 mL/hr |
| 5. 15-90 mL/hr;
5.3 mg/min | 15. 653.6-817 mcg/min;
666.7 mcg/min; yes | 28. 124.6-1246 mcg/min;
5-47 mL/hr;
853.3 mcg/min | 35. 90 mL/hr |
| 6. 4 mg/min; 240 mg/hr;
yes | 16. 544.2 mcg/min;
163 mL/hr | 29. 212.3-849 mcg/min;
6-25 mL/hr;
600 mcg/min | 36. 60 mL/hr |
| 7. 16 mL/hr | 17. 353.5 mcg/min;
13 mL/hr | | 37. 23 mL/hr |
| 8. 9 mL/hr | 18. 45 mL/hr | | 38. 40 mL/hr |
| 9. 60 mL/hr | 19. 50 mcg/min | | 39. 60 mL/hr |
| 10. 640 mcg/min; 24 mL/hr | 20. 30 mL/hr | | 40. 8 mL/hr |
| | 21. 204.8 mg/hr; 102 mL/hr | | |
| | 22. 1416 mcg/min; 9 mL/hr | | |
| | 23. 2.1 mcg/min; yes | | |

Introduction to the Math Lab Learning Packet

Clinical practice demands that nurses be proficient and accurate in calculating drug dosages in the clinical setting. This has become a common part of the practice of professional nursing and is a skill that is utilized many times on a daily basis. The goal of accurate medication calculation and administration has been a part of the curriculum identified in every clinical course in the nursing program. As students move through final clinical courses in nursing, it is expected that they will demonstrate an ever increasing proficiency in the ability to accurately calculate and administer medications to multiple clients in a variety of health care settings.

The clinical practice portion of Nursing III will afford students many opportunities to utilize the calculation skills learned in first year nursing courses. Students will be building upon this knowledge base in increasingly complex ways, and adding new content in calculation to existing abilities. You will be caring for multiple patients who often require IV infusions of medications used for respiratory, cardiac, peripheral vascular, and hematological diseases. You will rotate into critical care areas where IV titration of potent drugs is commonplace.

All drugs should be recognized as potentially dangerous treatment modalities, and must be handled with great care. Client safety is always top priority in calculation and administration. This means that the student must prepare for clinical by researching all drugs given, organizing, prioritizing, and delegating care in such a way that there is always adequate time to concentrate on necessary drug calculation, preparation and administration. If the drug is monitored by lab studies or therapeutic drug levels, the nurse must spend time assessing and correlating these values. All calculations that are done by students or RNs must be checked with another RN, and/or the pharmacist to insure accuracy before they are given. The final step is to evaluate the client's response to the drug(s) by looking for desired and untoward effects. The evaluation is documented and if necessary, the physician is notified in a timely manner if a significant untoward response occurs.

The math lab learning packet is designed to be used in conjunction with the *Dosage Calculation Module -- Adams: Math and Drug Calculation Online for Nursing and Health professionals*, which you have utilized throughout your coursework in the Nursing Program. The most important point to remember is that this Online Program is **designed to be fully self instructional**. Classroom time is not devoted to the content covered, except perhaps to review the occasional problem a student may have difficulty with. **Therefore, the Online Program can only teach if the student uses it!** Many of the problems that appear in the pre and post test section of the learning packet are taken directly from the clinical setting. These tests are designed to build the student's awareness of practice based problem solving, as well as, reinforce previously learned calculation skills. In addition, course specific information on commonly used drugs and the nursing implications related to these drugs are integrated throughout this learning packet. Be sure to read and study all areas carefully and complete all pre and post test exercises, clarifying any questions wherever necessary.

Instructions to the student

Prior to scheduled lab:

Review and practice your math theory from your previous nursing courses. Use your current math workbook and laboratory resources (CAL, etc.). **Complete the pre-test** found in this packet. Seek help in a timely manner from lab personnel if you have difficulty with any of the problems. Identify your own areas of weakness and work to overcome any problem areas.

Areas of review:

- Conversions
- IV Flow Rates
- Solution Dilutions
- Oral Medications
- Parenteral Medications
- Conversion to military time

During the lab:

Bring all tools necessary: completed Pre-test, calculator, pencils & paper, and math workbook. Go over any questions from the pre-test. Review handout and new material – which includes titration according to client's body weight and/or desired therapeutic effect. Total infusion times and solution dilution will be reviewed

After the lab:

Complete the Post-test within one week of the lab. Be sure you do this in a timely manner to give yourself enough time to prepare for success on the math test. It is most effective to visit the lab in blocks of one hour time frames for maximum learning and retention. Continue to review and practice to keep your skills sharp. Go over problems encountered in the clinical area with your clinical faculty. Bring problems to post conference and do several problems a day (on your own or with a group) so that you may strengthen your ongoing ability at calculating medications correctly.

Some Key Points

1. Know your equivalents!
2. Stop and think – is the answer reasonable? Estimate and approximate to get a sense of what is logical.
3. Label all answers completely and correctly (50 gtts/min is correct, 50 is not correct; 2 mL is correct, 2 is not correct; 1.5 tabs is correct, 1.5 is incorrect; 2215 hrs is correct, 2215 is incorrect).
4. Follow all directions carefully when rounding to the nearest whole number, the nearest tenth, the nearest hundredth, etc. When using a calculator, round the final answer only.
5. Always place a zero before a decimal if it is not preceded by another number (0.5 is correct, but .5 is incorrect).
6. Whenever you must calculate a dosage in the clinical area, you must verify your answer with another professional (RN, pharmacist) before administration of the drug.
7. Nursing students may not titrate medications independently. This must be done by an RN. Many drugs are titrated according to the client's clinical response.
8. Many medications are monitored by the use of therapeutic drug levels or other lab values. Become familiar with the lab values which must be checked before drug administration.
9. Any drug to be given by IV titration must be placed on an infusion pump. The patient must be carefully evaluated for response to the medication.

NUR 273 Math Pre-Test

Conversions: Complete the following conversions

1. 120 lbs = _____ kg
2. 2 g = _____ mg
3. 1g = _____ gr
4. 10 mL = _____ cc
5. 240 mg = _____ gr
6. 1 ounce = _____ mL
7. 5:00 PM = _____ hrs (military time)
8. 0030 hrs = _____ AM or PM
9. 1.5 qts = _____ mL
10. 1 mg = _____ micrograms (mcg)

IV Flow Rates: Calculate the following

11. 1.5 L Dextrose & NS to infuse in 10 hrs _____ mL/hr
12. 200 mL NS bolus to infuse in 45 min _____ mL/hr
13. 100 mL of IVPB antibiotic to infuse in 1 hr (60 gtts/mL) _____ gtts/min

14. 3000 mL of RL to infuse in 24 hrs (15 gtts/mL) _____ gtts/min

Solution Dilutions: Determine how much water must be added to dilute the ordered solution for administration via a feeding tube.

15. Give 40% Ensure, available is 320 mL, add _____ mL water
a. What is the total volume of Ensure & water combined? _____
b. The order reads: Infuse 40% ensure @ 45 mL/hr. If the feeding is started at 1400 hrs on Nov. 10th, when will it end? _____

16. Give 75% Pulmocare, available 240 mL, add _____ mL water

17. Give ½ strength Sustacal, available 120 mL, add _____ mL water

Oral Medications:

18. Order: Codeine gr ¼ po PRN. Available Codeine 30 mg tablets. Give _____ tab(s)

19. Order: Euthyroid 600 mcg po daily. Available Euthyroid 0.3 mg tablets. Give _____ tab(s)

20. Order: Phenobarbital gr 1/3 po bid. Available: Phenobarbital elixir 20 mg/5 mL.
Give _____ tab(s)

Parenteral Medications:

22. Order: Atropine gr 1/200 IM stat. Available Atropine 0.4 mg/mL. Give _____ mL

23. Order: Lanoxin 0.6 mg IV one time dose. Available Lanoxin 500 mcg/2 mL.
Give _____ mL

24. Order: Lasix 85 mg IV daily. Available Lasix 20 mg/mL. Give _____ mL

25. Order Penicillin 300 mg IM daily. Available penicillin 0.6 g/2mL. Give _____ mL

NUR 273 Math

Pre Test Answers

1. 54.55 kg (rounded to nearest hundredth)
2. 2000 mg
3. 15 gr
4. 10 mL
5. 4 gr
6. 30 mL
7. 1700 hrs
8. 12:30 AM
9. 1500 mL
10. 1000 micrograms
11. 150 mL/hr
12. 267 mL/hr (rounded to nearest whole number)
13. 100 gtts/min
14. 31 gtts/min (rounded to nearest whole number)
15. Add 480 mL water. a) 800 mL total volume, b) 0747 hrs on Nov 11
16. 80 mL water
17. 120 ml water
18. $\frac{1}{2}$ tabs
19. 2 tabs
20. 5 mL
21. 1.5 tabs
22. 0.75 mL
23. 2.4 mL
24. 4.25 mL
25. 1 mL

Post Test NUR 273 Math Packet

Use the following information to answer the **next 3 items**: A 105 lb. patient is to receive a medication with a safety range of 25 – 35 mg/kg/day. (Round to nearest hundredth)

1. What is the lowest recommended dosage per 24 hrs? _____
2. What is the highest recommended dosage per 24 hrs? _____
3. The physician orders 0.5 g q6hrs.
 - a.) What is the total dose/24 hrs? _____
 - b.) Is the ordered dose within the safe range? _____

Use the following information to complete the **next two items**. A 170 lb patient has an order for Dopamine 600 mg/0.5 L NS at 4 mcg/kg/min titrated to 12 mcg/kg/min via infusion pump to maintain the blood pressure above 100 systolic.

4. What is the initial setting for the infusion pump? _____ mL/hr
5. What is the maximum flow rate ordered? _____ mL/hr

Use the following information to complete the **next three items**. The order is for 1000 mL of Dextrose 5% with Heparin 30,000 U. The infusion pump is set at 75 mL/hr. The drug insert reads: Heparin safety range 20,000 to 40,000 units/24 hrs.

6. What is the hourly Heparin dosage? _____ units/hr
7. What is the daily Heparin dosage? _____ units/24 hrs
8. Is the dose ordered within the safe range? _____
What is the nursing implication of the above? (if any) _____

The following requires titration in addition to other calculations (for items 9-13).

The order is for Heparin bolus 10,000 units IV followed by a Heparin drip of 500 mL of RL with Heparin 50,000 units to start infusing at 1,000 units/hr.

9. How many units of Heparin are there per mL of Heparin drip? _____
10. What is the hourly flow rate? _____ mL/hr

This problem continues on the next page (items 11-13)

To maintain a PTT range of 70-100 seconds the following titration is ordered:

PTT 70-100 leave IV at current infusion rate

PTT > 100 reduce infusion by 200 units/hr

PTT < 70 increase infusion by 200 units/hr

Check PTT once daily and 4 hrs after any infusion adjustment

During first 24h do not reduce infusion for PTT > 100

After first 24h notify MD for PTT > 100

11. After 8h of therapy, the initial PTT is 65. What nursing action is indicated? (maintain, increase, decrease?) _____ . By how many mL/hr (if any change) _____
What should the infusion pump setting be? _____ mL/hr
12. During the first 24 hrs the PTT is 120. What nursing action is indicated? _____

13. The PTT at 28 hrs is 130. What nursing action is indicated? (maintain, increase, decrease?) _____
_____ By how many mL/hr (if any change) _____ What should the
infusion pump setting be now? _____ mL/hr

Use the following order for the **next three items**. 2000 mL of NS to infuse at 85 mL/hr. The first IV liter is started on Sept. 6 at 2000 hrs.

14. What is the total infusion time of 2L in hours and minutes? _____
15. What day and time in hours and minutes will the first liter of fluid be completed? (use military time) _____
16. What day and time in hours and minutes will the second liter of fluid be completed? (use military time) _____

Use the following order for the **next two items**: Administer one 12 oz can of $\frac{1}{4}$ strength Ensure via G tube at 85 mL/hr.

17. How much water must be added to dilute Ensure to $\frac{1}{4}$ strength? _____
18. In hours and minutes, how long will it take to complete the feeding? _____

Use the following order for the **next four items**: Order is for 500 mL of D5 NS IV to alternate with 500 mL of RL IV q6hrs. The drip factor is 15 gtt/mL, and the IV is started on Oct. 10 at 0900.

19. How much IV fluid will the patient receive in 24 hrs? _____
20. The flow rate for the IV should be set at _____ gtt/min

NUR 273 Math
Post Test Answers

1. 1193.18 mg/24 hrs lowest (rounded to nearest hundredth)
2. 1670.45 mg/24 hrs highest
3. No, too high (comes out to 2000 mg/24 hrs)
4. 15.42 mL/hr = 15 mL/hr (rounded to nearest whole number, as most infusion pumps must be set in whole numbers)
5. 46 mL/hr is highest
6. 2,250 units/hr
7. 54,000 units/24 hours
8. No, too high. Notify physician, question order, monitor pt for bleeding
9. 100 units/mL
10. 10 ml/hr
11. Increase Heparin by 200 units/hr (or 2 mL/hr). Total rate 12 mL/hr
12. Maintain infusion – monitor the patient
13. Decrease Heparin by 2000 units/hr (2 mL). Total rate 10 mL/hr
14. 23 hrs, 32 minutes
15. End Sept 7 at 0746 hrs
16. End Sept 7 at 1932 hrs
17. 120 mL water
18. 5 hours, 39 minutes
19. 2000 ml/24 hours
20. 21 gtts/min
21. End on Oct 10 at 1500 hrs
22. 1,328 mL by 0100 hrs
23. 30 mEq
24. 22.5 mL of KCL must be added
25. 33 gtts/min

21. Using military time, at what time will the first IV be completed? _____

22. How much IV fluid should be infused by 0100 hrs _____

Use the following order for the **next three items**. Administer 30 mEq KCL in 500 mL D5W Over 4 hrs. Dose of KCL available is 20 mEq in 15 mL.

23. How many mEq of KCL must be added to the IV solution? _____

24. How many mL's of KCL must be added to the IV solution: _____

25. At what rate must the IV be set if the drip factor is 15 gtt/mL _____ gtt/min.

More practice items are available in the nursing lab and in your math textbook!

NUR 273 Math
Post Test Answers

1. 1193.18 mg/24 hrs lowest (rounded to nearest hundredth)
2. 1670.45 mg/24 hrs highest
3. No, too high (comes out to 2000 mg/24 hrs)
4. 15.42 mL/hr = 15 mL/hr (rounded to nearest whole number, as most infusion pumps must be set in whole numbers)
5. 46 mL/hr is highest
6. 2,250 units/hr
7. 54,000 units/24 hours
8. No, too high. Notify physician, question order, monitor pt for bleeding
9. 100 units/mL
10. 10 ml/hr
11. Increase Heparin by 200 units/hr (or 2 mL/hr). Total rate 12 mL/hr
12. Maintain infusion – monitor the patient
13. Decrease Heparin by 2000 units/hr (2 mL). Total rate 10 mL/hr
14. 23 hrs, 32 minutes
15. End Sept 7 at 0746 hrs
16. End Sept 7 at 1932 hrs
17. 120 mL water
18. 5 hours, 39 minutes
19. 2000 ml/24 hours
20. 21 gtts/min
21. End on Oct 10 at 1500 hrs
22. 1,328 mL by 0100 hrs
23. 30 mEq
24. 22.5 mL of KCL must be added
25. 33 gtts/min

3.2.6. Dilution of Enteral Formula

Unit IV: Special Concerns in Nutrition

Dilution of Enteral Formula

When the concentration of a tube feeding is changed from 100% to a lower percent, water is added to the formula. Sometimes, the nurse must calculate how much fluid to add to the existing formula to change it to the percent ordered.

Use the following steps to change any 100% solution to the percent ordered.

1. Change the percent ordered to a decimal ($85\% = 0.85$).
2. Divide the total amount of formula used by the decimal.
3. Subtract the original total amount from the amount derived in step 2.
4. Add water to the formula in the amount derived in step 3.

Example:

The physician orders an enteral feeding at 25%. The formula for the feeding is available in 240 ml per can. How much water must be added to the 240 ml to change it to a 25% solution?

1. 25% becomes 0.25
2. 240 ml divided by .025 = 960 ml
3. 240 ml subtracted from 960 ml = 720 ml
4. 720 ml is the amount of water that must be added to the formula

Practice the following calculations to determine the amount of water to add to a 100% solution to change it to the percent ordered.

1. Change 360 ml formula to 75%
2. Change 500 ml formula to 30%
3. Change 240 ml formula to 50%
4. Change 100 ml formula to 25%

Ocean County College - One Day Per Week Nursing Program

NASOGASTRIC TUBE FEEDING PROBLEMS

KEY POINTS:

- Preparing dilute tube feedings requires calculating the number of mL of water to add to the formula to make the ordered strength.
- Information needed to solve the problem includes the amount of formula in the can and the ordered strength.

Working With Nasogastric Tube Feeding Problems

1. The doctor orders a $\frac{3}{4}$ -strength formula tube feeding for the patient. The formula comes in cans containing 240 mL. How much water will the nurse add to the can of formula to make the ordered $\frac{3}{4}$ -strength diluted tube feeding?

2. The patient receives a $\frac{1}{3}$ -strength formula tube feeding. The formula can contains 233 mL. How much water will the nurse add to the can to make the $\frac{1}{3}$ -strength diluted tube feeding?

3. The order is to prepare a $\frac{2}{3}$ -strength tube feeding of Nepro[®] for a patient with a percutaneous endoscopic gastrostomy (PEG) tube. How much water will the nurse add to the 237 mL can of Nepro to make a $\frac{2}{3}$ -strength tube feeding?

4. The physician orders 200 mL of a 1/4-strength tube feeding q.6h., for a patient with a NG tube. The formula can contains 250 mL. How much water will the nurse add to make the 1/4-strength tube feeding?
-
5. A patient who has been receiving full-strength Jevity Plus[®] PEG tube feedings develops diarrhea. The physician orders a diluted tube feeding of 1/2-strength Jevity Plus for the patient. How much water will the nurse add to the 237 mL can of Jevity Plus to make a 1/2-strength tube feeding?
-
6. The physician orders a 1/4-strength tube feeding of Osmolite[®] at 40 mL / hr for a patient with a NG tube. The Osmolite can contains 237 mL. How much water will the nurse add to make a 1/4-strength tube feeding?
-
7. A patient has an order for 1/2-strength Pulmocare[®] tube feedings, at 50 mL / hr through a PEG tube. The nurse prepares the dilute formula and has a total volume of 475 mL. According to hospital policy, only 4 hours of tube feeding formula can be hung at a time, to minimize bacterial growth. How many mL of the prepared 1/2-strength formula will the nurse use?
-

8. The physician orders a 250 mL bolus N/G tube feeding of $\frac{3}{4}$ -strength tube feeding q.8h. The formula can contains 237 mL. How much water will the nurse add to make the $\frac{3}{4}$ -strength tube feeding?

9. The physician orders a diluted tube feeding of $\frac{1}{3}$ -strength Jevity Plus for the patient. How much water will the nurse add to the 250 mL can of Jevity Plus to make a $\frac{1}{3}$ -strength tube feeding?

10. The physician orders a $\frac{2}{3}$ -strength tube feeding of Suplena[®] at 25 mL / hr, for a patient with a nasogastric tube. The Suplena can contains 240 mL. How much water will the nurse add to make a $\frac{2}{3}$ -strength tube feeding?

Working With Nasogastric Tube Feeding Problems
(pp. 29 – 31)

1. 80 mL
2. 466 mL
3. 119 mL
4. 750 mL
5. 237 mL
6. 711 mL
7. 200 mL
8. 79 mL
9. 500 mL
10. 120 mL

Exercise: FOCUS ON SAFETY
Making Clinical Judgments in Working With
Nasogastric Tube Feeding (p. 32)

b. The amount of water added to the formula.

CORRECT: *The ordered formula strength is 2/3. The nurse starts with 200 mL of formula. To make a 2/3-strength formula, the nurse needs to add 100 mL of water, not 80 mL.*

INCORRECT:

- a. The documented N/G tube intake should be 400 mL.
The documented N/G tube intake is correct.
- c. The IV intake is incorrect for the ordered rate.
The documented IV intake is correct.
- d. The formula strength should be questioned.
The formula strength is ordered by the physician.

Module: READING MEDICATION LABELS

Working With Reading Medication Labels
(pp. 33 –38)

1.
 - a. Precose
 - b. acarbose
 - c. 100 mg / tablet
 - d. tablet
 - e. oral

On this page, the problems are listed first with the key at the bottom of the page. To print problems and key, highlight them by clicking and dragging the mouse over them; under Edit, click on "copy"; open your word processor with a new page, and click on "paste."

Problems

1. Order: Give "Drug C" IV piggyback for a child weighing 66 lb. at a dosage of 50 mg/kg/day in divided doses q6h.
How many mg would each dose contain?

Tetracycline is supplied at 50 mg per 7 mL. How many mL should be administered?
2. Order: Tetracycline Elixir qid for a child weighing 50 lb at a dosage of 8 mg/kg/day in equally divided doses.
How many mg would one does contain?

Tetracycline is supplied at 50 mg per 7 mL. How many mL should be administered?
3. Order: Quinidine for an adult patient weighing 110 lb. at a dosage of 25 mg/kg/day q6h.
How many mg should the dose contain?

Quinidine is supplied as 300 mg tablets. How many should be given?
4. Order: Ampicillin IVPB for a child weighing 55 lb. at a dosage of 20mg/kg/day in 4 equally divided doses.
How many mg would be given per dose?

The Ampicillin is supplied as 250 mg in 1.5 mL after reconstitution. Give _____ mL.
5. Order: Pronestyl orally for a patient who weighs 198 lb. at a dose of 25 mg/kg/day given at 6 hour intervals.
Give _____ mg.
6. Order: Garamycin 35 mg IM q6h for a child weighing 42 lb.
The recommended dose is 6 - 7.5 mg/kg/day in 4 equally divided doses.
Is the order within the safe range?

Garamycin is supplied as 80 mg/mL. Give _____ mL.
7. Order: Tylenol suspension 1/2 tsp po q4h prn for fever for a child weighing 32 lb.
The medication is supplied as 325 mg per 10 mL
The recommended dose is 25 - 35 mg/kg/day q4h prn
Is the ordered dose in the safe range?
8. Order: "Drug X" 1g q4h po. The patient weighs 198 lb.
The recommended dose is 40 - 50 mg/kg/day.
Is the ordered dose safe?
9. Order: Erythromycin 300 mg po q6h for a 75 lb patient.
Safe range is 30 - 50 mg/kg/day.

10. Order: Theophylline loading dose 200 mg po for a 66 lb. child.
Drug handbook states, "po loading dose should not exceed 5 mg/kg."
Is the ordered dose safe?
11. Order: Cefadyl qid IM for JC who weighs 32 lb.
The PDR recommends Cefadyl 40 mg/kg/day in divided doses.
Give _____ mg per dose.
12. Order: Ceclor 20 mg/kg/day for BK who weighs 12 lb 3 oz in divided doses q8h.
Give _____ mg per dose.
13. The suggested dose of erythromycin is 40 mg/kg/day q6h
A neonate weighing 3000 g would receive _____ mg per dose?
14. Order: Claforan IM q8h for a child weighing 8 kg.
The drug guide recommends Claforan 100 mg/kg/day as safe dosage.
Give _____ mg per dose. (Round to hundredths)
15. Order: Cefadyl 5 mg qid IM for a child weighing 44 lb.
The PDR recommends 1 - 3 mg/kg/day.
Is the ordered dose safe?
16. The recommended pediatric dose of Ancef is 80 - 160 mg/kg/day
The doctor ordered 200 mg Ancef IV q4h for a child weighing 22 lb.
Is the ordered dose safe?
17. Order: Gentamicin 8 mg/kg/day q6h for a child weighing 72 lb
Give _____ mg per dose.
18. Order: KCl 10 mEq to be administered to a 44 lb child.
Directions: Dilute in 100 mL D5W and give at 25 mL/hr over 4 hours.
According to the PDR, the rate should not exceed 3 mEq/kg/24 hours.
Is the ordered dose safe?
19. Synthroid is ordered 175 mcg po every morning for an 8 year old weighing 29.5 kg
The pediatric drug handbook states, " for a child 6 - 12 years old: po dose 4 - 5 mcg/kg/day"
Is the ordered dose safe?
20. Order: Neupogen 5 mcg/kg/day IV once daily
Patient weight: 73 kg
Give _____ mcg

Key

1. Patient weight 30 kg
Daily dose 1500 mg/day
Each dose 375 mg

Daily dose 181.6 mg
Each dose 45.4 mg
Give 6.4 mL

3. Patient weight 50 kg
Daily dose 1250 mg
Each dose 312.5 mg
Give 1 tab
4. Patient weight 25 kg
Daily dose 500 mg
Each dose 125 mg
Give 0.75 mL
5. Patient weight 90 kg
Daily dose 2250 mg
Each dose 562.5 mg
6. Patient weight 19 kg
Ordered dose 140 mg/day
Safe range 114.5 mg/d - 142.5 mg/d
Yes, the ordered dose is within the safe range
Give 0.44 mL
7. Patient weight 14.5 kg
Each dose ordered 81.25 mg
Daily possible dose 487.5 mg/day
Safe range 363.6 mg/d - 507.5 mg/d
Yes, the dose ordered is within the safe range
8. Patient weight 90 kg
Ordered dose 6 g per day
Safe range 3.6 g/d - 4.5 g/d
No, the dose ordered is not within the safe range
9. Patient weight 34 kg
Ordered dose 1200 mg/d
Safe range 1020 mg/d - 1700 mg/d
Yes, dose ordered is within the safe range
10. Patient weight 30 kg
Ordered dose 200 mg loading dose
Safe dose 150 mg maximum loading dose
No, the ordered dose is not safe, it is 50 mg above the maximum loading dose.
11. $14.5 \text{ kg} * 40 \text{ mg} = 580 \text{ mg/day} \div 4 \text{ doses/day} = 145 \text{ mg per dose}$
12. Convert oz to lb: $3 \text{ oz} \div 16 \text{ oz/lb} = 0.19 \text{ lb}$
Convert wt. to kg: $12.19 \text{ lb} \div 2.2 = 5.5 \text{ kg}$
 $5.5 \text{ kg} * 20 \text{ mg/day} = 110 \text{ mg/day} \div 3 \text{ doses} = 36.67 \text{ mg per dose}$

13. $3000 \text{ g} = 3 \text{ kg}$
 $3 \text{ kg} * 40 \text{ mg} = 120 \text{ mg/day} \div 4 \text{ doses} = 30 \text{ mg per dose}$

14. $8 \text{ kg} * 100 \text{ mg/day} = 800 \text{ mg/day} \div 3 \text{ doses} = 266.67 \text{ mg per dose}$

15. $20 \text{ kg} * 1 \text{ mg/day} = 20 \text{ mg/day} \div 4 \text{ doses} = 5 \text{ mg per dose}$ is safe low dose and is dose ordered
 Yes, the dose is in safe range.

16. $10 \text{ kg} * 80 \text{ mg/day} = 800 \text{ mg/day} \div 6 \text{ doses} = 133.33 \text{ mg per dose}$ (low safe dose)
 $10 \text{ kg} * 160 \text{ mg/day} = 1600 \text{ mg/day} \div 6 \text{ doses} = 266.67 \text{ mg per dose}$ (high safe dose)
 Yes, ordered dose falls within safe range.

17. $72 \text{ lb} \div 2.2 = 32.7 \text{ kg} * 8 \text{ mg/day} = 261.6 \text{ mg/day} \div 4 \text{ doses} = 65.4 \text{ mg per dose}$

18. Calculate mEq/hr being administered per order

mEq =	10 mEq	= 2.5 mEq per hour
hour	4 hours	

Calculate safe hourly dose

$44 \text{ lb} \div 2.2 = 20 \text{ kg} * 3 \text{ mEq/24 hours} = 60 \text{ mEq/24 hours}$

$60 \text{ mEq} : 24 \text{ hours} = x \text{ mEq} : 1 \text{ hour}$

$x = 2.5 \text{ mEq per hour}$

Yes, the dose is safe because the hourly dose ordered is the same as the safe hourly dose.

19. $29.5 \text{ kg} * 4 \text{ mg} = 118 \text{ mg}$ (low safe dose)

$29.5 * 5 \text{ mg} = 147.5 \text{ mg}$ (high safe dose)

No the dose ordered is much higher and is not safe.

20. $73 \text{ kg} * 5 \text{ mcg} = 365 \text{ mcg}$