RN Study Guide for Preparing for the CNET Medication Administration Exam

Center for Nursing Education and Testing (CNET)

The C-NET test consists of three sections:

- Knowledge of drugs and their effects; 35 questions
- Rules for safe medication administration: 15 questions
- Dosage calculations: 10 questions
- A total of 60 questions
- You will have 90 minutes to take the test in
- You will have 2 attempts to pass the test
- You must pass each section with a grade of 80% or greater
- If you are NOT successful on all 3 sections of the test, you will only need to retake the section you did not pass. Ex: if you pass sections A&B and do not pass section C, then you will only need to retake section C the 2nd time.
- The study guide provided is a broad guide to assist you in preparation for the exam.
- It is strongly suggested by the Center for Nursing Professional Development that you prepare at least 3 hours reviewing the information on the study guide. Nurses who have not recently worked in direct patient care, or who provide specialized care are also encouraged to review the guide.

Principles of Medication Administration

Safe drug administration depends upon the nurse following the Rights of Medication Administration. Always ensure to check allergies prior to administration. Also, be aware of any potential drug/drug or drug/food interactions.

Rights of Medication Administration

1. Right Patient
2. Right Drug
3. Right Dose
4. Right Route
5. Right Time
6. Right Reason

*Always monitor for response to medication & teach/reinforce to the patient the reasons they are receiving medications.

The nurse must also have a basic understanding of the modes and routes of drug administration. This includes the administration of PO, IM, Sub Q, IV, rectal, vaginal, ear and eye medications.

Drug Properties

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Drug properties such as absorption, distribution, metabolism and excretion make up the pharmacokinetic profile of a drug. This affects the drug's onset of action, peak concentration, duration of action, and bioavailability.

Absorption- A drug must be absorbed into the bloodstream before it can act in the body.
Oral tablets must first disintegrate into smaller particles and dissolve in the gastric juices before being absorbed.

- Most absorption of oral medication happens in the small intestine.
- Oral solutions are usually absorbed more quickly since they do not need to disintegrate first.

- Tablets that are enteric coated or have thick coatings are absorbed slowly to prevent disintegration in the stomach or to provide a timed release of the medication.
- Drugs given IM must first be absorbed through the muscle.
- Rectal suppositories must first dissolve to be absorbed through the mucosa.
- Drugs given IV do not need to be absorbed since they are given directly into the blood.
- Many factors affect absorption of drugs; such as the dosage form, chemical make-up of the drug, route of administration, interactions with substances in the gastrointestinal tract, and patient characteristics.

Distribution- After being absorbed a drug is distributed into the blood and other tissues in the body.

Patient variations can affect the amount of a drug that is distributed through the body.

- In an edematous patient a drug dose must be distributed to a larger volume than in a non-edematous patient. *The dosage of a drug may need to be larger to account for this.
- In a dehydrated patient the dose of a drug is distributed into a smaller volume so the dose must be decreased.
- Patients who are obese need special consideration with some drug dosages since they may not distribute well into fatty tissue. Dosages of these drugs need to be based on lean body mass estimates. An example of a medication like this is digoxin.
- Remember, with both edema and dehydration the drug dosages need to be recalculated when the fluid status is corrected.

Metabolism- The liver metabolizes most drugs. Drug metabolism may be increased, decreased, or unchanged due to liver disease.

- Patients with liver disease must be monitored closely for desired drug effects or toxicity.

Excretion- Excretion by the kidneys is another way that a drug is eliminated from the body.

- Patients with decreased renal function need lower doses and maybe longer dosage intervals to avoid drug toxicity.

Other Factors-Patient age: Elderly patients have decreased hepatic and renal perfusion which may result in the need to decrease dosages and/or longer dosage intervals (decreased frequency) to avoid drug toxicity. Decreased GI motility and GI blood flow may also impact

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absorption.

Drug Therapy in Children

- Calculate children's dosages based on either body weight or body surface area.
- Measure infant doses in a syringe to provide an accurate dose.
- Administer oral drugs in liquid form to infants.
- A child may drink the oral medicine from a medication cup.
- Don't mix the drug with food or formula.

Effects of Drug Therapy

It is important for the nurse administering medications to know how the drug he/she is administering will affect the patient. Review the list below and become familiar with these aspects of commonly used drugs prior to taking the CNET exam. You must be aware of the drug's actions, contraindications, side effects, nursing considerations and patient/family teaching to facilitate the delivery of safe quality patient care.

Medication Knowledge

Have a general understanding of the medications included in the categories listed below; (side effects, nursing considerations and patient teaching instructions)

Antibiotics *Antihyperlipidemics/Statins* *Anti-coagulants* *Anti-convulsants* *Antifungal agents* *Antihistamines* *Anti-hypertensive agents* *Antiviral (HIV/AIDS) Medications* *Benzodiazepines* *Beta blockers* *Bisphosphonates* *Cardiac*	*Corticosteroids (Adrenals)* *Essential Vitamins* *Glaucoma medications* *Glucose lowering agents* *Hormone Therapy (Thyroid)* *Monoclonal Antibodies* *Narcotics (Opioid)* *Nitrates* *NSAID* *Anti-neoplatic* *Pain Management Agents* *Proton Pump Inhibitor* *Psychotherapeutic Agents* *TPA (Tissue Plasminogen Activator)*

Metric System & Common Conversions

Weight

Gram = g = 1 gram
Milligram = mg = 0.001 gram
Microgram = mcg = 0.001 milligram
1000 mcg = 1 milligram

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1000 mg = 1 gram

Volume
Liter = L =1L
Milliliter = ml = 0.001L
1000 ml = 1L
1 teaspoon (tsp) = 5 ml

***Know how to convert grams to mg and ml to tsp!**
To change g to mg *multiply* by 1000/to convert mg to g *divide* by 1000

Unit of Measure	Equals	Also Equals
1 Kilogram (kg)	1000 grams (g)	2.2 pounds (lb)
1 Gram (g)	1000 milligrams (mg)	1,000,000 micrograms (mcg)
0.001 grams (g)	1 milligram (mg)	1000 micrograms (mcg)
1 microgram (mcg)	0.001 milligrams (mg)	x
4 cups	1 Liter (L)	1000 milliliters (ml)
2 cups	16 ounces (oz)	1 pound (lb)
1 cup	8 ounces (oz)	240 milliliters (ml)
1 ounce (oz)	30 milliliters (ml)	450 drops (gtts)
1 ml=1cc	15 drops (gtts)	x
1 tablespoon (tbsp)	15 milliliters (ml)	x
1 teaspoon (tsp)	5 milliliters (ml)	x
1 grain	60 milligram (mg)	x

Ratios and Proportions (may use to cross multiply)

Ratios are comparing 2 things. In daily life ratios are often expressed as fractions
i.e.: 1 to 6 or 1/6
In terms of medicine we use ratios to explain things like mg per pill
i.e.: 1 pill is 10 mg, so 1 pill 10mg
Proportions are comparing 2 ratios. The equal sign between them shows this relationship.
1/2 = 2/4

<u>Dosage Calculations</u>

A. Oral and Parental Medications

To calculate correct oral and parenteral medication dosages follow three steps:
1. Be sure all measures are in the same system and all units are in the same size. Don't forget to convert when necessary.
2. Carefully consider what is a reasonable amount of the drug to be should be administered
3. Calculate the drug dosage using the formula:

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Amount to be administered = $\frac{\text{Dosage Ordered}}{\text{Dose Available}} \times \text{Quantity Available}$

Example 1: Ordered: Lasix 60 mg IV Available: Lasix 10 mg/ml

$\frac{\text{Desired Dose}}{\text{Dose Available}} \times \text{Quantity Available} = \text{Dose to be given}$

$\frac{60 \text{ mg}}{10} \times 1 \text{ ml} = 6 \text{ ml}$ Dose to be given = **6 ml.**

Example 2: A patient who weighs 60 Kg is to receive 5 mg/kg/day of a medication Intravenously in divided doses q 8h. How many mg of the medication should the patient receive in each dose?

Dose = 5 mg X 60 Kg/day
= 300 mg/day = 3 doses

Dose = **100 mg**

B: **Flow Rates**

To calculate the correct flow rate ordered, be sure to follow three simple steps:

Step 1: Be sure all measures are in the same system, and all units are in the same size, convert when necessary.

Step 2: Carefully consider what is a reasonable amount of drug to be administered

Step 3: Calculate the intravenous drip rate using the formula:

Drip Rate = $\frac{\text{Volume to be infused X Drop Factor}}{\text{Total Time in Minutes}}$ (Gtt/ml)

Example: Ordered: Infuse 1200 ml of Normal Saline over 6 hours. Drop factor of the infusion set is 15 gtts/ml
Drip Rate: _____ gtt/min

Step 1: Calculate total time in minutes;

6 hours X $\frac{60 \text{ mins}}{}$ = 360 min

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1 hour

Step 2: Calculate Drip Rate

Drip Rate = Volume to be Infused X Drop Factor
Total Time in Minutes

Drip Rate = 1200ml X 15 gtt/ml = 50 gtt/min
360 mins

C. Rounding numbers

Round to the nearest whole number

- If tenths is 5 or >, round up; if the tenths is 4 or less, round down.

Rounding to the 10ths or hundreds would be necessary when calculating parenteral and some oral medications.

- If the hundreds is 4 or lower it is dropped, if the hundreds is 5 or > round the prior number up by one.

When rounding teaspoons; must go to the nearest calibration, i.e. 1.3 tsp. should be written as 1 ¼ tsp.

Section A
Practice Problems for Oral and Parenteral Medications

1. Ordered: Hydrochlorothiazide 50 mg PO tablet Give: ____ Tab(s) Available: Hydrochlorothiazide 25 mg

2. Ordered: Lasix 20 mg IV Give: _____ ml(s) Available: Lasix 100 mg in 10 ml

3. Ordered: Lanoxin 0.125 mg PO daily Give: ____ Tab(s) Available: Lanoxin 0.25 mg tablets

4. Ordered: Inderal 45 mg PO TID Give: ____ Tab(s) per dose Available: Inderal 10 mg tablets

5. Ordered: Penicillin 250,000 units IM ml Give: _____ ml(s) Available: Penicillin500, 000 units per 10

6. Ordered: Ampicillin 250 mg IV q 6hrs Give: _____ ml(s) Available: Ampicillin 1 GM in 500 ml

7. Ordered: Demerol 50 mg IM q 4 hours Available: Demerol 100 mg in 2ml/prn for

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rigors Give: ____ ml(s) per dose

8. Ordered: Amoxicillin 100 mg PO qid Available: 80 ml bottle of Amoxicillin oral Suspension 125 mg per 5ml
Give: ____ ml per dose

9. Ordered: Duricef 1 gm PO qid ac Available: Duricef 250 mg tablets
Give: _____Tab(s)

10. Ordered: Motrin 250mg PO q6hrs Available: 90 ml bottle of Children's
Give_____ tsp./dose Motrin oral suspension 100 mg per 5ml

11. How many milligrams are equal to 0.075 grams?

12. The patient is to take aluminum hydroxide approximately 600mg tid. The drug is available in a suspension that contains 450mg/5ml. How many teaspoonfuls should the patient take with each dose?

Section B
Practice Problems for Intravenous Drug Calculations:

1. Ordered: Ampicillin 500 mg dissolved in 200 ml D5W Drop Factor: 10 gtts/ml
IV to run for 2 hours. Drip Rate: _____ gtt/min

2. Ordered: Normal Saline 1200 ml to infuse over 10 hours Drop Factor: 15 gtts/ml
Drip Rate: _____ gtt/min

3. Ordered: 1000 ml Lactated Ringers IV per 24 hours KVO Drop Factor: 60 gtt/ml
(Keep Vein Open) Drip Rate: _____ gtt/min

4. Ordered: 1500 ml D5NS IV to run for 12 hours Drop Factor: 20 gtts/ml
Drip Rate: _____ gtt/min

5. Ordered: 1L D5W to run 0900 to 1800 Drop Factor: 10 gtts/ml
Drip Rate: _____ gtt/min

6. Ordered: 2.5 L NS IV to infuse at 125 ml/h Drop Factor: 20 gtt/ml
Drip Rate: _____ gtts/min

7. Ordered: Ancef 1 g in 100 cc D5W IV piggy back to Drop Factor: 60 gtt/ml
Infuse over 45 minutes Drip Rate: _____ gtt/min

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8. Ordered: Ampicillin 500 mg in 50 ml of NS to infuse over 30 minutes Drop Factor: 15 gtt/ml
Drip Rate: _____ gtt/min

9. Ordered: 500 ml D5LR to infuse over 3 hours Drop Factor: 60 gtt/ml
Drip Rate: _____ gtt/min

10.Ordered: Dopamine 4 mcg/Kg/min. The patient weighs 50 kg.
Available: Dopamine 400 mg mixed in 500 ml of IV solution.
How many mls per hour should the infusion pump be set at?

11. Ordered: Ciprofloxacin 20 mg/kg/day. The child weighs 25kg.
Available: Ciprofloxacin 2 g in 5 ml of solution.
How many mls should the child receive per day?

12. An infusion began at 9 am, running at 40 drops/min.
The set delivers 50 drops per ml.
It is now 12 noon, how many mls should have infused?

13. A patient who weighs 135 lbs needs to be started on a heparin infusion. A bolus dose of 100 units per kg is ordered. The concentration of heparin is 1000 units per ml. How many ml of heparin should the patient receive?

Section C
Effects and Principles of Medication Administration practice questions:

1. The nurse is preparing to administer antibiotic drops in a patient's left ear. In which of these positions should be patient be placed?
   A. Fowlers or Dorsal Recumbent
   B. Sims
   C. Prone
   D. Right Side lying

2. An older adult who is receiving a large volume intravenous infusion of 5% glucose in water develops tachycardia and dyspnea. Which of these nursing actions is indicated first?
   A. Check the infusion site for signs of infiltration
   B. Decrease the rate of infusion
   C. Monitor oral fluid intake
   D. Check a blood glucose level

3. A nurse is preparing to administer Quinidine Sulfate to a patient and finds this entry on the medication administration record: Quinidine 200 mg. What initial nursing action is most appropriate?
   A. Administer Quinidine po with other scheduled medications

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B. Check the physician's order for the Quinidine in the patient's chart
C. Counting the patient's pulse for a full minute before administering the Quinidine
D. Give the medication to prevent delay of administration

4. A patient diagnosed with hypothyroidism is started on levothyroxine sodium (Synthroid) daily. Synthroid should be scheduled for administration at what time?
A. At bedtime
B. With lunch
C. Before breakfast
D. Any time

5. Liquid medications for the ear must not be administered at too high or low a temperature for which of these reasons?
A. The drops may stimulate the central nervous system.
B. The medication potency will be changed
C. The drops will become excessively viscous
D. The medication will dissolve

6. When administering a medication vaginally, which of the following is a nursing consideration?
A. Asking the patient to assume a lithotomy position for insertion
B. Instruct the patient to lie flat in bed for 30 minutes
C. Checking the patient's vital signs prior to insertion
D. Check to ensure IV patency

7. Which of these factors has the greatest effect on the rate of absorption of a drug given parentally?
A. The circulation in the tissues into which the drug is injected
B. The diameter of the needle used for injection
C. The potency of the drug
D. The time of day the drug can be administered

8. Protamine sulfate should be kept available for administration to counteract a side effect of which of these drugs?
A. Digoxin (Lanoxin)
B. Heparin
C. Warfarin sodium (Coumadin)
D. Vitamin K

9. Which of the following instructions should be provided to patients with tuberculosis?
A. Medication will be needed only as long as symptoms are present
B. It will be necessary to take medication throughout their lifetime

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C. The medication therapy may last as long as two years
D. If they are feeling better it is okay to discontinue therapy

10. Which of these would not be good practice when administering eye medication?
A. Hold the dropper more than 2 inches above the eye
B .Ask the patient to look upward
C. Place the medication in the lower conjunctival sac
D. Check the medication order for correct laterality

11. A patient is to receive the non-steroidal anti inflammatory drug naproxen (Naprosyn). The order should be questioned if the patient has a history of
A. Glaucoma
B. Peptic ulcer
C. Diabetes
D. Headaches

12. If a patient takes a drug at intervals shorter than the drug half-life the patient should be monitored for which of these potential issues?
A. Drug toxicity
B .Decreased absorption
C .Decreased therapeutic effect
D .Decreased compliance

13. A nurse should assess a patient started on insulin for side effects including?
A. Bradycardia
B. Tremors
C. Thirst
D. Pain

14. A patient is receiving dopamine hydrochloride (Intropin). The nurse should know the expected effect of this drug is to
A. Reduce hyperglycemia
B. Increase vasodilation
C .Increase blood pressure
D. Reduce serum potassium

15. An intramuscular (IM) injection is the administration of up to what volume of drug into a muscle?
A.3.0 ml
B.6.0 ml
C.2.0 ml
D.1.0 ml

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16. Vitamin B_6 (Pyridoxine) is found in which food groups?
    A .Seafood
    B. Whole grain cereals
    C. Eggs
    D. Chocolate

Additional Practice Questions

1. A medication comes in 25 mg tabs and is ordered 2 times a day for a total of 200mg per day. How many tabs should a patient receive with each dose?

2. A patient is to receive 2000 mg of a medication in 4 divided doses. The capsules are 500 mg each. How many capsules will be given with each dose?

3. A medication order is 600 mg po every 3 hours. How many grams is given per day?

4. A child is to receive a total of 240 mg per day of a medication. The medication is given every 8 hours and is available in a solution of 80 mg per 10 ml. How many teaspoons should the child receive with each dose?

5. The IV tubing lists its delivery rate as 20 gtts/ml. The drip rate for a medication is set at 60 gtts/min. How many ml (s) will the patient receive in 6 hours?

6. A patient is to receive 750 ml of Lactated Ringers over 4 hours. The gtt factor is 20gtts/ml. How many gtts/min would the patient receive?

7. A patient who weighs 150 lbs. is to receive 50mg/kg of a medication every 8 hours. How many mg does the patient receive each day?

8. A child is to receive penicillin IV at a dose of 50,000 units/kg/day. The child's weight is 70 lbs. or 32 kg. The medication is available as a powder in 2,000,000 unit vials. The nurse reconstitutes by adding diluent to yield 2 ml of solution. How many ml should the child receive per day?

9. A patient is receiving an infusion of 200 units of heparin per hour. The concentration of heparin is 20,000 units per 500 ml. The infusion pump will be set to infuse at how many ml per hour?

10. A patient is to receive heparin at a bolus dose of 200 units per kg. The patient weighs 200 lb. or

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91 kg. The concentration of heparin is 1000 units per ml. How many ml should the patient receive?

ANSWER KEYS

Section A

Oral and Parenteral Medications: Answer Key

1. Dose = Desired Dose x Quantity Available
   Dose Available

   Dose = 50 mg x 1 tablet = **2 tablets**
   25 mg

2. Dose = 20 mg x 10 ml = **2 ml**
   100 mg

3. Dose = 0.125 mg x 1 tablet = **0.5 tablet**
   0.25 mg

4. 45 mg 3 times per day
   45 mg x 1 tablet Dose = **4.5 tablets per dose**
   10 mg

5. 250,000 units x 10 ml = **5ml**
   500,000 units

6. Ordered dose is in mg. Available dose is in gram. You first need to convert grams to milligrams to ensure the dosage units you are comparing are the same. (1 gram = 1000 mg)

   Desired Dose x Quantity Available 250 mg x 500 ml = **125 ml.**
   Dose Available 1000 mg

7. 50 mg x 2 ml
   100 mg Dose = **1 ml.**

8. Dose = Desired Dose x Quantity Available 100 mg x 5 ml
   Dose Available 125 mg
   Dose = 0.8 x 5 ml = **4 ml.**

9. Convert grams to milligrams to compare like units.

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1000 mg x 1 tablet Dose = **4 tablets**
250 mg

10. Dose = Desired Dose x Quantity Available 250 mg x 5 ml
Dose Available 100 mg
Dose = 2.5 x 5 ml = 12.5 ml Since 1 tsp. = 5ml, divide 12.5 ml by 5.
12.5 ml = 2.5 tsp; written: **2½ tsp per dose**
5

11. 0.075 gram = how many mg? 1 gram = 1000 mg
Converting grams to milligrams, move the decimal point to the right 3 places or multiply by
1000.075gram X 1000mg = **75 mg**

12. Dose = Desired Dose x Quantity Available 600mg x 5 ml = (how many tsp? 1tsp =5ml)
Dose Available 450mg

6.66ml = 1.3tsp**;** written: **1 ¼ tsp per dose**
5ml

Section B
Intravenous Drug Calculations: Answer Key

1. Drip Rate = 200 ml x 10 gtt/ml = 16.666 gtts/min or **17gtt/min**
120 mins

2. Drip Rate = 1200 ml x 15 gtt = **30 gtt/min**
600 mins

3. Drip Rate = 1000ml x 60 gtts/ml = 41.66 gtts/min or **42 gtts/min**
1440 mins

4. Drip Rate = 1500 x 20 gtts = **42 gtt/min**
720 mins

5. Drip Rate = 1000ml x 10 gtts/ml = 18.52 gtts/min or **19 gtts/min**
540 min

6. Drip Rate = 125 ml x 20 gtt/ml = 41.66 gtt/min or **42 gtt/min**
60 mins

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7. Drip Rate = $\frac{100 \times 60 \text{ gtt}}{45 \text{ mins}}$ = 133.33 gtt/min or **133 gtt/min**

8. Drip Rate = $\frac{50 \times 15 \text{ gtts}}{30 \text{ mins}}$ = **25 gtt/min**

9. Drip Rate= $\frac{500 \times 60 \text{ gtts}}{180 \text{ mins}}$ = 166.66 gtt/min or **167 gtt/min**

10. **Calculate Dose:**

A. Desired Dose

Dose = 4mcg x 50 kg

Dose = 200 mcg per min Convert 200 mcg to mg (1 mcg = .001 mg) 200 mcg = 0.2 mg

B. Dose Available

Dopamine 400 mg in 500 ml or $\frac{400\text{mg}}{500\text{ml}} = \frac{4 \text{ mg}}{5 \text{ ml}}$

$\frac{\text{Desired Dose}}{\text{Dose Available}} = \frac{0.2\text{mg/min}}{4 \text{ mg}} \times \frac{5 \text{ ml}}{1}$ = .05mg/min x 5 ml = 0.25 ml/min x 60 min = **15ml**

11. **Calculate Dose:**

A. Desired Dose

Dose = 20mg x 25 kg

Dose = 500 mg per day

B. Dose Available

Ciprofloxacin 2g in 5 ml solution

Convert 2 g into mg; move the decimal 3 places to the right or multiply by 1000.

2 g x 1000 = 2000 mg

$\frac{\text{Desired Dose}}{\text{Dose Available}} = \frac{500 \text{ mg/day}}{2000 \text{ mg}} \times \frac{5 \text{ ml}}{1}$ = 0.25mg/day x 5 ml = **1.25 ml/day**

12. Begin with the Drip Rate formula:

Drip Rate = $\frac{\text{Volume to be infused x Drop Factor (Gtt/ml)}}{\text{Total Time in Minutes}}$

Fill in the formula with the information you already know, leaving the volume (the unknown) as X.

$\frac{40 \text{ drops/min}}{1} = \frac{X\text{ml x } 50 \text{ drops/ml}}{3 \text{ (60 min)}}$

Now, you must cross multiply to solve for X.

A. 40 x 180 = 50 X

B. $\frac{7200}{} = X$

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50
C. X = **144**

13. Begin by converting the patient's weight to kilograms-135 lbs /2.2= 61 kg.
100units x 61 kg = 6,100 units
Now you must cross multiply to solve for X
1,000 units = 1 ml 6,100 units = X ml 6,100 = 1,000x = **6.1 ml**

Section C-Effects and Principles of Medication Administration: Answer Key	**Answers Additional Questions**
1. D 2. B 3. B 4. C 5. A 6. B 7. A 8. B 9. C 10. A 11. B 12. A 13. B 14. C 15. A 16. B	1. 4 tabs 2. 1 capsule 3. 4.8 g 4. 2 teaspoons 5. 1080 ml 6. 63 gtts/min 7. 10, 200 mg/day 8. 1.6 ml 9. 5 ml 10. 18.2 ml

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