SELF-TEST 2 Oral Liquids

Solve these oral liquid problems. Answers are given at the end of the chapter. Remember the four methods:

Formula Method

$$\frac{\text{Desire}}{\text{Have}} \times \text{Supply} = x$$

Proportion

EXPRESSED AS TWO RATIOS

Supply:Have : : x:Desire

EXPRESSED AS TWO FRACTIONS

$$\frac{\text{Supply}}{\text{Have}} = \frac{x}{\text{Desire}}$$

Dimensional Analysis

$$\frac{\text{Supply}}{\text{Have}} \mid \text{Desire}$$

(add conversion factors as needed)

1. Order: erythromycin susp 0.75 g po qid
   Supply: liquid labeled 250 mg/mL
   $0.75\text{g} \cdot \frac{1000\text{mg}}{1\text{g}} \cdot \frac{1\text{mL}}{250\text{mg}} = 3\text{mL}$
2. Order: ampicillin susp 500 mg po q8h
   Supply: liquid labeled 250 mg/5 mL
   $500\text{mg} \cdot \frac{5\text{mL}}{250\text{mg}} = 10\text{mL}$
3. Order: cephalexin in oral suspension 0.35 g po q6h
   Supply: liquid labeled 125 mg/5 mL
   $0.35\text{g} \cdot \frac{1000\text{mg}}{1\text{g}} \cdot \frac{5\text{mL}}{125\text{mg}} = 14\text{mL}$
4. Order: cyclosporine 150 mg po stat and every day
   Supply: liquid labeled 100 mg/mL in a bottle with a calibrated dropper
   $150\text{mg} \cdot \frac{1\text{mL}}{100\text{mg}} = 1.5\text{mL}$
5. Order: trifluoperazine 5 mg po bid
   Supply: liquid labeled 10 mg/mL
   $5\text{mg} \cdot \frac{1\text{mL}}{10\text{mg}} = 0.5\text{mL}$
6. Order: digoxin 0.02 mg po every day
   Supply: pediatric elixir 0.05 mg/mL in a bottle with a dropper marked in tenths of a milliliter
   $0.02\text{mg} \cdot \frac{1\text{mL}}{0.05\text{mg}} = 0.4\text{mL}$
7. Order: potassium chloride 30 mEq po every day
   Supply: liquid labeled 20 mEq/15 mL
   $30\text{mEq} \cdot \frac{15\text{mL}}{20\text{mEq}} = 22.5\text{mL}$
8. Order: digoxin elixir 0.25 mg via nasogastric tube every day
   Supply: liquid labeled 0.25 mg/mL
   $0.25\text{mg} \cdot \frac{1\text{mL}}{0.25\text{mg}} = 1\text{mL}$
9. Order: risperidone 3 mg po bid
   Supply: liquid labeled 1 mg/mL
   $3\text{mg} \cdot \frac{1\text{mL}}{1\text{mg}} = 3\text{mL}$
10. Order: promethazine HCl syrup 12.5 mg po tid
    Supply: liquid labeled 6.25 mg/5 mL
    $12.5\text{mg} \cdot \frac{5\text{mL}}{6.25\text{mg}} = 10\text{mL}$
11. Order: hydroxyzine 50 mg po qid
    Supply: syrup labeled 10 mg per 5 mL
    $50\text{mg} \cdot \frac{5\text{mL}}{10\text{mg}} = 25\text{mL}$
12. Order: furosemide 40 mg po q12h
    Supply: liquid labeled 10 mg/mL
    $40\text{mg} \cdot \frac{1\text{mL}}{10\text{mg}} = 4\text{mL}$
13. Order: potassium chloride 10 mEq po bid
    Supply: liquid labeled 20 mEq/30 mL
    $10\text{mEq} \cdot \frac{30\text{mL}}{20\text{mEq}} = 15\text{mL}$
14. Order: prochlorperazine 10 mg po tid
    Supply: syrup labeled 5 mg/5 mL
    $10\text{mg} \cdot \frac{5\text{mL}}{5\text{mg}} = 10\text{mL}$
15. Order: phenobarbital 100 mg po at bedtime
    Supply: elixir labeled 20 mg/5 mL
    $100\text{mg} \cdot \frac{5\text{mL}}{20\text{mg}} = 25\text{mL}$

SELF-TEST 2 **Oral Liquids (*Continued*)**

16. Order: acetaminophen 650 mg po q4h prn
Supply: elixir labeled 160 mg/5 mL. Round to the nearest whole number
$650\text{mg} \cdot \frac{5\text{mL}}{160\text{mg}} = 20\text{mL}$

17. Order: diphenhydramine 25 mg po q4h
Supply: liquid labeled 12.5 mg/5 mL
$25\text{mg} \cdot \frac{5\text{mL}}{12.5\text{mg}} = 10\text{mL}$

18. Order: chlorpromazine 50 mg po tid
Supply: syrup labeled 10 mg/5 mL
$50\text{mg} \cdot \frac{5\text{mL}}{10\text{mg}} = 25\text{mL}$

19. Order: docusate 100 mg po every day
Supply: syrup labeled 50 mg/15 mL
$100\text{mg} \cdot \frac{15\text{mL}}{50\text{mg}} = 30\text{mL}$

20. Order: codeine 0.06 g po q4–6h prn
Supply: liquid labeled 15 mg/5 mL
$0.06\text{g} \cdot \frac{1000\text{mg}}{1\text{g}} \cdot \frac{5\text{mL}}{15\text{mg}} = 20\text{mL}$

SPECIAL TYPES OF ORAL LIQUID ORDERS

Some liquids, including OTC preparations and multivitamins, are ordered in the amount to be poured and administered. No calculation is required.

EXAMPLE

EXAMPLE 1:

Order: dextromethorphan syrup 2 tsp q4h prn po

Supply: liquid labeled dextromethorphan syrup

No calculation is needed. Pour 2 tsp and take every 4 hours by mouth as neces

EXAMPLE 2:

Order: milk of magnesia 30 mL tonight po

Supply: liquid labeled milk of magnesia

No calculation is required. Pour 30 mL milk of magnesia and give tonight by mouth.

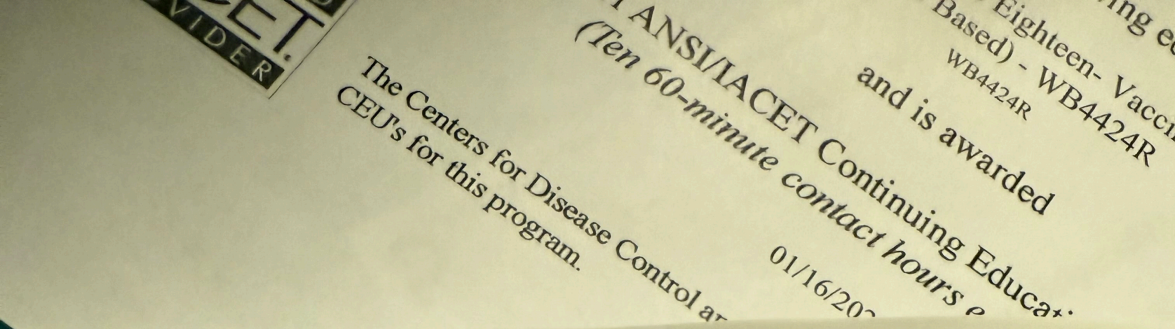
PROFICIENCY TEST 3 Calculations of Liquid Injections

Name: _____

Aim for 90% or better on this test. Assume you have only a 3-mL syringe unless indicated. See Appendix A for answers.

1. Order: digoxin 0.125 mg IM every day
   Supply: ampule labeled 0.5 mg/2 mL
   $0.125\text{mg} \cdot \frac{2\text{mL}}{0.5\text{mg}} = 0.5\text{mL}$
2. Order: diphenhydramine hydrochloride 40 mg IM stat
   Supply: ampule labeled 50 mg in 2 mL
   $40\text{mg} \cdot \frac{2\text{mL}}{50\text{mg}} = 1.6\text{mL}$
3. Order: morphine sulfate 8 mg IV q4h prn
   Supply: vial labeled 15 mg/mL; round to the nearest tenth
   $8\text{mg} \cdot \frac{1\text{mL}}{15\text{mg}} = 0.5\text{mL}$
4. Order: meperidine 50 mg IM × 1
   Supply: vial labeled 100 mg/mL (use a 1-mL syringe)
   $50\text{mg} \cdot \frac{1\text{mL}}{100\text{mg}} = 0.5\text{mL}$
5. Order: ascorbic acid 200 mg IM every day
   Supply: ampule labeled 400 mg/2 mL
   $200\text{mg} \cdot \frac{2\text{mL}}{400\text{mg}} = 1\text{mL}$
6. Order: vitamin B_{12} 1500 mcg every day IM
   Supply: vial labeled 5000 mcg/mL (use a 1-mL syringe)
   $1500\text{mcg} \cdot \frac{1\text{mL}}{5000\text{mcg}} = 0.3\text{mL}$
7. Order: atropine sulfate 0.6 mg IV for one dose
   Supply: vial labeled 0.4 mg/mL
   $0.6\text{mg} \cdot \frac{1\text{mL}}{0.4\text{mg}} = 1.5\text{mL}$
8. Order: sodium amytal 0.2 g IM stat
   Supply: ampule 200 mg/1 mL
   $0.2\text{g} \cdot \frac{1000\text{mg}}{1\text{g}} \cdot \frac{1\text{mL}}{200\text{mg}} = 1\text{mL}$
9. Order: hydromorphone 1.5 mg IM q4h prn pain
   Supply: vial labeled 2 mg/mL (use a 1-mL syringe)
   $1.5\text{mg} \cdot \frac{1\text{mL}}{2\text{mg}} = 0.75\text{mL}$
10. Order: penicillin G procaine 600,000 units IM q12h
    Supply: vial labeled 500,000 USP units/mL
    $600000\text{units} \cdot \frac{1\text{mL}}{500000\text{units}} = 1.2\text{mL}$
11. Order: prepare nitroglycerin 200 mcg (that will be added to IV fluids for infusion)
    Supply: vial labeled 0.8 mg/mL (use a 1-mL syringe)
    $200\text{mcg} \cdot \frac{1\text{mg}}{1000\text{mcg}} \cdot \frac{1\text{mL}}{0.8\text{mg}} = 0.25\text{mL}$
12. Order: neostigmine methylsulfate 500 mcg subcutaneous × 1 dose
    Supply: ampule labeled 1:4000
    $500\text{mcg} \cdot \frac{1\text{mg}}{1000\text{mcg}} \cdot \frac{1\text{g}}{1000\text{mg}} \cdot \frac{4000\text{mL}}{1\text{g}} = 2\text{mL}$
13. Order: levorphanol tartrate 3 mg subcutaneous × 1 dose
    Supply: vial labeled 2 mg/mL
    $3\text{mg} \cdot \frac{1\text{mL}}{2\text{mg}} = 1.5\text{mL}$
14. Order: epinephrine 0.4 mg subcutaneous stat
    Supply: ampule labeled 1:1000 (use a 1-mL syringe)
    $0.4\text{mg} \cdot \frac{1\text{g}}{1000\text{mg}} \cdot \frac{1000\text{mL}}{1\text{g}} = 0.4\text{mL}$
15. Order: magnesium sulfate 500 mg IM × 1 dose
    Supply: ampule labeled 50%
    $500\text{mg} \cdot \frac{1\text{g}}{1000\text{mg}} \cdot \frac{100\text{mL}}{50\text{g}} = 1\text{mL}$
16. Order: oxymorphone HCl 0.75 mg subcutaneous
    Supply: vial labeled 1.5 mg/mL (use a 1-mL syringe)
    $0.75\text{mg} \cdot \frac{1\text{mL}}{1.5\text{mg}} = 0.5\text{mL}$
17. Order: prepare lidocaine 100 mg (that will be added to IV fluids for infusion)
    Supply: ampule labeled 20% (use a 1-mL syringe)
    $100\text{mg} \cdot \frac{1\text{g}}{1000\text{mg}} \cdot \frac{100\text{mL}}{20\text{g}} = 0.5\text{mL}$

(continued)



PROFICIENCY TEST 3 Calculations of Liquid Injections (*continued*)

18. Order: digoxin 0.125 mg IV daily
Supply: ampule labeled 0.25 mg/2 mL $0.125\text{mg} \cdot \frac{2\text{mL}}{0.25\text{mg}} = 1\text{mL}$

19. Order: nalbuphine HCl 12 mg IM × 1 dose
Supply: vial 10 mg/mL $12\text{mg} \cdot \frac{1\text{mL}}{10\text{mg}} = 1.2\text{mL}$

20. Order: prepare 20 mEq KCl (that will be added to IV fluids for infusion)
Supply: vial 40 mEq/20 mL (use 10 mL syringe) $20\text{mEq} \cdot \frac{20\text{mL}}{40\text{mEq}} = 10\text{mL}$

PROFICIENCY TEST 4 Mental Drill in Liquids-for-Injection Problems

Name: _____

s you develop proficiency in solving problems, you will be able to calculate many answers with
n work. This drill combines your knowledge of equivalents and dosages. Solve these problems
nd write only the amount to give. If necessary, round to the nearest tenths. See Appendix A fo

Order	Supply	Give
1. 0.5 g IM	250 mg/mL	2mL
2. 10 mEq IV	40 mEq/20 mL	5mL
3. 0.5 mg IM	0.25 mg/mL	2mL
4. 100 mg IM	0.2 g/2 mL	

SELF-TEST 5 Parenteral Medication Calculations

In these practice problems, determine whether the dose is safe, calculate the amount needed, and state how the order should be administered. Round the lb to kg weight conversions to the nearest hundredth. Round the final answer to the nearest tenths. Answers appear at the end of this chapter. Follow the steps used in the examples.

1. Order: cefuroxime 200 mg IV q6h in 10 mL D5½NS
   Infant: 6 months; weight, 8 kg
   Supply: 750-mg vial of powder. Directions: Dilute with 8 mL sterile water for injection to make 90 mg/mL; stable for 3 days if refrigerated.
   Literature: The safe dose is 50 to 100 mg/kg/24 hours given q6–8h.
   Concentration for IV use: 50 mg/mL (minimum dilution) over 30 minutes

50mg · 8kg = 400mg
100mg · 8kg = 800mg
Safe dosage
200mg/kg · 1mL/90mg/kg = 2.2mL

2. Order: trimethoprim/sulfamethoxazole 75 mg IV q12h in 75 mL D5W over 1 hour
   Child: 3 years; weight, 15 kg
   Supply: Vial labeled 80 mg/5 mL
   Literature: Safe dose for a child is 8 to 10 mg/kg/24 hours given q12h
   Concentration for IV use: 1 mL in 15 to 25 mL (supply is a liquid)

8mg · 15kg = 120mg
10mg · 15kg = 150mg
Safe dosage
r=20mL/hr

3. Order: tobramycin 100 mg IV q8h in 50 mL D5½NS
   Child: 12 years; weight, 40 kg
   Supply: vial 80 mg/2 mL
   Literature: The safe dose is 3 to 5 mg/kg/24 hours given q8h.
   Concentration for IV use: 2 mg/mL (minimum dilution) over 15 to 30 minutes

3mg · 40kg = 120mg
5mg · 40kg = 200mg
not safe. Order dose is too high
75mg · 1mL/80mg = 4.7mL
Set pump 75mL/hr

4. Order: cefotaxime 900 mg IV q6h in 25 mL D5½NS
   Child: 5 years; weight, 18 kg
   Supply: 1 g powder. Directions: Dilute with 10 mL sterile water for injection to make 95 mg/mL; stable in the refrigerator 10 days.
   Literature: The safe dose is 50 to 200 mg/kg/24 hours given q6h.
   Concentration for IV use: 50 mg/mL; give over 30 minutes

50mg · 18kg = 900mg
200mg · 18kg = 3600mg
Safe
900mg · 1mL/95mg = 9.5mL
→ 50mL/hr = 25mL/30min

5. Order: nafcillin 150 mg IV q8h in 10 mL D5½NS
   Infant: 3 months; weight, 6 kg
   Supply: 500-mg vial of powder. Directions: Add 1.7 mL sterile water for injection to make 500 mg/2 mL; stable for 48 hours if refrigerated.
   Literature: The safe dose is 100 to 200 mg/kg/24 hours given q6h.
   Concentration for IV use: 6 mg/mL (minimum dilution) over 30 to 60 minutes

100mg · 6kg = 600mg
200mg · 6kg = 1200mg
not safe b/c the dilution does not match the requirements

6. Order: morphine 2.5 mg IVP q4h
   Child: 8 years; weight, 30 kg
   Supply: morphine injection 1 mg/mL
   Literature: 0.05 to 0.1 mg/kg/q4h IVP. Dilute 2 to 10 mg in at least 5 mL (minimum dilution) NS. Administer over 4 to 5 minutes.

0.05mg · 30kg = 1.5mg
0.1mg · 30kg = 3mg
Safe

7. Order: dexamethasone 4 mg IVP bid
   Child: 6 years; weight, 25 kg
   Supply: dexamethasone 4 mg/mL injection
   Literature: 0.08 to 0.3 mg/kg/day divided q6–12h. Give undiluted IVP over 30 seconds or less.

0.08mg · 25kg = 2mg
0.3mg · 25kg = 7.5mg
not safe b/c what's ordered is too high

8. Order: diphenhydramine 25 mg IVP q4–6h
   Child: 12 years; weight, 45 kg
   Supply: 50 mg/mL injection
   Literature: 12.5 to 25 mg IV q4–6h; maximum dose, 300 mg/24 hours
   Give undiluted IVP over 1 minute.

Safe dose.

(continued)

25mg · 6hr = 150mg
25mg · 4hr = 100mg

25mg · 1mL/50mg = 0.5mL

The Centers for Disease Control and ... CEU's for this program.

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in the following educational activity

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SELF-TEST 5 Parenteral Medication Calculations (*Continued*)

9. Order: digoxin maintenance dose IVP 50 mcg/day
   Infant: 15 lb → 6.82 kg 6 mcg · 6.82 kg = 40.92 mcg 7.5 mcg · 6.82 kg = 51.15 mcg
   Supply: 0.1 mg/mL injection
   Literature: 6 to 7.5 mcg/kg/day. Give undiluted or diluted in 4 mL D5W or NS over 5 minutes.

   Safe. $50 mcg \cdot \frac{1 mL}{100 mcg} = 0.5 mL$

10. Order: methylprednisolone IVP 60 mg bid
    Child: 9 years; weight, 80 lb → 36.36 kg → 120 0.5 mg · 36.36 kg = 18.18 mg 1.7 mg · 36.36 kg = 61.81 mg
    Supply: methylprednisolone 40 mg/mL
    Literature: 0.5 to 1.7 mg/kg/day. Give each 500 mg over 2 to 3 minutes.

not safe b/c the order amount is too high

CRITICAL THINKING TEST YOUR CLINICAL SAVVY

You are working in a pediatric unit and taking care of 5-year-old Georgia Smith. Although she usually has a sweet disposition, she has her moments when she will not do anything she doesn't want to do. She is receiving IV fluids continuously and is ordered an oral medication three times a day that has an aftertaste. Each time the medication is brought to her, she refuses to take it.

A. What are techniques to help her take the medication?

B. Are there other alternatives you could use regarding the medication? How would you implement any of these alternatives?

C. Are there strategies to suggest to the family to promote easier compliance?

D. Besides reducing the possibility of fluid overload, what are some other reasons IV infusion pumps are used with children?

Another client, 14-year-old Sean McBrady, is unable to swallow pills.

A. What are some alternatives to the medication?

B. Are there contraindications to any of the medication alternatives?

C. What are some ways to get children to swallow pills?

D. What would you suggest to the family to promote easier administration?

PUTTING IT TOGETHER: CLINICAL CASE STUDIES

...UMG TAB ...AHEAD Discard After