Test 4: Mental Drill in Liquids-for-Injection Problems

1. 2 mL IM
2. 5 mL IV
3. 2 mL IM
4. 1 mL IM
5. 0.5 mL IM
6. 1 mL IM
7. 0.75 mL or 0.8 mL subcutaneous
8. 1 mL subcutaneous
9. 20 mL IV
10. 2.5 mL IM
11. 0.8 mL IM
12. 2 mL IM
13. 2 mL IV
14. 1.5 mL IM
15. 1.5 mL IM
16. 0.35 mL or 0.4 mL IM
17. 1.5 mL subcutaneous
18. 1.5 mL IM

CHAPTER 6

Test 1: Basic IV Problems

1. **a.** You have 1000 mL running at 150 mL/hour, therefore

$$\frac{\overset{20}{\cancel{1000}}}{\underset{3}{\cancel{150}}} = \frac{\cancel{20}}{3} \quad \begin{array}{r} 6.6 \\ 3\overline{)20.0} \\ \underline{18} \\ 20 \\ \underline{18} \\ \end{array}$$

= approximately 6.6 hours or 6 hours 36 minutes (or 6.7 hours if rounded, which would be 6 hours 42 minutes)

b. $\frac{150 \times 10}{60}$ = 25 gtt/minute macrodrip

$\frac{150 \times 60}{60}$ = 150 gtt/minute microdrip

Dimensional Analysis

$$\frac{\overset{1}{\cancel{10}}\ \text{gtt} \mid 150\ \cancel{\text{mL}} \mid 1\ \cancel{\text{hour}}}{1\ \cancel{\text{mL}} \mid 1\ \cancel{\text{hour}} \mid \underset{6}{\cancel{60}}\ \text{minutes}} = \frac{150}{6} = 25\ \text{gtt/minute macrodrip}$$

$$\frac{\overset{1}{\cancel{60}}\ \text{gtt} \mid 150\ \cancel{\text{mL}} \mid 1\ \cancel{\text{hour}}}{1\ \cancel{\text{mL}} \mid 1\ \cancel{\text{hour}} \mid \underset{1}{\cancel{60}}\ \text{minutes}} = 150\ \text{gtt/minute microdrip}$$

c. Choose macrotubing; you could choose microtubing; however, the drip rate is hard to count.

2. **a.** 6 hour = 360 minutes

b. $\frac{100 \times \overset{1}{\cancel{60}}}{\underset{6}{\cancel{360}}} = \frac{100}{6}$ = 16.6 or 17 gtt/minute

$\frac{100 \times 10}{360} \times 2.7$ or 3 gtt/minute

c. Dimensional Analysis

$$\frac{\cancel{60}\ \text{gtt} \mid 100\ \cancel{\text{mL}} \mid 1\ \cancel{\text{hour}}}{1\ \cancel{\text{mL}} \mid 6\ \cancel{\text{hours}} \mid \cancel{60}\ \text{minutes}} = \frac{100}{6} = 16.6 \text{ or } 17\ \text{gtt/minute}$$

$$\frac{10 \text{ gtt} \mid 100 \cancel{\text{mL}} \mid 1 \cancel{\text{hour}}}{1 \cancel{\text{mL}} \mid 6 \cancel{\text{hours}} \mid 60 \text{ minutes}} = 2.7 \text{ or } 3 \text{ gtt/minute}$$

Because the amount is small and will run over 6 hours, choose *microdrip tubing.*

3. a. Because the stock bag is 250 mL NS, you would aseptically allow 100 mL to run off. This would leave 150 mL NS. If using an infusion pump, you could set the volume to be infused at 150 mL.

b. 3 hours = 180 minutes

$$\text{Macrodrip: } \frac{150 \times \overset{1}{\cancel{15}}}{\underset{12}{\cancel{180}}} = \frac{150}{12} = 12.5 \text{ or } 13 \text{ gtt/minute}$$

$$\text{Microdrip: } \frac{150 \times \overset{1}{\cancel{60}}}{\underset{3}{\cancel{180}}} = \frac{150}{3} = 50 \text{ gtt/minute}$$

Dimensional Analysis

$$\frac{\overset{1}{\cancel{15}}\ \text{gtt} \mid 150 \cancel{\text{mL}} \mid 1 \cancel{\text{hour}}}{1 \cancel{\text{mL}} \mid 3 \cancel{\text{hours}} \mid \underset{4}{\cancel{60}}\ \text{minutes}} = \frac{150}{12} = 12.5 \text{ or } 13 \text{ gtt/minute}$$

$$\frac{\overset{1}{\cancel{60}}\ \text{gtt} \mid 150 \cancel{\text{mL}} \mid 1 \cancel{\text{hour}}}{1 \cancel{\text{mL}} \mid 3 \cancel{\text{hours}} \mid \underset{1}{\cancel{60}}\ \text{minutes}} = \frac{150}{3} = 50 \text{ gtt/minute}$$

c. Microdrip because 50 gtt/minute provides a better flow. It would not be incorrect however to choose the macrodrip.

4. 21 mL/hour

Step 1. $\dfrac{\text{Number of milliliters}}{\text{Number of hours}} = \text{mL/hour}$

$$\frac{500 \text{ mL}}{24 \text{ hours}} \overset{20.8}{\overline{)500.0}} = 21 \text{ mL/hour}$$

$$\begin{array}{r} 48 \\ \hline 20\,0 \\ 19\,2 \\ \hline \end{array}$$

Set the pump at 21 mL/hour. Volume to be infused: 500 mL.

5. a. Use a reconstitution device to add 100 mg powder to 250 mL D5W and give IVPB over 1 hour (60 minutes);

b. $\dfrac{250 \times \cancel{10}}{\cancel{60}} = \dfrac{250}{6} \overset{41.6}{\overline{)250.0}} = 42 \text{ gtt/minute}$

Label the IVPB.

Dimensional Analysis

$$\frac{\overset{1}{\cancel{10}}\ \text{gtt} \quad \cancel{250\ \text{mL}} \quad \cancel{1\ \text{hour}}}{\cancel{1\ \text{mL}} \quad \cancel{1\ \text{hour}} \quad \underset{6}{\cancel{60}}\ \text{minutes}} = \frac{250}{6} \text{ or } 41.6 \text{ or } 42 \text{ gtt/minute}$$

Set the rate at 42 gtt/minute.

6. a. Order is 500 mg. Stock is 1 g in 10 mL.

1 g = 1000 mg, therefore 1000 mg is in 10 mL

Add 5 mL aminophylline to make 500 mg in 250 mL D5W.

Formula Method

$$\frac{500\ \cancel{\text{mg}}}{1000\ \cancel{\text{mg}}} \times 10\ \text{mL} = 5\ \text{mL}$$

Proportion

EXPRESSED AS TWO RATIOS

$$10\ \text{mL}:1000\ \text{mg} :: x:500\ \text{mg}$$

EXPRESSED AS TWO FRACTIONS

$$\frac{10\ \text{mL}}{1000\ \text{mg}} \times \frac{x}{500}$$

SOLUTION FOR BOTH PROPORTION METHODS

$$10 \times 500 = 1000x$$

$$\frac{5000}{1000} = x$$

$$5\ \text{mL} = x$$

Dimensional Analysis

Use conversion factor 1 g/1000 mg:

$$\frac{10\ \text{mL} \quad \overset{1}{\cancel{500\ \text{mg}}} \quad 1\ \cancel{\text{g}}}{1\ \cancel{\text{g}} \quad \quad \underset{2}{\cancel{1000\ \text{mg}}}} = \frac{10}{2} \text{ or } 5\ \text{mL}$$

b. $\dfrac{\text{Number of milliliters}}{\text{Number of hours}} = \text{mL/hour}$

$$\frac{250\ \text{mL}}{8\ \text{hours}} = 31.2 = 31\ \text{mL/hour}$$

Microdip: 31 mL/hour = 31 gtt/minute (no math necessary)

Label IV.

Set the rate at 31 gtt/minute.

7. 2800 mL

The client gets 125 mL/hour, and there are 24 hours in a day; four times a day, the client receives cefoxitin. That leaves 20 hours (24–4) times 125 mL/hour:

$$\begin{array}{r} 125 \\ \times\ 20 \\ \hline 2500\ \text{mL} \end{array}$$

The client gets 75 mL q6h and therefore is receiving 75 mL four times in 24 hours.

$$\text{So} \quad \begin{array}{r} 75 \\ \times\ \ 4 \\ \hline 300 \end{array}$$

add the 300 mL to 2500 mL = 2800 mL

8. a. 90 mL/hour—no math necessary—using an infusion pump

b. $\dfrac{\text{Total number of milliliters}}{\text{Milliliters per hour}} = \text{Hours}$

$$\begin{array}{r} \cancel{1000} \\ \hline 90 \end{array} \overline{)\,1000.0}\quad 11.1$$

$$\begin{array}{r} 90 \\ \hline 100 \\ 90 \\ \hline 10\,0 \end{array}$$

Approximately 11 hours or 11 hours 6 minutes

9. 50 mg

You have 0.5 g in 500 mL. 0.5 g = 500 mg. The solution is 500 mg in 500 mL. Reducing this amount would equal 1 mg in 1 mL. Because the client is receiving 50 mL/hour, the client is receiving 50 mg aminophylline per hour.

10. a. You need 75 mL D5W. Take a 100-mL bag of D5W and aseptically remove 25 mL. Add 5 mL Bactrim to the 75 mL. Time is 60 minutes. The order is 75 mL/hour. No math is necessary. You have a pump in milliliters per hour. (You could also use a Buretrol and add 75 mL of D5W to the Buretrol, then add the 5 mL of Bactrim.)

Label the IVPB.

b. Set the pump:

For 60 minutes,

Secondary volume (mL): 75

Secondary rate (mL/hour): 75

For 90 minutes, $\dfrac{75 \times 60}{90} = 50$ mL/hour

Secondary volume (mL): 75

Secondary rate (mL/hour): 50

11. $\frac{3}{4} \times 150$ mL = 112.5 mL Isocal
150 mL − 112.5 mL = 37.5 mL water

12. $\frac{1}{2} \times 500$ mL = 250 mL Vivonex
500 mL − 250 mL = 250 mL water

13. 25% = 0.25 = $\frac{1}{4}$ (use any of these)
$\frac{1}{4} \times 400$ mL = 100 mL Osmolite
400 mL − 100 mL = 300 mL water

14. 500 mL Isocal
0 mL water