

**DOSAGE CALCULATIONS:
ADDITIONAL PRACTICE QUESTIONS**

CALCULATION OF INTRAVENOUS FLOW RATES

When answering the following questions, be sure to:

- For IV drip rates (gtt/ min) and flow rates (mL/ hr) round off to the nearest whole number when applicable
- state the unit of measurement in each answer

CONVERTING TO mL/ hr

Using this formula will help you to answer the following questions:

$$\frac{\text{Total volume ordered (mL)}}{\text{Total time to be given (h)}} = \text{mL/ h}$$

1. The physician's order reads:
1 L of 5DW to infuse over 10 hours

How many mL/ h will the IV need to run at in order to deliver the solution as ordered?

2. The physician's order reads:
1.8 L of NS to infuse over 15 hours

How many mL/ h will the IV need to run at in order to deliver the solution as ordered?

3. The physician's order reads:
Give antibiotic in 30 mL D5W over 15 minutes

How many mL/ h will the IV need to run at in order to deliver the solution as ordered?

4. The physician's order reads:
750 mL of 1/3 – 2/3 over 5 hours

How many mL/ h will the IV need to run at in order to deliver the solution as ordered?

5. The physician's order reads:
1500 mL 5D1/2S over 12 hours

How many mL/ h will the IV need to run at in order to deliver the solution as ordered?

CALCULATING IV FLOW RATES

Using the following formula will help you to calculate your manual IV drip rate:

$$\frac{V}{T} \times \text{gtt factor (gtt/ mL)} = \text{gtt/ min}$$

V = volume of solution to be infused (in mL)

T = time over which the solution is to be infused (in min)

gtt factor = drops/ mL (can be found on the IV tubing packaging)

6. Macrodrip IV tubing typically has a gtt factor of either _____ , _____ ,
or _____ gtt/ mL.
7. All microdrip IV tubing has a gtt factor of _____ gtt/ mL.

8. Calculate the drops per minute (gtt/ min) using an administration set with a drop factor of 10gtt/ mL.
- a. IV of D1/2S at 150 mL/ h
 - b. IV of D5W at 125 mL/ h
 - c. IV of 5DW with 20 mEq of KCl at 100 mL/ h
 - d. IV of NS at 75 mL/ h
 - e. IV of 2/3-1/3 at 50 mL/h
9. Calculate the drops per minute (gtt/min) for each of the above using an administration set with a drop factor of 15 gtt/ mL.
- a.
 - b.
 - c.
 - d.
 - e.

10. Calculate the drops per minute (gtt/ min) for each of the above using a microdrip administration.
- a.
 - b.
 - c.
 - d.
 - e.

RECALCULATING IV FLOW RATES WHEN TOO FAST OR TOO SLOW

It is your responsibility to maintain the patient's IV at its ordered rate. A variety of circumstances (i.e. gravity, movement of the patient, location of the IV insertion site) may alter the IV flow rate causing it to run ahead or behind schedule. If this occurs, you may want to temporarily recalculate the flow rate to get the IV back "on time". While there is little concern about slowing an IV rate (even as slow as TKO), the same cannot be said for increasing an IV rate. In general, it is acceptable practice for the nurse to increase the flow rate by no more than 25% of the original order without a physician's order.

In all instances, before deciding to recalculate a patient's IV flow rate, you should consider notifying the physician as warranted by the patient's condition, hospital policy and good nursing judgment.

NOTE: If your patient's IV contains KCl, be sure that you do not recalculate the flow rate without considering the implications of the patient receiving additional KCl along with the additional IV solution.

11. 500 mL of D5NS is to infuse over 5 hours.
After 2 hours, there are 250 mL remaining in the IV bag.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 2 hours?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.
12. 1 L of NS is to infuse for 8 hours.
After 4 hours, there are 600 mL remaining in the IV bag.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 4 hours?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.

13. 1000 mL of D5W is to infuse for 10 hours.
After 5 hours, there are 500 mL remaining in the IV bag.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 5 hours?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.
14. 500 mL of 1/3 – 2/3 is to infuse over 5 hours.
After 1 hour, 250 mL has been infused.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 1 hour?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.

15. 500 mL of whole blood is to infuse over 4 hours.
After 2 hours, there are 375 mL remaining in the blood bag.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 2 hours?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.
16. 280 mL of red blood cells (RBC) is to infuse over 3 hours.
After 1 hour, there are 150 mL remaining in the blood bag.
- At what flow rate (mL/ h) should the IV be running?
 - How many mL should be left in the IV bag after 1 hour?
 - Is the IV ahead or behind?
 - Recalculate a new flow rate (mL/ h) in order to finish the bag on time.
 - Does the new flow rate fit with acceptable practice? Explain.

17. 280 mL of packed red cells (PC) is to be infused over 2 hours using a volumetric pump. The drop factor of the blood administration set is 10 gtt/mL.
 - a. According to the Canadian Blood Services, you are to run the blood at 50 mL/h for the first 15 minutes in order to assess for a transfusion reaction. How many mLs of blood would the patient receive in that first 15 minutes?
 - b. Now that the first 15 minutes has passed without incident, recalculate the flow rate (mL/h) so that the blood transfusion is completed within the original 2 hour time frame.

**CALCULATION OF INTRAVENOUS FLOW RATES
ANSWER KEY**

1. $\frac{1000 \text{ mL}}{10 \text{ h}} = \mathbf{100 \text{ mL/ h}}$

2. $\frac{1800 \text{ mL}}{15 \text{ h}} = \mathbf{120 \text{ mL/ h}}$

3. $\frac{30 \text{ mL}}{15 \text{ min}} = \mathbf{120 \text{ mL/ h}}$

4. $\frac{750 \text{ mL}}{5 \text{ h}} = \mathbf{150 \text{ mL/ h}}$

5. $\frac{1500 \text{ mL}}{12 \text{ h}} = \mathbf{125 \text{ mL/ h}}$

6. gtt factor of either **10, 15, or 20** gtt/ mL.

7. gtt factor of **60** gtt/ mL.

8a. $\frac{150 \text{ mL}}{60 \text{ min}} \times 10 \text{ gtt/ mL} = \mathbf{25 \text{ gtt/ min}}$

8b. $\frac{125 \text{ mL}}{60 \text{ min}} \times 10 \text{ gtt/ mL} = \mathbf{21 \text{ gtt/ min}}$
(Since you got an answer that goes to many decimal points, this is a case where you should round off to a whole number)

8c. $\frac{100 \text{ mL}}{60 \text{ min}} \times 10 \text{ gtt/ mL} = \mathbf{17 \text{ gtt/ min}}$

8d. $\frac{75 \text{ mL}}{60 \text{ min}} \times 10 \text{ gtt/ mL} = \mathbf{13 \text{ gtt/ min}}$

8e. $\frac{50 \text{ mL}}{60 \text{ min}} \times 10 \text{ gtt/ mL} = \mathbf{8 \text{ gtt/ min}}$

9a. $\frac{150 \text{ mL}}{60 \text{ min}} \times 15 \text{ gtt/ mL} = \mathbf{38 \text{ gtt/ min}}$

9b. $\frac{125 \text{ mL}}{60 \text{ min}} \times 15 \text{ gtt/ mL} = \mathbf{31 \text{ gtt/ min}}$

9c. $\frac{100 \text{ mL}}{60 \text{ min}} \times 15 \text{ gtt/ mL} = \mathbf{25 \text{ gtt/ min}}$

9d. $\frac{75 \text{ mL}}{60 \text{ min}} \times 15 \text{ gtt/mL} = \mathbf{19 \text{ gtt/ min}}$

9e. $\frac{50 \text{ mL}}{60 \text{ min}} \times 15 \text{ gtt/mL} = \mathbf{12 \text{ gtt/ min}}$

10a. $\frac{150 \text{ mL}}{60 \text{ min}} \times 60 \text{ gtt/mL} = \mathbf{150 \text{ gtt/ min}}$

10b. $\frac{125 \text{ mL}}{60 \text{ min}} \times 60 \text{ gtt/mL} = \mathbf{125 \text{ gtt/ min}}$

10c. $\frac{100 \text{ mL}}{60 \text{ min}} \times 60 \text{ gtt/mL} = \mathbf{100 \text{ gtt/ min}}$

10d. $\frac{75 \text{ mL}}{60 \text{ min}} \times 60 \text{ gtt/mL} = \mathbf{75 \text{ gtt/ min}}$

10e. $\frac{50 \text{ mL}}{60 \text{ min}} \times 60 \text{ gtt/mL} = \mathbf{50 \text{ gtt/ min}}$

11a. $\frac{500 \text{ mL}}{5 \text{ h}} = \frac{X}{1 \text{ h}} \quad \mathbf{X = 100 \text{ mL/ h}}$

11b. $100 \text{ mL/ h} \times 2 \text{ h} = 200 \text{ mL}$ should be infused out of a 500 mL bag so should be $\rightarrow \mathbf{300 \text{ mL left}}$

11c. Should be 300 mL left but there is only 250 mL left so IV is $\rightarrow \mathbf{AHEAD}$
(so IV needs to be slowed down)

11d. $\frac{250 \text{ mL}}{3 \text{ h}} = \frac{X}{1 \text{ h}} \quad \mathbf{X = 83 \text{ mL/ h}}$

11e. It is usually acceptable practice to slow an IV, even to TKO $\rightarrow \mathbf{YES, the new flow rate is acceptable.}$

12a. $\frac{1000 \text{ mL}}{8 \text{ h}} = \frac{X}{1 \text{ h}} \quad \mathbf{X = 125 \text{ mL/ h}}$

12b. $125 \text{ mL/ h} \times 4 \text{ h} = 500 \text{ mL}$ should be infused out of a 1000 mL bag so should be $\rightarrow \mathbf{500 \text{ mL left}}$

- 12c. Should be 500 mL left but there is 600 mL left so IV is → **BEHIND**
(so IV needs to be speeded up)
- 12d. $\frac{600 \text{ mL}}{4 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 150 mL/ h**
- 12e. Ordered rate = 125 mL/ h
25% of 125 mL = 31 mL
Therefore could safely ↑ flow rate by 31 mL to 156 mL/h. New rate = 150 mL/ h
which is less than the acceptable 156 mL/h → **YES, the new flow rate is acceptable.**
- 13a. $\frac{1000 \text{ mL}}{10 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 100 mL/ h**
- 13b. 100 mL/ h X 5 h = 500 mL should be infused out of a 1000 mL bag so should be → **500 mL left**
- 13c. Should be 500 mL left and there is 500 mL left so IV is → **RIGHT ON TIME!**
- 13d. N/A
- 13e. N/A
- 14a. $\frac{500 \text{ mL}}{5 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 100 mL/ h**
- 14b. 100 mL/ h X 1 h = 100 mL should be infused out of a 500 mL bag so should be → **400 mL left**
- 14c. Should be 100 mL infused but there has been 250 mL infused so IV is → **AHEAD**
(so IV needs to be slowed down)
- 14d. $\frac{250 \text{ mL}}{4 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 63 mL/ h**
- 14e. It is usually acceptable practice to slow an IV, even to TKO → **YES, the new flow rate is acceptable.**

15a. $\frac{500 \text{ mL}}{4 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 125 mL/ h**

15b. 125 mL/ h X 2 h = 250 mL should be infused out of a 500 mL bag so should be → **250 mL left**

15c. Should be 250 mL left but there is 375 mL left so IV is → **BEHIND**
(so IV needs to be speeded up)

15d. $\frac{375 \text{ mL}}{2 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 188 mL/ h**

15e. Ordered rate = 125 mL/ h
25% of 125 mL = 31mL
Therefore could safely ↑ flow rate by 31 mL to 156 mL/h.

New rate = 188 mL/ h which is more than the acceptable 156 mL/h → **NO, the new flow rate is not acceptable.**

16a. $\frac{280 \text{ mL}}{3 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 93 mL/ h**

16b. 93 mL/ h X 1 h = 93 mL should be infused out of a 280 mL bag so should be → **187 mL left**

16c. Should be 187 mL left but there is 150 mL left so IV is → **AHEAD**
(so IV needs to be slowed down)

16d. $\frac{150 \text{ mL}}{2 \text{ h}} = \frac{X}{1 \text{ h}}$ **X = 75 mL/ h**

16e. It is usually acceptable practice to slow an IV, even to TKO → **YES, the new flow rate is acceptable.**

17a. $\frac{50 \text{ mL}}{60 \text{ min}} = \frac{X}{15 \text{ min}}$ **X = 13 mL/ h**

17b. First you have to calculate how many mLs of blood is left in the bag:

$$\begin{array}{r} 267 \text{ mL} \\ -13 \text{ mL} \\ \hline 267 \text{ mL} \end{array}$$

Then you have to calculate the amount of time left: 2h – 15min = 1h 45min which is **105min**

And you end up with:

$$\frac{267 \text{ mL}}{105 \text{ min}} = \frac{X}{60 \text{ min}}$$

X = 153 mL/ h
(this is the rate that you would set the pump at for the rest of the transfusion.)