APPENDIX D
DRUG CALCULATIONS

Read the following information carefully before attempting the examples and exercises.

TABLETS

Formula method

$$\frac{\text{Required dose}}{\text{Stock dose}} = \text{No. of tablets to be given}$$

Ratio method

$$\text{Required dose} : \text{Required tablet}$$
$$\text{Stock dose} : \text{Stock tablet}$$
$$\frac{\text{Required dose}}{\text{Stock dose}} = \frac{\text{Required tablet}}{\text{Stock tablet}}$$

Note: Units for the required dose and stock dose must be the same. The stock dose is the mass you have available to you. The required dose is the mass that needs to be given to the client.

EXAMPLE

A client is ordered 150 mg soluble aspirin. 'Disprin' tablets containing 300 mg aspirin are available. How many tablets will you give?

Formula method

$$\frac{150\text{mg}}{300\text{mg}} = \text{No. of tablets to be given}$$
$$= 0.5 \text{ tablet}$$

Ratio method

$$150\text{mg} : \times \text{ tablet}$$
$$300\text{mg} : 1 \text{ tablet}$$
$$\frac{150\text{mg}}{300\text{mg}} = \frac{\times \text{ tablet}}{1 \text{ tablet}}$$
$$= 0.5 \text{ tablet}$$

DRIP RATES

$$\frac{\text{Total volume}}{\text{Total hours}} = \frac{\text{mL}}{\text{hr}}$$

Drops per minute (dpm)

Macro drip $$\frac{\text{Volume}}{\text{Time (hr)}} \times \frac{\text{Drop factor (20)}}{60 \text{ min}} = \text{dpm}$$

Micro drip $$\frac{\text{Volume}}{\text{Time (hr)}} \times \frac{\text{Drop factor (60)}}{60 \text{ min}} = \text{dpm}$$

Note: Drop factor for macro drip = 20 drops/mL; micro drip = 60 drops/mL.

EXAMPLE

A client is ordered an intravenous infusion of 1000 mL normal saline to run over 24 hours, using a macro drip. Calculate the drip rate.

$$\frac{1000}{24} \times \frac{20}{60} = 13.8$$
$$= 14 \text{ dpm}$$

MEDICATION DOSAGES

For intravenous and intramuscular injections.

Formula method

$$\frac{\text{Required dose}}{\text{Stock dose}} \times \frac{\text{Stock volume}}{1} = \text{Volume to be given}$$

Note: Units for the required dose must be the same. Units for the required volume and stock volume must be the same.

Ratio method

$$\text{Required dose} : \text{Required volume}$$
$$\text{Stock dose} : \text{Stock volume}$$
$$\frac{\text{Required dose}}{\text{Stock dose}} = \frac{\text{Required volume}}{\text{Stock volume}}$$

Note: Units for the required dose and stock dose must be the same. Units for the required volume and stock volume must be the same.

EXAMPLE

(i) You are required to give 6 mg morphine. In your stock ampoule there is 15 mg per 1 mL. How much of the ampoule will you need?

Formula method

$$\frac{6 \text{ mg}}{15 \text{ mg}} \times \frac{1 \text{ mL}}{1} = 0.4 \text{ mL}$$

Ratio method

$$6 \text{ mg} : \times \text{ mL}$$
$$15 \text{ mg} : 1 \text{ mL}$$
$$\frac{6 \text{ mg}}{15 \text{ mg}} = \frac{\times \text{ mL}}{1 \text{ mL}}$$
$$= 0.4 \text{ mL}$$

EXAMPLE

(ii) You are required to give 30 units insulin. In your stock vial there is 100 units per 1 mL. How much do you require?

Formula method

$$\frac{30 \text{ units}}{100 \text{ units}} \times \frac{1 \text{ mL}}{1} = 0.3 \text{ mL}$$

Ratio method

$$30 \text{ units} : \times \text{ mL}$$
$$100 \text{ units} : 1 \text{ mL}$$
$$\frac{30 \text{ units}}{100 \text{ units}} = \frac{\times \text{ mL}}{1 \text{ mL}}$$
$$= 0.3 \text{ mL}$$

EXAMPLE

(iii) You are required to give 12.5 mg morphine intravenously. In your stock ampoule there is 10 mg per 1 mL. How much of the ampoule do you need?

Formula method

$$\frac{12.5\text{ mg}}{10\text{ mg}} \times \frac{1\text{ mL}}{1} = 1.25\text{ mL}$$

Ratio method

12.5 mg : × mL
10 mg : 1 mL

$$\frac{12.5\text{ mg}}{10\text{ mg}} = \frac{\times\text{ mL}}{1\text{ mL}}$$

= 1.25 mL

CALCULATION OF VOLUME OR DOSE PER HOUR FOR VOLUMETRIC PUMPS

Formula method

$$\frac{\text{Required dose (per hour)}}{\text{Stock dose}} \times \frac{\text{Stock volume}}{1} = \text{Volume to be given per hour}$$

Ratio method

Required dose (per hour) : Required volume (per hour)
Stock dose : Stock volume

$$\frac{\text{Required dose}}{\text{Stock dose}} = \frac{\text{Required volume}}{\text{Stock volume}}$$

EXAMPLE

Your client is ordered 1 mg/hr morphine through the volumetric pump. You have made up an intravenous bag containing 50 mg morphine in 500 mL normal saline. How many mL/hr will you dial up on the volumetric pump?

Formula method

$$\frac{1\text{ mg/hr}}{50\text{ mg}} \times \frac{500\text{ mL}}{1} = 10\text{ mL/hr}$$

Ratio method

1 mg/hr : × mL/hr
50 mg : 500 mL

$$\frac{1\text{ mg/hr}}{50\text{ mg}} = \frac{\times\text{ mL/hr}}{500\text{ mL}}$$

= 10 mL/hr

CALCULATION OF VOLUME PER HOUR OR DOSE IN µG/MIN

This information is required when calculating quantities of potent drugs given to clients in the critical care areas.

Formula method

$$\frac{\text{Stock dose (mg)}}{\text{Stock volume (mL)}} \times \frac{1000\ \text{(convert mg to µg)}}{60\ \text{(convert hr to min)}} \times \text{ml/hr} = \text{Required dose (µg/min)}$$

Ratio method

Required dose (µg per minute) : Required volume (mL per hour)
Stock dose (mg) : Stock volume (mL)

Note: In this case the parameters that are available to us do not have the same units on both sides. Change the parameters so that the units are the same on both sides as follows. The stock dose must be multiplied by 1000 to convert the mg dose to µg. The required volume in mL per hour must be divided by 60 to obtain a volume amount per minute.

$$\text{Required dose (µg per minute)} : \text{Required volume (mL per hour/60)}$$
$$\text{Stock dose (mg × 1000)} : \text{Stock volume (mL)}$$

$$\frac{\text{Required dose (µg per minute)}}{\text{Stock dose (µg × 1000)}} = \frac{\text{Required volume (mL per hour/60)}}{\text{Stock volume (mL)}}$$

EXAMPLE

When you look at your infusions at the commencement of the shift you have 50 mg glyceryl trinitrate (GTN) diluted in 100 mL 5% dextrose solution running at 4 mL/hr via a volumetric pump. Calculate the dose in µg/min.

Formula method

$$\frac{50}{100} \times \frac{1000}{60} \times 4 = 33.3 \text{ µg/min}$$

Ratio method

$$\times \text{ µg/min} : 4 \text{ mL/hr/60}$$
$$50 \text{ mg} \times 1000 : 100 \text{ mL}$$
$$\frac{\times \text{ µg/min}}{50 \text{ mg} \times 1000} = \frac{4 \text{ mL/hr/60}}{100 \text{ mL}}$$
$$= 33.3 \text{ µg/min}$$

CALCULATION OF DOSE IN µG/KG/MIN

Formula method

$$\frac{\text{Stock dose (mg)}}{\text{Stock volume (mL)}} \times \frac{1000}{60} \times \frac{\text{mL/hr}}{\text{Client weight (kg)}} = \text{Required dose (µg/kg/min)}$$

Ratio method

A two-step process of the ratio method is performed to calculate the dose in µg/kg/min. Step 1 involves calculating the dose in mg/min. Step 2 involves determining the dose in µg/min/kg from the result obtained in Step 1.

Step 1

$$\text{Required dose (µg per minute)} : \text{Required volume (mL per hour/60)}$$
$$\text{Stock dose (mg × 1000)} : \text{Stock volume (mL)}$$
$$\frac{\text{Required dose (µg per minute)}}{\text{Stock dose (mg × 1000)}} = \frac{\text{Required volume (mL per hour/60)}}{\text{Stock volume (mL)}}$$

This ratio set-up gives the dose in µg/min. Another ratio is then set up to calculate the dose in µg/min/kg.

Step 2

$$\text{Required dose for 1 kg (µg/min)} : \text{1 kg}$$
$$\text{Required dose for client (µg/min)} : \text{Client's weight (kg)}$$
$$\frac{\text{Required dose for 1 kg (µg/min)}}{\text{Required dose for client (µg/min)}} = \frac{\text{1 kg}}{\text{Client's weight (kg)}}$$

This ratio set-up calculates the dose in µg/kg/min.

EXAMPLE

Your 70 kg client is currently receiving an infusion of dopamine at 10 mL/hr. Your medication dilution is 250 mg dopamine in 100 mL 5% glucose solution.

Formula method

$$\frac{250}{100} \times \frac{1000}{60} \times \frac{10}{70} = \frac{2\,500\,000}{420\,000}$$

= 5.9 μg/kg/min of dopamine being administered

Ratio method

(1) First calculate the dose for the client's weight.

$$\times\ \mu g/min : 10\ mL/hr/60$$

$$250\ mg \times 1000 : 100\ mL$$

$$\frac{\times\ \mu g/min}{250\ mg \times 1000} = \frac{10\ mL/hr/60}{100\ mL}$$

$$= 416.7\ \mu g/min$$

(2) Now calculate the dose for 1 kg.

$$\times\ \mu g/kg/min : 1\ kg$$

$$416.7\ \mu g/min : 70\ kg$$

$$\frac{\times\ \mu g/kg/min}{416.7\ \mu g/min} = \frac{1\ kg}{70\ kg}$$

$$= 5.9\ \mu g/kg/min$$

CALCULATION OF DOSE REQUIRED FOR A CHILD USING BODYWEIGHT

Formula method

Child's weight (kg) × Unit dose (per kg) = Required dose

EXAMPLE

A 5-year-old child weighing 18 kg is ordered penicillin G (benzyl penicillin) to be given IV 4 hourly for the treatment of a severe respiratory infection. The recommended dose of penicillin G for a severe infection is 100 000 u (60 mg)/kg/dose every 4 hours. What dose would you administer?

Dose (mg) = 18 kg × 60 mg/kg
= 1080 mg