KEY

Dimensional Analysis Practice Problems

1) 0.56kg = ? mg

$$0.56\text{ kg} \times \frac{1000\text{ g}}{1\text{ kg}} \times \frac{1\text{ mg}}{0.001\text{ g}} = 560{,}000\text{ mg}$$

2) 1.2ng = ? g

$$1.2\text{ ng} \times \frac{10^{-9}\text{ g}}{1\text{ ng}} = 1.2\times10^{-9}\text{ g}$$

3) 2.0 in = ? mm (1in = 2.54 cm)

$$2.0\text{ in} \times \frac{2.54\text{ cm}}{1\text{ in}} \times \frac{0.01\text{ m}}{1\text{ cm}} \times \frac{1\text{ mm}}{0.001\text{ m}} = 51\text{ mm}$$

4) 500ft = ? m

$$500\text{ ft} \times \frac{12\text{ in}}{1\text{ ft}} \times \frac{2.54\text{ cm}}{1\text{ in}} \times \frac{0.01\text{ m}}{1\text{ cm}} = 154.2\text{ m} \rightarrow 200\text{ m}$$

5) 10μL = ? cc (1mL = 1cm^3 = 1 cc)

$$10\mu\text{L} \times \frac{10^{-6}\text{ L}}{1\ \mu\text{L}} \times \frac{1\text{ mL}}{0.001\text{ L}} \times \frac{1\text{ cc}}{1\text{ mL}} = 0.01\text{ cc}$$

6) 3 wk = ? min

$$3\text{ wk} \times \frac{7\text{ day}}{1\text{ wk}} \times \frac{24\text{ hr}}{1\text{ day}} \times \frac{60\text{ min}}{1\text{ hr}} = \frac{30240}{30{,}000}\text{ min}$$

7) 50mL = ? cups (1L = 4.226cups)

$$50\text{mL} \times \frac{.001\text{ L}}{1\text{ mL}} \times \frac{4.226\text{ cups}}{1\text{ L}} = 0.2113\text{ cups}$$

0.2422 cups

8) 5.33km = ? dm

$$5.33\text{ km} \times \frac{1000\text{ m}}{1\text{ km}} \times \frac{1\text{ dm}}{.1\text{ m}} = 53300\text{ dm}$$

9) 123.0 ng = ? Mg

$$123.0\text{ng} \times \frac{10^{-9}\text{ g}}{1\text{ ng}} \times \frac{1\text{ Mg}}{10^{6}\text{ g}} = 1.230\times10^{-13}\text{ Mg}$$

10) 3yds = ? in (1 yd = 3ft)

$$3\text{ yds} \times \frac{3\text{ ft}}{1\text{ yd}} \times \frac{12\text{ in}}{1\text{ ft}} = \frac{108}{100}\text{ in}$$

rounded

CHEM 160

Worksheet: Dimensional Analysis KEY

1. 9 in → cm

$$\frac{9\ \text{in}}{1} \left| \frac{2.54\ \text{cm}}{1\ \text{in}} \right. = 9 \times 2.54\ \text{cm} = 22.86\ \text{cm} \rightarrow$$

20 cm
1 sig. fig.

2. 29 lb 4 oz → kg

$$29.25\ \text{lb} \left| \frac{0.45359\ \text{kg}}{1\ \text{lb}} \right. = 13.2675075\ \text{kg} \rightarrow$$

13.27 kg
4 sig. fig.

3. $210\ \text{cm} \times \frac{1\ \text{in}}{2.54\ \text{cm}} = 82.67\ \text{in} \rightarrow$

83 in
2 sig. fig

4. $3.05\ \text{m} \times \frac{39.37\ \text{in}}{1\ \text{m}} \times \frac{1\ \text{ft}}{12\ \text{in}} = \frac{3.05 \times 39.37}{12}\ \text{ft} = 10.00397\ \text{ft}$

10.0 ft
3 sig. fig.

5. $14\ \text{gal} \times \frac{3.785\ \text{L}}{1\ \text{gal}} = 52.99\ \text{L} \rightarrow$

53 L
2 sig. fig.

6. $2.5\ \text{L} \times \frac{1\ \text{qt}}{0.9463\ \text{L}} =$ 2.6 qt
2 sig. fig

This is less than 3 qt so it's not enough.

7. $20\ \text{ha} \times \frac{2.47\ \text{ac}}{1\ \text{ha}} \times \frac{1\ \text{owl}}{3\ \text{ac}} = 16.4666667\ \text{owl} \rightarrow$

20 owl (1 sig. fig)

8. $8\,\text{ac} \times \frac{1\,\text{hr}}{2.47\,\text{ac}} \times \frac{1\,\text{sheep}}{0.125\,\text{hr}} = \frac{8}{2.47 \times 0.125}\,\text{sheep} =$

25.91093117 sheep → 30 sheep (1 sig fig)

9. 1 pk = 34 g carbs

$6\,\text{days} \times \frac{1\,\text{pk}}{\text{day}} \times \frac{34\,\text{g carb}}{\text{pk}} \times \frac{16\,\text{oz}}{454\,\text{g}} = \frac{6 \times 34 \times 16}{454}\,\text{oz carb} =$

7.189427313 oz carb = 7 oz carb (1 sig. fig)

10. 9 g fat = 1 bar ; 1 pack = 0.6 dbar ; (a) ? oz fat (b) ? cal

$1\,\text{pack} \times \frac{0.6\,\text{dbar}}{1\,\text{pack}} \times \frac{10\,\text{bar}}{1\,\text{dbar}} \times \frac{9\,\text{g fat}}{1\,\text{bar}} \times \frac{1\,\text{lb}}{453.6\,\text{g}} \times \frac{16\,\text{oz}}{1\,\text{lb}} =$

(a) $\frac{0.6 \times 10 \times 9 \times 16}{453.6}\,\text{oz fat} = 1.904761905\,\text{oz} \approx 2\,\text{oz fat}$

(b) $0.6 \times 10 \times 9\,\text{g fat} \times \frac{9\,\text{Cal}}{1\,\text{g fat}} = 0.6 \times 10 \times 9 \times 9\,\text{Cal} = 486\,\text{Cal}$

500 cal (1 sig. fig)

11. 60 mg vit C = 1 day ; 70 mg vit C = 100 g orange ; 3 oz = 1 orange

$1\,\text{week} \times \frac{7\,\text{day}}{1\,\text{wk}} \times \frac{60\,\text{mg vit C}}{1\,\text{day}} \times \frac{100\,\text{g orange}}{70\,\text{mg vit C}} \times \frac{16\,\text{oz}}{454\,\text{g}} \times \frac{1\,\text{orange}}{3\,\text{oz}} =$

$\frac{7 \times 60 \times 100 \times 16}{70 \times 454 \times 3}$ oranges = 7 oranges (1 sig. fig.)

12. 5 mg tar = 1 cig ; 0.4 mg nic = 1 cig. ; 20 cig. = 1 pk

$80\,\text{oz tar} \times \frac{28.35\,\text{g}}{1\,\text{oz}} \times \frac{1\,\text{mg}}{10^{-3}\,\text{g}} \times \frac{1\,\text{cig}}{5\,\text{mg tar}} \times \frac{1\,\text{pk}}{20\,\text{cig}}$ → 2,000 pk (1 sig. fig.)

Dimensional Analysis key (cont)

12. cont. how many packs of cig. = 1 g nicotine

$$1\ g\ \text{nic} \times \frac{1\ \text{cig}}{0.4\ \text{mg nic}} \times \frac{1\ \text{mg}}{10^{-3}\ g} \times \frac{1\ \text{pk}}{20\ \text{cig}} =$$

$$\frac{1}{0.4 \times 10^{-3} \times 20}\ \text{pk} = 125\ \text{pk} \rightarrow \text{(100 pk (1 sig. fig.))}$$

13. 60 mi/hr. what dist. equals 1 sec.

1 sec → dist (ft).

$$1\ \text{sec} \times \frac{1\ \text{hr/h}}{60\ \text{sec}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{60\ \text{mi}}{1\ \text{hr}} \times \frac{5280\ \text{ft}}{1\ \text{mi}} =$$

$$\frac{60 \times 5280}{60 \times 60}\ \text{ft} = 88\ \text{ft} \rightarrow \text{(90 ft (1 sig. fig.))}$$

Medical calculations answer key

1. $\frac{3\ L}{24\ hrs} = \frac{?\ mL}{hr}$

$\frac{3\ L}{24\ hr} \times \frac{1\ mL}{0.001\ L} = \frac{125\ mL}{hr}$

2. $\frac{50\ mL}{30\ min} = \frac{?\ mL}{hr}$

$\frac{50\ mL}{30\ min} \times \frac{60\ min}{1\ hr} = \frac{100\ mL}{hr}$

3. $97.8°F = ?°C$ $\quad \frac{F-32}{1.8} = C = \frac{97.8-32}{1.8} = 36.6°C$

$39.2°C = ?°F$ $\quad °F = 1.8C+32 = 1.8(39.2)+32 = 102°F$

4. 250 mL bag IV = ? hours + 1845 on Monday.

$250\ mL\ IV \times \frac{1\ hr}{20\ mL\ IV} = 12.5\ hr$

(1230) 12.5 hr + 1845 = 3075 − 2400 = 675 min

1 hr 15 min

Tues 0715 ←

5. 43 units insulin = ? mL $\quad$ 1 unit = 0.1 mL

$43\ units \times \frac{1\ mL}{100\ unit} = 0.43\ mL$

6. $\frac{8\ \text{mcg}}{\text{kg}\cdot\text{min}} = ?\ \frac{\text{mL med}}{\text{hr}}$

$$\frac{8\ \text{mcg}}{\text{kg}\cdot\text{min}} \times \frac{60\ \text{min}}{1\ \text{hr}} \times \frac{100\ \text{mL}}{40\ \text{mg}} \times \frac{10^{-6}\ \text{mg}}{10^{-3}\ \text{mcg}} \times \frac{64\ \text{lb}}{1} \times \frac{1\ \text{kg}}{2.2\ \text{lb}} =$$

$$\frac{8 \times 60 \times 100 \times 10^{-6} \times 64 \times 1}{40 \times 10^{-3} \times 2.2}\ \frac{\text{mL}}{\text{hr}} = \boxed{35\ \frac{\text{mL}}{\text{hr}}}$$

7. $\frac{500\ \text{mL}}{10{,}000\ \text{units}}$ or $\frac{10{,}000\ \text{units}}{500\ \text{mL}} = 3\ \frac{\text{units}}{\text{hr}}$

$$\frac{10{,}000\ \text{units}}{500\ \text{mL}} \times \frac{40\ \text{mL}}{\text{hr}} = \frac{10{,}000 \times 40}{500}\ \frac{\text{units}}{\text{hr}}$$

$$= \boxed{800\ \frac{\text{units}}{\text{hr}}}$$

8. 15 mL = 3 tsp or 1 tbsp or $\frac{1}{2}$ oz

9. $120\ \frac{\text{mL}}{\text{hr}} = ?\ \frac{\text{gtt}}{\text{min}}$

$$120\ \frac{\text{mL}}{\text{hr}} \times \frac{15\ \text{gtt}}{1\ \text{mL}} \times \frac{1\ \text{hr}}{60\ \text{min}} = \frac{120 \times 15}{60}\ \frac{\text{gtt}}{\text{min}}$$

$$= \boxed{30\ \frac{\text{gtt}}{\text{min}}} \times \frac{1\ \text{min}}{60\ \text{sec}} \times 15\ \text{sec} = \boxed{7.5\ \text{gtt}}$$

Med. Conversion Problems (continued)

10. 250 mL IV = ? mL med

$$\frac{250\ \text{mL IV}}{1} \times \frac{0.001\ \text{L}}{1\ \text{mL}} \times \frac{40\ \text{mg med}}{1\ \text{L IV}} \times \frac{10\ \text{mL med}}{20\ \text{mg}} =$$

$$\frac{250 \times 0.001 \times 40 \times 10}{20}\ \text{mL med} = 5\ \text{mL med}$$

11. Flow rate for IV in gtt/min.

$$\frac{100\ \text{mL}}{30\ \text{min}} = \frac{?\ \text{gtt}}{\text{min}}$$

$$\frac{100\ \text{mL}}{30\ \text{min}} \times \frac{10\ \text{gtt}}{\text{mL}} = \frac{100 \times 10}{30}\ \frac{\text{gtt}}{\text{min}} = 33\ \frac{\text{gtt}}{\text{min}}$$

12. $$\frac{500\ \text{mL}}{3\ \text{hour}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{20\ \text{gtt}}{\text{mL}} = \frac{500 \times 20}{3 \times 60}\ \frac{\text{gtt}}{\text{min}} = 56\ \frac{\text{gtt}}{\text{min}}$$

13. Order 800 mL NS in 5 hours.
- 500 mL in 2 hours

300 mL in 3 hours remain.

Flow rate in gtt/min

$$\frac{300\ \text{mL}}{3\ \text{hour}} \times \frac{1\ \text{hour}}{60\ \text{min}} \times \frac{15\ \text{gtt}}{\text{mL}} = \frac{300 \times 15}{3 \times 60}\ \frac{\text{gtt}}{\text{min}} =$$

$$25\ \frac{\text{gtt}}{\text{min}}$$

14. a) ? hr min = $700\ \text{mL} \times \frac{1\ \text{hr}}{125\ \text{mL}} = 5.6\ \text{hr} =$ 5 hr 36 min

b) 8:45 pm + 5 hr 36 min = 13 hr 81 min ÷ 2 =
Sunday

2:21 AM Mon ← 1 AM + 81 min

Med calc. Cont.; Imed

15. ? rate $\left(\frac{mL(med)}{min}\right) = \frac{0.5\ mg\ med}{min} \times \frac{250\ mL\ soln}{150\ mg\ med}$

$= \frac{0.5 \times 250\ mL}{150} \frac{mL}{min}$

$= 0.83\ \frac{mL}{min}$

16. ? rate $\frac{mL}{min} = \frac{4\ mcg}{min} \times \frac{10^{-6}\ g}{10^{-3}\ mg} \times \frac{100\ mL}{50\ mg} =$

$\frac{4 \times 10^{-6} \times 100}{10^{-3} \times 50} \frac{mL}{min} = 0.008\ \frac{mL}{min}$

or $\frac{8\ mL}{min}$

17. ? $\frac{mg\ med}{min} = \frac{50\ mL}{1\ hr} \times \frac{250\ mg\ med}{100\ mL\ soln} = \frac{125\ mg}{hr}$

18. ? $\frac{mg}{hr} = \frac{600\ mg}{500\ mL} \times \frac{20\ mL}{hr} = \frac{24\ mg}{hr}$

19. micro drip $= \frac{20\ gtt}{mL}$

? $\frac{gtt}{min} = \frac{125\ mL}{1\ hr} \times \frac{20\ gtt}{mL} \times \frac{1\ hr}{60\ min}$

$= \frac{125 \times 20}{60} \frac{gtt}{min} = \frac{41.2\ gtt}{1\ min}$

Med Calc (cont)

20 a) Order $\frac{20 \text{ mEq KCl}}{1 \text{ L } D5\frac{1}{4}NS}$

$$? \text{ mL KCl} = \frac{20 \text{ mEq KCl}}{1 \text{ L } D5\frac{1}{4}NS} \times \frac{1000 \text{ mL } D5\frac{1}{4}NS}{1 \text{ L}} \times \frac{1 \text{ A}}{1000 \text{ mL}} \times \frac{5 \text{ mL KCl}}{10 \text{ mEq KCl}} = \frac{20 \times 1000 \times 5}{1000 \times 10} \text{ mL KCl}$$

$$= 10 \text{ mL KCl}$$

b) @ 250 mL bag is 1/4 of 1L bag, so

$10 \text{ mL} \times \frac{1}{4} =$ 2.5 mL KCl should be added