Solve:

1. $a^4 \cdot a^5 =$
2. $(10^2 \cdot 10^3)/10^4 =$
3. $a(2a)^2 =$
4. $(6^{-1})^3 =$

5. $12y^2 / 4y^3 =$
6. $(a^3)^0 =$
7. $x^2y^4z^3 \cdot x^1y^2z^5 =$

Solve for x:

1. $3x - 9 = 36$
2. $192 = 3x^2$
3. $4x^3 = 108$
4. $\frac{16 - x}{7} = 19$

SIGNIFICANT FIGURES and SCIENTIFIC NOTATION

1. SIGNIFICANT FIGURES

The precision of a measurement is expressed in terms of significant figures (**sf**). The value 0.24 has 2 sf while 0.240 has 3 sf. The extra zero at the end makes this measurement more precise and is included as a sf. A zero before the first digit does not count as significant as precision is not increased,

0.02 m is the same as 2 cm (both have 1 sf); 0.020 m is the same as 2.0 cm (both have 2 sf)

Practice: State the number of sf in each of the following

0.0420 km (.....)	4.1 g (.....)	3.9120 m (.....)	0.031 W (.....)
0.310 W (.....)	0.00310 W (.....)	0.037 km (.....)	3.037 km (.....)

2. EXPONENTIAL (SCIENTIFIC) NOTATION

Scientific notation is used to control the number of significant digits in both large & small numbers. For example **3400** has 4 digits but what if the number of sf you were allowed was only 2 . The same number could be written as **3.4×10^3** which only has **2 sf**; so does 3.4×10^{-5} (0.000034) & 3.4×10^8 (340 000 000)

EX: 2000 km could have 1 sf, or 2, or 3, or 4; but 2×10^3 km is unambiguously expressed to 1 sf while 2.00×10^3 km is more precisely expressed with 3 sf. *(see over for practice)*

Practice: Convert the following numbers to scientific notation with the correct number of sf (in bracket)

452 100 *(3)*..... 3 562 100 *(2)* ..... 0.0005915 *(3)* ..... 0.000298*(1)* .....

Convert the following measurements from SN

4×10^4 = ... 4.0×10^{-4} = ... 3.2×10^3 = ... 3.200×10^3 = ...

3. WORKING WITH SIGNIFICANT FIGURES: There are *2 rules* you should remember

a) When adding or subtracting, the answer has the same number of **decimal places** as the value with the **lowest** number of decimal places.

b) When multiplying/dividing, the answer has the same number of **significant digits** as the value with the **lowest** number of significant digits. **Don't round off until the end**.

Ex 1: A farm field is **625.4 m** in **82 m**. Calculate its **area**.

area = length x width
= 625.4 m x 82 m ** 82 m is the least precise measurement – 2 sf*
= 5128.2 m^2
= **5.1×10^3** m^2 *** the answer can have no more than 2 sf of precision*

Ex 2: A teacher gives **66.0 g** of candy to each of her **28** students. How much candy does she give out?

Total mass = 28 x 66.0 g
= 1848 g *The number 28 is counted so does not limit the precision*
= **1.85** kg (3 sf) *of the answer – so answer can be expressed to 3 sf*

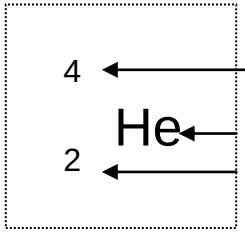
a. 3.414 s + 10.02 s + 58.325 s + 0.00098 s
b. 2.326 h – 0.10408 h
c. 10.19 m x 0.013 m
d. 140.01 cm x 26.042 cm x 0.0159 cm
e. 80.23 m / 2.4 s
f. 4.301 kg / 1.9 cm^3
g. An experiment calls for 16.156 g of substance A, 28.2 g of substance B, 0.0058 g of substance C, and 9.44 g of substance D.
How many significant digits are there in each measurement?
What is the total mass of substances in this experiment?
How many significant digits are there in the answer to part b?

h. A metal block has a volume **1.000 m** x **0.504 m** x **0.025 m**. Its mass is **118.44 kg**. Calculate its density.

ATOMIC NOTATION WORKSHEET **NAME:**

Use the information from the chart in the Atomic Number, Mass Number Worksheet to complete the **atomic notation** chart. The first two have been completed for you as examples.

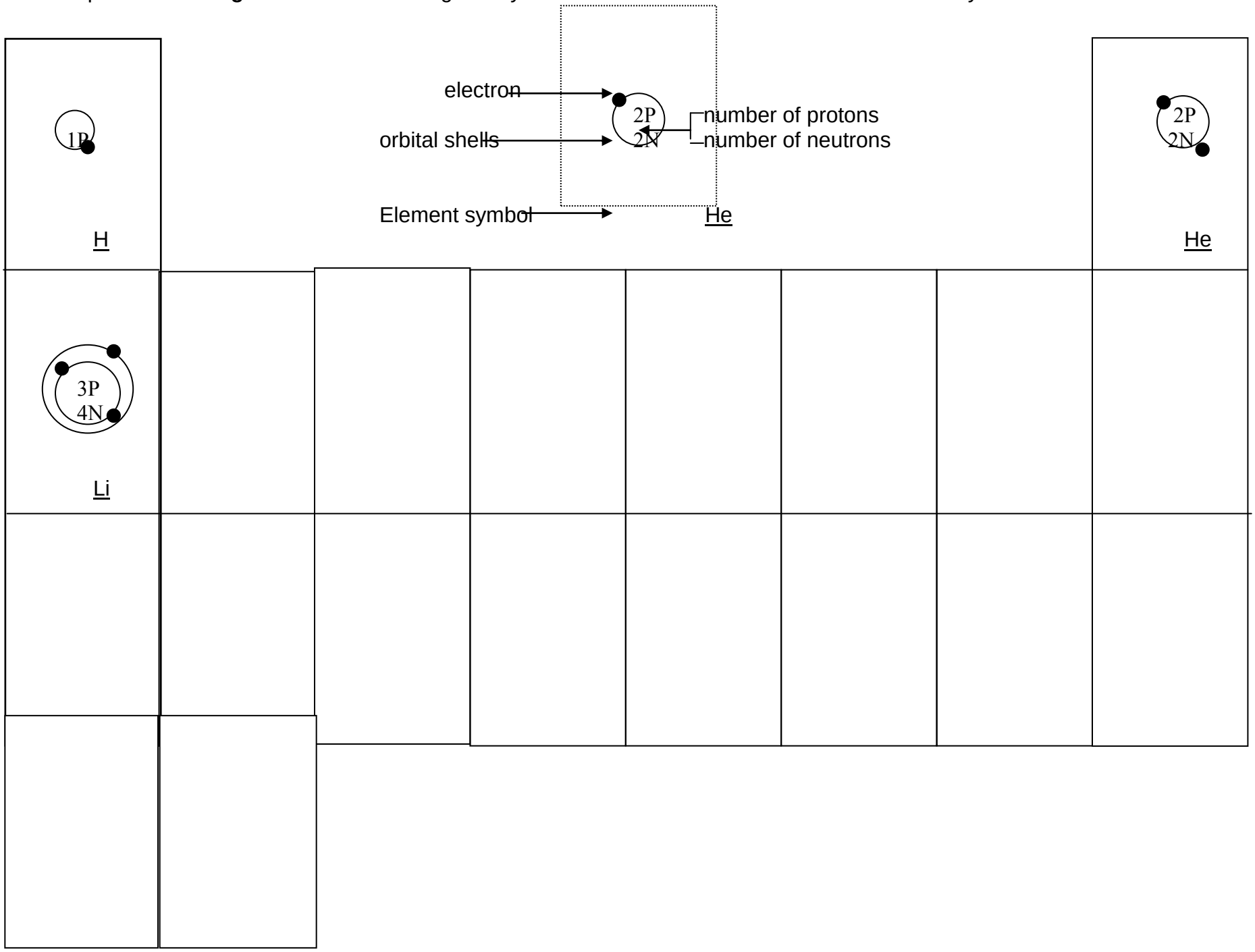
ATOMIC NOTATION



$^{1}_{1}H$							$^{4}_{2}He$
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca						

BOHR DIAGRAM WORKSHEET **NAME:**

Draw complete **Bohr Diagrams** for the following twenty elements. The first **three** have been done for you.



6.4.7

SNC 1D **Counting Atoms** **Worksheet**

Complete the following charts by using the coefficients and subscripts listed in the in the compounds below.

Na_2CO_3

Type of Atom	# of Atoms
Total	

$Ca_3(PO_4)_2$

Type of Atom	# of Atoms
Total	

K_2CrO_4

Type of Atom	# of Atoms
Total	

$3\ BaCl_2$

Type of Atom	# of Atoms
Total	

$NH_4C_2H_3O_2$

Type of Atom	# of Atoms
Total	

$4\ Al_2(CO_3)_3$

Type of Atom	# of Atoms
Total	

$Pb(NO_3)_2$

Type of Atoms	# of Atoms
Total	

$2\ (NH_4)_2Cr_2O_7$

Type of Atom	# of Atoms
Total	

Chemical formula worksheet Name_____

In the 1st 2 columns write the correct chemical formula, in the 2nd the correct name.

Name	Formula	Formula	Name
Magnesium Fluoride		CaF_2	
Lithium Chloride		KBr	
Calcium Chloride		CuCl	
Copper (I) Iodide		$CuCl_2$	
Potassium Bromide		CuO	
Aluminum Oxide		$AlCl_3$	
Iron(II) Oxide		AgCl	
Aluminum Sulfide		MgI_2	
Sodium Chloride		NaBr	
Barium Chloride		$ZnCl_2$	
Sodium Acetate		FeS	
Iron (III) Sulfate		LiF	
Iron (III) Sulfide		PbO_2	
Sodium Hydroxide		$AgNO_3$	
Ammonium Bromide		$NaCO_3$	
Potassium Sulfate		$(NH_4)_2SO_4$	
Sulfuric Acid		KNO_3	
Barium Chlorate		$NaC_2H_3O_2$	
Potassium Nitrate		$Mg\ CO_3$	
Ammonium Phosphate		$Al\ (C_2H_3O_2)_3$	
Hydrogen Hydroxide		$Fe\ (NO_3)_3$	
Calcium Chlorate		$Ca\ CO_3$	
Copper (II) Nitrate		$Ca\ SO_4 \bullet 2H_2O$	
Ammonium Chloride		$Sr(OH)_2$	

Review– Naming Chemical Compounds

The following are a good mix of naming and formula writing problems to help you get some practice. I will expect that you know how to name both ionic and covalent compounds in your work.

Name the following chemical compounds:

1) NaBr _____

2) $Ca(C_2H_3O_2)_2$ _____

3) P_2O_5 _____

4) $Ti(SO_4)_2$ _____

5) $FePO_4$ _____

6) K_3N _____

7) SO_2 _____

8) CuOH _____

9) $Zn(NO_2)_2$ _____

10) V_2S_3 _____

Write the formulas for the following chemical compounds:

11) silicon dioxide _____

12) nickel (III) sulfide _____

13) manganese (II) phosphate _____

14) silver acetate _____

15) diboron tetrabromide _____

16) magnesium sulfate heptahydrate _____

17) potassium carbonate _____

18) ammonium oxide _____

19) tin (IV) selenide _____

20) carbon tetrachloride _____

Naming Acids and Bases

Name the following acids and bases:

1) $NaOH$ _____

2) H_2SO_3 _____

3) H_2S _____

4) H_3PO_4 _____

5) NH_3 _____

6) HCN _____

7) $Ca(OH)_2$ _____

8) $Fe(OH)_3$ _____

9) H_3P_____

Write the formulas of the following acids and bases:

10) hydrofluoric acid _____

11) hydroselenic acid _____

12) carbonic acid _____

13) lithium hydroxide _____

14) nitrous acid _____

15) cobalt (II) hydroxide _____

16) sulfuric acid _____

17) beryllium hydroxide _____

18) hydrobromic acid _____

Balancing Equations Practice Worksheet

*Balance the following equations **and** identify the type of reaction.*

1) ___ $NaNO_3$ + ___ PbO → ___ $Pb(NO_3)_2$ + ___ Na_2O

2) ___ AgI + ___ $Fe_2(CO_3)_3$ → ___ FeI_3 + ___ Ag_2CO_3

3) ___ $C_2H_4O_2$ + ___ O_2 → ___ CO_2 + ___ H_2O

4) ___ $ZnSO_4$ + ___ Li_2CO_3 → ___ $ZnCO_3$ + ___ Li_2SO_4

5) ___ V_2O_5 + ___ CaS → ___ CaO + ___ V_2S_5

6) ___ $Mn(NO_2)_2$ + ___ $BeCl_2$ → ___ $Be(NO_2)_2$ + ___ $MnCl_2$

7) ___ AgBr + ___ $GaPO_4$ → ___ Ag_3PO_4 + ___ $GaBr_3$

8) ___ H_2SO_4 + ___ $B(OH)_3$ → __ $B_2(SO_4)_3$ + ___ H_2O

9) ___ S_8 + ___ O_2 → ___ SO_2

10) ___ Fe + ___ $AgNO_3$ → ___ $Fe(NO_3)_2$ + ___ Ag

Word Equations Worksheet

Write the word equations for each of the following chemical reactions: ***Show states as well!!***

1) When dissolved beryllium chloride reacts with dissolved silver nitrate in water, aqueous beryllium nitrate and silver chloride powder are made.

2) When isopropanol (C_3H_8O) burns in oxygen, carbon dioxide, water, and heat are produced.

3) When dissolved sodium hydroxide reacts with sulfuric acid (H_2SO_4), aqueous sodium sulfate, water, and heat are formed.

4) When fluorine gas is put into contact with calcium metal at high temperatures, calcium fluoride powder is created in an exothermic reaction.

5) When sodium metal reacts with iron (II) chloride, iron metal and sodium chloride are formed.

PRACTICE: MANIPULATING MOLES

1. Complete the blanks in the following chart. (watch the conditions when calculating volumes)

substance	conditions	molar mass	# of moles	mass	Volume	# of molecules
Ne (g)	**–83°C/ 650kPa**		3.5			
N_2O (g)	**690°C/ 22kPa**					$2.0x10^{23}$
SO_3 (g)	**128°C/2600kPa**			4.0 g		
C_4H_{10} (g)	**25°C/ 99kPa**				18.5 L	
F_2 (g)	**–25°C/ 410kPa**			265 g		
N_2O_4 (g)	**–196°C/ 85kPa**				112 L	
CH_2Cl_2 (g)	**160°C/ 110kPa**					$6.0x10^{24}$
NaCl (s)	**0°C/ 101.3kPa**		0.24			
UF_6 (g)	**20°C/ 5420kPa**			1.4 kg		

* Multi-stepped mole problems **(use your mole map & show all your work / steps)**

2. Calculate:

a) the mass **of** 1.0 L **of carbon dioxide gas @ STP**

b) the mass **of** 1.0 L **of carbon dioxide gas @ 20°C and 2250 kPa**

c) the volume **of** 350 mg **of sulfur dioxide gas @ 225 °C and 900 kPa**

Calculating the CONCENTRATION of an Aqueous Solution

1. You calculate the molar concentration of the following solutions !!

a) 3.65 g of hydrochloric acid dissolved in 200 mL of water	**b) 235 g of sodium chloride dissolved in 2.2 L of water**	c) 4.5 g of potassium hydroxide dissolved in 250 mL of water
d) 25 g of potassium bisulfate dissolved in 800 mL of water	e) 1.8 g of sodium hydroxide dissolved in 50 mL of water	f) 20 g of magnesium hydroxide dissolved in 500 mL of water
g) 15.0 g of sodium sulfate dissolved in 100 mL of water	h) 22 g of potassium nitrite are dissolved in 500 mL of water. What is the concentration of the potassium ion in this sol'n ?	i) 4.0 g of sugar ($C_6H_{12}O_6$) dissolved in 450 mL of Pepsi
j) 1.5 g of sodium phosphate are dissolved in 100 mL. What is the concentration of the sodium ion in the resulting sol'n ?	k) The solubility of calcium bromide is 32 g / 100 mL. What is the molar solubility ?	l) The solubility of lead iodide is 0.09 g / 100 mL. What is the molar sol'y ?

To find the mass **of solute necessary** to make up a solution **you must know three (3) things about the solution**

i) The concentration of the solution to be made.→Molarity **-M or [ ]**

ii) The molar mass of the solute in grams.→ mm

iii) The volume of solution that you intend to make in litres→ #L

These variables are related to each other by the formula →mass of solute = [sol'n] * molar mass * # L

2. You calculate the masses **required to make the following solutions !!**

a) 100 mL of 0.15 M potassium hydroxide sol'n	**b) 250 mL of 2.5 M copper nitrate sol'n**	c) 500 mL of 0.01 M potassium permanganate sol'n

d) 3.5 L of 0.4 M sodium carbonate sol'n	e) 2.0 L of 0.4 M ferrous diammonium disulfate hexahydrate sol'n	f) 250 mL of 0.12 M sodium hydroxide sol'n
g) 125 mL of 0.50 M Ba^{2+} sol'n using barium nitrate	h) 250 mL of 0.025 M cobalt nitrate sol'n using cobalt(II) nitrate hexahydrate	i) 225 mL of 0.2 M OH^- solution using calcium hydroxide

Dilutions **(pg 320)** **(using →** [stock] * # $L_{(stock)}$ = [diluted] * # $L_{(dil)}$ **)**

3. A student prepares 400 mL of 0.05 M HCl . His lab partner spills 100 mL of water into it. What is the [HCl] now ?

4. What volume of 0.1 M KCl sol'n should be diluted to prepare 750 mL of 0.04 M KCl sol'n?

5. Concentrated. H_3PO_4 is 14.6 M. How would you prepare 4.5 L of 0.375 M H_3PO_4 sol'n ?

Mixtures. **Using →** [mixture] = total # moles mixed / total # litres of sol'n
or → [mixture] = ([sol'n A] * $\#L_A$) + ([sol'n B] * $\#L_B$) / ($\#L_A$ + $\#L_B$)

6. Find the final concentration when the following solutions are mixed
a) 100 mL of 0.4 M HCl and 150 mL of 0.75 M HCl
b) 50 mL of 1.2 M H_2SO_4 and 150 mL of 0.3 M H_2SO_4
c) 5 mL of 3.5 M HNO_3 and 95 mL of 0.2 M HNO_3

7. If 90 mL of 0.35 M HNO_3 is added to 50 mL of 0.40 M $NaNO_3$, what is the [NO_3^-] in the final sol'n

8. A sol'n is made by mixing 200 mL of 0.2 M $CaCl_2$ and 300 mL of 0.1 M $CaCl_2$. What is the concentration of $CaCl_2$ in the final sol'n? What would the [Ca^{2+}] and [Cl^-] be in this mixture ?

*** 9. Solution "A" is 0.475 M NaOH. Solution "B" also contains NaOH. When 250 mL of solution A is mixed with 400 mL of sol'n B , the resulting sol'n is 0.325 M NaOH. What is the [B] ?**

EXAMPLE 1: GIVEN A 50% DEXTROSE SOLUTION

50% dextrose = 50 g/100 mL

Therefore: 1 mL contains 50 g = 0.5 g/100 mL

Question 1: How many mL of dextrose solution contain 20 g?

If 1 mL contains 0.5 g

Then 20.0 *0.5 = 40.0 mL – the number of mL that contains 20 g

Question 2: How many grams of dextrose are contained in 15 mL?

If 1 mL contains 0.5 g

Then 15 mL contain 15 x 0.5 g = 7.5 g

Exercise 4.1

Calculate the concentration in mg/mL for each of the following solutions.

a) 1 g/L	b) 0.6 g%	c) 200 mg%
d) 0.5 g/cL	e) 0.2 g/L	f) 10 g/cL
g) 20 g/L	h) 4000 mg%	i) 0.1 g/L

Exercise 4.2

For each of the solutions in Exercise 4.1, calculate the number of mg contained in the volumes shown.

a) 0.5 mL of (a)	b) 3.5 mL of (b)	c) 0.2 mL of (c)
d) 2 mL of (d)	e) 5.0 mL of (e)	f) 10.00 mL of (f)
g) 2.5 mL of (g)	h) 4.0 mL of (h)	i) 9 mL of (i)

Exercise 4.3

For each of the solutions in Exercise 4.1, calculate the number of mL required to obtain the following quantity.

a) 7.3 mg of (a)	b) 12 mg of (b)	c) 1 mg of (c)
d) 7.5 mg of (d)	e) 0.8 mg of (e)	f) 650 mg of (f)
g) 85 mg of (g)	h) 30 mg of (h)	i) 0.4 mg of (i)

5.2 Nitroglycerine tablets contain 0.3 mg per tablets. The physician orders 0.6 mg. How many tablets are required?

5.3 A drug kit contains a 10 mL pre-loaded syringe containing epinephrine in a concentration of 1:10000 (that is 1 g in 10 000 mL). How many mL must be used to provide a dose of 0.5 mg?

5.6 A drug kit contains a 5 mL pre-loaded syringe containing lidocaine in a concentration of 20 mg/mL. The patient weights 70 kg. A physician is ordered to prepare 3 doses of 1 mg/kg. How many mL will is required?