# 1 - Moles and mass calculations

## 1. Symbols

Prerequisite: common chemical names.

(a) State the symbols used to represent

i. molar mass

ii. relative molecular mass

iii. mass of a sample

iv. number of moles of a sample

v. Avogadro's number

iv. a

- iii. mass of water
- iv. number of moles of ethanol
- v. relative molecular mass of sodium

- iii. MHzo
- IV. MCHACHAOH
- Arma

#### 2. Calculating molar mass

Calculate the molar mass for the following.	Report units and give your answers to 4	significant
figures.		

(a) Sulphuric acid

(a) 98.08 mi

 $H_2SO_4: M_{H_2SO_4} = 2M_H + M_S + 4M_0$ = 2(1.008) + 32.065 + (6.00) 4 = 98.08 /mol

(b) HCI(aq)

(b) 36.46 9 no

 $HCL: M_{HCl} = M_{H} + M_{Cl}$ = 1.008 + 35,453 = 36.46 9/mol

(C) 2H35CI(aq)

THESE ARE NOW EXACT MASSES INSTRAD OF A MINTURE OF ISOTOPES AT

NATURAL ABUNDANCES.

(c) 37.00 %

(d) CuSO<sub>4(s)</sub>

(d) 159.6 9mol

 $M_{cuso4} = M_{cu} + M_s + 4M_o$ = 63.546 + 32.065 + 4 (16.00) = 159.6  $\frac{9}{m}$ 

(e)  $CuSO_4 \cdot 5H_2O_{(s)}$ 

(e) 249.7 %mol

 $M_{CLSO4.8720} = M_{CLSO4} + 5M_{420} = 159.6 + 5(18.00)$ = 249.7 \$/mol

## 3. Mole conversions

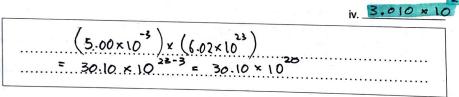
dive your answers to appropriate number of significant figure	vers to appropriate number of significant figures	
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(a) Without using a calculator, determine the number of particles of a compound X in:

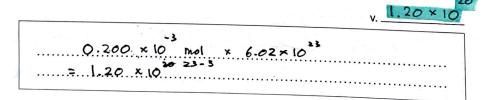
ii. 
$$6.02 \times 10^{23}$$
 molecules of X
$$\frac{6.02 \times 10^{23}}{L} = \frac{6.02 \times 10^{23}}{6.02 \times 10^{23}} = 1.00$$
iii.  $6.02 \times 10^{25}$  molecules of X
$$\frac{6.02 \times 10^{25}}{6.02 \times 10^{23}} = 1.00 \times 10^{25}$$
iii.  $1.20 \times 10^{15}$  molecules of X
$$\frac{6.02 \times 10^{25}}{6.02 \times 10^{23}} = 1.00 \times 10^{25}$$
iii.  $1.20 \times 10^{15}$  molecules of X
$$\frac{1.20 \times 10^{5}}{4} = \frac{12.0 \times 10^{4}}{4}$$
iii.  $\frac{1.20 \times 10^{15}}{4} = \frac{12.0 \times 10^{4}}{4}$ 

- (b) Without using a calculator, determine the moles of a compound X in:
  - i. 1.00 mol

iv.  $5.00 \times 10^{-3}$  mol



v. 0.200 mmol



## 4. Moles → mass

Give your answers to appropriate number of	of significant figures
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(a) i. Deduce the molar mass of  $CaCO_{3}(s)$ .

	100.1 m
Mcaco, = Mca + Mc + 3 Ma	
= 100.1 g/ma	

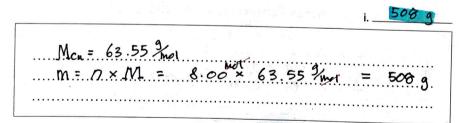
ii. Deduce the mass contained in 2.00 mol of  $\mathrm{CaCO}_{3}(\mathbf{s})$  .

±		ii. 200.2
2.00 mal × 100.1 mal =	200.2 mot	not

iii. Deduce the number of moles contained in 0.250 mol of  ${\rm CaCO_{3(s)}}$  . MASS

	ar palake,	111	25.00 9
0.250 mot x	100.1 mgt	31.4	ward; :
······································		 	

- (b) Deduce the mass, in g, in:
  - i. 8.00 mol copper powder.



ii. 5.00 mol ZnO(	ii.	5.00	mol	ZnO	s
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	00 mol x (65.409+	16.00) I'met	
= 40	?.tg		<u> </u>
iii. 5.00 <b>№</b> H <sub>2</sub> O <sub>(g)</sub>			
mmel		, y	1.00 × 10
	-31		
n= 5.00 x 10	$ \begin{array}{l} 1 = (5.00 \times 10^{-3}) \text{ mul} \\ = 90.0 \times 10^{-3} \end{array} $	10 00 %	
W. = . W. X. IV	1 = (5.00 × 10 / ×.	1.6.00.7.041	×
	= 40.0 × 0	9	100 mm
ss moles	e salaran di salaran Sirika da salaran	time to the second of the second of	
and an appropri	iate number of significant fig	ures.	
i. Deduce the molar mas		4.00	
). Deduce the molal max	35 51 545 3(s) .	8 150	100.1
Anna L		L.	
300			
SAME AS AB	ZOVE: 100-1 g/mal		
: Did the number of	of moles contained in 200.2	of CaCO (s)	
II. Deduce the number of	i moles contained in 20012	, c. c. c 3(a)	2.000

iii.	Deduce the number of mole	s contained	l in 5.00 g	of CaCO <sub>3(s)</sub>
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		des to	
m	= 5.00 g		,
. W W		 	

- (b) Deduce the number of moles in:
  - i. 8.00 g sodium hydroxide powder.

		0.200 M
m	8.000	
n = M	40.03 0.200 Mg	oL.
		, ~

ii.  $5.00 \text{ g CuSO}_4 \cdot 5 \text{ H}_2 \text{O(s)}$ 

		0.0200 Mol
<u>M</u>	5.00 g	
n = IVI cusay stho.	= 250.08/md =	0.0200 mal
		240
2, 100 2, 100 1,		

iii. 5.00 kg H<sub>2</sub>(g)

	· · · · · · · · · · · · · · · · · · ·			III
	5000 9	5000		se
.n. <del>.</del> .	MI <sub>H</sub> ,	Z Thiol		mel
• • • • • • • • • • • • • • • • • • • •				
			,	

iv. 0.360 mg NH<sub>2(1)</sub>

w1		iv. 0.020×10 m	OK.
n = M	$= \frac{0.360 \times 10^{-3}}{18} = 0.$		0.020 × 10 ×100 ÷100
-why			2.0 × 10 *