Announcements – Lecture II – Thursday, Sep 5th

Class Web Site : www.chem.umass.edu/genchem

iClicker ... for credit starts on Thursday, Sep 12.

Register your iClicker in OWL by Tuesday, Sep 10.

1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_1

When 36.456 is added to 74.2 the result is –

*

A)	110.656
B)	110.6
C)	110
D)	110.7
E)	I have no clue!

36.456
74.2
110.656
↳ > 50 ... round up

110.7

When adding and subtracting the resultant should be recorded according to the number with the fewest decimal places.

1.3 Example_2

When 18.44 is multiplied by 36.1 the answer should be reported to ___ significant figures –

A) 1
B) 2
C) 3
D) 4
E) I have no clue!

18.44 ... 4
36.1 ... 3

When multiplying and dividing, the number with the fewest significant figures rules.

1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_3

MAIN QUESTION

Question

Carry out the following calculation and report the answer in the correct number of significant figures.

$$(168)\left[\frac{23.56 - 2.3}{1.248 \times 10^3}\right] =$$

(3) (3) (4)

Significant figures	
A)	1
B)	2
C)	3
D)	4
E)	I have no clue!

Any addition or subtraction should be completed first:

$23.56 - 2.3 = 21.2(6)$

↳ 3 Sig figs

Note the use of Scientific Notation ... 1.248×10^3

100 ... 1 significant figure

1.00×10^2 has 3 significant figures

1.5 Factor-Label Method – Dimensional Analysis – The Mathematics of Chemistry

What is a Handy Way to Convert from One Unit to Another?

1.5 Example_1

Prior to the metric system, the common unit of weight was the pound (lb). Under the S.I. System, 1 lb = 453.5g. If an old recipe calls for 9 ounces of flour (16 oz = 1 lb), how many grams of flour is this equivalent to?

$1\ \text{lb} = 453.5\ \text{g}$

$16\ \text{oz} = 1\ \text{lb}$

$$\frac{9\ \text{oz}}{1} \left| \frac{1\ \text{lb}}{16\ \text{oz}} \right. = 0.56\ \text{lb}$$

$$\frac{0.56\ \text{lb}}{1} \left| \frac{453.5\ \text{g}}{1\ \text{lb}} \right. = 255\ \text{g}$$

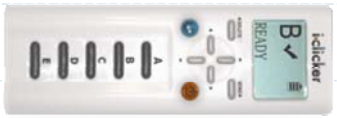
1.5 Dimensional Analysis – The Mathematics of Chemistry

What is a Handy Way to Convert from One Unit to Another?

1.5 Example_2

A field is 100m long by 45m wide. What is the area in cm^2? (1m = 100cm)

To illustrate the power of dimensional analysis, first find the area in m^2 and then do the conversion to cm^2.



A)	4.5×10^5	B)	4.5×10^7
C)	45	D)	0.45
E)	Oops … I must have made a mistake		

$$\text{Area} = 100\,m \times 45\,m = 4.5 \times 10^3\,m^2$$

$$4.5 \times 10^3\,m^2 = 4.5 \times 10^3\,m\,m$$

$$4.5 \times 10^3\,m\,m \left|\frac{100\,cm}{1\,m}\right|\left|\frac{100\,cm}{1\,m}\right| = 4.5 \times 10^7\,cm\,cm$$

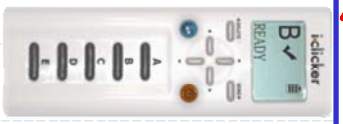
$$= 4.5 \times 10^7\,cm^2$$

1.5 Factor-Label Method – Dimensional Analysis – The Mathematics of Chemistry

What is a Handy Way to Convert from One Unit to Another?

1.5 Example_3

The density of whole blood at 37^{0}C is 1.06 g.cm^{-3}. What is the mass, in grams of a 15.0 cm^3 sample of blood?



A)	15.9g
B)	14.2g
C)	Neither a or b
D)	Tom I am clueless!

Would it help if I told you .. $1.06\ g.cm^{-3} = \frac{1.06\ g}{1\ cm^3}$?

$$15.0\ cm^3 \left| \frac{1.06\ g}{1\ cm^3} \right. = 15.9\ g$$

1.5 Example_4

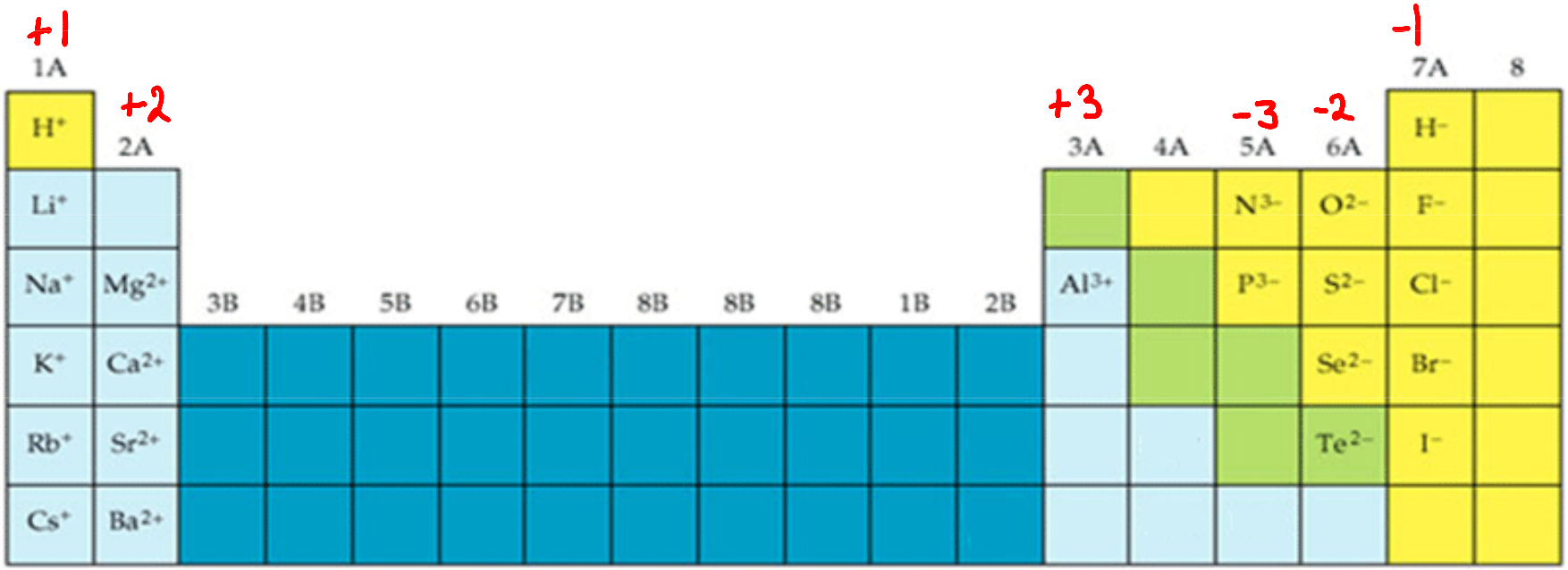
Ammonium Nitrate decomposes explosively according to the following balanced chemical equation:

$2\,NH_4NO_3(s) = 2\,N_2(g) + 4\,H_2O(g) + O_2(g)$ ← Balanced chemical equation

If 3.4 moles (the chemists unit of quantity) decomposes, how many moles of gaseous water are produced.

$$3.4 \text{ mol } NH_4NO_3 \left| \frac{4 \; H_2O}{2 \; NH_4NO_3} \right. = 6.8 \text{ mol } H_2O$$

3.5 How Do We Name Ionic Compounds – *An Early First Visit*



Monoatomic cations retain the parent name: Na = sodium Na^+ = sodium

Monoatomic anions end in 'ide': O = oxygen O^{2-} = oxide