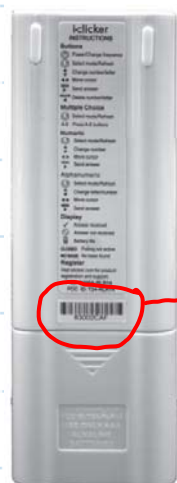


Announcements – Lecture II – Thursday, Sep 8^h

1. Class Web Site: www.chem.umass.edu/genchem
2. iClicker for credit starts Thursday , September 15th

Register your iClicker in Owl (a home work assignment) by Tuesday, September 13th

3. First Lab – Saturday, September 24th ... 1-4pm ... ISB 155 /160 (A-E)



iClicker ID.

1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_1

When 36.456 is added to 74.2 the result is –
*

36.456

74.2

110.6(56)

↳ 56 > 50

Round up

110.7



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

When adding and subtracting the resultant should be recorded limited by the number with the fewest decimal places.

1.3 How Do Scientists Report Numbers – Significant Figures

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 has 4 significant figures
36.1 has 3 significant figures

When multiplying and dividing the resultant should be recorded limited by the number with the fewest significant figures.

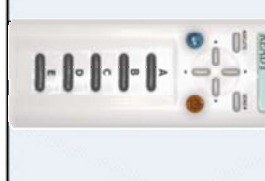
1.3 How Do Scientists Report Numbers – Significant Figures

1.3 Example_3

MAIN QUESTION

Question

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

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


Significant figures

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

In a complex series of manipulations:

a) Addition and subtraction should be performed first.

b) Then do the multiplication and division

$$\begin{array}{r} 23.56 \\ - 2.3 \\ \hline 21.2(6) \\ \rightarrow 3 \text{ sig figs} \end{array}$$

Note the use of Scientific Notation

1.248×10^3 has 4 sig figs.

100 has 1 sig fig.

1.00×10^2 has 3 sig figs.

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?

Real world ... access to the internet !

$$\frac{9 \text{ ounces}}{\text{ounces}} \times \frac{g}{\text{ounces}} = ? \text{ g}$$

Google the desired conversion factor !

Exam situation ... NO internet! ... NO gram to ounces given ; ... got to use what is given :

$$16 \text{ ounces} = 1 \text{ lb} \quad ; \quad 1 \text{ lb} = 453.5 \text{ g}$$

$$\frac{9 \text{ ounces}}{16 \text{ ounces}} \times 1 \text{ lb} = 0.56 \text{ lb}$$

$$\frac{0.56 \text{ lb}}{1 \text{ lb}} \times 453.5 \text{ g} = 255 \text{ g}$$

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 | | |

$$A_{\text{area}} = 100 \text{ m} \times 45 \text{ m} = 4.5 \times 10^3 \text{ m}^2$$

$$4.5 \times 10^3 \text{ m}^2 = 4.5 \times 10^3 \text{ m m}$$

$$\frac{4.5 \times 10^3 \text{ m m}}{1 \text{ m} \quad 1 \text{ m}} = 4.5 \times 10^7 \text{ cm} \cdot \text{cm}$$
$$= 4.5 \times 10^7 \text{ cm}^2$$

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°C is $1.06 \text{ g}\cdot\text{cm}^{-3}$. 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 that : $1.06 \text{ g}\cdot\text{cm}^{-3} = \frac{1.06 \text{ g}}{1 \text{ cm}^3}$

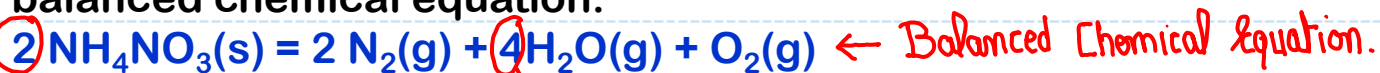
$$\frac{15.0 \text{ cm}^3}{1} \times \frac{1.06 \text{ g}}{1 \text{ cm}^3} = 15.9 \text{ g}$$

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_4

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



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

$$3.4 \text{ mol NH}_4\text{NO}_3 \left| \frac{4 \text{ H}_2\text{O}}{2 \text{ NH}_4\text{NO}_3} \right. = 6.8 \text{ mol H}_2\text{O}$$