

Homework Assignment #1: Mathematics Review
Due date: Check Schedule

Name: _____
(Print and Pledged)

Purpose for homework: Physical Chemistry involves extensive use of mathematics. Thus, we need to ensure that our math skills are ready for the tasks before us.

Note of confidence: Once you review how to work these problems, you will have reviewed the skills to do ANY math problems that we will do in class.

Instructions: Work the following problems **using the homework format in your syllabus**. (Show all work and circle answers. *Exception to homework rules for this assignment: You may write on this paper instead of recopying each problem onto notebook paper.*) Feel free to work together but turn in your own work. Feel free to come ask me questions. Please do not wait until the night before to start your homework.

I. Signs, symbols, abbreviations that you should know/review

$\ln \Rightarrow$ natural logarithm (base e)

$\log \Rightarrow$ logarithm (base 10)

$\int \Rightarrow$ integral of _____

$\frac{d}{dx} \Rightarrow$ derivative of _____ with respect to x

$\frac{\partial}{\partial x} \Rightarrow$ partial derivative of _____ with respect to x

What is the difference between a derivative and a partial derivative? (Rhetorical question not to be turned in.)

II. Solve the following and simplify (group like terms together). (Section A2.4 & 6 in our textbook may be helpful.)

1) $\ln(e^x)$

2) $\int \frac{1}{x} dx =$

3) $\frac{d}{dx}(x^5 + x^3 - \frac{1}{2}x^2 + x) =$

4) $\int (x^5 + x^3 - \frac{1}{2}x^2 + x) dx =$

5) $\int_0^{10} e^x dx =$

6) $\frac{d}{dx} e^{-\frac{x}{5}}$

7) $\frac{d}{dx} x e^{-x}$

8) $\frac{\partial}{\partial x} (x^3 y^2) =$

9) $\frac{\partial}{\partial y} (x^3 y^2) =$

10) $\int x^{-3} dx =$

11) $\log(1,000,000) =$

12) $[H^+] = 0.001 \text{ M}; \text{pH} = ?$

III. Dimensional Analysis (Show your work, circle your answer, and report your answer using appropriate significant figures and units! Please circle your answer.)

13) 1 mile = ? meters

14) 1 liter = ? cm^3 = ? in^3

15) If you have 1.0 mole of cotton balls, how many individual cotton balls do you have?

16) If 4.8×10^4 balls of cotton can be made from 100.1 lbs of cotton, how much does one mole of cotton balls weigh in kg?

17) What is the mass in kilograms of 1.0 cotton balls?

IV. Physics

18) What property of gases has the units of force/unit area?

19) In Newton's Law, Force = mass x ?

20) $\frac{1}{2}mv^2 =$ _____ energy of a particle

V. SI System

21) 1 kg = ? grams

22) 1 cm = ? meters

23) What is the SI unit of force?

24) What is the SI unit of pressure?

VI. Logarithms (Please use the logarithm rules on p. A2.11 in our textbook to complete these problems.) Using $a = 3$, $b = 2$, and $c = 5$, find the numerical answer to the following problems. But, first, please show the appropriate logarithm rule to simplify the problem. For example... $a^{b \cdot c} = a^{b+c} = 3^{(2+5)} = 3^7 = 2,187$

25) $a^b/a^c =$ _____

26) $(a^b)^c =$ _____

27) $\ln a^b =$ _____

28) Solve for a (separate “ a ” on the left side of the equation by itself). Then numerically solve for a by solving the right side of the equation where $b = 2$. (Will “ a ” really equal 3?)

$\ln a = b \rightarrow a =$ _____

VII. Discussion Questions

29) (a) Explain the difference between dx and Δx . (b) Explain the physical significance of dx/dt . (Hint: Using a diagram could be helpful.)