**CHEM 1154: PROBLEM SET ZERO**

*(All calculations can be done without the use of calculator!)*

## A. Dealing with powers of ten.

1. $(2 \times 10^{89})/(0.010)^2 =$
2. $[(5 \times 10^{-55}) \times (4 \times 10^{23})]/ [(0.0010)^4 (2 \times 10^5) =$
3. $(3 \times 10^{-3})^3/(5 \times 10^{10}) =$
4. $(3 \times 10^{-5})/(5.0 \times 0.20) =$
5. $(450 \times 10^3)/(5.0 \times 10^{-3}) =$

## B. Dealing with ln and log.

You have to be able to go from one to the other by making use of the relationship: **$2.3 \log x \cong \ln x$**

We also need to know the log of the following simple numbers:

| | | | |
|---|---|---|---|
| log 2 = 0.30 | log 3 = 0.48 | log 4 = 0.60 | log 5 = 0.70 |
| log 6 = 0.78 | log 7 = 0.85 | log 8 = 0.90 | log 9 = 0.96 |

If you know the log of 2,3,7 you can derive the log of the other five numbers by simply using the property of logs stated below:

$\log (a \times b) = \log a + \log b$

6. $\log 2 \times 10^{-4} =$
7. $\log 5 \times 10^{-6} =$
8. $\log 2.4 =$
9. $\log 1.5 =$
10. $1 \times 10^6 = e^x$ calculate the approximate value of x
11. $2 \times 10^{-4} = 500e^x$ calculate the approximate value of x

## C. Common constants encountered in calculations.

There are certain constants which are commonly encountered in chemical calculations in this course for example:
1 Faraday = 96485 Coulombs $\cong 1 \times 10^5$ Coulombs
R = 8.314 J/mol-K = 0.082057 L-atm/mol-K

Often the gas constant is multiplied by some temperature and therefore we can make good estimates of these values, for example:
$8.314 \times 298 \cong 2.5 \times 10^3$ and $0.082057 \times 298 \cong 25$

*For all of the following questions you are only calculating approximate values to only one significant figure since these are to be done without calculators.*

12. $0.082057 \times 1200 \cong$
13. $8.314 \times 1200 \cong$
14. $0.082057 \times 600 \cong$

15. $0.05916/3 \cong$
16. $-4.5 \times 10^3 = -(5)(96485)\varepsilon°$; what is the value of $\varepsilon°$?
17. $1.50 \times 10^5(400 - 300)/(8.314 \times 400 \times 300) =$
18. $\ln(x/0.8) = (23 \times 10^3)(100)/[8.314 \times 400 \times 300]$; solve for x

19. $1 \times 10^6 = e^{x/(8.314 \times 300)}$; solve for x

20. $\ln(x/1 \times 10^{20}) = [(-46000)(398 - 298)]/[8.314 \times 298 \times 398)]$; solve for x

21. $4.3 \times 10^{-18} = 27\ x^4$ ; solve for x

22. $1.2 \times 10^{-17} = (1.2 \times 10^{-3})[OH^-]^2$; solve for $[OH^-]$