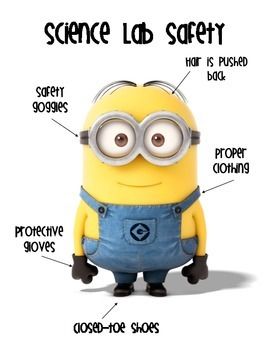
**Chemistry I Notes**

**Unit 1 - Intro to Chemistry, Measurement, Dimensional Analysis, and Error**

1. **The ABC’s of Safety Rules in the Chemistry Lab**
   1. Appropriate eye protection must be worn **at all times!**
   2. Lab aprons can be used to protect good clothing and you
   3. Loose clothing should not be worn because it may dip into chemicals or fall into a flame and catch fire
   4. Wear shoes that cover your feet.
   5. Do not apply cosmetics, eat, or drink in the lab.
   6. Do not taste any chemical!
   7. Pour from large containers to smaller ones.
   8. Work with volatile chemicals under a fume hood.
   9. Check glassware for stars or cracks.
   10. Heat test tubes at an angle.
   11. Handle hot glassware with gloves or beaker tongs.
   12. First light the match **THEN** turn on the gas!
   13. Do not smell any chemicals directly!
   14. Do not pipet solutions by mouth!
   15. Wash your hands with soap and water before leaving.
   16. Know the hazards of the materials being used.
   17. Tie back loose hair.
   18. Know the safety equipment.
   19. Carry out only the experiments assigned by your teacher.
   20. Never remove chemicals from the laboratory.
   21. Never work alone in the lab.
   22. Remember that the lab is a place for serious work!
   23. Demonstrate safe behavior.
   24. Know how to dispose of waste.
   25. Report any accidents or unsafe conditions immediately!
   26. And have fun with the labs while taking them seriously.
2. **Equipment**

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Picture** |
|  | * Used for holding various chemicals. * Not for measuring precisely. * Sizes vary. | Beaker, glass, 250 ml |
|  | * Used to precisely measure the volume of liquids or run experiments. * Read from the meniscus at eye level. * Plastic ring always on top if applicable. * Sizes vary. | [Glass Graduated Cylinders, Single Metric Scale](http://www.carolina.com/product/rubber+tubing,+amber,+1-8-in+bore,+1-32-in+wall,+10+ft.do?keyword=rubber+tubing&sortby=bestMatches) |
|  | * Used to approximately measure the volume various liquids. * Useful for mixing by swirling * Sizes vary. | [Pyrex Erlenmeyer Flask Starter Pack](http://www.carolina.com/product/crucible+cover,+porcelain,+38+mm.do?keyword=crucible&sortby=bestMatches) |
|  | * Used to prepare precise standard solutions. * They are only good for 1 specific volume. * Comes in many sizes | Pyrex® Volumetric Flask |
|  | * Used to close flasks and test tubes. * The holes allow the insertion of glass tubing, probes, or thermometers as needed by the experiment. | [ANd9GcSziAKDfqKy-SRra_5gWFK6MQIUnpzFATioY5jwQ0GltFa2PVTerlYU6NUNsA](http://www.google.com/imgres?imgurl=https://www.pelletlab.com/v5Files/sfwlHpleNfygCJH2/148862/640/b_l_stopper_05.jpg&imgrefurl=http://www.pelletlab.com/rubber_stoppers&usg=__mmXcKpI3gc_Kn-BBNPMNhZZbvrc=&h=640&w=640&sz=26&hl=en&start=8&zoom=1&tbnid=t1nblAkSNOhQNM:&tbnh=137&tbnw=137&ei=gZhMTsO8OoPnsQLVnuTvBg&prev=/search?q%3Drubber%2Bstopper%26hl%3Den%26gbv%3D2%26tbm%3Disch&itbs=1) |
|  | * Used to hold chemicals/tubes while experimenting. * Not for measuring precisely. * Waft! * Aim away from faces. * Sizes vary. * Label tubes. | [Test Tube Rack](http://www.carolina.com/product/crucible+cover,+porcelain,+38+mm.do?keyword=crucible&sortby=bestMatches) |
|  | * Used for precisely measuring dispensed liquids | 738050_le |
|  | * Base/Pole of set-up for experimenting. * Holds glassware in place for heating or evaporating. | [Support Stands with Rings](http://www.google.com/imgres?imgurl=http://www.thesciencefair.com/Merchant2/graphics/00000001/PiPump_3825_2_M2.jpg&imgrefurl=http://www.thesciencefair.com/Merchant2/merchant.mvc?Screen%3DPROD%26Product_Code%3D3825-2%26Category_Code%3DPIPUMPFILL&usg=__BSgaGqC5EhOmwZ1-3WOk9l6_UBo=&h=440&w=120&sz=22&hl=en&start=1&zoom=1&tbnid=8O5aZ2omDxTOuM:&tbnh=127&tbnw=35&ei=BJRMTsGDGcS2sQK1rdT6Bg&prev=/search?q%3Dpipet%2Bpump%26hl%3Den%26gbv%3D2%26tbm%3Disch&itbs=1) |
|  | * Used for carrying or holding hot test tubes. | [Test Tube Clamp with Grips, Stoddard](http://www.google.com/imgres?imgurl=http://ecx.images-amazon.com/images/I/11BUuBS7rUL._SL500_AA300_.jpg&imgrefurl=http://www.amazon.com/Japonesque-Dropper-Bottle/dp/B000J242TE&usg=__42GmcYPX94PhOrqML9Q2AE2KO3U=&h=300&w=300&sz=4&hl=en&start=20&zoom=1&tbnid=bwfTihELopQOEM:&tbnh=116&tbnw=116&ei=pZVMTu3cOKOQsQK9nsDdBg&prev=/search?q%3Ddropping%2Bbottle%26um%3D1%26hl%3Den%26sa%3DN%26rlz%3D1T4ADFA_enUS415US420%26tbm%3Disch&um=1&itbs=1) |
|  | * Used to heat substances. | 701012A_le |
|  | * Used to heat substances quickly or if > 400oC is needed. * Do not use with flammable substances. | 706706_app |
|  | * Used to absorb and spread the heat of flame. * Keeps glassware from cracking and breaking. * Part of ring stand set-up. | Wire Gauze |
|  | * Used to hold a crucible in place on a ring stand. * Helps absorb and spread heat of flame. * Part of ring stand set-up. | Triangles |
|  | * Used for heating substances. * Can withstand high direct heat. | Porcelain Crucibles, High Form[742688_app](http://www.carolina.com/product/crucible+cover,+porcelain,+38+mm.do?keyword=crucible&sortby=bestMatches) |
|  | * Used to carry crucible. | Crucible Tongs, Nickel-Plated |
|  | * Used to carry beakers. | Surefast Beaker Clamp |
|  | * Used to grind substances into powder or slurry. | Porcelain Mortars and Pestles |
|  | * Used to scoop chemical powders. * Not a measuring instrument. * Ours do not have handles. | Lab Scoop |
|  | * Used to stir substances. * Clean in between uses. | Glass Stirring Rods |
|  | * Used to show chemical reactions. | Watch Glasses |
|  | * Used to evaporate excess liquids. | [ANd9GcQOdYF2Fymud4uJi1yU96N2xbI8dRGee9_Bjssys3HR26TA-YxVsWdRBw](http://www.google.com/imgres?imgurl=http://www.chem.unr.edu/store/images/evapdish.jpg&imgrefurl=http://www.chem.unr.edu/store/porcelain/evapdish.html&usg=__RSOk5qrgp0fROoffDa_lAJdjy3E=&h=146&w=218&sz=5&hl=en&start=3&zoom=1&tbnid=UdelVrZ3OmB5lM:&tbnh=72&tbnw=107&ei=ipJMTt7yFOuFsgLus7zPBg&prev=/search?q%3Devaporating%2Bdish%26hl%3Den%26gbv%3D2%26tbm%3Disch&itbs=1) |
|  | * Used to safely transfer substances from one container to another. | Funnel, Polypropylene, Nalgene, 2 5/8 in |
|  | * Usually contains deionized water. * Handy for rinsing glassware and for dispensing small amounts of dH2O for chemical reactions. | Wash Bottles |
|  | * Disposable pipets used to transfer small amounts of chemicals. * Graduated pipets can precisely measure small amounts of chemicals. | Plastic Microchemistry Pipets |
|  | * Used to collect liquid through the process of capillary action. | Heparinized Capillary Tubes (Vial of 100) |

1. **Introduction into Science and Chemistry**
2. The Functions of Science
   1. Pure science – the search for knowledge; facts
   2. Applied Science – using knowledge in a practical way
3. How does scientific knowledge advance?
   1. Curiosity
   2. Good observations
   3. Determination
   4. Persistence
4. Scientific Method Tools
   1. Observation – uses the five senses
   2. Inference – involves a judgment or assumption
   3. Robert Boyle, “Scientific speculation is worthless unless it was supported by experimental evidence.”
   4. Observations are also called data.
      1. Qualitative data – descriptions; no numbers
      2. Quantitative data – involves measurements; must have numbers and UNITS
5. Parts of the Scientific Method
   1. Identify an unknown
   2. Make a hypothesis
   3. Experiment to test the hypothesis
   4. Draw a valid conclusion
6. Scientific Law vs. Theory
   1. **Law** 
      1. appleA verbal or mathematical description of a phenomenon that allows for general predictions.
      2. Describes what happens and not why.
      3. Unlikely to change greatly over time unless a major experimental error is discovered.
   2. atom**Theory** 
      1. Attempts to explain why nature behaves as it does.
      2. Is incomplete and imperfect, evolving with time to explain new facts as they are discovered.
7. Chemistry is the study of matter and its changes
8. beakerHow to succeed in Chemistry?
   1. Learn the language
   2. Use the illustrations
   3. Review your notes frequently
   4. Work as many problems as possible
   5. Do NOT cram for exams.
9. Areas of Chemistry
   1. Organic
      1. The study of carbon-containing compounds
   2. Inorganic
      1. Everything except carbon (compounds containing metals, etc.)
   3. Physical
      1. Measuring physical properties of substances
   4. Biochemistry
      1. The chemistry of living things
10. Graphs
    1. Bar Graphs - shows how many of something are in each category
    2. Pie Graphs - shows how a whole is broken into parts
    3. Line Graphs (most commonly used) - shows continuous change
       1. Elements of a good line graph are
          1. axes labeled, with units
          2. use the available space
          3. title
          4. neat
11. Basic Concepts in Chemistry
    1. **Chemical -** any substance that takes part in, or occurs as a result of, a chemical reaction
       1. All matter can be considered to be chemicals or mixtures of chemicals.
    2. **chemical reaction** - a rearrangement of atoms such that
       1. “what you end up with” = **products**
       2. differs from “what you started with” = **reactants**
12. The International System of Units

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Name** | **Symbol** |
| Length | meter | m |
| Mass | kilogram | kg |
| Time | second | s |
| Amount of substance | mole | mol |
| Thermodynamic temperature | Kelvin | K |
| Electric current | amperes | amps |
| Luminous intensity | candela | cd |

1. Prefixes in the SI system

|  |  |  |  |
| --- | --- | --- | --- |
| **Prefix** | **Symbol** | **Meaning** | **Power of 10 for Scientific Notation** |
| mega- | M | 1,000,000 | 106 |
| kilo- | k | 1,000 | 103 |
| deci- | d | 0.1 | 10-1 |
| centi- | c | 0.01 | 10-2 |
| milli- | m | 0.001 | 10-3 |
| micro- | μ | 0.000001 | 10-6 |
| nano- | n | 0.000000001 | 10-9 |

1. **Significant Figures and Scientific Notation**
2. Scientist use significant figures to determine how precise a measurement is
3. Significant digits in a measurement include all the known digits plus one estimated digit
   1. The same rules apply with all instruments
   2. Read to the last digit that you know
   3. Estimate the final digit
4. Rules for Significant Figures
   1. All non-zero digits are **ALWAYS** significant
   2. All zeros between significant digits are **ALWAYS** significant
   3. All **FINAL** zeros to the right of the decimal **ARE** significant
   4. All zeros that act as place holders are **NOT** significant
      1. Another way to say this is: zeros are only significant if they are between significant digits OR are the very final thing at the end of a decimal
   5. All counting numbers and constants have an infinite number of significant digits
5. Rules for Rounding Significant Digits
   1. If the digit to the immediate right of the last significant digit is less that 5, do not round up the last significant digit.
   2. If the digit to the immediate right of the last significant digit is greater that a 5, you round up the last significant figure
   3. If the number to the immediate right of the last significant is a 5, and that 5 is followed by a non-zero digit, round up
   4. If the number to the immediate right of the last significant is a 5, and that 5 is followed by a zero, you look at the last significant digit and make it even.
6. Scientific notation is used to express very large or very small numbers
   1. It consists of a number between 1 & 10 followed by x 10 to an exponent
   2. The exponent can be determined by the number of decimal places you have to move to get only 1 number in front of the decimal
   3. If the number you start with is greater than 1, the exponent will be positive
   4. If the number you start with is less than 1, the exponent will be negative
   5. Going from Scientific Notation to Ordinary Notation you start with the number and move the decimal the same number of spaces as the exponent.