

GEL4050 Igneous & Metamorphic Petrology

Chemistry, Math, Mineralogy Review Sheet

Disclaimer: This review sheet is courtesy of the instructor. While care has been taken to include everything that might be tested, omissions or oversights may have occurred. The instructor shall NOT be liable for any missed answer on your part just because the topic is not explicitly mentioned here. It is still the STUDENT'S RESPONSIBILITY to know and be able to use these basic concepts which should have been learned previously.

Please review in detail the following basic mineral identification, chemistry & mathematical concepts. You will be tested on these generalities during the first week of class. If you receive less than 70% on each test you may FAIL the class, because you are expected to know the basics below. I will NOT have time to tutor or re-teach you! YOU WILL NEED A SCIENTIFIC CALCULATOR FOR THE COURSE. Be familiar with the operation of your calculator!!!

CHEMISTRY REQUIREMENTS - TESTED ONLINE

Periodic Table
1998 Dr. Michael Blaber

1	1 H 1.008																	2 He 4.003					
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18					
3	11 Na 22.99	12 Mg 24.30							← VIII →									13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.05	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80					
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.91	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3					
6	55 Cs 132.9	56 Ba 137.3	La-Lu	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po 210.0	85 At 210.0	86 Rn 222.0					
7	87 Fr 223.0	88 Ra 226.0	Ac-Lr	104 Db	105 Jl	106 Rf	107 Bh	108 Hn	109 Mt	110 Uun	111 Uuu												

← s d p →

Lanthanides	57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm 146.9	62 Sm 150.4	63 Eu 152.0	64 Gd 157.2	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Actinides	89 Ac 227.0	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	94 Pu 239.1	95 Am 241.1	96 Cm 244.1	97 Bk 249.1	98 Cf 252.1	99 Es 252.1	100 Fm 257.1	101 Md 258.1	102 No 259.1	103 Lr 262.1

← f →

Be familiar with the use and application of the Periodic Table. More specifically with:

Element Names and Associated Symbols

Example: Au = Gold, Hg = Mercury, Fe = Iron

The Atomic Model

Example: How many Protons, Neutrons, Electrons & major occupied electron levels are in a Calcium Atom? 20 Protons, 20 Electrons, 20 Neutrons, 4 major occupied electron levels

Calculating Neutrons

Example: How many Neutrons are in Chromium? $52 - 24 = 28$

Atomic Mass Calculation of Compounds

Example: What is the atomic weight of Quartz? $\text{SiO}_2 = 28.09 + 2 \times 16.00 = 60.09 \text{ g/mol}$

Simple Mol Calculations

Example: How many moles of Quartz are in 100.0g? $100.0 \text{ g} \div 60.09 \text{ g/mol} = 1.664 \text{ mol}$

Common Valences of Elemental Ions

Example: O = -2, Ca = +2, Cl = -1, Fe = +2 or +3

Ionic Compounds & Associated Formulas Example: Reaction of Calcium & Chlorine makes...? CaCl_2

Outside the Periodic Table:

Polyatomic Ions Example: What is a Nitrate? NO_3^{-1}

Also be familiar with:

- difference between covalent, ionic, metallic and hydrogen bonding
- difference between cations and anions
- meaning of chemical formulas and subscripts
- understand pH and the difference between oxidizing and reducing environments
- working knowledge of solutions, solubility, mixtures, homogenous and heterogenous systems, and precipitation is a must.

MATH REQUIREMENTS - TESTED ONLINE

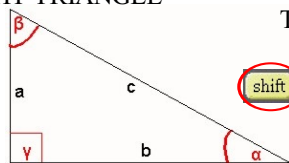
Solving for Other Variables in Equations Example: If $F = m \times a$, what is a ? $a = F/m$

Straight Line Equation & Rectilinear Coordinates Example: If $m=3$, $b=1$, $y=10$, what is x ? $x=3$
 $y = m x + b$

Percent Calculation Example: You analyze 125g of rock and measure 1.8g potassium in the sample. What is the percentage of potassium? $1.8\text{g}/125\text{g} \times 100 = 1.4\%$

TRIGONOMETRIC FUNCTIONS OF A RIGHT TRIANGLE

Sine $\alpha = \sin \alpha = a/c$
Cosine $\alpha = \cos \alpha = b/c$
Tangent $\alpha = \tan \alpha = a/b$
Cotangent $\alpha = \cot \alpha = b/a$
Secant $\alpha = \sec \alpha = c/b$
Cosecant $\alpha = \csc \alpha = c/a$



Taking the Inverse of tan...



FOCUS ON THE TANGENT FUNCTIONS, especially figuring slope angles if height and length are given!!!

EQUATIONS FOR AREA

Area of a circle with radius r
Area of a triangle with a base b and altitude h
Area of a rectangle with sides a and b
Area of a parallelogram with sides a and b and an included angle z
Area of a trapezoid whose parallel sides are a and b and with an altitude h

$$A = \pi r^2 \quad (\pi = 3.1416)$$
$$A = 1/2 bh$$
$$A = ab$$
$$A = ab \sin z.$$
$$A = 1/2(a + b)h.$$

EQUATIONS FOR CIRCUMFERENCE

Circumference of a circle with a diameter d $C = \pi d.$
Circumference of a triangle of sides a , b and c $C = a + b + c.$
Circumference of a rectangle with sides a and b $C = 2 a + 2b.$

EQUATIONS FOR VOLUME

Volume of a regular prism $V = \text{area of base} \times \text{altitude}.$
Volume of a pyramid $V = 1/3 \text{ area of base} \times \text{altitude}.$
Volume of a cylinder with radius r and height h $V = \pi r^2 h$
Volume of a cone with radius r and height h $V = 1/3 \pi r^2 h$

SIGNIFICANT DIGITS

The significant digits are all the digits you measured + the one you estimated.

Counting Significant Digits - Four basic rules:

Zeros in the beginning of a number never count.

Zeros at the end of a number count only if there is a written decimal point.

The digits 1 - 9 always count.

Zeros between the digits 1 - 9 always count.

Calculating with significant digits: RULE: Answer can only be as precise as the least precise number used!

Addition / Subtraction: Example: $1.45 + 1.4318 = 2.88!$

Multiplication / Division: Example: $3.0 \times 1.26 = 3.9!$

THE METRIC SYSTEM

Know the metric system backwards and forwards, especially units for MASS, LENGTH, VOLUME.

CORRELATION

Be able to identify / interpret statistical correlation (R) from a graph

MINERALOGY REVIEW

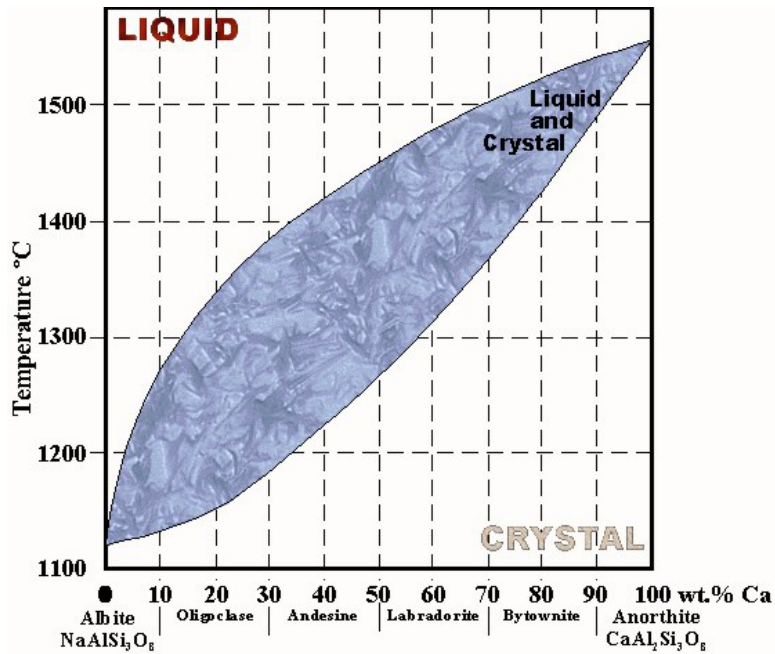
BOWEN'S REACTION SERIES

Know minerals and mineral associations

Know or be able to derive oxide formulas for minerals in the Bowen's Reaction series

Be familiar with Silica to Cation ratios

PLAGIOCLASE PHASE DIAGRAMS



Know how to interpret and read plagioclase phase diagrams

PLM (Polarized Light Microscope) & Tin-Sections

Be able to identify / label all the parts of a PLM

Be able to identify minerals in thin section from photographs presented both in PPL (Plain Polarized Light) and XPL (Cross Polarized Light)

Be able to identify mineral extinction types and associated minerals

Be able to identify pleochroism

Be able to explain the difference between polarized and non-polarized light.

OXIDE FORMULAS

Be able to derive mineral oxide formulas from mineral sum formulas and vice versa.