Mineralogy Exam 1 - 2007 Name _____
NDSU Dept. of Geosciences

Short answer [4 points each]

1. A $\bar{1}$ (one-fold rotoinversion axis) is equivalent to what single symmetry operation? _____.
   A $\bar{2}$ (two-fold rotoinversion axis) is equivalent to what single symmetry operation? _____.
   A $\bar{3}$ is equivalent to what *two* symmetry operations? _____.

2. The space group of magnetite (Fe_3O_4) is $Fd3m$. It has a _____ Bravais lattice and the point group _____ in the _____ crystal system.

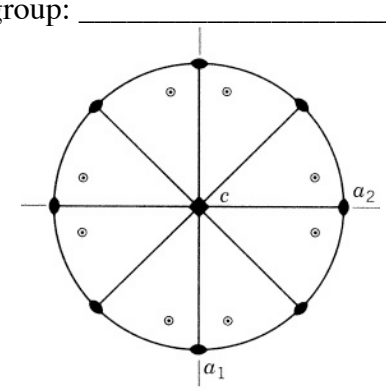
3. The plane that has intercepts of $-\frac{1}{2}$ along the a-axis, is parallel to the b-axis, and $-\frac{1}{3}$ along the c-axis is the ( ).

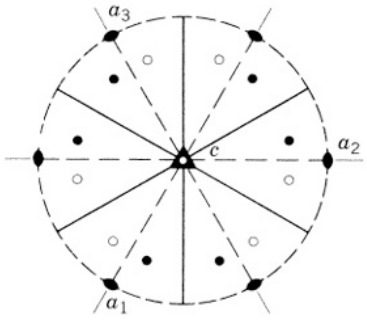
4. Fill in the blanks:

Crystal System	Characteristic Symmetry	Metrical Properties
Monoclinic		
		$a_1=a_2\neq c$; $\alpha=\beta=90°$; $\gamma=120°$

5. For the following figures, what are the: [12 pts]

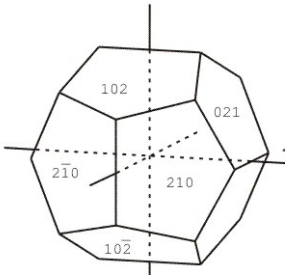
   Crystal system: _____ Crystal system: _____
   Principal directions: < >< >< > Principal directions: < >< >< >
   Point group: _____ Point group: _____

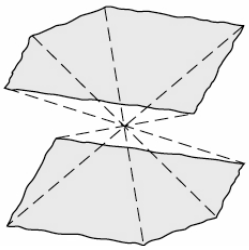


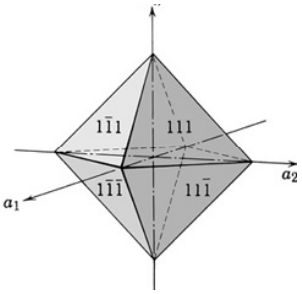


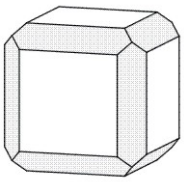
6. Draw a complete stereogram with symmetry elements and generalized equivalent faces for the point group $\bar{4}2m$. Indicate the principal directions. [20 pts]

7. For each figure, name the crystal form or combination of forms. [12 pts]









_____ _____ _____ _____

_____ _____ _____ _____

8. Define piezoelectricity. Why do some crystals exhibit this property, while others do not? [6 pts]

9. Rutile, TiO_2, is used as a pigment in paint. It has space group $P\frac{4_2}{m}nm$. [15 pts]

a. What does this tell you about the crystal structure of rutile?
b. Your text states that rutile has $a = 4.59$ Å and $c = 2.96$ Å. What does this mean?
c. Rutile's cleavage is parallel to {110}. Describe this – how many directions is this?

10. Why do some minerals have cleavage, and others do not? [5 pts]

11. Are the following minerals? Why or why not? [9 pts]

a) a pure platinum ring b) coal c) window glass

12. What is the main difference between point groups and space groups? [5 pts]