

MINERALOGY I TAKE-HOME ASSIGNMENT #1

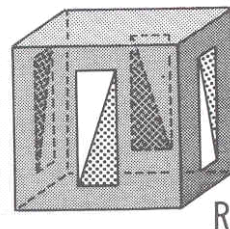
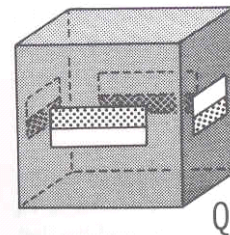
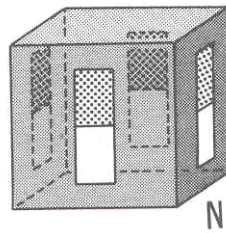
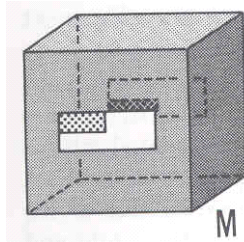
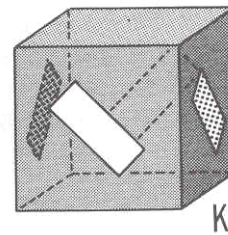
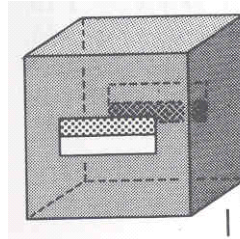
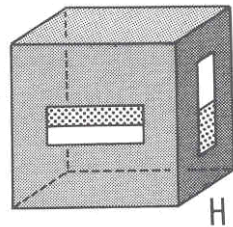
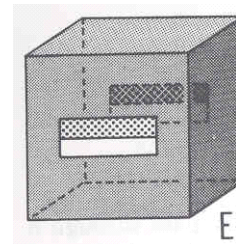
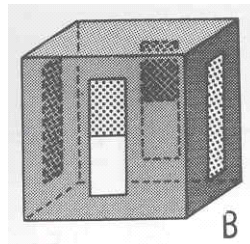
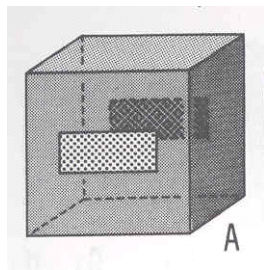
P.C. Pilonen

Due date: December 14th, 2007

Name: _____



Question #1. Determine the point group symmetry for each of the 10 'cubes'. Hint: Consider the patterns on their faces. *None* of the models are from the cubic crystal system! (10 marks).



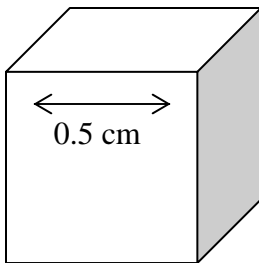
Question #2: Electrostatic valency principle (5 marks)

Show that the electrostatic valency principle (Pauling's Rule #2) is satisfied in the structure of zircon (ZrSiO_4). Predict the coordination environment of Zr, Si and O. In this structure, Zr^{4+} is [8-coordinated], Si^{4+} is [4]-coordinated and O^{2-} is [3]-coordinated.

Question #3. Unit cell contents (10 marks)

The garnet spessartine, $\text{Mn}_3\text{Al}_2\text{Si}_3\text{O}_{12}$, has a unit cell edge, $a = 11.62\text{\AA}$. A student picks up a cubic spessartine garnet in the field that is 0.5 cm in diameter. How many *moles* of Mn are there in this garnet? (show all your work). (8 marks).

Note: $1\text{\AA} = 10^{-8}\text{ cm}$ (or $1\text{ cm} = 10^8\text{\AA}$), Avogadro's number: 6.0225×10^{23}



Question #4. Systematic mineralogy.

Out of the following mineral groups that we did not cover in class, choose one, research it, and write a short essay on the group, including information on crystal structure, chemistry, substitutions, etc. (20 marks).

1. Astrophyllite-group
2. Epidote group
3. Tourmaline group
4. Eudialyte group
5. Pyrochlore group
6. Apatite group
7. Platinum-group element alloys
8. Joaquinite group
9. Arrojadite group