

Name _____

GEOL 3010

Hour Exam I

Sample

I. (24) Define the following:

A. Mineral

B. Polymorph

C. Crystal form

D. Vitreous

E. Chalcophile

F. Atmophile

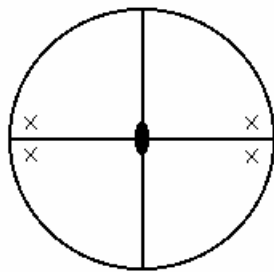
II. (9) Give an example of a mineral with the following values of Mohs' hardness:

- | | |
|-------------|--------------|
| A. 1. _____ | D. 6. _____ |
| B. 3. _____ | E. 8. _____ |
| C. 4. _____ | F. 10. _____ |

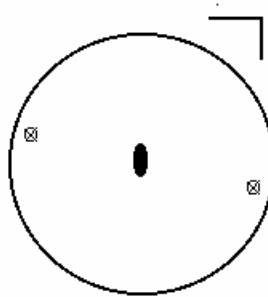
III. (15) Write the number of the appropriate mineral group (right column) next to the following minerals (left column):

- | | |
|--|-----------------------|
| a. _____ Celestine (SrSO_4) | 1. Orthosilicate |
| b. _____ Galena (PbS) | 2. Chain Silicate |
| c. _____ Sylvite (KCl) | 3. Layer Silicate |
| d. _____ Biotite ($\text{K}(\text{Mg,Fe})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$) | 4. Framework Silicate |
| e. _____ Sanidine (feldspar) KAISi_3O_8 | 5. Native Element |
| f. _____ Proto-enstatite (MgSiO_3) | 6. Halide |
| g. _____ Graphite (C) | 7. Sulfide |
| h. _____ Olivine (Mg_2SiO_4) | 8. Sulfate |
| i. _____ Witherite (BaCO_3) | 9. Phosphate |
| j. _____ Apatite ($\text{Ca}_5(\text{PO}_4)_3\text{OH}$) | 10. Carbonate |

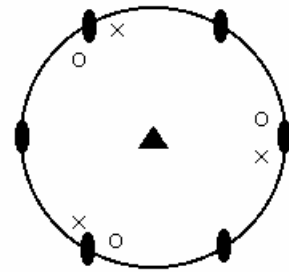
IV. (12) For each of the following point-group symmetry diagrams, identify the point group (crystal class) and crystal system



A.



B.

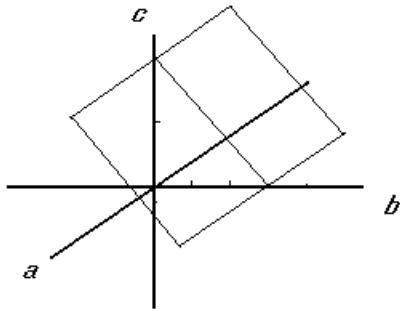


C.

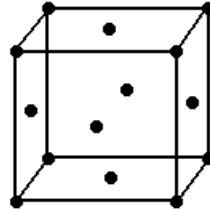
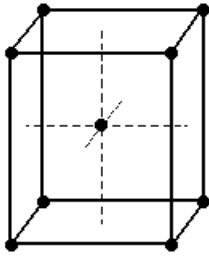
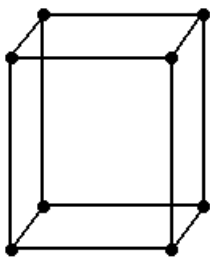
Point Group: _____

Crystal System: _____

- V. (6) As illustrated below, a lattice plane intercepts the b -axis at 3 units, the c -axis at 2 units, and is parallel to a . Give the Miller indices for the plane.



- VI. (6) Identify the lattice type (P, A, B, C, I, F, or R) for each of the following:



- VII. (12) Identify the crystal system:

A. $a = b = c$; $\alpha = \beta = \gamma = 90^\circ$ _____

B. $a = b \neq c$; $\alpha = \beta = \gamma = 90^\circ$ _____

C. $a \neq b \neq c$; $\alpha = \beta = \gamma = 90^\circ$ _____

D. $a = b \neq c$; $\alpha = \beta = 90^\circ, \gamma = 120^\circ$ _____

E. $a \neq b \neq c$; $\alpha = \gamma = 90^\circ$ _____

F. $a \neq b \neq c$; _____

- VIII. (8) Shown below are two symmetry diagrams for primitive orthorhombic space groups in standard orientation (a-vertical, b horizontal, and c normal to page). Give the Hermann-Mauguin symbol for these space group and for the crystal class (point group) to which it belongs.

axis plane

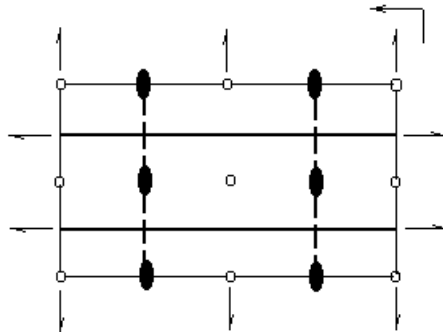
a _____

b _____

c _____

H-Msymbol _____

Point Group _____



- IX. (10) Last year, some colleagues and I synthesized a sample of clinopyroxene at 120 kbar and 1400°C using the 5000-ton press at the Bavarian Geological Institute at Bayreuth in Germany. Given below is a chemical analysis of the sample we made. Calculate the formula (Numbers of Si, Mg, and Fe cations per six oxygens).

Oxide	MolWt Oxide	Wt%
SiO ₂	60.086	59.00
MgO	40.312	37.77
FeO	71.846	3.23

Atom	AtWt	Cations per 6 Oxygens
O	15.9994	6.000
Si	28.087	
Mg	24.305	
Fe	55.847	