(礦物部分共50分)

一、 【解釋名詞，每題5分，共10分】:

(1) *Steno's* law　　(2) phase rule

二、 【簡答題，每題2分，共20分】: 下列是摘自礦物學課本對*Margarite*礦物之描述性資料，請在詳細閱讀後按照題號簡單回答本題的10個小題。

**Margarite**—$CaAl_2(Al_2Si_2O_{10})(OH)_2$

**Crystallography.** Monoclinic; *m*. Seldom in distinct crystals. Usually in foliated aggregates with micaceous habit. *Cc*; $a = 5.13$, $b = 8.92$, $c = 19.50$ Å; $\beta = 100°48'$; $Z = 4$. *ds*: 4.40(8), 3.39(8), 3.20(9), 2.51(10), 2.42(8).

**Physical Properties.** *Cleavage* {001} perfect. H $3\frac{1}{2}$–5 (harder than the true micas). G 3.0–3.1. *Luster* vitreous to pearly. *Color* pink, white, and gray. Translucent. Folia somewhat brittle; because of this brittleness margarite is known as a *brittle mica*. *Optics*: (−); $\alpha = 1.632$–$1.638$; $\beta = 1.643$–$1.648$; $\gamma = 1.645$–$1.650$; $2V = 40°$–$67°$; $Z = b$, $Y \wedge a = 7°$.

**Composition and Structure.** Most analyses are close to the above end-member composition with CaO 14.0, $Al_2O_3$ 51.3, $SiO_2$ 30.2 and $H_2O$ 4.5%. A small amount of Na may replace Ca. The dioctahedral structure of margarite is very similar to that of muscovite (see Fig. 19.65). In margarite, however, the tetrahedral layer has the composition $(Si_2Al_2)O_{10}$ instead of $(Si_3Al)O_{10}$ as in muscovite. Because of the greater electrical charge on the $(Si_2Al_2)O_{10}$ sheet the structure can be balanced by incorporated divalent $Ca^{2+}$ ions instead of monovalent $K^+$. The bond strength between the layers is therefore greater; this is expressed in the brittle nature of margarite.

**Diagnostic Features.** Characterized by its micaceous cleavage, brittleness, and association with corundum.

**Occurrence.** Margarite occurs usually with corundum and diaspore and apparently as an alteration product. It is found in this way in the emery deposits of Asia Minor and on the islands of Naxos and Nicaria, Greece. In the United States, associated with emery at Chester, Massachusetts; Chester County, Pennsylvania; and with corundum deposits in North Carolina.

**Name.** From the Greek *margarites* meaning *pearl*.

**Similar Species.** Another *brittle mica* is *clintonite*, $CaMg_2AlAl_3SiO_{10}(OH)_2$, which may be regarded as the Ca analogue of phlogopite.

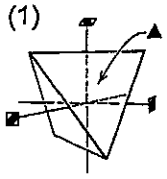
1. *Margarite*的結晶構造屬於哪一個晶系？哪一個晶族？
2. *Margarite*的結晶構造屬於哪一個*Bravais*晶格？哪一個空間群？
3. *Margarite*的折射率最高是多少？ 最高的雙折射率是多少？
4. *Margarite*具有什麼解理？ 硬度是多少？
5. *Margarite*的光澤為何？通常呈現出半透明的什麼顏色？
6. 與*Margarite*一樣具有最明顯相同特性的是哪種礦物？ 此礦物含有哪種*Margarite*沒有的化學元素？
7. 為什麼*Margarite*會比*muscovite*脆？
8. *Margarite*常與哪兩種礦物共生？
9. 根據上述資料，哪兩個國家發現有很多*Margarite*？
10. *Margarite*的名字是從哪一個字而來的？什麼意思？

三、 (1) 根據各種科學方法推測發現，在構成整個地球的所有礦物中，以具有哪一種結晶構造的礦物所佔比例最高？請繪圖簡單說明其構造。(2)請繪圖簡單說明*diamond*構造與*sphalerite*構造的異同。【10分】

見背面

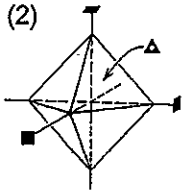
四、 請寫出以下五個礦物晶體的晶系(system)與晶族(class)。請注意圖中的符號與英文字母代表一般礦物學課本中的意義，而且可能並未全部標示出來。【10分】

(1)



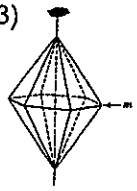
tetrahedron

(2)



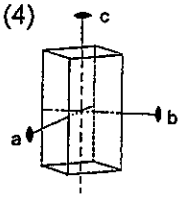
octahedron

(3)



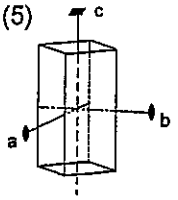
hexagonal dypyramid

(4)




$a \neq b \neq c$
$\alpha = \beta = \gamma = 90°$

(5)




$a = b \neq c$
$\alpha = \beta = \gamma = 90°$

(岩石部分共50分)

一、 【解釋名詞，每題5分，共30分】:

(1) diagenesis　(2) potential temperature　(3) continental crust
(4) eclogite　(5) asthenosphere　(6) andesite

二、 【簡答題，共20分】:

(1) 請描述地函 (mantle) 的礦物和岩石組成。【10分】

(2) 何謂變質相 (metamorphic facies)？請繪圖舉例說明。【10分】

試題隨卷繳回