科目名稱：地球物質 (礦物部分共 50 分)

一、【解釋名詞，每題 5 分，共 10 分】

(1) crystal lattice　　(2) solid solution

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

Azurite—$Cu_3(CO_3)_2(OH)_2$

Crystallography. Monoclinic; *2/m*. Habit varies; crystals are frequently complex and malformed. Also in radiating spherical groups.

$P2_1/c$; $a = 4.97$, $b = 5.84$, $c = 10.29$ Å, $\beta = 92°24'$; $Z = 2$. *ds*: 5.15(7), 3.66(4), 3.53(10), 2.52(6), 2.34(3).

Physical Properties. *Cleavage* {011} perfect, {100} fair. H $3\frac{1}{2}$–4. G 3.77. *Luster* vitreous. *Color* intense azure-blue, see Plate IV, no. 1. *Streak* light blue. Transparent to translucent. *Optics:* (+), $\alpha = 1.730$, $\beta = 1.758$, $\gamma = 1.838$; $2V = 67°$; $X = b$, $Z \wedge c = -13°$; pleochroic in blue $Z > Y > X$; $r > v$.

Composition and Structure. CuO 69.2, CO_2 25.6, H_2O 5.2%. Cu 55.3%. The structure of azurite contains Cu^{2+} ions in square, coplanar groups with $2O^{2-}$ and $2(OH)^-$. These square groups are linked into chains parallel to the *b* axis. Each $(OH)^-$ group is shared by 3 Cu^{2+} and each oxygen of the triangular (CO_3) group is bonded to one copper.

Diagnostic Features. Characterized chiefly by its azure-blue color and effervescence in HCl.

Alteration. Pseudomorphs of malachite after azurite commonly observed; less common after cuprite.

Occurrence. Azurite is less common than malachite but has the same origin and associations. It was found in fine crystals at Chessy, near Lyons, France; Tsumeb, Namibia; Touissit, Morocco; and Broken Hill, New South Wales, Australia. In the United States at the Copper Queen and other mines, Bisbee and Morenci, Arizona. Widely distributed with copper ores.

Use. A minor ore of copper.

Name. Named in allusion to its color.

Rare Hydrous Carbonates. *Aurichalcite*, $(Zn,Cu)_5(CO_3)_2(OH)_6$ pale green to turquoise-blue in orthorhombic acicular crystals. *Gaylussite*, $Na_2Ca(CO_3)_2 \cdot 5H_2O$, monoclinic and *trona*, $Na_3(CO_3)(HCO_3) \cdot 2H_2O$, monoclinic, are both found in saline-lake deposits.

1. *Azurite* 的中文礦物名稱是什麼？*Azurite* 是因為什麼而得名？
2. 如何鑑定 *Azurite*？
3. *Azurite* 的結晶構造屬於哪一個晶系？哪一個晶族？哪一個空間群？
4. *Azurite* 的折射率最低是多少？ 條痕是什麼顏色？
5. *Azurite* 具有什麼解理？硬度是多少？
6. *Azurite* 的比重是多少？以中文來說是什麼光澤？
7. *Azurite* 的結晶構造中，最長的軸是哪個軸？一個晶胞中有多少個原子？
8. 自然界中 *Azurite* 常會被換質，雖然保留原本 *Azurite* 晶體的外型，但卻變成哪種礦物？通常會與哪一種金屬的礦床共生？
9. *Azurite* 的光學性質具有幾個光軸？具有什麼顏色的多色性？
10. 另外有兩個英文名字拼法與 *Azurite* 很類似的礦物(即 *Lazurite* 與 *Lazulite*)各叫什麼中文名稱？

三、在野外最常見到的兩種白色礦物就是 quartz 與 calcite。請根據這兩種礦物的五種性質差異，列出五種分辨二者的不同「方法」。(請注意：僅列出性質差異得零分，需列出「性質差異」與確實可行的「辨識方法」。)【20 分】

見背面

國立臺灣大學 102 學年度碩士班招生考試試題

科目名稱：地球物質 (岩石部分共 50 分)

一、 【解釋名詞，每題 5 分，共 30 分】:

(1) lithosphere (2) diagenesis (3) metamorphism
(4) andesite (5) ophiolite (6) mantle plume

二、 【簡答題，共 20 分】:

(1) 請比較(a)中洋脊(b)隱沒帶兩種板塊構造環境的岩漿成因。【8 分】

(2) 何謂變質相(metamorphic facies)？請繪圖舉例說明。【8 分】

(3) 請描述大屯山的主要岩石組成和成因。【4 分】

試題隨卷繳回