

(礦物部分共 50 分)

- 一、簡答題：下列是摘自礦物學課本對 *Smithsonite* 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。(注意：照抄英文得零分)【共 20 分】

Smithsonite—ZnCO₃

Crystallography. Hexagonal; $\bar{3}2/m$. Rarely in small rhombohedral or scalenohedral crystals. Usually reniform, botryoidal, or stalactitic, and in crystalline incrustations or in honeycombed masses known as *dry-bone ore*. Also granular to earthy.

$R\bar{3}c$. Hexagonal cell, $a = 4.66$, $c = 15.02$ Å; $Z = 6$; rhombohedral cell, $a = 5.63$ Å, $\alpha = 48^\circ 20'$, $Z = 2$. $ds: 2.75(10), 3.55(5), 2.33(3), 1.946(3), 1.703(4)$.

Physical Properties. *Cleavage* {10 $\bar{1}$ 1} perfect. $H 4-4\frac{1}{2}$. $G 4.30-4.45$. *Luster* vitreous to waxy. *Color* usually dirty brown. May be colorless, white, green, blue, or pink. The yellow variety contains Cd and is known as *turkey-fat ore*. *Streak* white. Translucent. *Optics:* (-); $\omega = 1.850$, $\epsilon = 1.623$.

Composition and Structure. For pure ZnCO₃, ZnO 64.8, CO₂ 35.2%. Considerable Fe²⁺ may substitute for Zn, but there appears to be a gap in the ZnCO₃-FeCO₃ series. Mn²⁺ is generally present in only a few percent, but the occurrence of a zincian rhodochrosite with Zn:Mn = 1:1.2 suggests there may be a complete series between ZnCO₃ and MnCO₃. Ca and Mg are present in amounts of only a few weight percent. Small amounts of Co are found in a pink, and small amounts of Cu in a blue-green variety of smithsonite. Smithsonite is isostructural with calcite.

Diagnostic Features. Soluble in cold HCl with effervescence. Distinguished by its effervescence in acids, tests for zinc, its hardness, and its high specific gravity.

Occurrence. Smithsonite is a zinc ore of supergene origin, usually found with zinc deposits in limestones. Associated with sphalerite, galena, hemimorphite, cerussite, calcite, and limonite. Often found in pseudomorphs after calcite. Smithsonite is found in places in translucent green or greenish-blue material, which is used for ornamental purposes. Laurium, Greece, is noted for this ornamental smithsonite, and Sardinia, Italy, for yellow stalactites with concentric banding. Fine crystallized specimens have come from the Broken Hill Mine, Zambia, and from Tsumeb, Namibia. In the United States smithsonite occurs as an ore in the zinc deposits of Leadville, Colorado; Arkansas and Wisconsin. Fine greenish-blue material has been found at the Kelly mine, Magdalena district, New Mexico.

Use. An ore of zinc. A minor use is for ornamental purposes.

Name. Named in honor of James Smithson (1754-1829), who founded the Smithsonian Institution in Washington, D.C. English mineralogists formerly called the mineral *calamine*.

Similar Species. *Hydrozincite*, Zn₂(CO₃)₂(OH)₆, occurs as a secondary mineral in zinc deposits.

1. *Smithsonite* 的中文礦物名稱是什麼？*Smithsonite* 是因為什麼而得名？
2. *Smithsonite* 與哪一種常見礦物同構造？常會形成哪一種礦物的假型？
3. *Smithsonite* 的結晶構造屬於哪一個晶族？哪一個空間群？
4. *Smithsonite* 通常是什麼顏色？接觸冷鹽酸會如何？
5. *Smithsonite* 具有什麼解理？硬度是多少？
6. *Smithsonite* 的比重是多少？以中文來說是什麼光澤？
7. *Smithsonite* 的結晶構造（晶胞）中，最長的軸是哪個軸？一個六方晶胞中有多少個氧原子？
8. *Smithsonite* 通常會在什麼岩石中的鋅礦床內出現？也會在哪個島的黃色同心帶狀鐘乳石中出現？
9. *Smithsonite* 的光學性質具有幾個光軸？最高雙折射值為多少？
10. *Smithsonite* 有什麼用途？類似礦物的英文名稱叫什麼？

- 二、許多人因為欣賞礦物的璀璨與美麗而蒐集礦物晶體，還有的人是為了商業價值而蒐集寶石礦物。地質學家雖然也研究與蒐集礦物，但顯然不是為了前述的理由。請簡單敘述地質學家蒐集研究礦物的目的，即礦物具有哪些重要的「地質意義」？【10分】

- 三、解釋名詞：【每題 5 分，共 20 分】

- (1) Twin
- (2) Bravais lattices
- (3) Pyrite
- (4) Point group

見背面

(岩石部分共 50 分)

一、討論上部地函岩漿形成的控制因素？以及所對應的地體構造環境。【15分】

二、詳述台灣變質相的分布，以及形成的控制機制。【15分】

三、解釋名詞：【每題 4 分，20 分】

- (1) Stromatolite
- (2) Melange
- (3) Protolith
- (4) Aphaneritic texture
- (5) Carbonatite

試題隨卷繳回