以下試卷共 15 題，**請選擇 10 題作答，每題 10 分 (共 2 頁)**

資源處理:

1. Please draw the schematic diagram and explain the electric double layer and zeta potential.
2. What factors affect the efficiency and particle size distribution for ball-milling process?
3. Please list and explain the chemical reagents used in froth flotation.
4. Stokes' law: If the particles are falling in the viscous fluid by their own weight due to gravity, then a terminal velocity, also known as the settling velocity, is reached when this frictional force combined with the buoyant force exactly balance the gravitational force. Please derive the terminal velocity (v) ? (particle size = d; mass of the particle= m; specific density of the particle= δ; specific density of the fluid=δ'; viscosity of the fluid= η.
5. Minerals fall into one of three magnetic properties: ferromagnetic, paramagnetic and diamagnetic. Please explain the diamagnetic, paramagnetic and ferromagnetic and how to use the differences in the magnetic properties to separate the magnetite, hematite and gangue?

普通物理

6. Please explain (a) the Compton effect and (b) photoelectric effect.
7. The threshold wavelength for a metal is λ_{th}. What's the work function for the metal? What is the stopping potential as the incident light wavelength of λ_i is used?
8. A capacitor of capacitance C is discharging through a resistor of resistance R. (a) In terms of the time constant τ=RC, when will the charge on the capacitor be half its initial value? (b) When will the charge stored in the capacitor be half its initial value?
9. Draw the schematic energy band diagrams for the n-type and p-type semiconductors and label all critical features.
10. Please explain the Fermi energy? The ability of a metal to conduct electricity depends on the probability that available vacant levels will actually be occupied. If an energy level is available at energy E, what is the probability P(E) that is actually occupied by an electron?

材料科學

11. Please draw the crystallographic directions of [100], [110] and crystallographic

(背面仍有題目,請繼續作答)

planes of (111) and (110) for isometric system.

12. What are the six crystal systems? Define them using crystallographic axes and their characteristic symmetry.
13. Please explain the kinds of phase transformation in the minerals and describe the differences between them.
14. Please explain the Schottky and Frenkel defects.
15. Please explain (a) the polarization mechanisms and (b) ferroelectricity.