

國立臺灣科技大學103學年度碩士班招生試題

系所組別：機械工程系碩士班戊組

科目：材料製造與應用

(總分為100分)

1. A brass wire is cold-drawn 25 percent to a diameter of 1.10 mm. It is then further cold-drawn to 0.900 mm. What is the total percent cold reduction? (10 分)
2. For a bronze alloy, the stress at which plastic deformation begins is 280 MPa, and the modulus of elasticity is 115 GPa.
 - (a) What is the maximum load that may be applied to a specimen with a cross-sectional area of 325 mm^2 without plastic deformation? (5 分)
 - (b) If the original specimen length is 120 mm, what is the maximum length to which it may be stretched without causing plastic deformation? (5 分)
3. What is the chief difference between heat-treatable and non-heat-treatable alloys? (10 分)
4. (a) Cite two advantages of powder metallurgy over casting. (5 分) (b) Cite two disadvantages. (5 分)
5. What are some of the properties that make aluminum an extremely useful engineering material? (5 分) Describe the three principal casting processes used for aluminum alloys. (10 分)
6. Describe the isostatic-pressing method for producing ceramic products. (10 分)
7. Explain why metals are typically better thermal conductors than ceramic materials. (10 分)
8. Why does chromium in stainless steels make them more corrosion resistant in many environments than plain carbon steels? (10 分)
9. The following is a list of metals and alloys:

Plain carbon steel	Magnesium	Stainless steel
Gray cast iron	Zinc	Titanium alloy
Brass	Tool steel	

Select from this list the one metal or alloy that is best suited for each of the following applications, and give at least one reason for your choice (a,b,c 各 5 分，計 15 分):

- (a) The block of an internal combustion engine
- (b) Condensing heat exchanger for steam
- (c) Jet engine turbofan blades

