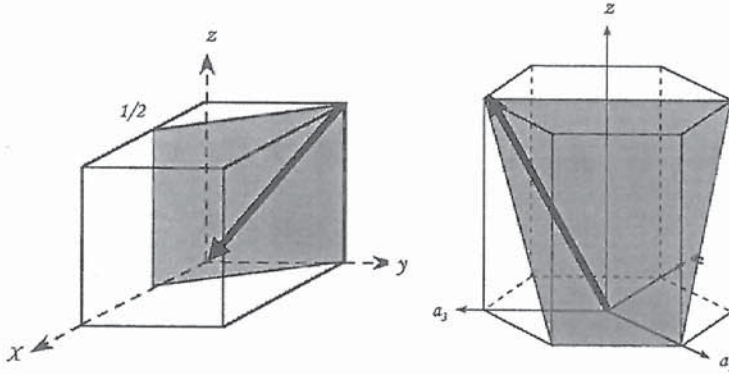


大同大學 107 學年度(寒)轉學入學考試試題

考試科目:材料導論 系別:材料工程學系 第全頁

註:本次考試 不可以參考自己的書籍及筆記; 不可以使用字典; 不可以使用計算器。

1. Determine the indices for the direction and plane shown in the following cubic unit cell and hexagonal unit cells: (5%*4)



2. Show for the body-centered cubic crystal structure that the unit cell edge length a and the atomic radius R are related through $a = 4R/\sqrt{3}$. (7%)
3. Atomic radius, crystal structure, electronegativity, and the most common valence are tabulated in the following table for several elements; for those that are nonmetals, only atomic radii are indicated.

Element	Atomic Radius (nm)	Crystal Structure	Electronegativity	Valence
Cu	0.1278	FCC	1.9	+2
C	0.071			
H	0.046			
O	0.060			
Ag	0.1445	FCC	1.9	+1
Al	0.1431	FCC	1.5	+3
Co	0.1253	HCP	1.8	+2
Cr	0.1249	BCC	1.6	+3
Fe	0.1241	BCC	1.8	+2
Ni	0.1246	FCC	1.8	+2
Pd	0.1376	FCC	2.2	+2
Pt	0.1387	FCC	2.2	+2
Zn	0.1332	HCP	1.6	+2

Which of these elements would you expect to form the following with copper: (8%*2)

- (a) A **substitutional** solid solution having complete solubility
- (b) An **interstitial** solid solution
4. Cite the values of the diffusion coefficients for the interdiffusion of carbon in both α -iron (BCC) and γ -iron (FCC) at 900°C. Which is larger? **Explain** why this is the case. (7%)
5. Define **Yield strength** at a strain offset of 0.002. (10%)
6. What is **pearlite microstructure** in carbon steels? (10%)
7. Define **strain hardening** of metals. (10%)
8. What is **eutectoid reaction**? (10%)
9. What is **heterogeneous nucleation**? (10%)