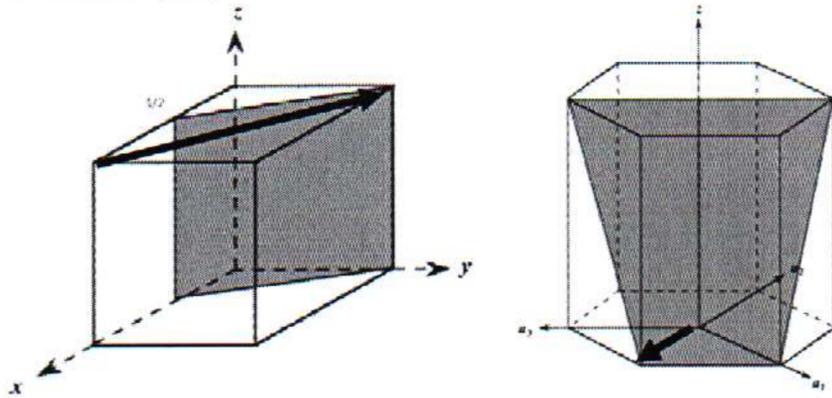


大同大學 101 學年度轉學入學考試試題

考試科目：材料科學導論 所別：材料工程學系 第 1/1 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。

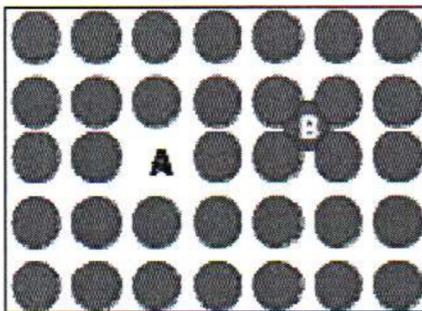
1. Determine the indices for the direction and plane shown in the following cubic unit cell and hexagonal unit cells: (8%)



2. Identify the three crystal structure: Body-Centered Cubic (BCC), Face-Centered Cubic (FCC), Hexagonal Close-Packed (HCP). (r : radius of sphere and a : length of cube side) (28%)

Crystal Structure	Atom/ unit cell	The relation between r and a	Coordination number	Atomic packing factor (APF)	Close-packed planes (Miller indices)
BCC	(1)	(2)	(3)	(4)	(5)
FCC	(6)	(7)	(8)	(9)	(10)
HCP	(11)	(12) $a=2r$, $c=1.633a$	(13)	(14)	(15)

3. () In below figure, A or B indicate self-interstitial. (4%)



4. () Match how HCP crystal structure may be generated by the stacking sequence of close-packed plane of atoms (1)ABAB... (2)ABCABC...(3)ACAC... (4%)

5. Of those metals listed in Table. I.
- (1) Which is the strongest? Why? (4%)
 - (2) Which is the hardest? Why? (4%)
 - (3) Which is the stiffest? Why? (4%)
 - (4) Which will experience the greatest percent reduction in area? Why? (4%)

Table. I Tensile Stress-Strain Data for Several Hypothetical Metals to be Used with Concept Checks 6.2 and 6.4

Material	Yield Strength (MPa)	Tensile Strength (MPa)	Strain at Fracture	Fracture Strength (MPa)	Elastic Modulus (GPa)
A	310	340	0.23	265	210
B	100	120	0.40	105	150
C	415	550	0.15	500	310
D	700	850	0.14	720	210
E	Fractures before yielding			650	350

< 背面繼續 >

大同大學 101 學年度轉學入學考試試題

考試科目：材料科學導論 所別：材料工程學系 第 2/2 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。

6. For a 40 wt% Sn– 60 wt% Pb alloy (Fig.1) at 150°C(300°F).

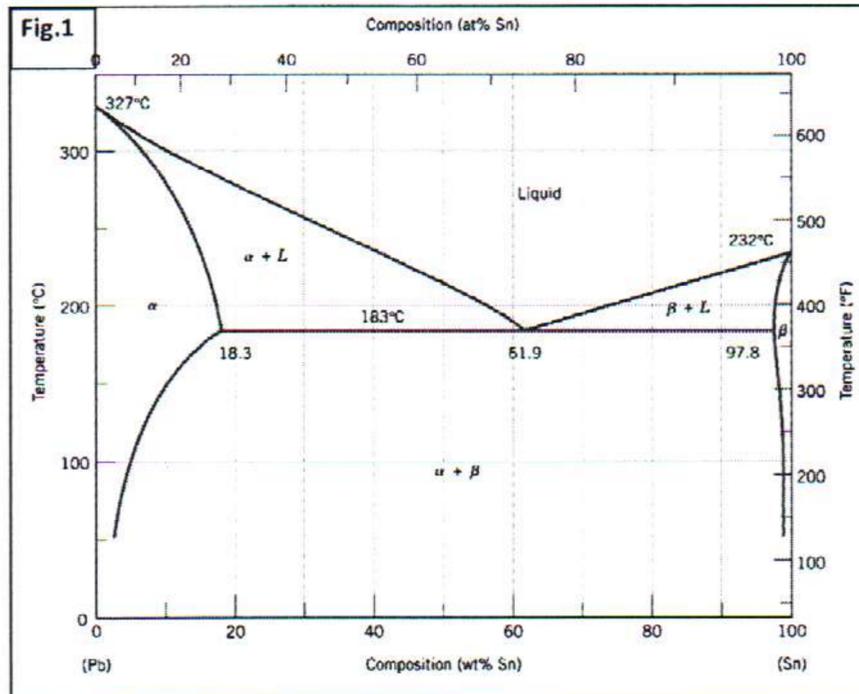
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(a) What phase(s) is (are) present?(4%)

(b) What is (are) the composition(s) of the phase(s)?(8%)

(c) Calculate the relative amount of each phase present in terms of mass fraction and volume fraction.(10%)

(The densities of Pb:11.23 and Sn:7.24 g/cm³, respectively.)



7. Briefly explain why fine pearlite is harder and stronger than coarse pearlite, which in turn is harder and stronger than spheroidite. (5%)

8. Cite two reasons why martensite is so hard and brittle. (8%)

9. Rank the following iron– carbon alloys and associated microstructures from the hardest to the softest: (a) 0.25 wt% C with coarse pearlite; (b) 0.80 wt% C with Spheroidite; (c) 0.25 wt% C with Spheroidite; (d) 0.80 wt% C with fine pearlite. Justify this ranking.(5%)