Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE	:	FTD 12102
SUBJECT TITLE	:	METALLURGY
LEVEL	:	DIPLOMA
TIME / DURATION	:	4.00 pm – 6.00 pm (2 HOURS)
DATE	:	14 NOVEMBER 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This question paper consists of FIVE (5) questions. Answer FOUR (4) questions only.
6. Answer all questions in English.

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FOUR (4) questions only.

Question 1

(a) Explain the general process of performing penetration hardness testing.

(10 marks)

(b) In steel processing, there are two basic steps involved. Describe the process to produce pig iron in a blast furnace. Picture will be an advantage.

(15 marks)

Question 2

(a) A Brinell hardness measurement using a 10mm diameter indenter and 500kg load, produces an indentation of 1.8mm on the sample. Calculate Brinell Hardness Number (BHN).

(5 marks)

(b) Why Silicon is considered as one of the important elements in carbon steel?

(5 marks)

(c) Identify **THREE (3)** important areas in the Complete Solid Solution Phase Diagram.

(15 marks)

Question 3

(a) Gold forms a FCC structure and has an atomic radius of 1.44 Å. Calculate the volume of its unit cell.

(6 marks)

(b) Define the meaning of quenching and list down each type of quenching starting from Phase 1 to Phase 2. Then, briefly describe the process involved in Phase 1.

(15 marks)

(c) Compare and contrast between covalent and ionic bonding.

(4 marks)

Question 4

(a) Refer Fig 1. Answer following question.

(i) State specifically the name of the above test.

(ii) What are the function of load cell and extensometer.

(iii) List down the information or data produced by the above test.

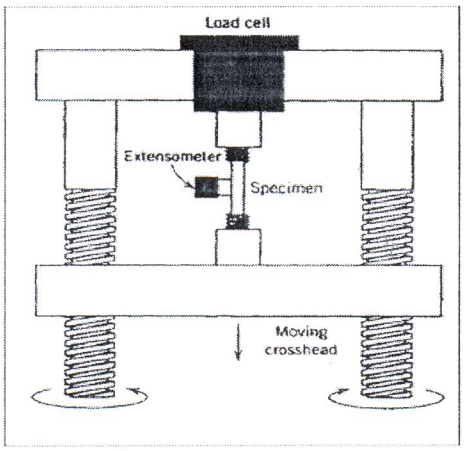


Figure 1: Mechanical test

(10 marks)

(b) Calculate the Vickers hardness number (VHN) for metal if the indentation cause by 50 kg is 1.5 mm for d1.

(5 marks)

(c) Draw a Complete Solid Solution Phase Diagram and show the important points in the diagram.

(10 marks)

Question 5

(a) Calculate the radius of a vanadium (V) atom, given that V has a BCC crystal structure, a density of 5.96 g/cm^3, and an atomic weight of 50.9 g/mol.

(6 marks)

(b) List down **FOUR (4)** factors that influencing corrosion.

(4 marks)

(c) By referring to Figure 2, describe the phenomena of failure associated and explain the needs of insulation.

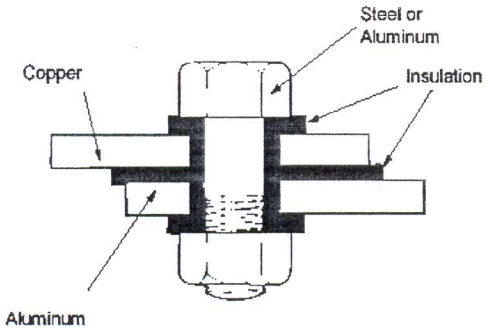
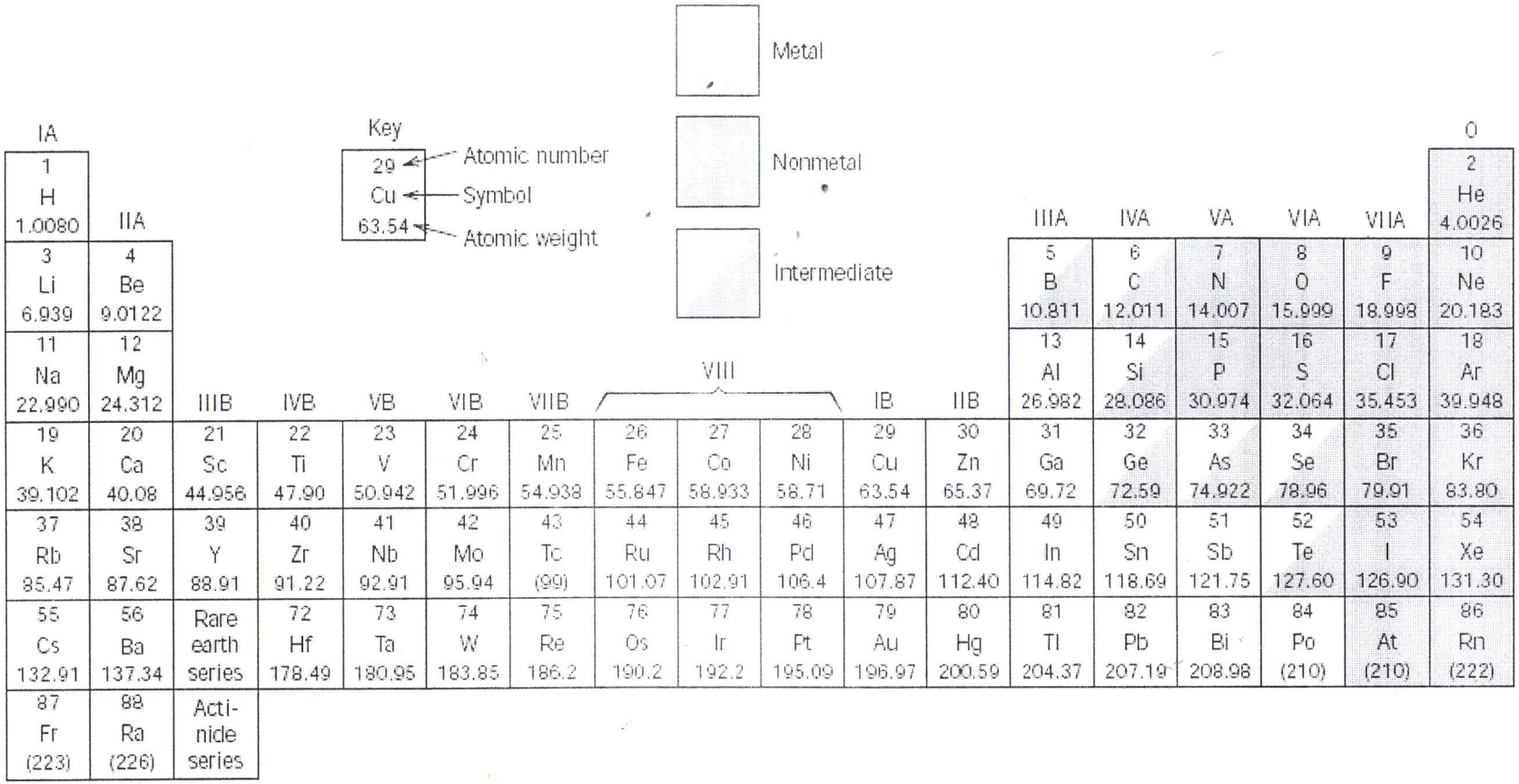


Figure 2: Failure of component

(15 marks)

END OF QUESTION



IA							VIII					IIIA	IVA	VA	VIA	VIIA	0
1 H 1.0080	IIA									IB	IIB						2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.183
11 Na 22.990	12 Mg 24.312	IIIB	IVB	VB	VIB	VIIB				IB	IIB	13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.91	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
55 Cs 132.91	56 Ba 137.34	Rare earth series	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.98	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	Acti-nide series															

Rare earth series	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
Actinide series	89 Ac (227)	90 Th 232.04	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (254)	103 Lw (257)

$$APF = (n)(\frac{4\pi r^3}{3})(\frac{1}{a^3})$$

$$\rho = \frac{nA}{V_c N_A}$$

$$N = \frac{N_A \rho}{A}$$

$$N_v = N \exp(\frac{-Q}{kT})$$

$$a_{fcc} = \frac{4r}{\sqrt{2}}$$

$$a_{bcc} = \frac{4r}{\sqrt{3}}$$

$$a_{sc} = 2r$$

$$D = D_o \exp(\frac{-Q_d}{RT})$$

$$m_\alpha phase = \frac{m_\beta - m_x}{m_\beta - m_\alpha} x Total\ Mass$$

$$m_\beta phase = \frac{m_x - m_\alpha}{m_\beta - m_\alpha} x Total\ Mass$$

$$m_L phase\% = \frac{m_s\% - m_x\%}{m_s\% - m_{L\%}} x100$$

$$m_s phase\% = \frac{m_x\% - m_L\%}{m_s\% - m_{L\%}} x100$$

$$\rho_\alpha = \frac{100}{\frac{C_{A(\alpha)}}{\rho_A} + \frac{C_{B(\alpha)}}{\rho_B}}$$

$$\rho_\beta = \frac{100}{\frac{C_{A(\beta)}}{\rho_A} + \frac{C_{B(\beta)}}{\rho_B}}$$

$$V_\alpha = \frac{\frac{m_\alpha}{\rho_\alpha}}{\frac{m_\alpha}{\rho_\alpha} + \frac{m_\beta}{\rho_\beta}}$$

$$V_\beta = \frac{\frac{m_\beta}{\rho_\beta}}{\frac{m_\alpha}{\rho_\alpha} + \frac{m_\beta}{\rho_\beta}}$$

$$\sigma = \frac{F}{A_o}$$

$$\varepsilon = \frac{\Delta l}{l_o}$$

$$E = \frac{\sigma}{\varepsilon}$$

$$\%elongation = \frac{\Delta l}{l_o} x100\%$$

$$\%\ area\ reduction = \frac{\Delta A}{A_o} x100\%$$

$$BHN = \frac{F}{\frac{\pi D}{2}(D - \sqrt{D^2 - d^2})}$$

$$VHN = \frac{1.85F}{d^2}$$