

	SONANNESBORG
PROGRAM	: BACHELOR OF ENGINEERING TECH. (BEngTech)
	ENGINEERING METALLURGY / EXTRACTIVE METALLURGY
<u>SUBJECT</u>	: FUNDAMENTALS OF METALLURGY B1
	PHYSICAL METALLURGY (PAPER1)
<u>CODE</u>	: METMTB1
DATE	SUPPLEMENTARY EXAMINATION
	JANUARY 2020
<b>DURATION</b>	: (2 HOURS)
<u>WEIGHT</u>	: 40: 60
TOTAL MARKS	: 100
FULL MARKS	: 100
<b>EXAMINER</b>	: Ms G.P APHANE
<b>MODERATOR</b>	: Mr LG JUGANAN
NUMBER OF PAGES	: 4 PAGES IN TOTAL
<b>INSTRUCTIONS</b>	: ALL THE ANSWERS MUST BE COMPLETED IN THE
	EXAM SCRIPTS AND QUESTION PAPERS MUST BE
	HANDED IN.
REQUIREMENTS	: 1 POCKET CALCULATOR
	NO CORRECTION FLUID SHALL BE USED

# ALL WORK SHALL BE HANDED IN.

#### **INSTRUCTIONS TO CANDIDATES:**

PLEASE ANSWER ALL THE QUESTIONS

# Question1

1.1 Differentiate between the following:

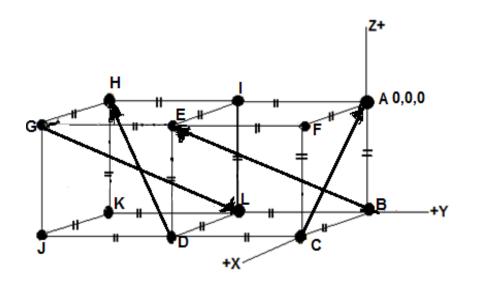
a. Frenkel and Schotkky defects	(4)
b. Microstructure and macrostructure	(4)
c. Atomic mass and atomic weight	(4)
d. Edge and screw dislocations	(4)
1.2 Name and explain three types of van der Waals forces.	(6)
	[22]

## Question 2

2.1 Referring from the periodic table, write the electron configuration and the valence				
electrons of potassium and bromine.	(8)			
2.2 State the functional classification of materials (there are eight of them) and				
include one example for each.	(16)			
	[24]			

# Question 3

3.1 Determine the coordinates for each point from B to L with A as the origin and the miller indices of GL, CA, DH and EB (11+8)



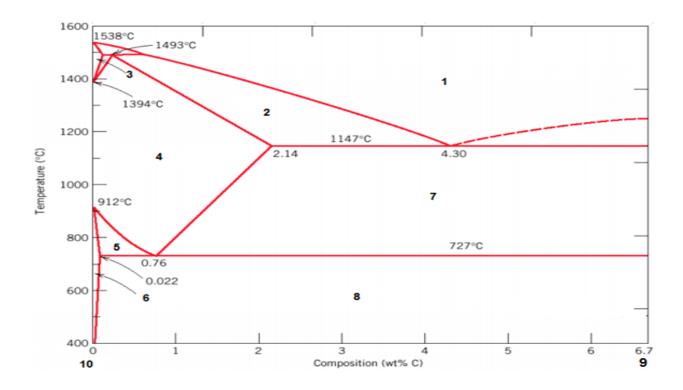
[19]

#### Question 4

4.1 The Iron (Fe) has a BCC structure with the atomic radius of 0.124nm. Deter	rmine
the lattice parameter.	(3)
4.2 State Pauli's exclusion principle.	(2)
4.3 The lattice parameter of BCC caesium is 6.13 Å. Calculate the density of caesium.	(5)
4.4 Calculate the radius of an iridium atom, given that Ir has an FCC crystal structure, a density of 22.4g/cm <sup>3</sup> .	(5) [15]

## Question 5

5.1 Referring to the iron-iron carbide diagram below, label the phases that are present from 1 to 10. [20]



TOTAL [100]

1 nanometer (nm) =  $10^{-9}$  m =  $10^{-7}$  cm = 10 Å 1 angstrom (Å) = 0.1 nm =  $10^{-10}$  m =  $10^{-8}$  cm

	7	6	сл		ω	2	-	
	132.90045 87 Francium (223)	Cs Cs	37 Rb Rubidium 85.4678	19 R Potassium 39 0983	Na Sodum 22 98977	3 Lithium 6.941	Hydrogen 1,00794	IA IA
	137.327 88 Radium Radium (226)	Ch	38 Sr Strontum 87.62	20 Ca Catolum 40.078	Magreesum	4 Beyllum 9.01218	IIA	
			39 Yatium 88.50585	21 Sc Scandium 44 95591	IIIA			
57 La Landhanum 138.9065 89 89 Actinium (227)	178.40 104 Rf Rutrestoctum (261)	Hf	40 Zr Zeconium 91 224	22 Ti Titanium 47.867	IVA			Peri
58 Cee Ceeum 140,116 90 7h Thorium 232,0391	105 Db Dubonium (262)	<sup>73</sup> Ta	A1 Nictium 92 50638	23 V Vanadium 50.9415	VA	Liquids Gases Artificial	Solids	iodi
59 Pr 140.80765 91 Protactinium 231.03588	106 Sg Seatoorgum (203)	¥	42 Mo Molytedenum 95.94	24 Cr Chromium 51.9961	VIA	Liquids Gases Artificially Prepared		с Та
60 Neodymium 144 24 92 Uranium 238 0289	107 107 Bh Bahrium (264)	75 Re	43 Tc Technelium	25 Mn Manganese 54 90805	VIIA	đ	Atomic	Periodic Table of the Elemer
61 Promethiam (145) 93 Np Neptunam (237)	100 23 100 23	0S	44 Ru Ruthernium 101.07	26 Fe Iron 55.845		Symbol	Atomic Number	of th
62 Sm Samarium 150.39 94 94 Pudonium (244)	109 Mt Methorium (208)	۳ ار	45 Rh Rhodiam 102.90550	27 Co Cobait 58 50320	VIIIA	Hydrogen 1.0079 -	26	Ie E
63 Europium 151.964 95 Americium (243)	196.078 196.078 10 110 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 10	78 Pt	46 Pd Palladium 105.42	28 Nickel Nickel S8 6934		4	-	lemo
64 Gd Gd Gadolinium 157.25 96 Com Cuitum (247)	196.90055 111 Unununium (272)	Au	A7 Ag Saver	29 Cu Copper S3.546	8	Atomic Weight		ents
65 Tb Terbum 158 92534 97 97 BK Bekellum (247)		BH	48 Cd Cadmium 112.411	30 Zn <sup>Znc</sup>	B			
66 Dy Dysprotum 102.50 98 Cf Californium (251)	Thallum 204.3633	<b>L</b>	49 In Indiam 114.818	31 Ga Gallum 69.723	Auminum 28 98154	5 Boron 10.811	IIB	
67 HO Hotmium 164 9002 99 <b>PS</b> Einsteentum (252)	207.2	82 Pb	50 Sn <sup>Te</sup> 118.710	32 Ge Germanium 72.61	Silcon 28.0855	G Canton 12.0107	IVB	
68 Ercium 167.28 100 Femium (257)	208.98038	Bi	51 Sb Antimony 121.760	33 AS Ansenic 74.92160	Phosphorus 30.97376	7 N Nitrogen 14.00674	VB	
69 Tm Thulium 168, 93421 101 Mendelevium (256)	(209)	Po	52 Tellurium 127.60	34 Se Selenium 78.96	Suthar 32.006	8 Ouygen 15, 9994	VIB	
70 Yb Yberbian 173.04 102 Nobelian (259)	(210)		53	35 Br Bromine 79.904	Chlorine 35 4527	9 Fucrine 18.99840	VIIB	_
71 Lutetum 174.087 103 Ln Lawrencium (262)	(222)	Rn	54 Xenon 131 20	36 Kr Krypton 83.80	Argon 39 548	Neon 20.1797	2 Heium 4 00280	<b>≤</b>