UNIVERSITY OF JOHANNESBURG

PROGRAM	: BACHELOR OF ENGINEERING TECH. (BEngTech) *ENGINEERING METALLURGY / EXTRACTIVE METALLURGY*
SUBJECT	: **FUNDAMENTALS OF METALLURGY B1** **PHYSICAL METALLURGY** (**PAPER1**)
CODE	: **METMTB1**
DATE	SUPPLEMENTARY EXAMINATION JANUARY 2020
DURATION	: (2 HOURS)
WEIGHT	: 40: 60
TOTAL MARKS	: 100
FULL MARKS	: 100
EXAMINER	: Ms G.P APHANE
MODERATOR	: Mr LG JUGANAN
NUMBER OF PAGES	: 4 PAGES IN TOTAL
INSTRUCTIONS	: 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

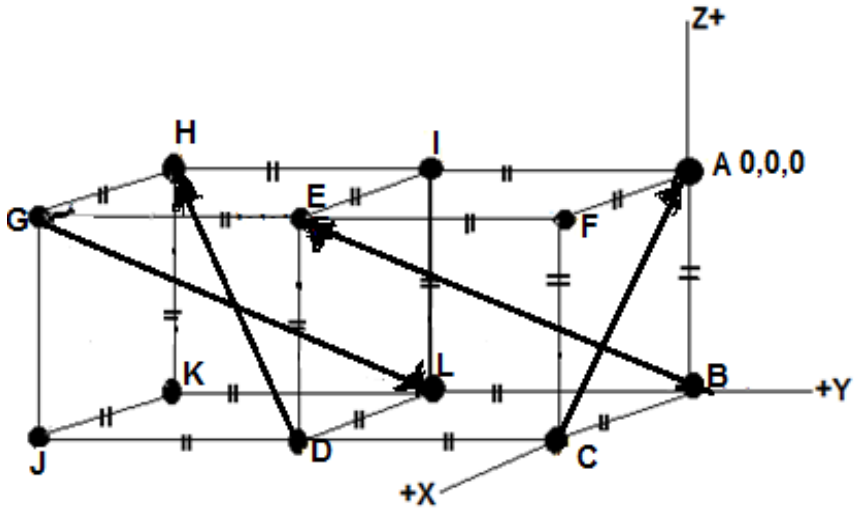
2.1 Referring from the periodic table, write the electron configuration and the valence electrons of potassium and bromine. (8)

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. Determine the lattice parameter. (3)

4.2 State Pauli's exclusion principle. (2)

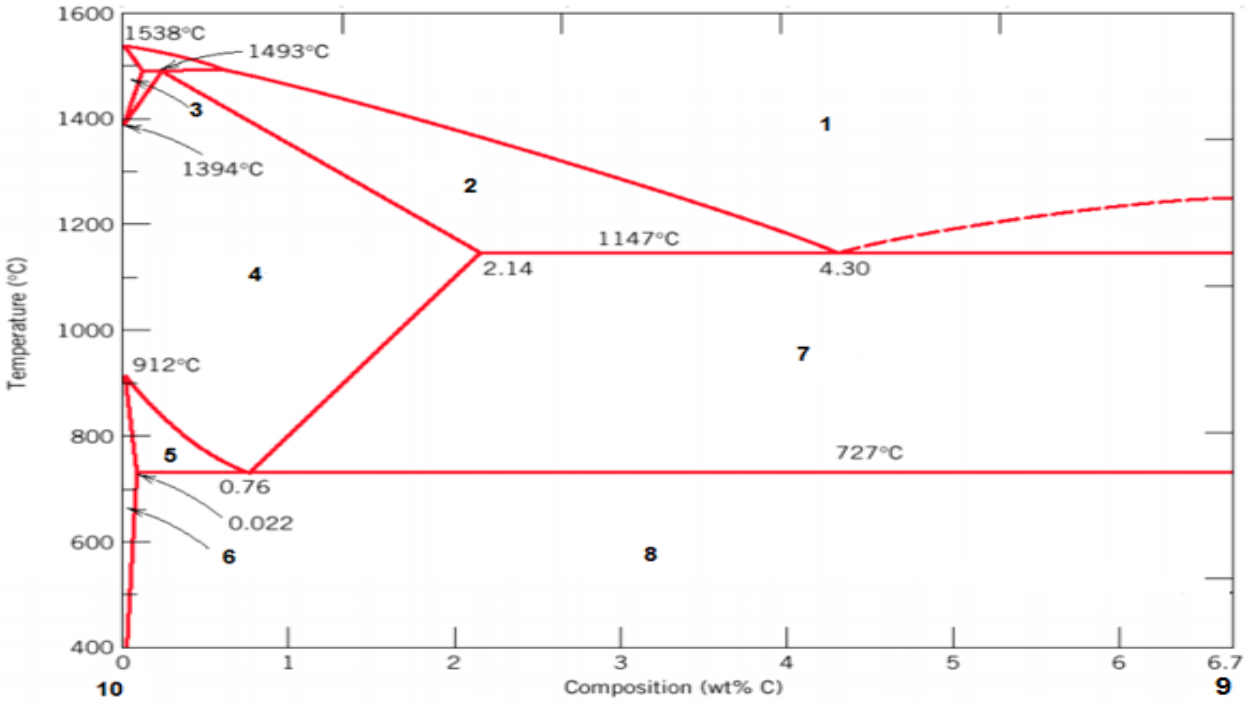
4.3 The lattice parameter of BCC caesium is 6.13 Å. Calculate the density of caesium. (5)

4.4 Calculate the radius of an iridium atom, given that Ir has an FCC crystal structure, a density of 22.4g/cm^3. (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

Periodic Table of the Elements