

SCHOOL OF CHEMICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST -I
FALL SEMESTER 2024-2025

SLOT: D1+TD1

Programme Name & Branch : B.Tech. Chemical Engineering
Course Code : BCHE206L
Course Name : Materials Science and Engineering
Faculty Name(s) : Dr. Thomas THEODORE (17964)
Class Number(s) : VL2024250108354
Date of Examination : 28 August 2024
Exam Duration : 90 minutes

Maximum Marks: 50

General Instruction(s):

- Answer ALL the questions.
- Use of non-programmable calculator is permitted.
- Figures should be neatly drawn using pencil.

Q. No.	Question	Marks
1.	a) Name the important criteria in selecting materials for a protective sports helmet. b) Identify materials that would satisfy the above criteria. c) Why would a solid metal helmet not be a good choice?	10
2.	Sterling silver contains 92.5 weight% silver and 7.5 weight% copper. Copper is added to silver to make the metal stronger and more durable. A small sterling silver spoon has a mass of 100 g. Calculate the number of copper and silver atoms in the spoon. Given the atomic weights of silver and copper are 107.87 and 63.55, respectively.	10
3.	In order to raise the temperature of 100 grams of water from room temperature (30°C) to boiling temperature (100°C), an energy input of 33,440 J is required. If one uses a microwave oven ($\lambda = 1.2$ cm) to achieve this, how many photons of the microwave radiation are required? determine the number of photons to achieve the same increase in temperature if ultraviolet ($\lambda = 1 \times 10^{-8}$ m), visible ($\lambda = 5 \times 10^{-7}$ m), and infrared ($\lambda = 1 \times 10^{-4}$ m) lights were used. What important conclusions can you draw from this exercise?	10
4.	Verify that the atomic packing factor for the BCC crystal structure is 0.68 and that for the FCC crystal structure is 0.74.	10
5.	(a) A cubic plane has the following axial intercepts: $a = 1/3$, $b = -2/3$, $c = 1/2$. What are the Miller indices of this plane? (05 Marks) (b) Draw the following crystallographic planes in cubic unit cells: (i) (110) and (ii) (221). (05 Marks)	10