PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - MAY/JUNE 2024   SET-A

Semester : Semester II - 2023   **Date :** June 13, 2024
Course Code : PHY1001   **Time :** 01.00PM - 04.00PM
Course Name : Material Physics   **Max Marks :** 100
Program : B.Tech   **Weightage :** 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ANY TEN QUESTIONS   **10Q X 2M=20M**

1. Explain the terms (i) Basis (ii) Space lattice (iii) Unit cell

    (CO1) [Knowledge]

2. Calculate the interplanar spacing of (100), (110) and (111) planes for a simple cubic structure?

    (CO1) [Knowledge]

3. Define coordination number and packing factor?

    (CO1) [Knowledge]

4. Write few properties of ceramic materials?

    (CO2) [Knowledge]

5. An iron bar 3 m long is stretches by 0.5 mm. Compute the strain.

    (CO2) [Knowledge]

6. What is the formula to calculate the strain?

    (CO2) [Knowledge]

7. Convert 30°C scale to Fahrenheit and Kelvin scale?

    (CO3) [Knowledge]

8. What are the Factors that affects the Corrosion rate?

    (CO3) [Knowledge]

9. At what temperature, Celsius and Fahrenheit equal, prove it?

    (CO3) [Knowledge]

10. When quantum confinement effect is observed in nanomaterials.

    (CO4) [Knowledge]

11. Why large surface area is important in nano materials?

    (CO4) [Knowledge]

12. What are the criterias for a particle to be called as nanoparticle?

(CO4) [Knowledge]

PART B

ANSWER ANY EIGHT QUESTIONS   8Q X 5M=40M

13. Derive the relationship between atomic radius and lattice parameter for SCC and FCC.

(CO1) [Comprehension]

14. How crystalline solids are different from amorphous (Non-crystalline) solids ?

(CO1) [Comprehension]

15. Steel and copper wires of the same length and radius are stretched by the same weight one after the other. Young's modulus of steel and copper are $2X10^{11}N/m^2$ and $1.2X10^{11}N/m^2$ respectively. The ratio of increase in length?

(CO2) [Comprehension]

16. A brass wire of length 2 m has one end, fixed to a rigid support, and from the other end, a 4 kg wt is suspended. If the cross-sectional area of the wire is $12.25X10^{-8}m^2$ Find the extension produced in the wire (Young's modulus of wire = $11X10^{10}N/M^2$)

(CO2) [Comprehension]

17. Explain different modes of heat transfer with examples.

(CO3) [Comprehension]

18. Write the difference Between Dry corrosion and Wet corrosion.

(CO3) [Comprehension]

19. Explain Zero dimension (0D), one dimension (1D), two dimension (2D) and Three dimension (3D) nanomaterials with neat diagrams and examples .

(CO4) [Comprehension]

20. (a) What happens to optical properties of the materials, when the size of the bulk material is reduced to few nanometers? (3 marks)
    (b) Nano particle has a band gap of 2 eV. Calculate the wavelength of light emitted by luminescence process. (2 Marks)

(CO4) [Comprehension]

21. State and explain seebeck effect and it's application.

(CO3) [Comprehension]

22. What are the different types of carbon nanotubes?

(CO4) [Comprehension]

PART C

ANSWER ANY FOUR QUESTIONS   4Q X 10M=40M

23. The Bragg's angle in the first order for (220) reflection from face centered cubic lattice is 38 degrees. When X-rays of wavelegth 1.54 Angstrom (Å) are employed in a diffraction experiment, determine the lattice parameter of same lattice.

(CO1) [Application]

24. (a) Write the difference between and ductile and brittle materials with examples. (4 Marks)
(b) The stress versus strain graphs for wires of two materials A and B are shown in below figure. Calculate the ratio of Youngs moduli of the material A and Material B. Which material is showing high youngs modulus? (6 Marks)
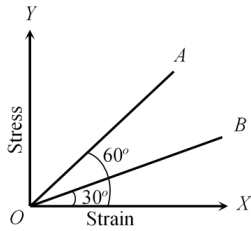
(CO2) [Application]

25. (a) Define corrosion and write harmful effects of corrosion. (4 marks)
(b) Explain the methods for preventing corrosion? (6 Marks)

(CO3) [Application]

26. Explain the applications of nanotechnology in different sectors with examples?

(CO4) [Application]

27. Read the following statements below carefully and state if it is true or false with reasons.
(a) The Young's modulus of rubber is greater than that of steel;
(b) The stretching of a coil is determined by its shear modulus.
(c) Hookes law is applicable only within elastic limit.
(d) Body centered cubic has greatest packing fraction?

(CO2,CO1) [Application]

28. (a) A metal rod is 64.522 cm long at 12 ^oC and 64.576 cm at 90 ^oC. Find the coefficient of linear expansion of its material.
(b) A quantum dot solution is emitting a red color with a wavelength of 700 nm. What is the energy associated with this wavelength of light?

(CO4,CO3) [Application]