



Reg. No. : .....

Name : .....

**Third Semester B.Sc. Degree (CBCSS – Supplementary) Examination,  
November 2022  
(2016 – 18 Admissions)  
CORE COURSE IN PHYSICS  
3B03PHY : Allied Physics**

Time : 3 Hours

Max. Marks : 40

- Instructions :** 1) Section – A : Answer **all** questions (very short answer type, **each** question carries 1 mark).  
2) Section – B : Answer **any seven** questions (short answer type, **each** question carries 2 marks).  
3) Section – C : Answer **any four** questions (short essay/problem type, **each** question carries 3 marks).  
4) Section – D : Answer **any two** questions (long essay type, **each** question carries 5 marks).  
5) Write answers in **English** only.

## SECTION – A

1. Define the term symmetry operations.
2. The packing fraction of a BCC structure is
3. As per Stokes law the viscous force acting on a spherical drop of radius  $a$  moving with velocity  $v$  is
4. Inductive reactance of an ac circuit is (4×1=4)

## SECTION – B

5. Explain the terms Lattice and Basis.
6. Sketch (1 0 0) and (1 0 1) planes in simple cubic cell.
7. Write a short note on :
  - 1) Unit cell and
  - 2) Primitive cell.
8. Describe simple cubic; face centred cubic and the hexagonal close packed structure.

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9. Explain equation of continuity in the case of a liquid flow.
10. Explain neutral surface and neutral axis of a beam.
11. State and explain superposition theorem.
12. Distinguish between streamline and turbulent motion of liquid.
13. Define Q factor of an LCR circuit.
14. Explain Kirchoff's laws. (7×2=14)

## SECTION – C

15. Explain the powder method of crystal structure analysis.
16. Calculate the glancing angle on the plane (1 0 0) of a rock salt crystal ( $a = 2.84 \text{ \AA}$ ) corresponding to second order diffraction maximum for X-ray wavelength  $0.8 \text{ \AA}$ .
17. State and prove maximum power transfer theorem.
18. An air bubble of radius 1 mm is allowed to rise through a long cylindrical column of a viscous liquid and travels at a steady rate of  $2.1 \text{ cm s}^{-1}$ . If the density of the liquid is  $1470 \text{ kg m}^{-3}$ , find its viscosity. Assume  $g = 9.8 \text{ m/s}^2$ , neglect the density of air.
19. If the excess pressure inside a spherical bubble is balanced by that due to a column of oil (relative density 0.8) 2 mm high when  $r = 1 \text{ cm}$ , find the surface tension of the soap bubble.
20. Explain the growth of current in a CR circuit. (4×3=12)

## SECTION – D

21. a) What are Miller indices ? How are they determined ?  
b) The orthorhombic crystal has lattice parameters in the ratio  $0.424 : 1 : 0.366$ . Find the Miller indices of a crystal plane whose intercepts are in the ratio  $0.212 : 1 : 0.183$ .
22. Show that Young's modulus  $Y$ , modulus of rigidity  $\eta$  and Poisson's ratio  $\sigma$  are related by the equation  $Y = 2\eta(1 + \sigma)$ .
23. State and prove Bernoulli's theorem and mention any 2 applications.
24. Derive an expression for impedance of an LCR series circuit. Explain Resonance. Obtain an expression for resonant frequency. (2×5=10)