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Ex/PG/SC/CBS/PHY/TH/403/2022

M. Sc. PHYSICS EXAMINATION, 2022

(2nd Year, 2nd Semester)

X-RAYS AND CRYSTALLOGRAPHY (II)

PAPER – 403

Time : Two hours

Full Marks : 40

Answer *any four* questions.

- c) Draw the stereographic projections of the following point groups.
- i) $\bar{3}$ ii) $3/m$ iii) $\bar{4}$
- d) Explain with a neat diagram how a third mutually perpendicular 2-fold axis is automatically generated when two 2-fold axes are placed perpendicular to each other. 2+1+4.5+2.5
5. a) Explain with a diagram how the operation of a two-fold screw axis (2_1) produces the invariance of a lattice point.
- b) Draw the space-group diagrams of $P1$ and $P\bar{1}$. Discuss how many inversion centers can exist in $P\bar{1}$.
- c) What is the asymmetric unit of a unit cell? Discuss the advantages with an example? 2+(3+3)+2

1. a) What is 'phase problem' in crystallography?
b) How phase problem can be overcome? 6+4
2. a) How the atoms are located in a structure through Patterson method?
b) Why this method is not useful for lighter atoms? 7+3
3. a) What do you mean by 'structure refinement'?
b) How the observed and calculated structures are assessed through the residual factors?
c) Why the anisotropic refinement is needed for non-hydrogen atoms? 4+3+3
4. a) Explain what is the point group symmetry for crystals?
b) Which crystal system exhibits highest number of point groups?

[Turn over