

## Survey of Materials

### Homework Extra, due date is end of the course

**Notes:** In multiple choice problems explain your answer. Be concise: if your answer is correct but the explanations contain mistakes or irrelevant information the grade will be decreased. Add references if needed. Upload solution as a single file "YourName.pdf" or "YourName.zip".

#### Material structural properties

1. What materials readily form amorphous structures rather than crystalline: (A) metals; (B) ionic solids; (C) covalent solids; (D) molecular solids; (E) polymers.

#### Basic geometry of molecules

2. For  $P_4O_6$  molecule determine point group, asymmetric unit, and independent geometrical parameters (two sets: coordinates and internals).

#### Basic geometry of crystals

3. For pyrite: ( $FeS_2$ ) crystal determine space group, asymmetric unit, and independent geometrical parameters (two sets: coordinates and internals).

#### Crystallography

4. What is the difference in coordination polyhedra of Y and  $\alpha$ -La?

#### Electronic structure

5. From the band structure shown here <http://zhugayevych.me/edu/Materials/images/bands.png>, determine bandgap(s) and bandwidth(s). Speculate on possible chemical composition and crystal structure.