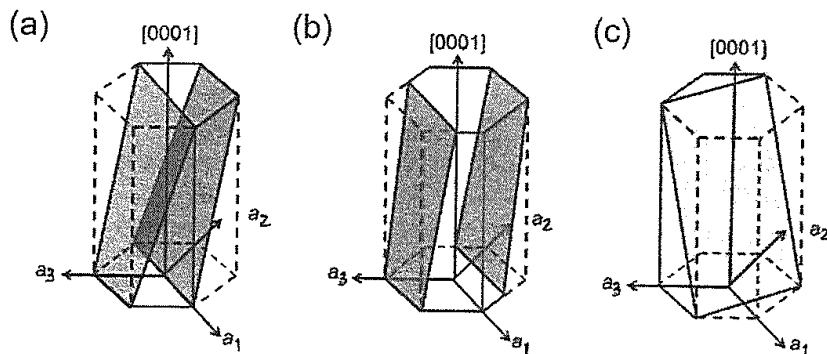
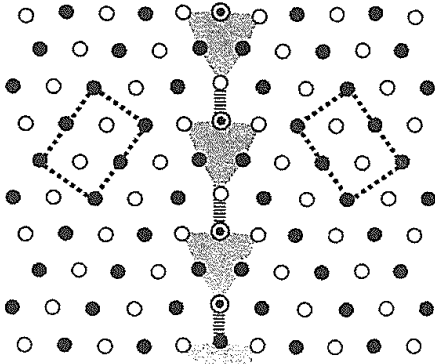


1. Please explain, in details, two of the following materials fields: (1) high-entropy alloy, (2) gradient materials, (3) MRAM, (4) 2D materials, and (5) quantum materials. (10%)
2. Of poly(hexamethylene adipamide) and poly(hexamethylene adipate), which polymer would be better used for cloth? Why? (10%)
3. A crystalline polymer was stretched several hundred % at room temperature (RT). X-ray diffraction spectrum was acquired while held under tension. When the sample was released, the polymer retracted and diffraction peaks disappeared. Explain this phenomenon, especially with consideration of relationship between T_m and RT. (10%)
4. Sketch crystal structure of $BaTiO_3$, Al_2O_3 , and ZrO_2 . (10%)
5. Please list, as least, four methods to improve fracture strength of ceramic materials. (10%)
6. Why is Si-Ge proposed to be promising semi-conductor materials? Please answer this question in English only. (10%)
7. Please index gray planes as shown below by Miller indices. (10%)



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8. The schematic diagram below shows a grain boundary of face-centered cubic crystals along $[1\ 1\ 0]$ projection direction. Please define Σ value for this boundary. Is it a coherent boundary? (10%)



9. "In metallic materials, raising work hardening rate could enhance materials elongation." Please justify this statement in details. (10%)
10. What is delayed fracture in general? Of 304L and 316L stainless steels, which could have higher susceptibility to delayed fracture. (10%)