1 Spectroscopy

1/31:

1. Does the wavelength of the characteristic radiation caused by bombarding of the anode material with electrons depend on voltage? Please, explain.
2. Please, explain which effects take place in the X-ray tube upon increasing the current and voltage.
3. Determine the maximum wavelength of the X-ray emission caused by electrons traveling with 35 keV of energy.
4. Which material will work better for X-ray absorption: Fe or Pb? Note: Fe has atomic number and atomic weight equal to 26 and 55.8, respectively; Pb has atomic number and atomic weight equal to 82 and 207.2, respectively. Please, explain.
5. List three types of interactions of X-rays with matter.
6. Define the Bravais lattice for graphene.
7. Pt has a structure where Pt atoms occupy the positions at the vertices of the cube and in the middle of the facets. Please, draw the Bravais lattice for Pt. How many atoms are in the basis for the lattice? If the Pt atoms at the facets of the cube will be replaced with something else (e.g., Au), will it affect the Bravais lattice?
8. What are the types of Bravais lattices?
9. Pt was alloyed with Co and a PtCo alloy was formed. Please, analyze the peak positions measured for the Pt and PtCo alloy, and make a conclusion about the trend of peak positions in the XRD diffractogram of $CoPt_3$ if it has the same lattice.

	Pt	PtCo	$CoPt_3$
(111)	39.036	40.252	
(200)	45.876	46.425	
(220)	66.905	68.117	
(311)	80.624	81.662	

10. The shell of an unknown material was grown around Pt nanoparticles. As a result, the peak positions of Pt were shifted by $\sim 1.5\%$ toward the higher 2θ. Please, calculate the strain.
11. Please, think about your project and come up with an experiment that involves X-ray diffraction. If this method is not relevant to the scope of your research, explain your reasoning.