Reaction Identification, Lewis Dot Structures, and VSEPR of Explosive Compounds

Use the paper entitled: High-Energy-Density Materials: Synthesis and Characterization of N5+[P(N3)6]−, N5+ [B(N3)4]−, N5+ [HF2]−⋅n HF, N5+[BF4]−, N5+ [PF6]−, and N5+ [SO3F]− (Angew. Chem. Int. Ed. *2004*, 43, 4919-4914.) and your fundamental knowledge of general chemistry to answer the following questions.

A. Use Reaction 11 on page 4922 to answer the following questions:

1. What kind of reaction is this? (double displacement, redox, precipitation, acid-base, combustion, gas evolution)
2. Is the reaction balanced?
3. Write out the total ionic equation. Label the spectator ions. Note: SbF6- is an (unusual?) polyatomic ion
4. Write out the net ionic equation.
5. Draw a picture of what species are in solution once the reaction has gone to completion. Make sure to include the precipitate in your drawing.

B. VSEPR theory

1. Draw the Lewis structures and include any significant resonance structures of the following ions:
2. **SbF6-**
3. **N(CF3)2-**
4. **SO3F-**
5. **N5+ (*bonus*)**
6. Draw and name the molecular and electronic geometries of the central atoms using VSEPR. Make sure that your structures from above have the correct central atom before starting. *(Bonus) For N5+, do this for each nitrogen atom in your most reasonable resonance structure*

C. Look at Figure 5 on page 4922 and consider the following questions

3) Which N5+ compound synthesized in this paper is the most explosive?

**N5[SbF6] N5[PF6] N5[BF4] N5[SO3F] N5[P(N3)6] N5[B(N3)4]**

Why?? [Students may need to access external resources to fully answer this question.]