Atomic Nuclear structure

Objective: How and why does an atom acquire mass and charge

1. Aluminum has 44 known isotopes. Although only 1 stable form of aluminum, the term stable meaning it does not undergo radioactive nuclear decay. Al-27 is stable and Al-26 is radioactive with a half-life of 105 years.
   a. If an aluminum atom has 14 neutrons, will it be radioactive? 13\text{Al} - 27 \text{No} 
   b. What is the mass number of this atom? 27
   c. What is the mass number of the most common isotope of aluminum based upon its average atomic mass? 27
   d. This same aluminum atom, given the opportunity, will (gain/lose) 3 electrons in nature to form a (cation/anion) with a charge of \( \pm 3 \).
   e. Aluminum is undergoing (oxidation/reduction) as it forms its most common ion.
   f. Write the reaction of letter e of the previous question. \( \text{Al} \rightarrow \text{Al}^{3+} + 3e^- \)
   g. (true/false) Aluminum gains protons to become a +3 charge.
   h. Why is the average atomic mass not on the periodic table?

2. Chlorine has two very common isotopes that occur in nature. Cl-35 and Cl-37.
   a. Based upon the average atomic weight of this substance sketch a bar graph below that would provide evidence supporting the average atomic weight.

   ![Bar Graph](image)

   b. Student hypothesis: The difference in mass of various isotopes is due to the fact that electrons is specific atoms are easily lost and gained forming cations and anions. Justify/Nullify.

   e\text{-} \text{almodA} \text{ vs } \text{modA}

   c. Based upon what you know about the structure of the chloride ion,
      i) How many protons and electrons does it have? \( \text{Cl}^{-} 17, 18e^- \)
      ii) What charge does it form and why does it form this charge?
      \(-1\), Shell out a shell = stable