are boron (B); silicon (Si); germanium (Ge); arsenic (As); antimony (Sb) and tellurium (Te).

6. **Metals are solids at room temperature (with mercury the sole exception) - non-metals include solids, one liquid (bromine) and gasses.**

Physical properties:

- **Metals conduct electricity - non-metals do not (the allotrope of carbon, graphite, is an exception but is not a *metallic conductor* as its conductivity actually *increases* with temperature).**
- **Metals are shiny, malleable and ductile - non-metals are not normally associated with these properties.**
- **Metals usually have a higher density than non-metals.**

Chemical properties:

- **Metals are cationic and non-metals anionic in salts.S.**
- **Some metals react with acid to give hydrogen gas and the metal cation - nonmetals do not react in this way.**
- **Metal oxides are basic in nature - non-metal oxides are acidic.**

7.

	N	Cl	H
amount in 100 g	26.2	66.4	7.5
ratio (divide by atomic mass)	$\frac{26.2}{14.01} = 1.87$	$\frac{66.4}{35.45} = 1.87$	$\frac{7.5}{1.08} = 7.44$
divide by smallest	$\frac{1.87}{1.87} = 1.00 \sim 1$	$\frac{1.87}{1.87} = 1.00 \sim 1$	$\frac{7.44}{1.87} = 3.98 \sim 4$

The empirical formula is $NClH_4$ – probably ammonium chloride $[NH_4]^+[Cl^-]$

8. **The molar mass of H_2 is $2 \times 1.008 = 2.016$ g mol^{-1}. The number of moles in 4.00 g is:**

$$\text{number of moles} = \frac{\text{mass (in g)}}{\text{molar mass (in g mol}^{-1})} = \frac{4.00\,\text{g}}{2.016\,\text{g mol}^{-1}} = 1.98\ \text{mol}$$

The molar mass of Cl_2 is $2 \times 35.45 = 70.90$ g mol^{-1}. The number of moles in 10.00 g is:

$$\text{number of moles} = \frac{\text{mass (in g)}}{\text{molar mass (in g mol}^{-1})} = \frac{10.0\,\text{g}}{70.90\,\text{g mol}^{-1}} = 0.141\ \text{mol}$$

The reaction is:

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

***One* mole of H_2 reacts with *one* mole of Cl_2 to give *two* moles of HCl. There is more H_2 present than can react with the amount of Cl_2 – H_2 is in excess and at the end of the reaction (1.98 – 0.141) mol = 1.84 mol of H_2 will be left over.**