Atomic Structure and Bonding

Set 5: Atomic Structure and the Periodic Table

answers in red

1. Copy and complete the following table for the first 20 elements, one example is done for you.

Z	Name	Symbol	Metal/non-metal	Electron configuration	Valence electron behaviour	Bonding
1	Hydrogen	H	Non-metal	1	Shares e/ Loses 1 e	Covalent/ ionic
2	Helium	He	Non-metal	2	None	Non-bonding
3	Lithium	Li	Metal	2, 1	Loses 1 e	Ionic/metallic
4	Beryllium	Be	Metal	2, 2	Loses 2 e	Ionic/metallic
5	Boron	B	Non-metal	2, 3	Shares e	Covalent
6	Carbon	C	Non-metal	2, 4	Shares e	Covalent
7	Nitrogen	N	Non-metal	2, 5	Shares e/ gains 3 e	Covalent/ionic
8	Oxygen	O	Non-metal	2, 6	Shares e/ gains 2 e	Covalent/ionic
9	Fluorine	F	Non-metal	2, 7	Shares e/ gains 1 e	Covalent/ionic
10	Neon	Ne	Non-metal	2, 8	None	Non-bonding
11	Sodium	Na	Metal	2, 8, 1	Loses 1 e	Ionic/metallic
12	Magnesium	Mg	Metal	2, 8, 2	Loses 2 e	Ionic/metallic
13	Aluminium	Al	Metal	2, 8, 3	Loses 3 e	Ionic/metallic
14	Silicon	Si	Non-metal	2, 8, 4	Shares e	Covalent
15	Phosphorus	P	Non-metal	2, 8, 5	Shares e/ gains 3 e	Covalent/ionic
16	Sulphur	S	Non-metal	2, 8, 6	Shares e/ gains 2 e	Covalent/ionic
17	Chlorine	Cl	Non-metal	2, 8, 7	Shares e/ gains 1 e	Covalent/ionic
18	Argon	Ar	Non-metal	2, 8, 8	None	Non-bonding
19	Potassium	K	Metal	2, 8, 8, 1	Loses 1 e	Ionic/metallic
20	Calcium	Ca	Metal	2, 8, 8, 2	Loses 2 e	Ionic/metallic

2. a) What elements appear to always lose electrons? Metals
   b) Describe the position of these elements on the periodic table.
   Left of the periodic table

3. a) What elements appear to always gain electrons? Non-metals
   b) Describe the position of these elements on the periodic table.
   Right of the periodic table

4. a) What elements do not gain or lose electrons? Carbon, boron and silicon.
   b) Describe the position of these elements on the periodic table.
   They are in the middle of the table.

5. Is there a pattern between the number of valence electrons and whether or not electrons are gained or lost?
When up to three valence electrons are present they are usually lost to achieve an octet.
When four are present, they are neither gained nor lost, they will share.
When more than four electrons are present, they will gain more to make an octet.
Atoms with a stable octet will neither gain, lose nor share electrons as it is stable.