SCH3U	Unit Test				
Matter, Trends & Bonding	NAME:	/20 K	/14 I	/8 C	/15 A	/57

PART A: Multiple Choice (12 marks)

Circle the best answer.

1. Which of the following is an example of a chemical change?
   a. A substance melts
   b. A gas is produced
   c. Salt dissolved in water
   d. All of the above

2. The atomic mass of barium is due to the number of:
   a. Neutrons and electrons in the nucleus
   b. Electrons in the nucleus
   c. Protons and neutrons in the nucleus
   d. Protons and electrons in the atom

3. In the alkali metals group, as the atomic number increases:
   a. the electronegativity increases
   b. the electronegativity decreases
   c. the atomic radius decreases
   d. the electron affinity increases

4. In a neutral atom:
   a. the number of protons is always equal to the number of neutrons
   b. the number of neutrons is always equal to the number of electrons
   c. the number of protons is always equal to the number of electrons
   d. the atomic number is always equal to the number of neutrons

5. Of the following attractions which is generally the weakest attractive force between particles?
   a. Ionic bond
   b. Covalent bond
   c. Dipole - dipole force
   d. London dispersion force

6. Consider the equation $X(g) + \text{energy} \rightarrow X^+ + e^-$. The "energy" represents:
   a. Electron affinity
   b. heat of sublimation
   c. ionization energy
   d. sublimation energy

7. Electron affinity increases as you go from left to right on the periodic table because
   a. atomic radius decreases
   b. ionization energy decreases
   c. of the periodic law
   d. all of the above

8. When fluorine forms an ionic bond it tends to
   a. Lose electrons
   b. Gain electrons
   c. Share electrons
   d. Lose protons

9. Which of the following is **NOT** a molecular compound?
   a. CO(g) b. Co(s) c. $CO_2(g)$ d. CH_4(g

10. Which of the following substances is most likely to have hydrogen bonding?
    a. Ammonia, NH_3 (g)
    a. Methane, CH_4 (g)
    b. Phosphine, PH_3 (g)
    c. All of the above

11. What type of bond is likely to form between the elements molybdenum, Mo and chlorine, Cl?
    a. Non polar covalent
    b. Polar covalent
    c. Ionic
    d. None of the above

12. Which statement is true about the elements sulfur, S, and chlorine, Cl?
    a. They are in the same group
    b. They are in the same period
    c. They are both metalloids
    d. They are both halogens

PART B: Match-Up (8 marks)

Match the term on the left with the most appropriate definition on the right.

1.	Polar Covalent Bond		A	The energy that is needed to remove an electron from a neutral atom.
2.	Isotopes		B	A chemical bond in which two electrons are shared by two atoms.
3.	Ions		C	An arrangement of eight electrons in the valence shell of an atom.
4.	Ionization Energy		D	A covalent bond between atoms that have significantly different electro negativities. This results in the electron pair being shared unevenly.
5.	Atomic Radius		E	A positively or negatively charged particle that results from a neutral atom or group of atoms giving up or gaining electrons
6.	Stable Octet		G	The distance from the nucleus of an atom to the approximate outer boundary of the cloud-like region of its electrons.
7.	Covalent Bond		H	Atoms of an element that are chemically similar but have different numbers of neutrons and thus, different mass numbers.
8.	Electro negativity		J	A relative measure of an atom's ability to attract shared electrons in a chemical bond.

PART C: Short Answer (37 marks)

Answer the following questions in the space provided. Please be sure to write complete answers.

1. What are three possible ways in which an atom can achieve a complete octet? **[A-3]**

2. Chromium is found in small quantities in the environment throughout Canada. This element occurs naturally as four different isotopes, as shown in the table below:

Isotope	Abundance (%)
Cr-50	4.35
Cr-52	83.79
Cr-53	9.50
Cr-54	2.36

What is the atomic mass of chromium? **[I-3]**

3. A friend has read that touching tarnished silver to aluminum foil immersed in very hot water can remove tarnish. However, the water must be able to conduct electricity for the reaction to take place. Your friend is considering dissolving either table sugar, $C_{12}H_{22}O_{11}$ (s), or washing soda, Na_2CO_3(s), in the water to facilitate the tarnish removal method. Which compound would you recommend? Why? **[A-2]**

4. (a) Draw the Bohr-Rutherford diagram for an atom of aluminium-27. **[I-6]**

(b) Provide the **electron configuration** for aluminium: _____

(c) What **ion** is formed by the atom in part a (provide the symbol with charge)? _____

(e) Name one element that might gain the three electrons from the atom and become stable. _____

5. A student records the following evidence in a lab book.

Unknown substance	Pure state	Solubility in water	Solution conductivity
I	solid	high	low
II	solid	low	low
III	solid	high	none
IV	solid	high	high

Which of the substances in the table above is most likely an ionic compound? Explain your answer. **[I-3]**

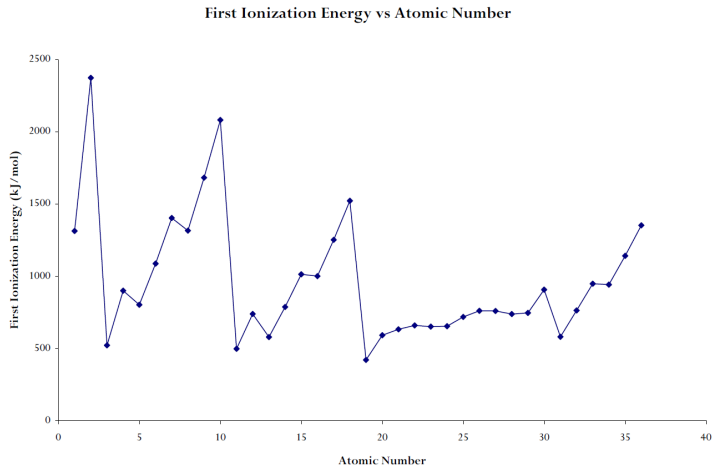
6. For each pair of elements listed below:
   i. predict the type of molecule/compound that would be formed **[I-2]**
   ii. draw the chemical formula, Lewis structure and structural formula for each compound (if possible) **[C-6]**
   iii. name each compound. **[C-2]**

b. Sulfur and chlorine

c. Sodium and oxygen

7. Imagine you are clasping a hockey puck in your hands. Anyone who wants to take that puck from you will have to exert energy to do so.
   a. How is this situation **analogous** (similar) to removing a valence electron from an atom? **[A-2]**

   b. Using the following graph, answer the following questions:



   i. What is the trend shown across the period (left to right)? **[A-1]**

   ii. Using key terms described in class, explain why this trend occurs. **[A-3]**

   iii. What is the trend shows as you move down a group? **[A-1]**

   iv. Using key terms described in class, explain why this trend occurs. **[A-3]**