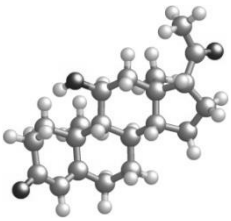


Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Assignment One on Chemical Bonding

• **Ions:**

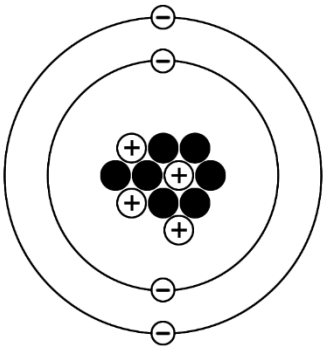
1. Atoms of metallic elements become ions by…

A Gaining electrons
B Sharing electrons
C Losing electrons
D Gaining electrons

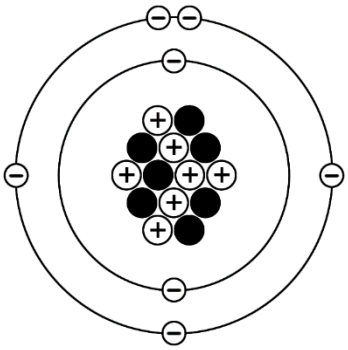
2. Element **Z** has six valence electrons. Its ion is represented by…

A Z^{+}
B Z^{-}
C Z^{2+}
D Z^{2-}

3. The diagram below shows the atomic structure of two particles, **X** and **Y**.



Particle **X**



Particle **Y**

Complete the table below for both particles.

	Particle **X**	Particle **Y**
Name of Element		
Nuclide Notation		
Electronic Configuration		
Formula of Ion Formed		

4. Using the information given in the table, answer the following questions.

Element	Atomic Number	Mass Number	Electronic Configuration
A	4	9	2,2
B	10	20	2,8
C	17	35.5	2,8,7
D	12	24	2,8,2
E	19	39	2,8,8,1

a) State two elements that are able to form ions with the same electronic configuration as argon.

……...

……...

b) Which element(s) form positive ion(s)? For each element that forms a positive ion, write down the formula of the ion formed (use the symbols given in the question).

……...

……...

c) Which element(s) form negative ion(s)? For each element that forms a negative ion, write down the formula of the ion formed (use the symbols given in the question).

……...

……...

5. The atomic number of aluminium is 13. Write the electronic configuration of the aluminium **ion**.

……...

6. Give the nuclide notation of a known element / ion that contains 18 electrons, 16 protons and 16 neutrons.

……...

7. Calcium forms the ion Ca^{2+}. How many protons and electrons does a single Ca^{2+} ion contain?

Number of protons: ……

Number of electrons: ……

8. Draw the stated diagrams for the following ions.

	Dot-and-cross diagram showing the valence electrons only:	Dot-and-cross diagram showing the **full** electronic configuration – **all** electrons and shells:
a) A chloride ion, Cl^-		
b) A magnesium ion, Mg^{2+}		
c) A potassium ion, K^+		

• Ionic Bonding:

9. **a)** Draw a dot-and-cross diagram, showing the valence electrons only, to show the bonding in magnesium fluoride.

b) The formula of magnesium fluoride is: ……...

10. The table below gives the electronic configurations of five elements.

Element	Electronic Configuration
A	2,3
B	2,8,7
C	2,8,1
D	2,8,8
E	2,6

Use the information given in the table to answer the following questions.

a) **i)** Element **B** and **C** react to form a compound. Draw a dot-and-cross diagram, showing the valence electrons only, to show the bonding between elements **B** and **C**.

ii) The formula of the compound formed between elements **B** and **C** is: ……..

b) **i)** Element **C** and **E** react to form a compound. Draw a dot-and-cross diagram, showing the valence electrons only, to show the bonding between elements **C** and **E**.

ii) The formula of the compound formed between elements **C** and **E** is: ……..

11. The table below gives the locations of six different chemical elements in the Periodic Table.

Element	Group Number	Period Number
P	2 (II)	2
Q	1 (I)	4
R	13 (III)	3
S	17 (VII)	3
T	16 (VI)	2
U	17 (VII)	4

Use the information given in the table to answer the following questions.

Write the chemical formula for the compound formed by elements:

a) **P** and **S**: ……

b) **Q** and **T**: ……

c) **R** and **U**: ……

12. **W**, **X**, **Y** and **Z** are four consecutive elements with atomic numbers n, $n + 1$, $n + 2$ and $n + 3$ respectively. **Y** is a chemically inert gas.

a) Element **W** and element **Z** react together to form a solid compound **T**.

i) State the type of bonding found in compound **T**.

……

ii) Give the formula of compound **T**.

……

b) Element **X** forms a compound with element **Z**.

i) Give the formula of the compound formed between element **X** and element **Z**.

……

ii) Draw a dot-and-cross diagram, showing the valence electrons only, to show the bonding between element **X** and element **Z**.

13. What is the chemical formula of a compound formed between a Group 2 (II) element **X** and a Group 16 (VI) element **Y**?

……..

14. a) Draw lines to match the names of the polyatomic ions with their formulae.

Name of Polyatomic Ion	Formula of Polyatomic Ion
Hydroxide •	• NH_4^+
Sulfate •	• OH^-
Nitrate •	• NO_3^-
Carbonate •	• SO_4^{2-}
Ammonium •	• CO_3^{2-}

b) Element **A** is silvery grey in colour and forms a compound with hydroxide ions (OH^-) which has the formula **A**OH. Which Group of the Periodic Table does element **A** belong to?

……..

15. Which Group of the Periodic Table does element **D** belong to if it forms a compound with calcium which has the formula Ca**D**$_2$?

……..

• Covalent Bonding

16. The electronic configurations of elements **U**, **V**, **W**, **X** and **Y** are shown below:

U: 2,8,1 **V**: 2,8,6 **W**: 1 **X**: 2,7 **Y**: 2,4

Complete the table below to indicate the type of bonding (ionic or covalent) and the formula of the compound that is formed when the following pairs of element react and bond together.

Elements	**U** and **W**	**V** and **Y**	**W** and **Y**	**U** and **X**
Type of Bond				
Formula of Compound				

17. Hydrogen chloride is a covalent compound while sodium chloride is an ionic compound.

a) Explain, in terms of electrons, how a covalent compound differs from an ionic compound.

……...

……...

b) Explain how a covalent compound differs from an ionic compound in terms of the type of elements that typically form the compounds.

……...

……...

18. Draw dot-and-cross diagrams, showing the valence electrons only, to show the bonding present in the compounds formed when the following pairs of elements combine together.

a) hydrogen and chlorine	**b)** hydrogen and oxygen
c) carbon and hydrogen	**d)** carbon and oxygen

- Scan the QR code given below to view the answers to this assignment.

http://www.chemist.sg/chemical_bonding/assignment/bonding_assignment_one_ans.pdf

Periodic Table of the Chemical Elements (2017)

Group																	
1	2											13	14	15	16	17	18
							1 H hydrogen 1.0										2 He helium 4.0
3 Li lithium 6.9	4 Be beryllium 9.0		Key atomic number atomic symbol name relative atomic mass									5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2
11 Na sodium 23.0	12 Mg magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9
19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium –	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57–71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

lanthanoids	57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium –	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.1	71 Lu lutetium 175.0
actinoids	89 Ac actinium –	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –