

# Science (Chemistry) ~ Covalent & Ionic Bonding

Name : \_\_\_\_\_ ( ) Class: \_\_\_\_\_ Date : \_\_\_\_\_

## Metals & non-metals

| I II |    |        |    |    |    |    |    |    |    |    |    | NON-METALS |    |    |    |     | U  |
|------|----|--------|----|----|----|----|----|----|----|----|----|------------|----|----|----|-----|----|
|      |    |        |    |    |    |    |    |    |    |    |    | III        | IV | V  | VI | VII | He |
| Li   | Be |        |    |    |    |    |    |    |    |    |    | B          | C  | N  | O  | F   | Ne |
| Na   | Mg | METALS |    |    |    |    |    |    |    |    |    | Al         | Si | P  | S  | Cl  | Ar |
| K    | Ca | Sc     | Ti | V  | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga         | Ge | As | Se | Br  | Kr |
| Rb   | Sr | Y      | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In         | Sn | Sb | Te | I   | Xe |
| Cs   | Ba | La     | Hf | Ta | W  | Re | Os | Ir | Pt | Au | Hg | Tl         | Pb | Bi | Po | At  | Rn |

metals
  non-metals

dividing line between metals and non-metals

## Metals

- Group 1 and Group II are metals.

⇒ 2, 1    2, 8, 1    2, 8, 8, 1 & Proton no 3, 11, 19

⇒ 2, 2    2, 8, 2    2, 8, 8, 2 & Proton no 4, 12, 20

metals

- 2, 8, 3 or Proton no 13 is also a metal.

## Non - metals

- Group VI ( except Po ) and Group VII are non-metals

$\Rightarrow 2, 6 \quad 2, 8, 6$  & Proton no 8, 16  
 $\Rightarrow 2, 7 \quad 2, 8, 7$  & Proton no 9, 17

} **Non-metals**

- For Group V & Group IV

$\Rightarrow 2, 4 \quad 2, 8, 4$  & Proton no 6, 12  
 $\Rightarrow 2, 5 \quad 2, 8, 5$  & Proton no 7, 15

} **Non -metals**

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**Group I , II , III** are metals.

**Group IV . V , VI & VII** are non-metals.

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**Covalent Bond** : Form between non-metal and non - metal

$\Rightarrow$  By sharing of electrons to form the stable octet configuration

**Ionic Bond** : Form between metal and non-metal

$\Rightarrow$  Metal lose electrons to form **positive ion**, Non-metal gain electrons to form **negative ion**

There is a transfer of electrons from metal to non-metal

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### Question 1

Element P has an electronic configuration of 2, 8, 6.

Element R has an electronic configuration of 2, 8, 8, 1

What is likely to form if P and R combine?

### Question 2

What is formed when an element X of atomic number 19 reacts with an element Y of atomic number 17?

### Question 3

In which of the following sets do all the compounds contain only ionic bonds?

- A. calcium oxide , carbon dioxide, magnesium oxide
- B. calcium oxide , magnesium oxide, sodium chloride
- C. carbon dioxide, copper (II) sulphate , hydrogen chloride
- D. Copper (II) sulphate, hydrogen chloride, magnesium oxide

#### Question 4

Element X has the electronic structure 2 , 8 , 5.

Element Y has the electronic structure 2 , 8 ,

What is the likely formula of the compound containing only X and Y ?

#### Question 5

In which pair do the elements combine to form a compound with ionic lattice?

- A. carbon and hydrogen
- B. carbon and oxygen
- C. silicon and oxygen
- D. potassium and chlorine

#### Question 6

The proton ( atomic ) number of element X is 6.

The proton ( atomic ) number of element Y is 9.

What is the formula of a compound formed between X and Y ?

### Question 7

Draw a 'dot and cross' diagram to show the bonding in potassium fluoride.  
You only need to show the outer (valence) electrons.

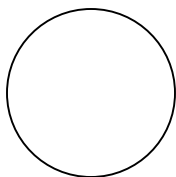
### Question 8

Draw a 'dot and cross' diagram to show the bonding in

- (a) chlorine molecules,  $\text{Cl}_2$
- (b) hydrogen chloride,  $\text{HCl}$
- (c) magnesium chloride  $\text{MgCl}_2$

Question 9

The diagram below shows the outer shell electrons of an atom of element X.



(a) To which group of the Periodic Table does X belong?

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(b) Draw a 'dot and cross' diagram to show the bonding in the compound of X with carbon. Your diagram should show outer electrons only.

(c) (i) Write the formula for the compound of element X with sodium.

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(ii) Predict the type of bonding present in the compound of X with sodium.

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### Question 10

The table shows the proton (atomic) numbers of three elements.

| <i>Element</i> | <i>proton (atomic) number</i> |
|----------------|-------------------------------|
| <i>X</i>       | <i>3</i>                      |
| <i>Y</i>       | <i>9</i>                      |
| <i>Z</i>       | <i>10</i>                     |

Which statement about X, Y and Z is correct?

- A. X and Y can combine to form an ionic compound XY
- B. X and Z can combine to form an ionic compound XZ
- C. Y and Z can combine to form a covalent compound YZ
- D. Y and Z can combine to form an ionic compound YZ. (            )

### Question 11

Oxygen has isotopes  $^{16}\text{O}$  and  $^{18}\text{O}$ . Which of the following correctly compares these isotopes?

|          |                      | $^{16}\text{O}$      | $^{18}\text{O}$      |
|----------|----------------------|----------------------|----------------------|
| <b>A</b> | Formula of ion       | $\text{O}^{2-}$      | $\text{O}^{2+}$      |
| <b>B</b> | Formula of hydride   | $\text{H}_2\text{O}$ | $\text{H}_4\text{O}$ |
| <b>C</b> | Electron arrangement | 2 , 6                | 2 , 8                |
| <b>D</b> | Neutrons in nucleus  | 8                    | 10                   |

(            )

### Question 12

An element X forms a positive ion with the electronic structure 2 , 8 , 8 .  
What is the proton number ( atomic number ) of X ?

- A. 16
- B. 17
- C. 18
- D. 19 (            )

### Question 13

- (a) Define proton (atomic) number and nucleon (mass) number.
- (b) An element has a proton number 9 and a nucleon number of 19.  
Draw the electronic structure of an atom of this element and state the composition of its nucleus.
- (c) Draw a 'dot and cross' structure for a molecule of this element.