

# Chemistry



## Chapter Two

### 1- Write the scientific term for each of the following:

1-Element in which all energy levels are completely filled.	Noble gases
2-Elements in which (4f) is filled gradually.	Lanthanides
3-Elements in which (5f) is filled gradually.	Actinides
4- Elements of (S) and (P) blocks except the inert gas.	Representative elements
5- Elements in which sublevel (P) is successively filled.	p- block
6-The distance between two nuclei of two bonded atoms.	Bond length
7-The amount of energy required to remove the most loosely bound electron.	Ionization energy
8-Half the distance between two nuclei of two similar bonded atoms.	Atomic radius
9-The energy required to convert $M^+$ to $M^{+2}$ .	2 <sup>nd</sup> I.E
10- The ability of the atom to attract the bond electrons to itself.	Electro negativity
11- The amount of energy released when an extra electron is added to the atom.	Electron affinity
12- Nonmetallic oxides that react with bases.	Acidic oxides
13- Metallic oxides that react with acids.	Basic oxides
14- The oxides that react with both acid and bases.	Amphoteric
15- The number that refers to the electric charges that the atom would have in the compound.	Oxidation number
16- The no. of hydrogen atoms that combine with one atom of the element.	Valency
17- The process of gaining electrons.	Reduction
18- The process of losing electrons.	oxidation

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## 2- Choose the correct answer:

- 1) An element of electronic configuration  $1S^2, 2S^2, 2P^6$  is considered ..... elements.
- a) Transition      b) representative      c) **inert**      d) (a) and (b)
- 2) Period six in the periodic table contains ..... types of elements.
- a) 32      b) 18      c) 2      d) **4**
- 3) An element of electronic configuration  ${}_{54}\text{Xe}: 6S^2, 4f^{14}, 5d^2$  represents ..... element.
- a) representative      b) noble  
c) **main transition**      d) inner transition
- 4) An element of electronic configuration  ${}_{54}\text{Xe}: 6S^2, 4f^7, 5d^1$  represents ..... element.
- a) main transition      b) **inner transition (lanthanides)**  
c) inner transition (actinides)      d) representative
- 5) The electro negativity increases across the period as the .....
- a) atomic radius increases      b) **atomic radius decreases**  
c) atomic no. decreases      d) (a) and (c)
- 6) The electron affinity increases across period as the .....
- a) atomic number increases      b) atomic number decreases  
c) atomic radius decreases      d) **(a) and (c)**
- 7) Metals are characterized by their.....
- a) large atomic radius      b) high ionization energy  
c) low electron affinity      d) **(a) and (c)**

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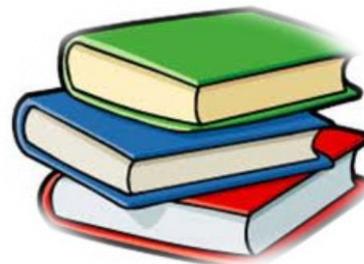


- 8) The oxidation no. of sulphur in  $\text{Na}_2\text{S}_2\text{O}_3$  is .....
- a) (+1)                      b) (-1)                      c) **(+2)**                      d) (+4)
- 9) The element of oxidation no. (+1) **or** (-1) is .....
- a) Sodium                      b) fluorine                      c) **hydrogen**                      d) oxygen
- 10) The oxidation no. of nitrogen in  $\text{NH}_2\text{OH}$  is .....
- a) (+3)                      b) (-3)                      c) **(-1)**                      d) (+1)
- 11) The oxidation no. of phosphorus in  $(\text{P}_4)$  is .....
- a) (-4)                      b) (+4)                      c) **Zero**                      d) (-3)

### 3- Give reason:

- 1- P- block elements represents 6 groups in the periodic table.
- **Bec. (P) sublevel is successively filled by 6 electrons.**
- 2- Ionization energy of sodium  $_{11}\text{Na}$  is less than that of chlorine  $_{17}\text{Cl}$
- **Bec. the radius of sodium atom is greater than that of chlorine atom.**
- 3- The electron affinity of fluorine  $_9\text{F}$  is less than that of chlorine  $_{17}\text{Cl}$  in spite that the size of fluorine atom is smaller.
- **Due to the small of fluorine atom and the repulsion force between the added electron and (9) electrons.**
- 4- Nonmetals don't conduct electricity.
- **Bec. there are no free electrons, which strongly bounded to the nucleus.**
- 5- Caesium is considered the strongest metal.
- **Bec. it has the largest atomic radius.**

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6-  $\text{Al}_2\text{O}_3$  is an amphoteric oxide.

- Bec. it reacts with both acids and bases producing salt and water.

7-  $\text{ClO}_3(\text{HO})$  acid is stronger than  $\text{PO}(\text{HO})_3$  acid.

- Bec. the no. of non bonded oxygen with hydrogen in  $\text{ClO}_3(\text{HO})$  is greater than that in  $\text{PO}(\text{HO})_3$ .

8- Oxidation no. of sulphur with oxygen is (+ve) , whereas it is (-ve) with hydrogen.

- Bec. sulphur is less in electronegativity than oxygen but higher than hydrogen.

9- The Bt ionization energy of noble gases is very high.

- Bec. it causes breaking down completely filled energy level.

## **4- a) Determine: type , block and the location of the following elements in periodic table:**

1-  $_{17}\text{Cl} : 1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^5$  Representative – p – block – period (3)

2-  $_{26}\text{Fe} : 1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^6 , 4s^2 , 3d^6$  main transition – d – block – period(4)

3-  $_{18}\text{Ar} : 1s^2 , 2s^2 , 2p^6 , 3s^2 , 3p^6$  noble gas – p – block – period (3)

b) 1- Calculate the radius of carbon atom , knowing that

$$\text{Cl} - \text{Cl} = 1.98 \text{ \AA} \quad , \quad \text{C} - \text{Cl} = 1.76 \text{ \AA}$$

### **Solution :**

$$R_{\text{Cl}} = \frac{1.98}{2} = 0.99 \text{ \AA}$$

$$R_{\text{C}} = 1.76 - 0.99 = 0.77 \text{ \AA}$$

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2- Calculate the bond length (C – Si) , Knowing that: C- C = 1.54 Å ,  
(Si) radius = 1.17 Å

**Solution :**

$$R_c = \frac{1.54}{2} = 0.77 \text{ Å}$$

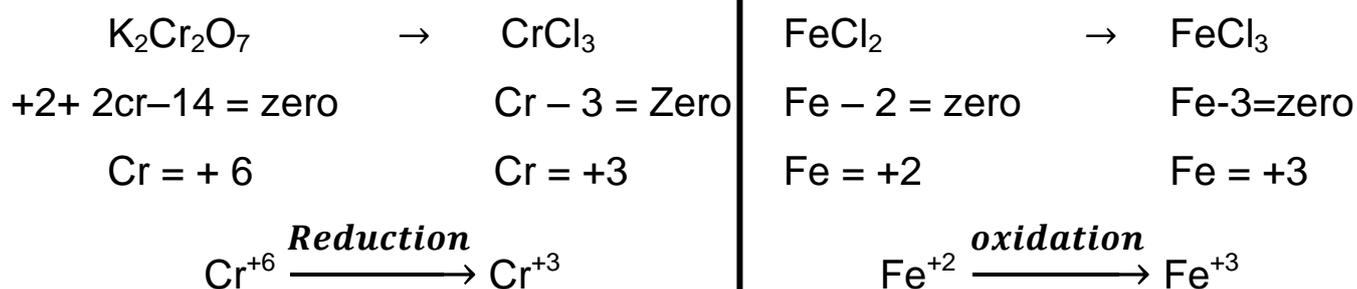
$$(C - Si) = 0.77 + 1.17 = 1.94 \text{ Å}$$

c) **Illustrate by symbolic equations with respect to energy ( exothermic / endothermic):**

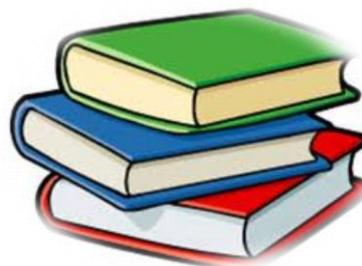


5- **Explain the oxidation – Reduction process for the named elements in the following reactions:**

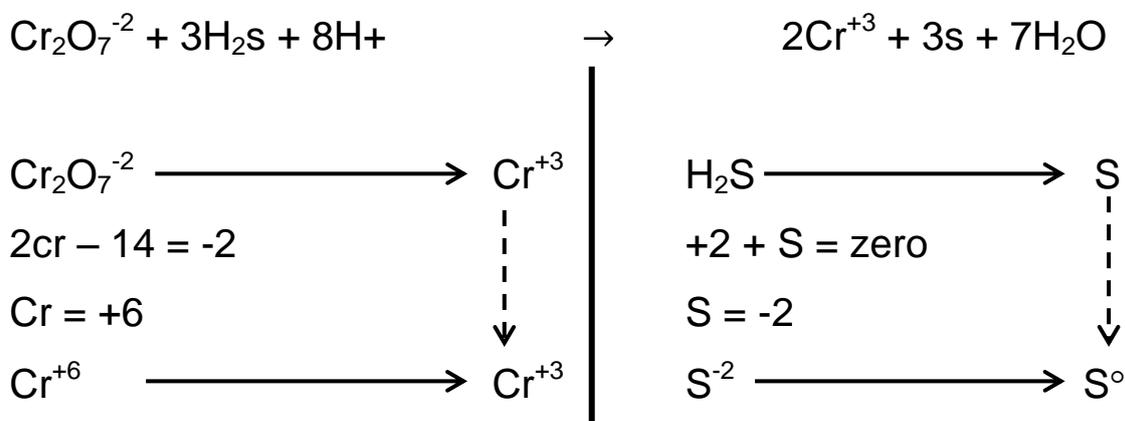
1- **Iron and chromium:**



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## 2- Chromium and sulphure:



## b) Explain the graduation of atomic radius in the periodic table:

1- Periods : The atomic radius decreases due to increase

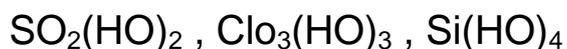
The attraction force of the nucleus

2- Groups : The atomic radius increases due to increase

The : 1- no. of energy levels      2- Repulsion force

3- Screening effect

## c) Rearrange the following acids according to increase their strength , giving reasons:



**Solution:**  $\text{Si}(\text{HO})_4, \text{PO}(\text{HO})_3, \text{SiO}_2(\text{HO})_2, \text{ClO}_3(\text{HO})$

Due to increase the non bonded oxygen atoms

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## 6- Compare between:

Main transition element	Representative elements
<ul style="list-style-type: none"><li>(d) block element</li><li>3 Serieses: 1<sup>st</sup> 3d is filled 2<sup>nd</sup> 4d is filled / 3<sup>rd</sup> 5d is filled</li><li><b>Examples:</b> <math>{}_{26}Fe</math> <math>{}_{48}Cd</math></li></ul>	<ul style="list-style-type: none"><li>(s) and (P) block elements except noble gases.</li><li>All energy levels are filled except the last one. example <math>{}_{17}Cl</math></li></ul>

Noble gases	Inner transition elements
<ul style="list-style-type: none"><li>All energy levels are completely filled</li><li>Electronic structure <math>ns^2, nP^6</math> except helium (<math>{}_{2}He : 1S^2</math>)</li></ul>	<ul style="list-style-type: none"><li>(f) block elements.</li><li>Lanthanides: (4f) is successively filled.</li><li>Actinides: (5f) is successively filled</li></ul>

1 <sup>st</sup> ionization energy	2 <sup>nd</sup> ionization energy
<ul style="list-style-type: none"><li>Results in ion carries one(+ve) charge <math>M \rightarrow M^+ + e, \Delta H^{\oplus}</math></li><li>Less than 2<sup>nd</sup> I.E</li></ul>	<ul style="list-style-type: none"><li>Results in ion carries two(+ve) charge <math>M^+ \rightarrow M^{+2} + e, \Delta H^{\oplus}</math></li><li>Greater than 1<sup>st</sup> I.E</li></ul>

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Metals	Metalloids	Non metals
<ul style="list-style-type: none"> <li>• Elements whose value level contains less than half its capacity of electrons (<math>_{11}\text{Na}</math> , <math>_{20}\text{Ca}</math> )</li> <li>• Characterized by: large atomic radius small I.E / E.A / E.N</li> </ul>	<ul style="list-style-type: none"> <li>• Elements that have the appearance of metals but the properties of non metals</li> <li>• Their properties are moderate between metals and nonmetals</li> </ul>	<ul style="list-style-type: none"> <li>• Elements that have more than 4 electrons in the valence level (<math>_{16}\text{S}</math>)</li> <li>• Characterized by: small atomic radius great I.E / E.A / E.N</li> </ul>
Acidic oxides	Basic oxides	Amphoteric oxides
<ul style="list-style-type: none"> <li>• Nonmetal oxides (<math>\text{CO}_2</math> / <math>\text{SO}_3</math>) Dissolve in water producing acids</li> <li>• React with alkaline forming salt and water</li> </ul>	<ul style="list-style-type: none"> <li>• Metal oxides(<math>\text{Na}_2\text{O}</math>)</li> <li>• React with acids forming salt and water.</li> </ul>	<ul style="list-style-type: none"> <li>• Oxides that react with bases and acids producing salt and water in each ( <math>\text{Al}_2\text{O}_3</math> ) / <math>(\text{SnO})</math> / <math>(\text{Sb}_2\text{O}_3)</math></li> </ul>