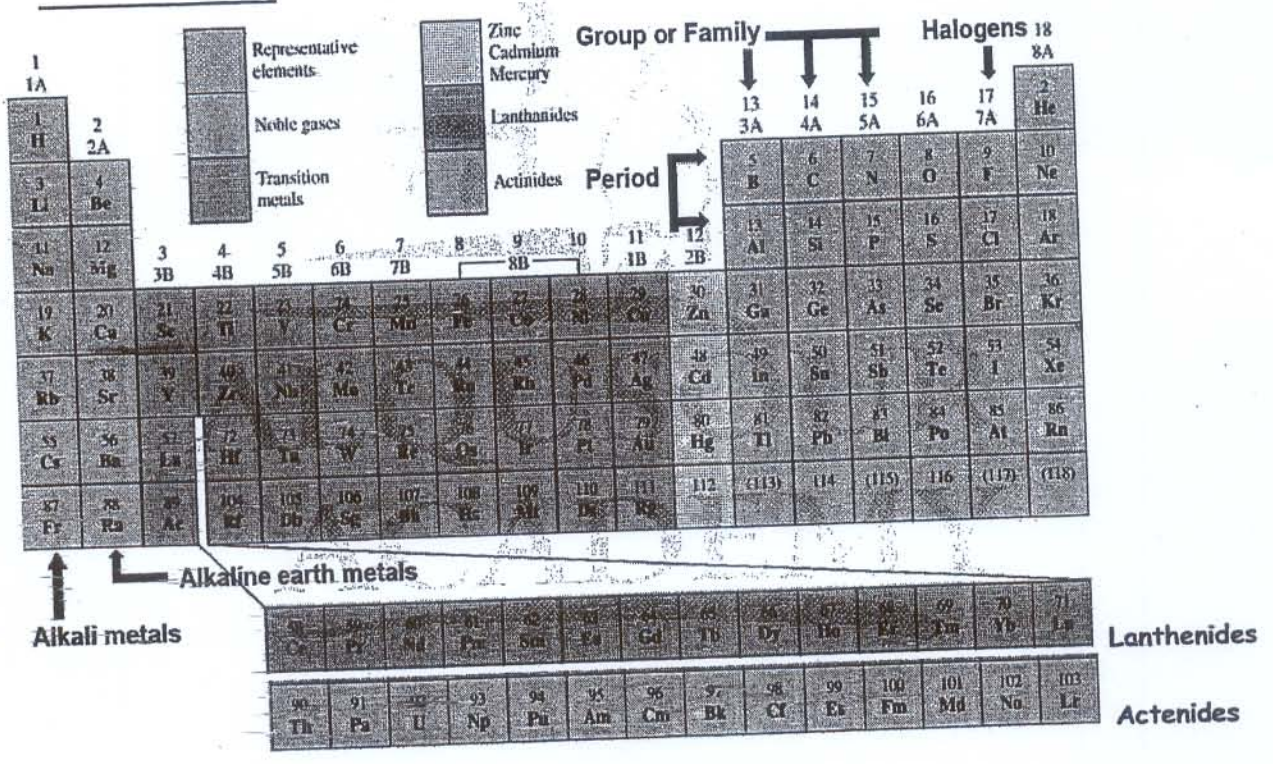


CH.2: Periodic Properties of the Elements

2.5. Periodic Classification of the Elementes

Figure below shows the periodic table which divides into categories:

- Representative elements
- Transition elements (or transition metals)
- Actinides
- Nobel gases
- Lanthanides



1 1A	2 2A	Representative elements										Group or Family										Halogens 18																																																											
1 H	2 He	Noble gases										Zinc Cadmium Mercury										13 3A										14 4A										15 5A										16 6A										17 7A										18 8A									
3 Li	4 Be	Transition metals										Lanthanides										5 B										6 C										7 N										8 O										9 F										10 Ne									
11 Na	12 Mg	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 9B	10 10B	11 11B	12 12B	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr																																														
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	55 Cs	56 Ba	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu																																															
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	(113)	(114)	(115)	(116)	(117)	(118)	Lanthenides																																																															
																	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	Actinides																																																		

Handwritten signature or stamp in Arabic script.

The Periodic Table: (Mendeleev's arrangement of the elements).

The Periodic Table consists for:

1- **GROUPS:** vertical columns on the periodic table. elements in the same group tend to have physical and chemical properties in common.

Types of groups:

1. **Representative Elements:** (main group elements), (labeled with the letter A).

1A >>> Alkalimetals.

2A >>> Alkaline earthmetals.

6A >>> Chalcogens.

7A >>> Halogens.

8A >>> Noble gases which have completely filled shells (exception of He).

2. **Transition metals:** (labeled with the letter B): group (1B → 7B) plus group 8B contain three short columns in the center of the table,

2- **PERIODS:** horizontal rows on periodic table (exist 7 period). elements in the same period sometimes display similar physical properties.

The elements arrange in order of increasing atomic number.

Ex: H¹, He², Li³, Be⁴, B⁵, C⁶.....

The elements in table donated by:

11	→	atomic number
Na	→	atomic symbol
22.99	→	atomic weight

The Parts of an atom:

Protons, neutrons, electrons:

Particle:	Charge:	Location:	Atomic Mass:
Proton	Positive	Nucleus	One
Neutron	None	Nucleus	One
Electron	Negative	Clouds Around Nucleus	1/1836

- nucleus: The center of an atom, consists of protons and neutrons
- energy levels: regions where electrons are located.

atomic theory :

- atomic mass: = # of neutrons(N) and protons(P) in an atom.
- atomic number: = # of protons or # of electrons in an atom.
- isotopes: atoms of the same element that have a different number of neutrons

Or, by algebra...

- If I give you protons, neutrons, and electrons, you can tell me the atomic number and atomic mass.

Ex: an atom with 16 protons, and 17 neutrons has...

- Atomic number of 16,
- atomic mass of 33.
- and 16 electrons.

The elements in table consist for:

1. Metals: elements locate in left side and the middle of the table .

Ex: Li, Na, Mg, Ca, Sc, Ti, V, Nb

2. Nonmetals: elements locate on the upper right side of the table.

Ex: C, N, O, F, Ne, P, S, Cl

3. Metalloides: elements locate between metals and nonmetals of the table.

Ex: B, Si, Ge, As, Sb, Te, At

2.7. Ions and Ionic Compounds:

Ions:

When electrons are removed from or added to a neutral atom or molecule, a charged particle called an ion is formed.

Ions:

* Positively charged: cations.

most common type is metal cation: Na^+ , Ca^{2+} , Al^{3+} , Fe^{2+} , Fe^{3+} .

* Negatively charged: anions.

most-common type is nonmetal anion: Cl^- , O^{2-} , N^{3-} , P^{3-} , S^{2-} .

Any atoms gain or lose electrons to end up the same number of electrons as the noble gas.

^{11}Na >>> lose one electron to give Na^+ (which has the same number of electrons same as ^{10}Ne).

^{17}Cl >>> gain one electron to give Cl^- (which has the same number of electrons same as ^{18}Ar).



Charges in periodic table:

- Group 1A >>> +1
- Group 2A >>> +2
- Group 3A >>> +3
- Group 5A >>> -3
- Group 6A >>> -2
- Group 7A >>> -1

Li⁺, Mg²⁺
Na⁺, Ca²⁺
K⁺, Cs²⁺
Rb⁺, Sr²⁺

Al³⁺

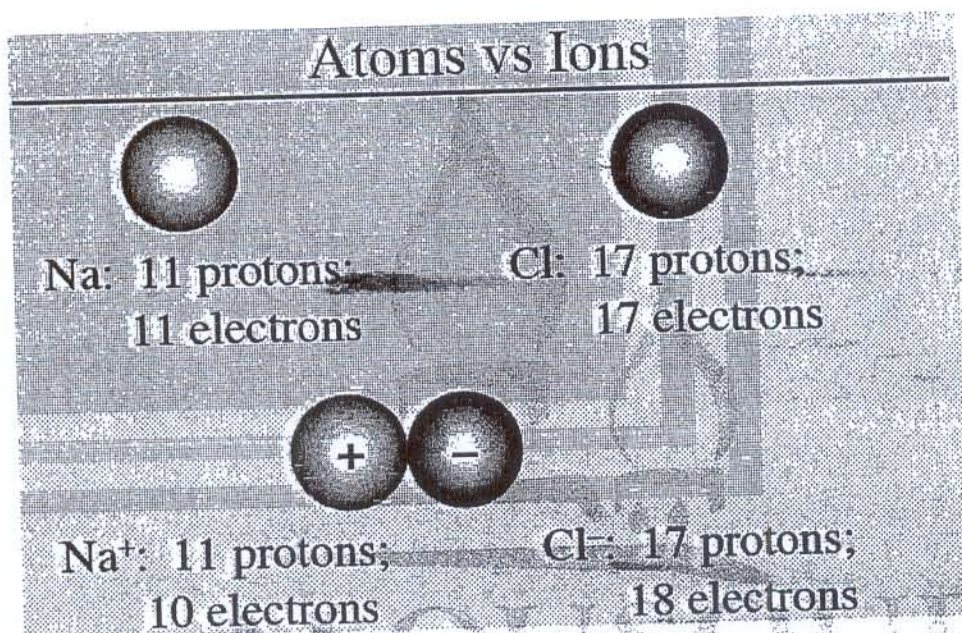
N³⁻ O²⁻
P³⁻ S²⁻

F⁻
Cl⁻
Br⁻
I⁻

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
	1A	2A	3B	4B	5B	6B	7B	8B			1B	2B	3A	4A	5A	6A	7A	8A	
Period																		2	
1	1																	2	
	H																	He	
2	3	4											5	6	7	8	9	10	
	Li	Be											B	C	N	O	F	Ne	
3	11	12											13	14	15	16	17	18	
	Na	Mg											Al	Si	P	S	Cl	Ar	
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
6	55	56	*	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
	Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	87	88	**	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
	Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uub	Uut	Uuq	Uup	Uuh	Uus	Uuo	
lanthanides	*	57	58	59	60	61	62	63	64	65	66	67	68	69	70				
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb				
actinides	**	89	90	91	92	93	94	95	96	97	98	99	100	101	102				
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No				

Ionic and Molecular Compounds:

- Ionic compounds are usually formed between metals and nonmetals.
- Molecular compounds are usually formed between two nonmetals.



Q: Which of the following compounds are ionic or molecular compound?

- N₂O >>> molecular compound.
 Na₂O >>> ionic compound.
 CaCl₂ >>> ionic compound.
 SF₄ >>> molecular compound.

Chemical Formulas:

- Empirical formula: tells us which elements are present and the simplest whole-number ratio of their atoms.
- Molecular formula: shows the exact number of atoms of each element in the Smallest unit of a substance.

Molecular formula = (Empirical formula)*n where n: integer #.

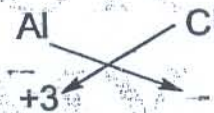
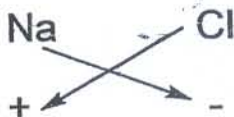
Ex:

CH₂O >>> Empirical formula.
C₆H₁₂O₆ >>> Molecular formula. (n = 6).

The empirical formula for an ionic compound:

The ions in an ionic compound always occur in such a ratio that the total positive charge equals the total negative charge:

Ex: NaCl, BeBr₂, AlCl₃.





Questions:

1. Which of the following is the **most** important factor in determining an element's place in the periodic table?
 - A. Number of protons
 - B. Number of neutrons
 - C. Atomic charge
 - D. Atomic density
2. Oxygen has an atomic number of 8. Which of the following elements would you expect to be most similar to oxygen in terms of its chemical properties?
 - A. Nitrogen (N)
 - B. Fluorine (F)
 - C. Sulfur (S)
 - D. Chlorine (Cl)
3. Potassium (K), atomic number 19, will most likely react with which of the following elements?
 - A. Sodium (Na), because it is in the same column.
 - B. Calcium (Ca), because it is in the same row.
 - C. Chlorine (Cl), because it is a nonmetal.
 - D. Argon (Ar), because it is a noble gas.
4. Group 1 (the alkali metals) includes lithium (Li), sodium (Na), and potassium (K). These elements have similar chemical properties because they have the same:
 - A. numbers of protons and neutrons.
 - B. numbers of electrons in the outer energy level.
 - C. numbers of protons in the nucleus.
 - D. numbers of neutrons in the nucleus.



5. Metals and nonmetals generally form ionic bonds with each other. Which of the following sets of elements will **most likely** form an ionic bond?
- A. Na, F
 - B. Cl, F
 - C. Na, K
 - D. He, O
6. Which of the following statements is wrong for structure of an atom?
- A. Protons and neutrons are in the center.
 - B. Electrons are moving around the nucleus.
 - C. Electrons are negatively charged particle.
 - D. Neutrons are positively charged particles.
 - E. Mass of one proton is equal to mass of one neutron.
7. If ${}_{12}\text{X}^{+2}$ and Y^{-2} have the same number of electrons, What is the atomic number of Y?
- A. 6.
 - B. 8.
 - C. 10.
 - D. 12.
 - E. 13.
8. What is the formula of compound which is formed by the element ${}_{20}\text{Ca}$ and ${}_{9}\text{F}$?
- A. CaF.
 - B. CaF₃.
 - C. CaF₂.
 - D. Ca₂F.
 - E. Ca₃F.



9. If atomic mass number of ${}_{24}X$ is 51, what is the number of neutrons of X?

- A. 27.
- B. 24.
- C. 51.
- D. 75.
- E. 40.

10. Atomic mass number of X^{-1} is 80. If its neutron number is greater than its atomic number by 10. What is its electron number of this ion?

- A. 35.
- B. 36.
- C. 33.
- D. 30.
- E. 45.

ALQOSOUR
ACADEMY



ANSWER SHEET:

<u>Q.no:</u>	<u>Ans:</u>
<u>1</u>	
<u>2</u>	
<u>3</u>	
<u>4</u>	
<u>5</u>	
<u>6</u>	
<u>7</u>	
<u>8</u>	
<u>9</u>	
<u>10</u>	

ALOUSOUR
ACADEMY



KEY:

<u>Q.no:</u>	<u>Ans:</u>
<u>1</u>	A
<u>2</u>	C
<u>3</u>	C
<u>4</u>	B
<u>5</u>	A
<u>6</u>	D
<u>7</u>	B
<u>8</u>	C
<u>9</u>	A
<u>10</u>	B

تفصيل الأسئلة