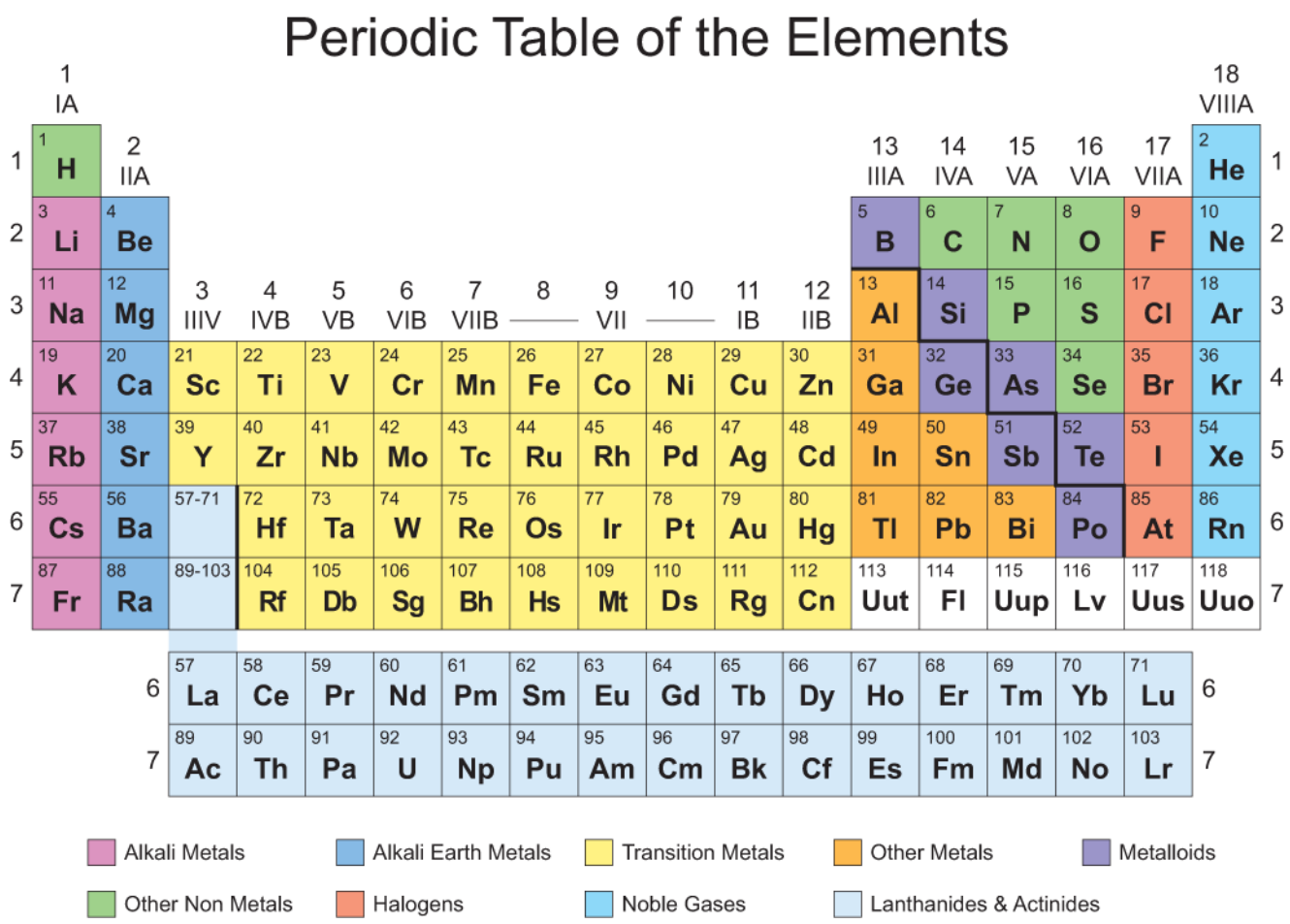
Classification of Elements – The periodic Table

SYNOPSIS



From the earliest times, scientists have been trying to classify the available elements on the basis of their properties.

Dobereiner proposed ‘law of triads’. Newland proposed law of octaves. Mendeleeff divide the elements into groups on the basis of “atomic weights”. The limitations in mendeleev’s periodic table are removed in modern periodic table.

In modern periodic table eighteen groups and seven periods. There are ‘s’ block, ‘p’ block, ‘d’ block and ‘f’ block elements.

Atomic radius, Ionization energy, electron affinity, Electro negativity are the main characteristic of the enlacements both in groups and periods

2Mark Questions

1. Elements in a group generally possess similar properties, but elements along a period have different properties. How do you explain this statement?

A. According to modern periodic law, the physical and chemical properties of elements are the periodic function of their atomic number or electronic configuration.

That means that elements having the similar valency electronic configuration have similar properties.

But, the valency electronic configuration of different elements in the same period is different so, the properties of different elements in a period are different.

2. s - block and p - block elements except 18^{th} group elements are sometimes called as 'Representative elements' based on their abundant availability in the nature. Is it justified? Why?

A. s - block and p - block elements except 18^{th} group elements are called 'Representative elements'.

All these elements have incomplete shells. So they are chemically reactive to obtain stable electronic configuration of noble gases ns^2np^6.

So, they are abundant in nature in the form of compounds.

3. How does metallic character change when we move?

i. Down a group **ii. Across a period**

A. i. As we go down the group, tendency to loose on electron increases. So metallic character increases.

ii. Across a period, from left to right, metallic character decreases. i.e., non-metallic character increases.

4. Complete the following table using the periodic table.

Period Number	**Filling up orbital's (sun shells)**	**Maximum of electrons, filled in all the sub shells**	**Total no.of electrons in the period**
1			
2			
3			
4	**4s, 3d, 4p**	**18**	**18**
5			
6			
7	**7s, 5f, 6d, 7p**	**32**	**incomplete**

A.

Period Number	**Filling up orbital's (sun shells)**	**Maximum of electrons, filled in all the sub shells**	**Total no.of electrons in the period**
1	1s	2	2
2	2s, 2p	8	8
3	3s, 3p	8	8
4	4s, 3d, 4p	18	18
5	5s, 4d, 5p	18	18
6	6s, 4f, 5d, 6d	32	32
7	7s, 5f, 6d, 7p	32	incomplete

5. The electronic configuration of the elements X, Y and Z are given below?

a) X = 2

b) Y = 2, 6

c) Z = 2, 8, 2

i) Which element belongs to second period?

ii) Which element belongs to second group?

iii) Which element belongs to 18th group?

A. i) Y belongs to second period, since, differentiating electron enter into second shell.

ii) Element 'Z' belongs to second group. Because, its velence is 2

iii) Element 'X' belongs to 18^{th} group, because its 1^{st} shell completely filled with electrons.

6. Identify the element that has the largest atomic radius in each pair of the following and mark it with a symbol (✓). (AS1)

(i) Mg or Ca **(ii) Li or Cs** **(iii) N or D** **(iv) B or Al**

A. i) **Mg or Ca:** Ca (✓) →[Ca > Mg]

Since as we go down the group, atomic sizes of elements increases

ii) **Li or Cs:** Cs (✓) [Cs > Li]

In since, as we go down the group, atomic sizes of elements increases

iii) **N or D:** D (✓) [N < D]

iv) **B or Al:** Al (✓) [Al > B]

7. Complete the following table using the periodic table.

Period number	Total no. of elements	Elements		Total no. of elements in			
		From	To	s-block	p-block	d-block	f-block
1.							
2.							
3.							
4.							
5.							
6.							
7.							

A.

Period number	Total no. of elements	Elements		Total no. of elements in			
		From	To	s-block	p-block	d-block	f-block
1.	2	H	He	1	1		
2.	8	Li	Ne	2	6		
3.	8	Na	Ar	2	6		
4.	18	K	Kr	2	6	10	
5.	18	Rb	Xe	2	6	10	
6.	32	Cs	Rn	2	6	10	14
7.	Incomplete	Fr	-	2	2(Incomplete)	10	14

8. Identify the element that has the lower Ionization energy in each pair of the following and mark it with a symbol (✓).

(i) Mg or Na

(ii) Li or O

(iii) Br or F

(iv) K or Br

A. i) Mg (or) Na — Na (✓)

ii) Li (or) O — Li (✓)

iii) Br (or) F — Br (✓)

iv) K (or) Br — K (✓)

9. Why was the basis of classification of elements changed from the atomic mass to the atomic number?

A. i) The properties of elements depends upon the number of electrons present in the valence shell which are related to atomic number.

ii) Thus the properties of different elements can be compared if we know their atomic numbers.

iii) On the other hand, atomic mass can in no way determine the chemical properties of elements, because it does not vary regularly with gradation in the chemical properties of elements.

iv) So, the basis, of the classification of elements changed from atomic mass to the atomic number.

10. On the basis of atomic numbers predict to which block the elements with atomic number 9, 37, 46 and 64 belongs to?

A. The elements with atomic number a, belong to group 17 (VIIA). So, it belongs to p-block.

The element with atomic number 37, belongs to Group 1(IA). So, it belongs to s-block.

The elements with atomic number 46, belongs to Group10 (vIIB). So, it belongs to d-block.

The elements with atomic number 64, belongs to Lanthanides. So, it belongs to f-block.

11. An element X belongs to 3^{rd} period and group 2 of the periodic table. State

a) The no. of valence electrons

b) The valency

c) Whether it is metal or a nonmetal.

A. An element X belongs to 3^{rd} period and group 2 is Mg

a) The no. of valence electrons is 2

b) The valency of atom 2

c) The element belongs to IIA group. It is of the periodic table.

So, it is a metal.

12. An element has atomic number 19. Where would you expect this element in the periodic table and why?

A. Atomic number of the element -19

Arrangement of these 19 electrons is 2, 8, 8, 1

So, the differentiating electron enters into 4^{th} shell. So, the element belongs to 4^{th} period. So the element belongs to 4^{th} period.

The no. of valence electrons = 1. So it belongs to 1^{st} group

$\therefore$ The element with atomic number 19 belongs to 4^{th} period and I group.

13. Collect the information about reactivity of VIII A group elements (noble gases) from internet or from your school library and prepare a report on their special character when compared to other elements of periodic table.

A. The VIIIA group elements are chemically inactive. All of them have stable "octet" in their valence shells except helium the nobel gases have high ionization energy and zero electron affinity values. Consequence to this loosing or gaining an electron or sharing of electrons is difficult.

But some compounds of these gases have been prepared under suitable conditions.

Xenon (Xe) shows a tendency to lose an electron and exist in a positive oxidation state. Therefore it reacts with highly electronegative elements like F_2 & O_2 only .

EG. XeO_3; XeO_4; XeF_2, XeF_4

14. Comment on the position of hydrogen in periodic table.

A. i) The position of hydrogen in the periodic table is unique.

ii) Its properties resemble with both Alkali metals (IA) and halogens (VIIIA) because it can loose one electron like alkali metals as well as gain one electron as halogens

iii) So, it is placed at the top of both alkali metals and halogens.

15. How do you appreciate the role of electronic configuration of the atoms of elements in periodic classification?

A. According to modern periodic law, the properties of elements are the periodic function of their atomic number or electronic configuration.

So, the classification of elements have done basing on electronic configuration. The electronic having same outer shell electronic configuration are kept in the same group. The elements have same chemical properties.

So, I appreciate the role of electronic configuration of the atoms of element which plays a key role in the process of classification of elements.

1 Mark Questions

1. Name two elements that you would expect to have chemical properties similar to Mg. What is the basis for your choice?

A. Calcium (Ca) and strontium (Sr) are the two elements, which are similar to Mg in chemical properties.

Because, they belong to the same group IIA. All the elements which are in the same group have same electronic configuration and same chemical properties.

2. Using the periodic table, predict the formula of compound formed between and element X of group 13 and another element Y of group 16.

A. Element X of group 13 Element X of group 13

Valency of X is 13 Valency = 18 – 16 = 2

Formula of the compound formed between X and Y

X^{3} Y^{-2}

$(X_2 Y_3)$

3. How does the valency vary on going down a group?

A. The valency doesn't changes on going down a group.

4. Sate Modern Periodic Law.

A. The Physical and chemical Properties of the elements are the periodic functions of their Electronic Configurations of the atoms.

5. How does the valency vary in a period on going from left to right?

A. The valency starts from a and increases upto 4 and then decreases to get o, while mulling from left to right.

6. State law of triads.

A. Dobereiner stated that when elements with similar properties are taken three at a time and arranged in the ascending order of their atomic weights, the atomic weight of the middle element is the average of the atomic weights of the first and third elements.

7. Which elements are called as Lanthanoids and Actinoids?

A. i) 4f elements from $_{58}$Ce to $_{11}$Lu posses almost the same properties as $_{57}$ la. So they were called as Lanthanoids.

ii) 5f elements from $_{90}$Th to $_{103}$Lr posses almost the same properties as $_{89}$Ac. So they were called as Actinoids.

8. According to Mosley, what is atomic number?

A. According to Mosley, the number of positive charges (protons) in the atom of an element is the atomic number of those elements.

4 Mark Questions

1. Newlands proposed the law of octaves. Mendeleeff suggested eight groups for elements in his table. How do you explain these observations in terms of modern periodic classification?

A. Newlands proposed the law of octaves. According to newlads law of octaves, every eighth elements starting from a given one be a repetition of the first with regard to its properties.

Mendeleeff suggested eight groups for elements in his table. The elements in the same group have same properties that means every eighth element starting from a given element have same property with that.

In terms of modern concept, after completion of one shell. The properties of elements are repeated. After completion of one shell of the properties of elements are repeated.

So, Newlands law of octaves and Mendeleeff's suggestion of eight groups for elements are also reliable according to modern concepts.

2. What are the limitations of Mendeleeff's periodic table? How could the modern periodic table overcome the limitations of Mendeleeff's table?

A. Limitations of Mendeleeff's periodic table:

1) Position of Hydrogen: The position of hydrogen in table is not certain because it can be placed in group IA as well as in group VIIA as it resembles both with alkali

Metals of IA group and halogens of VIIA group.

2) Anomalous pair of elements: Certain elements of higher atomic mass precede those with lower atomic mass.

Eg: Tellurium precedes iodine;

Potassium (A = 39) placed after Argon (A = 40).

3) Dissimilar elements placed together: Elements with dissimilar properties were placed in same group as sub-group A and sub-group B.

Eg: Li, Na, K of IA group have little resemblance with Cu, Ag, Au of IB group.

4) Some similar elements are separated: Some similar elements like 'copper and mercury' 'Silicon and thallium', etc, are placed in different groups of periodic table.

5) Position of Isotopes: Isotopes of elements are placed in the same position in the table. Modern periodic table removes various anomalous of Mendeleeff's table in the following way:

1) Hydrogen is placed in IA group according to its electronic configuration. But it is not included in IA group elements (Alkali metals).
2) Basing on their electronic configuration anomalous pairs (R and Ar) are put in order according to their atomic number.
3) Dissimilar elements were placed in different groups
4) Copper and Mercury come in different groups according their electronic configuration.
5) All the istopes of same element have same atomic number. So all Isotopes are put in same group as a single element in modern periodic.

3. Define modern periodic law. Discuss the construction of the long of the periodic table.

Modern periodic law: The Physical and chemical Properties of the elements are the periodic functions of their Electronic Configurations.

i) The modern periodic table has eighteen vertical columns known as groups and seven horizontal rows known as periods.

ii) Elements are arranged in the order of increasing atomic numbers in periods.

iii) In groups the elements are placed having similar electronic configuration a having similar number of electrons in their outermost shells.

s-block elements: The elements with valence shell electronic configuration ns^1 and sn^2 are called s-block elements.

p-block elements: The elements with valence shell electronic configuration ns^2np^6 are called p-block elements.

These s and p block elements together known as representative elements.

d-block elements: The elements with valence shell configuration $ns^2np^6(n-1)d^1$ to $ns^2np^6(n-1)d^{10}$ are called d-block elements. These are also called as Transition elements.

f-block elements: The elements in which orbitals are being filled in their atoms are called f-block elements. These elements are also called as inner transition elements.

Inert gases:

The elements with complete outermost shell configuration (ns^2np^6) are known as inert gases. He, Ne, Ar, Kr, Xe and radon do not react with any other elements. So these are called inert gases.

First period contains 2 elements

2^{nd} and 3^{rd} periods contains 8 elements each.

4^{th} and 5^{th} periods contains 18 elements each.

6^{th} period contains 32 elements

7^{th} period is incomplete

- The elements from Ce_{58} to Lu_{71} are called Lanthanides.
  These elements are 4f block elements
- The elements from Th_{90} to Lr_{103} are called as Actinoids.
  These elements are 5f block elements.
- Lanthanides & Actinoides are shown separately at the bottom of the periodic table.

4.Explain how the elements are classified into s, p, d and f block elements in the periodic table and give the advantages of this kind of classification.

A. Depending on the valency shell electronic configuration elements are classified into s, p, d and f block

s-block elements: The elements with valence shell electronic configuration ns^1 and sn^2 are called s-block elements.

p-block elements: The elements with valence shell electronic configuration ns^2np^{1-6} are called p-block elements. s and p block elements are known as representative elements.

d-block elements: The elements with valence shell electronic configuration $ns^2(n-1)d^{1-10}$ are called d-block elements.

These are known as Transition elements.

f-block elements: The elements in which f-block are being filled in their atoms are called f-block elements. These are known as Inner Transition elements.

Advantage:

The division of elements into blocks is useful to divide the elements into groups. Every group has the elements with same valence electronic configuration. So they have similar chemical properties

s-block elements – IA & IIA groups
p-block elements – IIIA & VIIIA groups
d-block elements – IB & VIIIB groups
f-block elements – Lanthanides & Actinoides.

5. Given below is the electronic configuration of elements A, B, C, D.

A.$1s^2\ 2s^2$

B.$1s^2\ 2s^2\ 2p^6\ 3s^2$

C.$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

D.$1s^2\ 2s^2\ 2p^6$

1) Which are the elements coming with in the same period

2) Which are the ones coming with in the same group?

3) Which are the noble gas elements?

4) To which group and period does the elements 'C 'belong.

A. 1) A and D elements belongs to same period, since their outmost shell is same (II period)

C and D elements belongs to same period, since their outermost shell is same (III period)

2) Element A,B belongs to same group because of their similar outermost electronic configuration.

3) Element D is the Noble gas due to its completely filled electronic configuration in its outermost orbit.

4) The element the C - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ belongs to III period & 15^{th} group (VA)

6. Write down the characteristics of the elements having atomic number 17.

Electronic configuration _____ ($1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$)

Period number _____ (III)

Group number _____ (17^{th} (or) VIIA)

Element family _____ (Halogens)

No. of valence electrons _____ (2 + 5 = 7 electrons)

Valency _____ (-1)

Metal or non-metal _____ (Non metal)

7. a) State the number of valence electrons, the group number and the period number of each element given in the following table:

Element	Valence electrons	Group number	Period number
Sulphur			
Oxygen			
Magnesium			
Hydrogen			
Fluorine			
Aluminum			

b) State whether the following elements belong to a Group (G), Period (P) or Neither Group nor Period (N).

Elements	G/P/N
Li,C,O	
Mg, Ca, Ba	
Br, Cl, F	
C,S, Br	
Al, Si, Cl	

Li, Na, k	
C,N,O	
K, Ca, Br.	

A. a)

Element	**Valence electrons**	**Group number**	**Period number**
Sulphur	6	16 (VIA)	3
Oxygen	6	16 (VIA)	2
Magnesium	2	2 (IIA)	3
Hydrogen	1	1(IA)	1
Fluorine	7	17 (VIIA)	2
Aluminum	3	13 (IIIA)	3

b)

Elements	**G/P/N**
Li,C,O	D
Mg, Ca, Ba	G
Br, Cl, F	G
C,S, Br	N
Al, Si, Cl	P

Li, Na, k	G
C,N,O	P
K, Ca, Br.	P

8. In period 2, element X is to the right of element Y. Then, find which of the elements have:

i) Low nuclear charge

ii) Low atomic size

iii) High ionization energy

iv) High electronegativity

(v) More metallic character

A. i) In a period, nuclear charge increases from left to right so, Y has low nuclear than X.

ii) In a period, atomic radius decreases from left to right so, X has low atomic radius than Y.

iii) In a period, ionization energy increases from left to right so, X has high ionization energy than Y.

iv) In a period, electro negativity increases from left to right so, X has high electro negativity value than Y.

v) In a period, metallic character decreases from left to right so, Y has more metallic character than X.

9. a) What is a periodic property? How do the following properties change in a group and period? Explain.

(a) Atomic radius

(b) Ionization energy

(c) Electron affinity

(d) Electro negativity.

(b) Explain the ionization energy order in the following sets of elements:

a) Na, Al, Cl

b) Li, Be, B

c) C, N, O

d) F, Ne, Na

e) Be, Mg, Ca.

A. Periodic property: The repetition of chemical properties and regular gradation in physical properties in groups as well as in periods according to their outermost shell configuration is called as periodicity.

The property of an element which is related and repeated according to electronic configuration of the atoms of elements is known as periodicity.

a) Atomic radius:

The distance between the centers of the nucleus to the outermost shell of an atom is called atomic radius.

In groups: Atomic radius increases from top to bottom in a group. This is due to the addition of new shell.

In periods: Atomic radius decreases from left to right in a period. As we go to right electrons enter in a same shell. So the nuclear attraction on the outer shell increases. As a result size of the atom increases.

b) Ionization energy:

The energy required to remove an electron from the outer most orbit of a neutral gaseous is called ionization energy.

Ionization energy decreases as we go, down in a group. Ionization energy generally increases from left to right in period.

c) Electron affinity:

The electron affinity of an element is defined as the energy liberated when an electron is added to its neutral gaseous atom.

Electron affinity decreases as we go down in a group. Electron affinity increases along a period from left to right.

d) Electro negativity:

The electro negativity of an element is defined as the relative tendency of its atom to attract electrons towards it when it is bounded to the atoms of another element.

Electro negativity decreases ads we go down in a group. Electro negativity increases along a period from left to right.

ii) a) Na, A*l*, C*l*

Na < A*l* < c*l*

All these elements belong to same period. The order of their atomic size is [Na > A*l* > C*l*]. As we move from left to right in a period Ionization energy increases.

b) Li, Be, B — I.E – Be > Li > B

As these 3 elements belongs to same period. The electronic configuration of

Li – $1s^2\ 2s^2$; Be- $1s^2\ 2s^2$; B- $1s^2 2s^2\ 2p^1$

The penetration power of 2p is less compared to 2s. So, it is easy to remove electron from 2p.

c) C, N, O :— I.E : N > C > O

C, N, O belongs to some period. The electronic configuration of

c – $1s^2\ 2s^2\ 2p^{\ 2}$: N- $1s^2\ 2s^2\ 2p^3$; O – $1s^2\ 2s^2\ 2p^4$

Nitrogen has half filled configuration in degenerated orbital. So, it is more stable compare to C & O, so, N has high ionization energy.

d) F, Ne, Na: (Ne > F > Na) — I.E

Ne is an inert gas, so it has highest ionization energy. Na has larger size compare to F. So, it has low ionization energy.

e) Be, Mg, Ca: IE (Ca < Mg < Be)

These elements belongs to same group the atomic size of these elements is in the order of Ca > Mg > Ba.

As atomic size increases ionization energy decreases.

10. Aluminum does not react with water at room temperature but reacts with both dil. HC*l* and NaOH solutions. Verify these statements experimentally. Write your observations with chemical equations. From these observations, can we conclude that A*l* is a metalloid?

A. Metalloids are elements which resemble both metals and non-metals. The valency shell of metalloids contain 3, 4, 5, 6 elements starting from periods 2 to 5 respectively. A*l* belongs to 3^{rd} period. It contains 3 valence electrons. So, it is not a metalloid as it contains 3 valence electrons instead of 4.

A*l* doesn't react with water at room temperature. But it reacts at high temperature with water

$2Al + 6H_2O \rightarrow 2Al(OH)_3 + 3H_2$

Al reacts with dil Hcl & liberates Hydrogen gas

$2Al + 6\ HCl \rightarrow 2AlCl_3 + 3H_2$

Al reacts with dil NaOH and liberates hydrogen gas

$2Al + 2NaOH + 6\ H_2O \rightarrow [Na_2\ Al(OH)_4] + 3H_2(4)$

From the above reactions, we conclude that all react with both acids as well as bases. So, it is Amphoteric.

11. Collect information regarding metallic character of elements of IA group and prepare report to support the idea of metallic character increases in a group as we move from top to bottom

A. The tendency of an element to lose electron and form positive ions is called metallic character.

The elements to the left of the periodic table i.e., IA group have greater tendency to lose electrons so, they are strong metals. Li, Na, K, Rb, Cs (IA) are strong metals as they lose one electron and posses high reactivity.

As we go down in a group the atomic size increases and electrons in the outer shell experiences less nuclear attractions and so can lose electron easily. Thus increased metallic character.

Ionization energies decreases from LI to Cs and atomic radius increases from Li to Cs in IA group. So, metallic character increases from Li to Cs in IA group.

12. Without knowing the electronic configurations of the atoms of elements Mendeleev still could arrange the elements nearly close to the arrangements in the Modern periodic table. How can you appreciate this?

A. 1) Mendeleeff arranged the element known at that time in a chart in a systematic order in the increasing order of their atomic weight.

2) Mendeleeff tried to explain the similarities of elements in the same group in terms of their common valency.

3) Elements present in a given vertical column (group) have similar properties.

4) Each group is divided into 2 sub- group A and B. The elements within any sub group resemble each other to great extent.

5) A period comprises the entire range of elements after which properties repeat themselves. There are 7 periods in the Mendeleeff's periodic table.

6) Based on the arrangements of the elements in the table he predicted that some elements were missing and left blank spaces at the appropriate places in the table.

7) His predicted properties were almost the same as the observed properties of those elements after their discovery.

8) In this way, without knowing the electronic configuration of the atoms of elements Mendeleeff still could arrange the elements nearly close to the arrangements in the modern periodic table.

13. How the positions of elements in the periodic table help you to predict its chemical properties? Explain with an example.

A. Position of elements in the periodic table helps us to predict their chemical properties i.e, If the elements are present at extreme left or extreme right, they are highly reactive metals & non metals respectively.

- The elements which are almost left in the periodic table are metals and highly reactive.

Eg: Li, Na, K, Mg & Ca etc, are left in the periodic table these are metals and highly reactive.

- The elements which are right in the periodic table are non-metals and gases.

Eg: O, F, Cl, S etc, are right in the periodic table. These are non metals.

- The elements which are in the 18th group are noble gases and inert for chemical reactions

Eg: He, Ne, Ar etc, are noble gases which are in 18th group (VIIIA). These are inert for chemical reactions.

Fill in the Blanks

1. Lithium, _____ and potassium constitute a Dobereiner's triad. (Na(sodium))
2. _____ was the basis of the classifications proposed by Dobereiner, Newlands and Mendeleeff (Atomic Mass).
3. Noble gases belongs to _____ group of periodic table. (18^{th} ($VIII_A$))
4. The incomplete period of the periodic table is _____. (7^{th} period)
5. The measure of tendency to attract shared electron pair towards itself is called _____. (Electro magnetivity)
6. The energy required to remove an electron from neutral gaseous atom is called _____. (Ionization energy)
7. d-block elements are also called as _____. (Transition elements)
8. Elements in the same group have _____ chemical properties. (Similar)
9. Metallic character _____ while move from top to bottom. (Increases)
10. If an element A is present in the third group of periodic table, the formula o fits Oxide _____. (A_2O_3)
11. _____ is the most electronegative element. (F(flourine))

Multiple Choice Questions

1. Number of elements present in period – 2 of the long form of periodic table **[ ]**

a) 2 b) 8 c) 18 d) 32

2. Nitrogen (Z = 7) is the element of group V of the periodic table. Which of the following is the atomic number of the next element in the group? **[ ]**

a) 9 b) 14 c) 15 d) 17

3. Electron configuration of an atom is 2, 8, 7 to which of the following elements would it be chemically similar? **[ ]**

a) nitrogen(Z=7) b) fluorine(Z=9)

c) phosphorous(Z=15) d) argon(Z=18)

4. Which of the following is the most active metal? **[ ]**

a) lithium b) sodium c) potassium d) rubidium

5. IE_2 — IE_1 **[ ]**

a) α b) = c) > d) None

Key:

1) b; 2) c; 3) b; 4) d; 5) c.

Match the following

I.	Group-I		Group-II
1.	Alkali family	[ ]	A) Be
2.	Noble gas	[ ]	B) Na
3.	Halogen family	[ ]	C) N
4.	Boron family	[ ]	D) C*l*
5.	Alkali Earth family	[ ]	E) Ar

Key:

1. B; 2. E; 3. D; 4. C; 5. A.

II.	Group-I Orbital		Group-II Maximum number of electrons filled
1.	s. orbital	[ ]	A) 6
2.	p	[ ]	B) 2
3.	d	[ ]	C) 14
4.	f	[ ]	D) $2h^2$
5.	For ‘n’ orbit	[ ]	E) 10

Key:

1. B; 2. A; 3. E; 4. C; 5. D.

III.	Element family		Valence shell electronic configuration
1.	Alkali metal	[ ]	A) $ns^2\ np^1$
2.	Alkaline earth metal	[ ]	B) ns^2np^2
3.	Boron family	[ ]	C) ns^2
4.	Carbon family	[ ]	D) ns^2np^6
5.	Noble gas family	[ ]	E) ns^1

Key:

1. E; 2. C; 3. A; 4. B; 5. D.

Important Tables

1. Group A, B, C, D, E elements atomic weight, Arithmetic mean

Group	Elements and their Atomic weight			Arithmetic mean of Atomic weight
A	Lithium (Li) 7.0	Sodium (Na) 23.0	Potassium (K) 39.0	$\frac{7.0 + 39.0}{2} = 23.0$
B	Calcium (Ca) 40.0	Strontium (Sr) 87.5	Barium (Ba) 137.0	
C	Chlorine (Cl) 35.5	Bromine (Br) 80.0	Iodine (I) 127.0	
D	Sulphur (S) 32.0	Selenium (Se) 78.0	Tellurium (Te) 125.0	
E	Manganese (Mn) 55.0	Chromium (Cr) 52.0	Iron (Fe) 56.0	

2. Newland's table of elements

Table 1: Newlands' table of elements.

Element	No.	Element	No.	Element	No.	Element	No.	Element	No.	Element	No.	Element	No.	Element	No.
H	1	F	8	Cl	15	Co&Ni	22	Br	29	Pd	36	I	42	Pt&Ir	50
Li	2	Na	9	K	16	Cu	23	Rb	30	Ag	37	Cs	44	Os	51
G	3	Mg	10	Ca	17	Zn	24	Sr	31	Cd	38	Ba&V	45	Hg	52
Bo	4	Al	11	Cr	19	Y	25	Ce&La	33	U	40	Ta	46	Tl	53
C	5	Si	12	Ti	18	In	26	Zr	32	Sn	39	W	47	Pb	54
N	6	P	13	Mn	20	As	27	Di&Mo	34	Sb	41	Nb	48	Bi	55
O	7	S	14	Fe	21	Se	28	Ro&Ru	35	Te	43	Au	49	Th	56

3. Mendeleef's periodic table

Table-2 : Mendeleeff's Periodic Table (1871 version)

Reihen	Gruppe I. – R^2O	Gruppe II. – RO	Gruppe III. – R^2O^3	Gruppe IV. RH^4 RO^2	Gruppe V. RH^3 R^2O^5	Gruppe VI. RH^2 RO^3	Gruppe VII. RH R^2H^7	Gruppe VIII. — RO^4
1	H = 1							
2	Li=7	Be=9.4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27.3	Si=28	P=31	S=32	Cl=35.5	
4	K=39	Ca=40	–=44	Ti=48	V=51	Cr=52	Mn=55	Fo=56, Co=59 Ni=59, Cu=63
5	(Cu=63)	Zn=65	–=68	–=72	As=75	So=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	–=100	Ru=104, Rh=104 Pd=106, Ag=108
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	–	–	–	– – – –
9	(–)	–	–	–	–	–	–	
10	–	–	?Ek=178	?La=180	Ta=182	W=184	–	Os=195, Ir=197, Pt=198, Au=199
11	(Au=198)	Hg=200	Tl=204	Pb=207	Bi=208	–	–	
12	–	–	–	Th=231	–	U=240	–	– – – –