CHEMISTRY -CLASS NOTES

CLASS10

ENGLISH MEDIUM

UNIT 1

PERIODIC TABLE AND ELECTRONIC CONFIGURATION

1. What is the basis of classification of elements in the modern periodic table?
Answer : Atomic Number.
2.Atomic number of sodium is 11. Write its electronic configuration. Find the group number and period number of the element. Check whether the element is a metal or not.
Answer: **Electronic configuration**= 2,8,1
Group Number = 1
Period Number = 3
Since the element belongs to the first group, it is a metal.
3. When an electron moves away from the nucleus;
* Its energy increases
* The attraction between the nucleus and the electron decreases.

The shell wise electronic configuration of certain elements are given below

Element	Shells			
	K	L	M	N
$_{3}$**Li**	2	1	-	-
$_{11}$**Na**	2	8	1	-
$_{18}$**Ar**	2	8	8	-
$_{19}$**K**	2	8	8	1

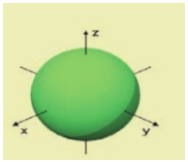
Though the third shell (M) can accommodate a maximum of 18 electrons, ***the last shell cannot accommodate more than eight electrons.***

According to The Bohr model of an atom , electrons are revolving round the nucleus through fixed circular paths called Orbits or shells. Since each electron is associated with a definite amount of energy, these orbits are also known as Main energy levels. In these main energy levels, different Sub energy levels (Sub shells)are assigned. Sub shells are named as s , p , d, f etc.
(s- sharp. p -principal. d- diffuse. f- fundamental)

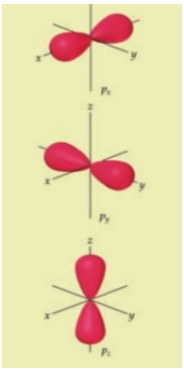
Orbitals: - orbitals are regions in a sub shell where the probability of finding an electron is maximum.

Shapes of orbitals(Only for extra reading)

s Orbital is spherical



P sub shell has three orbitals. P*x* , P*y* and P*z*. They are dumb bell shaped



The following table shows the maximum number of electrons that can be accommodated in various shells and sub shells.

Number of the shell	**1**	**2**		**3**			**4**			
Name of the shell	**K**	**L**		**M**			**N**			
Maximum number of electrons	**2**	**8**		**18**			**32**			
Name of sub shell	*1s*	*2s*	*2p*	*3s*	*3p*	*3d*	*4s*	*4p*	*4d*	*4f*
Maximum number of electrons	**2**	**2**	**6**	**2**	**6**	**10**	**2**	**6**	**10**	**14**

4. What is the relation between the shell number and the number of sub shells?
The shell number and the total number of sub shells are same .

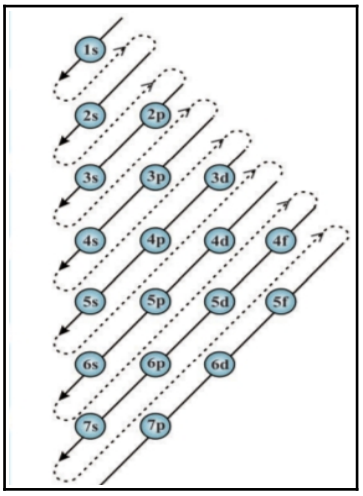
For eg: The **first shell**(K) has **only one sub shell** (1s) , the **second** shell (L) has **two sub shells** (2s ,2p) and so on.

5. *Which sub shell is common to all shells?* ***s***

Distribution of electrons in various sub shells

Electrons occupy various sub shells according to the **increasing order of their energies.**
This is known as sub shell electronic configuration.

It can be understood from the following figure.



1s <2s <2p <3s <3p <4s <3d <4p <5s <4d< ...

6. Write the sub shell electronic configuration of the first 30 elements of the periodic table.

Element	Atomic Number	Sub shell electronic configuration	Short form
$_{1}$H	**1**	$1s^1$	
$_{2}$He	**2**	$1s^2$	
$_{3}$Li	**3**	$1s^2$ $2s^1$	**[He] $2s^1$**
$_{4}$Be	**4**	$1s^2$ $2s^2$	**[He] $2s^2$**
$_{5}$B	**5**	$1s^2$ $2s^2$ $2p^1$	**[He] $2s^2$ $2p^1$**
$_{6}$C	**6**	$1s^2$ $2s^2$ $2p^2$	**[He] $2s^2$ $2p^2$**
$_{7}$N	**7**	$1s^2$ $2s^2$ $2p^3$	**[He] $2s^2$ $2p^3$**
$_{8}$O	**8**	$1s^2$ $2s^2$ $2p^4$	**[He] $2s^2$ $2p^4$**
$_{9}$F	**9**	$1s^2$ $2s^2$ $2p^5$	**[He] $2s^2$ $2p^5$**
$_{10}$Ne	**10**	$1s^2$ $2s^2$ $2p^6$	
$_{11}$Na	**11**	$1s^2$ $2s^2$ $2p^6$ $3s^1$	**[Ne] $3s^1$**
$_{12}$Mg	**12**	$1s^2$ $2s^2$ $2p^6$ $3s^2$	**[Ne] $3s^2$**
$_{13}$Al	**13**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^1$	**[Ne] $3s^2$ $3p^1$**
$_{14}$Si	**14**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^2$	**[Ne] $3s^2$ $3p^2$**
$_{15}$P	**15**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^3$	**[Ne] $3s^2$ $3p^3$**
$_{16}$S	**16**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^4$	**[Ne] $3s^2$ $3p^4$**
$_{17}$Cl	**17**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^5$	**[Ne] $3s^2$ $3p^5$**
$_{18}$Ar	**18**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$	

$_{19}$K	**19**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^1$	**[Ar] $4s^1$**
$_{20}$Ca	**20**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^2$	**[Ar] $4s^2$**
$_{21}$Sc	**21**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^1$ $4s^2$	**[Ar] $3d^1$ $4s^2$**
$_{22}$Ti	**22**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^2$ $4s^2$	**[Ar] $3d^2$ $4s^2$**
$_{23}$V	**23**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^3$ $4s^2$	**[Ar] $3d^3$ $4s^2$**
$_{24}$Cr	**24**	**$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $4s^1$**	**[Ar] $3d^5$ $4s^1$**
$_{25}$Mn	**25**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $4s^2$	**[Ar] $3d^5$ $4s^2$**
$_{26}$Fe	**26**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^2$	**[Ar] $3d^6$ $4s^2$**
$_{27}$Co	**27**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^7$ $4s^2$	**[Ar] $3d^7$ $4s^2$**
$_{28}$Ni	**28**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^8$ $4s^2$	**[Ar] $3d^8$ $4s^2$**
$_{29}$Cu	**29**	**$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^{10}$ $4s^1$**	**[Ar] $3d^{10}$ $4s^1$**
$_{30}$Zn	**30**	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^{10}$ $4s^2$	**[Ar] $3d^{10}$ $4s^2$**

7. Chromium and Copper show exceptional electronic configuration. Give reason.
The d sub shell can accommodate a maximum of 10 electrons. The completely filled configuration (d^{10}) or the half filled configuration (d^5) of this subshell is ***more stable*** than the others.

Likewise, for f sub shell, f^7 and f^{14} arrangements are more stable.

8. The subshellwise electronic configuration of an atom is **$1s^2$ $2s^2$ $2p^6$ $3s^2$**.
Based on this find answers to the following.

How many shells are possible in this atom? ……**3 . (K , L, M)**

Which are the sub shells of each shell ? ……**K =1(1*s*) L =2 (2*s* , 2*p*) M= 1 (3s)**

Which is the sub shell to which the last electron was added ?……..**3s**

What is the total number of electrons in the atom?……**12**

What is its atomic number? ……**12**

How can the subshell electronic configuration be written in short form?……..**[Ne] $3s^2$**

9.Write the subshell electronic configuration of Zirconium (Z=40)
$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^{10}$ $4s^2$ $4p^6$ **$4d^2$** $5s^2$ or **[Kr] $4d^2$ $5s^2$**

Subshell electronic configuration and blocks

The block to which the element belongs will be the same as the ***subshell to which the last electron is added.*** In the periodic table the elements are arranged in ***s, p, d*** and ***f*** blocks

Examples

Element	Atomic Number	Sub shell electronic configuration	The sub shell to which the last electron is added	Block
$_{3}$Li	3	$1s^2$ $\mathbf{2s^1}$	***s***	***s***
$_{12}$Mg	12	$1s^2$ $2s^2$ $2p^6$ $\mathbf{3s^2}$	***s***	***s***
$_{7}$N	7	$1s^2$ $2s^2$ $\mathbf{2p^3}$	***p***	***p***
$_{21}$Sc	21	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $\mathbf{3d^1}$ $4s^2$	***d***	***d***
$_{17}$Cl	17	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $\mathbf{3p^5}$	***p***	***p***
$_{26}$Fe	26	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $\mathbf{3d^6}$ $4s^2$	***d***	***d***
$_{4}$Be	4	$1s^2$ $\mathbf{2s^2}$	***s***	***s***
$_{26}$Fe	26	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $\mathbf{3d^6}$ $4s^2$	***d***	***d***
$_{18}$Ar	18	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $\mathbf{3p^6}$	***p***	***p***

Subshell electronic configuration and Period

Period number = The shell number of the outer most shell in the subshell electronic configuration.

Examples

Element	Sub shell electronic configuration	No. of the outer most (highest) shell	Period
$_{4}$Be	$1s^2$ $\mathbf{2}s^2$	2	**2**
$_{6}$C	$1s^2$ $2s^2$ $\mathbf{2}p^2$	2	**2**
$_{11}$Na	$1s^2$ $2s^2$ $2p^6$ $\mathbf{3}s^1$	3	**3**
$_{19}$K	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $\mathbf{4}s^1$	4	**4**
$_{21}$Sc	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^1$ $\mathbf{4}s^2$	4	**4**
$_{22}$Ti	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^2$ $\mathbf{4}s^2$	4	**4**
$_{29}$Cu	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^{10}$ $\mathbf{4}s^1$	4	**4**

s Block Elements

The elements in which the last electron enters into the s sub shell of the outermost shell are called s block elements. These include elements of group I (alkali metals) and group II (Alkaline earth metals)

* In chemical reactions, s block elements donate electrons . Hence they show positive oxidation states.

Alkali metals donate one electron. Hence they show +1 oxidation state.
Alkaline earth metals donate two electron. Hence they show +2 oxidation state.

The group number of s block elements
For s block elements the number of electrons in the outermost s subshell will be the group number.

AR7KHB

10. *The oxides and hydroxides of* ***s*** *block elements are basic in nature. Justify.*
Most of the oxides and hydroxides of ***s*** block elements react with acids to give salt and water. *They turn red litmus blue.*

11. Suppose that 1 st and 2 nd group elements are represented by the symbols **X** and **Y**.Complete the table given below.

Group	Valency	Oxidation State	Symbol of ion	Formula of oxide
1 **[X]**	1	+1	-----	X_2O
2 **[Y]**	2	-----	Y^{2+}	

Answer :

Group	Valency	Oxidation State	Symbol of ion	Formula of oxide
1 **[X]**	1	+1	X^{+}	X_2O
2 **[Y]**	2	+2	Y^{2+}	**YO**

s block elements show definite valency and oxidation states

12. Write the **characteristics of s block elements (*Summary*)**

* Metallic nature.

* Low ionization energy.
  (Only a small amount of energy is needed to remove a weakly bonded electron)
* Low electro negativity. (Tendency to attract electron is less as they donate electrons)

* Lose electrons in chemical reactions.

* Compounds are mostly ionic .

* Elements of group 1 have greater reactivity in their respective periods.

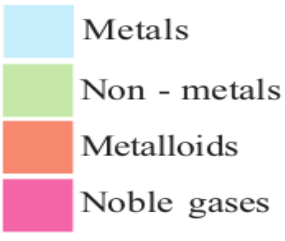
* Oxides and Hydroxides are basic in nature.

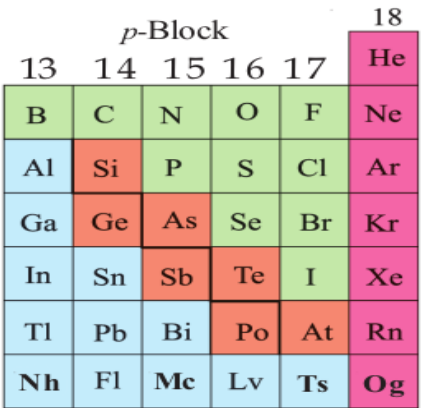
* Highest atomic radius in the respective periods .

* Reactivity increases down the group.

'*p*' block elements

* The elements in which the last electron goes to the ***p*** subshell of the outermost shell are called ***p*** block elements.
* The p block consists of elements of group 13 to 18.
* Elements of solid , liquid and gaseous states at room temperature are present in p block.
* Most of the elements of group 18 are chemically inert.
* Among the p block elements, the highest reactivity is shown by group 17 elements.
* They show higher ionisation energy and electronegativity than s block elements.
* Metallic Character increases down the group (Decreases along a period).





18

Group number of p block elements

* The **group number of p block** elements can be obtained by adding **10** to the total **number of electrons in the s and p sub shell of the outermost shell. (s+ p+10)**

13. Elements of group 18 usually show higher ionisation energy Give reason.
In group 18 elements, the shells and the last sub shell contain maximum number of electrons that can be accommodated in them. They are stable. Hence large amount of energy is needed to remove electrons.

14. Among the p block elements, the highest reactivity is shown by group 17 elements. Give reason.
The atomic size of group 17 elements are smaller. Their outermost shell contains 7 electrons . ***They need only one electron for attaining stability.*** They have the highest electro negativity in the respective periods. Hence they are highly reactive.

15. The element having the highest electronegativity is in the p block.
Find its name and position.
Answer: Fluorine (F) ..Group = 17 ; Period= 2

16. Elements in the solid , liquid and gaseous states at room temperature are present in ***p*** block. Give examples.

Physical States	*Elements*
Solid	B ,Al, C, Si, P, S, Po etc..
Liquid	**Bromine** Gallium (At high temperatures)
Gas	N, O, F , Cl, He, Ne, Ar, Kr, Xe, Rn..

17. Complete the table ***(symbols are not real)--Answer***

Element	***Outer electronic configuration***	***Complete subshell electronic configuration***	***Atomic Number Z***	***Period***	***Group***	***Block***
X	$3s^2$	$1s^2\ 2s^2\ 2p^6\ 3s^2$	12	3	2	s
Y	$3s^2\ 3p^5$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$	17	3	17	p

Which element has a valency 1 ? **Y**
Which element shows metallic character ? **X**
Which element has the highest ionisation energy? Y
Write the chemical formula of the compound formed by the combination of X and Y and label the oxidation states **XY_2 ; X = + 2 , Y = - 1**
18. Representative elements are…?

Answer: Elements of ***s*** and ***p*** blocks are collectively called representative elements.

19. The outermost subshellwise electronic configuration of an element Y (Symbol is not real) is $3s^2\ 3p^4$

- To which period and group does this element belong to?
- Write down the outermost subshell electronic configuration of the element coming just below it in the same group.

Answer: **Group**= 2+4+10 =16 **Period** =3

Outermost subshell electronic configuration of the element coming just below it=$\mathbf{4}s^2\ \mathbf{4}p^4$

'*d*' block elements

* *The elements in which the last electron goes to the **d** sub shell of the **Penultimate** shell are called **d** block elements.*

* *The d block consists of elements of group 3 to 12 of the periodic table.*

* *They are also known as Transition elements.*

(The word transition refers to a slow but steady change from one to the other)

* *These are all metals*

* *They show similarity in properties not only in a group but also in a period*

* *The show variable oxidation states.*

* *Most of their ions and compounds are coloured.*

* *Many transition metals or their compounds are good catalysts.*

Finding the group of d block elements

The group number of the d block elements will be the same as the ***sum of*** electrons in the ***outermost s*** subshell ***and*** the number of electrons in ***the preceding d subshell. (s+d)***

20.*d* Block elements show similarity in properties not only in a group but also in a period. Give reasons.

In *d* Block elements, the last electron enters into the *d* sub shell of the Penultimate shell. Hence there will be no change in the number of electrons present in the last shell. The chemical properties of an element mainly depend on the number of electrons in its last shell. In *d* block elements, the number of electrons present in the last shell will be the same in a group and in a period (with a few exceptions).

Group	3	4	5	7	8	9	10	12
Element	$_{21}$Sc	$_{22}$Ti	$_{23}$V	$_{25}$Mn	$_{26}$Fe	$_{27}$Co	$_{28}$Ni	$_{30}$Zn
Electronic Configuration	[Ar] $3d^1\ \mathbf{4s^2}$	[Ar]$3d^2\ \mathbf{4s^2}$	[Ar]$3d^3\ \mathbf{4s^2}$	[Ar]$3d^5\ \mathbf{4s^2}$	[Ar]$3d^6\ \mathbf{4s^2}$	[Ar] $3d^7\mathbf{4s^2}$	[Ar] $3d^8\mathbf{4s^2}$	[Ar] $3d^1\mathbf{4s^2}$

Since Chromium and Copper show exceptional electronic configuration , they have been excluded here.

21. What do you mean by the term Valency?
Valency of an element is the number of electrons gained , lost or shared by an atom during chemical combinations. It is considered to be the combining capacity of the element.

22. *The d block elements show variable oxidation state. Give an example.*
Two compounds of Iron (Fe) are given below.
1. Ferrous Chloride - $FeCl_2$ and
2. Ferric Chloride - $FeCl_3$
We know the oxidation state of Chlorine is -1

The oxidation state of Fe in $FeCl_2$ is +2 . Fe^{2+} ions are present in $FeCl_2$
Fe^{2+} is formed by the loss of two electrons.

The Sub shell electronic configuration of Fe is $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^2$

Therefore the Sub shell electronic configuration of Fe^{2+} is $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^0$
(**Two electrons are removed from the 4s orbital**)

On the other hand the oxidation state of Fe in $Fe Cl_3$ is **+3** . Hence Fe^{3+} ions are present in $FeCl_3$
Fe^{3+} is formed by the loss of three electrons.
The Sub shell electronic configuration of Fe is $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^2$
Therefore the Sub shell electronic configuration of Fe^{3+} is $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $\mathbf{4s^0}$
(Two electrons are removed from the 4s orbital and **the third one from 3d**)

Atom/ Ion	**Sub shell electronic configuration**
Fe	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^2$
Fe^{2+}	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^6$ $4s^0$
Fe^{3+}	Fe is $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $\mathbf{4s^0}$

23. The d block elements show variable oxidation state. Give reason:
In d block elements, there is only a ***slight difference in the energy between the Outermost s subshell and the penultimate d sub shell.*** In some occasions , these inner d electrons may participate in chemical reactions in addition to the outermost s electrons. Hence they show variable oxidation valency (Oxidation state)

Element / Compound	**Oxidation State of Mn**	**Atom / Ion of Mn**	**Subshell electronic configuration**
Mn	0	Mn	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $\mathbf{4s^2}$
$MnCl_2$	2+	Mn^{2+}	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^5$ $\mathbf{4s^0}$
MnO_2	4+	Mn^{4+}	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^3$ $\mathbf{4s^0}$
Mn_2O_3	3+	Mn^{3+}	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^4$ $\mathbf{4s^0}$
Mn_2O_7	7+	Mn^{7+}	$1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^0$ $\mathbf{4s^0}$

(Oxidation state of Oxygen is -2)

24. Most of the ions and compounds of the d block elements are coloured . Give examples

Compound	Colour
Copper suphate	Blue
Cobalt nitrate	Light Pink
Potassium per***mangana***te	Deep Purple
Ferrous Sulphate	Light green
Cupric Chloride	**Green** *with a tint of blue*

Compounds of transition elements are used for giving colour to glasses and in oil paintings

The '*f* ' block elements

* The elements in which the last electron enters into the f sub shell of the ***ante penultimate shell*** are called f block elements.
* The f block elements are the elements coming after lanthanum and actinium and are placed in two rows at the bottom of the periodic table.
* They are arranged in the 6^{th} and 7^{th} period of the periodic table in two separate raws. First raw is called *Lanthaniods.* The second raw is called Actionids.
* Like d block elements, they also show variable oxidation states.
* Most of the *actinoids* are radioactive and are artificial elements.
* Uranium (U) ,Thorium (Th), Plutonium etc are used fuels in nuclear reactors.
* Many of them are used as catalysts in petroleum industry.

25. Note the part of the periodic table given below . ***The symbols given in the column are not real.***

1	← Group →																18
	2											13	14	15	16	17	
														E	F	G	H
		3	4	5	6	7	8	9	10	11	12						
A	B			C	D												

- List out the elements of the s block. **(A , B)**
- Which element shows +2 oxidation state? **(B)**
- Which element contains 5 electrons in the outermost shell?**(E)**
- Which is the element that has 5 p electrons in the outermost shell? **(G)**
- Which are the elements in which the last electron enters the d subshell? **(C, D)**
- Which element has the highest ionisation energy? **(H)**
- Which is the highly reactive non metal?**(G)**
- Which element shows - 2 oxidation state?**(F)**

- The outermost electronic configuration of an element **in this is** $2s^2\ 2p^6$.
  (i) Which is the element (**H**)
  (ii) Write down the complete electronic configuration **($1s^2\ 2s^2\ 2p^6$)**
  (iii) Write any two characteristics of this element

(Hint : Write any two characteristics of group 18 elements : high ionisation energy, less reactivity, stability ..**)**

- Write the chemical formula of the compound formed between A and G **(AG)**
- Write the chemical formula of the compound formed between B and G **(BG_2)**

Let's assess

1. Based on the hints given, find out the atomic number and write down the subshell electronic configuration of elements (Symbols used are not real).
   i) A – period 3 group 17
   ii) B – period 4 group 6
2. When the last electron of an atom was filled in the 3d subshell, the subshell electronic configuration was $3d^8$. Answer the questions related to this atom.
   - Complete subshell electronic configuration
   - Atomic number
   - Block
   - Period number
   - Group number
3. Pick out the wrong subshell electronic configurations from those given below.
   a) $1s^2\,2s^2\,2p^7$ b) $1s^2\,2s^2\,2p^2$
   c) $1s^2\,2s^2\,2p^5\,3s^1$ d) $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^2\,4s^1$
   e) $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^2\,4s^2$

Let's Assess Questions (Page 29, 30)

Answers:

1. A - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

B - $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^5\,4s^1$

2. $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^8\,4s^2$

- Atomic Number= 28
- Block= d
- Period = 4
- Group= 10

3. a,c,d

4. The element X in group 17 has 3 shells. If so,
   a) Write the subshell electronic configuration of the element.
   b) Write the period number.
   c) What will be the chemical formula of the compound formed, if the element X reacts with Y of the third period which contains one electron in the p sub shell?
5. The element Cu with atomic number 29 undergoes chemical reaction to form an ion with oxidation number +2.
   a) Write down the subshell electronic configuration of this ion?
   b) Can this element show variable valency? Why?
   c) Write down the chemical formula of one compound formed when this element reacts with chlorine ($_{17}$Cl).
6. Certain subshells are given below.

   2s, 2d, 3f, 3d, 5s, 3p
   a) Which are the subshells that are not possible?
   b) Give reason.

Answers

4. a. $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^5$
b. 3
c. YX_3

5. a) Cu^{2+} , $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $3d^9$

b) Yes it can. It is a d block element . In d block elements, there is only a slight difference in the energy between the Outermost s subshell and the penultimate d sub shell. In some occasions , these inner d electrons may participate in chemical reactions in addition to the outermost s electrons. Hence they show variable oxidation valency (Oxidation state)

c.) CuCl and $CuCl_2$

6. a) 2d , 3f
b) Only two sub shells are possible for the second shell . They are ***s*** and ***p***
Only two sub shells are possible for the third shell . They are ***s*** ,***p*** and ***d***