

## Periodic Classification of Elements

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### Check Point 01

#### Q. 1. State Dobereiner's law of triads.

**Answer:** Dobereiner created some groups having three elements in each group. He called these groups triads. He stated that when the elements in a group are arranged in increasing order of their atomic masses then the atomic mass of the middle element is approximately the average of the atomic masses of two other elements.

#### Q. 2. What is Newlands' law of octaves? Why is it called so?

**Answer:** Newland arranged the known elements in increasing order of atomic mass. He found that the every eighth element had properties similar to that of first one. He compared it to the octaves found in music and thus it is called Newland's law of octaves.

#### Q. 3. On what basis Mendeleev classify the elements?

**Answer:** Mendeleev classified the elements on the basis of their fundamental property, i.e. atomic mass and chemical properties. He reacted the elements with hydrogen and oxygen and formulae of the hydrides and oxides of the elements were considered as a basic property for their classification.

#### Q. 4. Why did Mendeleev left some gaps in his periodic table?

**Answer:** Mendeleev left some gaps in his periodic table because he predicted the existence of some elements which had not been discovered at that time.

#### Q. 5. Why was the position of hydrogen not fixed in Mendeleev's periodic table?

**Answer:** Electronic configuration of hydrogen is similar to that of alkali metals. Just like alkali metals, it reacts with halogens, oxygen and sulphur to form compounds of similar formulae. For e.g.:  $\text{H}_2\text{S}$  and  $\text{Na}_2\text{S}$ . On the other hand, hydrogen reacts with metals and non-metals just like halogens. Due to this anomalous behaviour of hydrogen, Mendeleev was unable to fix a position for it.

### Check Point 02

#### Q. 1. How many groups and periods are present in the modern periodic table?

**Answer:** Vertical columns in the periodic table are called "groups". There are 18 such groups in modern periodic table. Horizontal rows are called "periods". There are 7 such periods in modern periodic table.

**Q. 2. What is the main difference between Mendeleev's and modern periodic law?**

**Answer:** The main difference between the Mendeleev's and modern periodic law is that Mendeleev considered the properties of elements as periodic function of their atomic masses while modern periodic law considers the properties of elements as periodic function of their atomic numbers.

**Q. 3. Elements of the same group have similar properties. Why?**

**Answer:** Elements present in the same group have a same number of electrons in their valence shells. On moving down a group, the number of shells increases but the number of electrons in the valence shell remains the same. That's why the elements of the same group have similar properties.

**Q. 4. In which period and group would you place the elements with the following electronic configurations.**

(i) 2,8 (ii) 2,5

**Answer:**

(i) The electronic configuration is 2,8. It means that the given element contains 2 electrons in K shell and 8 electrons in L shell. Thus the element contains 2 shells. Thus it belongs to the second period. Secondly, there are 8 electrons in the valence shell (completely filled) which is true for the 18<sup>th</sup> group.

(ii) The electronic configuration is 2,5. It means that the given element contains two shells, thus the period is 2<sup>nd</sup>. Secondly, there are 5 electrons in the valence shell which is true for the 15<sup>th</sup> group.

**Q. 5. How does the atomic size of the elements vary along a period?**

**Answer:** The atomic size increases on moving down the group. This is because of the increase in a number of shells due to which the distance between the outermost electron and the nucleus increases.

The atomic size decreases on moving along a period. This is because of the increase in the effective nuclear charge on moving from left to right which tends to pull the electrons towards the nucleus.

**Q. 6. A metal M forms an oxide having the formula  $M_2O_3$ . It belongs to the third period in the modern periodic table. Write the atomic number and valency of the metal.**

**Answer:** Since the Molecular formula of oxide of a metal (M) is  $M_2O_3$  where valency of oxygen is 2 and the valency of the metal is 3. Since the metal has a valency of 3 and belongs to the third period, so the metal is Aluminium.

### Chapter Exercise

**Q. 1. Among the following elements F, Cl, Br and I, which does not fit in Dobereiner's triad.**

**Answer:** F does not fit in Dobereiner's triad.

Dobereiner stated that when the elements in a group are arranged in increasing order of their atomic masses then the atomic mass of the middle element is approximately the average of atomic masses of two other elements. Fluorine doesn't fit into this rule while the atomic mass of Br is average of the atomic masses of Cl and I.

**Q. 2. What is the basis for the classification of modern periodic table?**

**Answer:** Elements were arranged in the increasing order of their atomic numbers. This leads to the modern periodic law that the properties of elements are the periodic function of their atomic numbers.

**Q. 3. Name the two elements whose valencies are equal to their group number.**

**Answer:** For group II elements, the group no. (2) is equal to the valency of the elements present in this group. So two such elements belonging to group II are Calcium and Magnesium.

**Q. 4. Which element comes after (right) lithium in the periodic table?**

**Answer:** Lithium is present in the 1<sup>st</sup> group and the 2<sup>nd</sup> period. On moving along the period from left to right, the atomic number increases. The atomic number of Li is 3 so the atomic number of next element will be 4. Thus the next element to Li is Beryllium.

**Q. 5. Calcium is element with atomic number = 20. Is it more reactive or less reactive than Mg.**

**Answer:** Both Mg and Ca belong to the same group (group II) and are capable of losing electrons which is responsible for their reactivity. Mg lies above Ca in Group II. As we move down a group, the effective nuclear charge on valence shell electrons decreases due to which losing electrons become easier. Thus Ca is more reactive than Mg.

**Q. 6. Why does carbon has valency 4 and chlorine 1?**

**Answer:** The electronic configuration of Carbon is: 2,4. We can see that there are 4 electrons in the valence shell of Carbon, thus it has a valency of 4.

The electronic configuration of Chlorine is: 2,8,7. Though there are 7 electrons in valence shell of Cl but instead of losing 7 electrons it tends to gain 1 electron. Thus its valency is 1.

**Q. 7. A metal M belongs to 13th group in the modern periodic table. Write the valency of the metal.**

**Answer:** Since the metal M belongs to the Group 13, so its valence shell will have 3 electrons. Thus the valency of the metal M belonging to 13<sup>th</sup> group is 3.

**Q. 8. X is an element with Atomic number = 20. What will be the formula of its chloride?**

**Answer:** The atomic number 20 indicates that the electronic configuration of element is 2,8,8,2. The number of electrons in valence shell is 2. Thus its valency is 2. So the formula of its chloride will be  $MCl_2$ . Moreover we know that calcium has an atomic number=20, therefore the exact molecular formula will be  $CaCl_2$ .

**Q. 9. Out of the three elements Ca, Mg. Sr which one will have atom of biggest size?**

**Answer:** Ca, Mg and Sr all three belong to the same group and are present in the order  $Mg < Ca < Sr$ . The atomic size increases on moving down the group. This is because of the increase in number of shells due to which the distance between the outermost electron and the nucleus increases. Thus Sr will have atoms of biggest size.

**Q. 10. Out of Li, C and N, which element form the most basic oxide and which form the most acidic oxide?**

**Answer:** Li, C and N all three belong to the same period. They are present in the order:  $Li < Be < B < C < N$ . On moving along a period from left to right, the metallic character decreases and non-metallic character increases. So Li has the most metallic character and N has the most non- metallic character. Since metal-oxides is basic in nature, therefore oxide of Li will be most basic and non-metal oxide is acidic in nature, therefore Oxide of Nitrogen will be most acidic.

**Q. 11 Initially It was believed that atomic mass of beryllium was 13. But Mendeleev suggested that its atomic mass should be 9.**

**(i) was Mendeleev suggestion correct?**

**(ii) How had he reached to this Conclusion?**

**Answer:** (i) yes, Mendeleev's suggestion was correct as it was found later on experimentally that beryllium's atomic mass is 9.

(ii) He studied the formula of hydrides and oxides of beryllium and observed that they had similarity with those of magnesium oxides and hydrides. Thus he placed the beryllium above Mg and predicted its atomic mass as 9.

**Q. 12. An element X belongs to the second period and group 15 of the periodic table. Find out**

**(i) the number of valence electrons in its atoms.**

**(ii) valency of the elements.**

**Answer:** (i) Since the element belong to the 15<sup>th</sup> group , so it must have 5 valence electrons in its atoms.

(ii) since the element is in 2<sup>nd</sup> period and belongs to 15<sup>th</sup> group, so it must be nitrogen. Nitrogen has a valency of 3.

**Q. 13. Identify the similarity in the atoms of pairs of elements given below:**

**(i) Na (atomic number=11) and**

**K (atomic number=19)**

**(ii) B (atomic number=5) and**

**C (atomic number=6)**

**Answer:** (i) Both Na and K belongs to the same group (group I). Both contains same number of electrons in their valence shells i.e. 1

(ii) Both B and C belong to the same period (2<sup>nd</sup> period). Both contains same number of shells i.e. 2

**Q. 14. Write the trend of atomic size along a group and a period in the modern periodic table.**

**Answer:** The atomic size increases on moving down the group. This is because of the increase in number of shells due to which the distance between the outermost electron and the nucleus increases.

The atomic size decreases on moving along a period. This is because of the increase in the effective nuclear charge on moving from left to right which tends to pull the electrons towards the nucleus.

**Q. 15. An atom of some element has electronic configuration 2,8,6.**

**(i) What is the atomic number of this element?**

**(ii) Name the element that shows chemical similarity with it.**

**Answer:** The electronic configuration tells about the number of electrons present in different shells. Thus total electrons can be found by adding the electrons present in all shells i.e.  $2+8+6=16$ . The number of electrons and protons are equal. Therefore, atomic number is 16.

(ii) The element with atomic number(Z)=16 is sulphur. The other element which show chemical similarity with sulphur is oxygen.

**Q. 16. The order of metallic character of elements A, B, C and D is  $D>A>C>B$**

**(i) What is the order of their electronegative character?**

**(ii) What is the nature of oxide of B If oxide of A is amphoteric?**

**Answer:**

(i) As the metallic character decreases, the tendency to loose valence electrons also decreases. In other words the tendency to gain electron increases, so their electronegative character increases:

Order:  $D<A<C<B$

(ii) Since the element B has least metallic character, so it will have maximum non-metallic character in it. Non-metal oxides are acidic in nature, therefore oxide of B will be acidic in nature.

**Q. 17. Write the reason for the following (number in parenthesis is atomic number of the substance)**

**(i) Lithium (3) and sodium (11) are considered as active metals.**

**(ii) Fluorine (9) is more reactive than chlorine (17).**

**Answer:** (i) Lithium and sodium contain only single electrons in their valence electrons which they can readily loose to react. Due to their high reactivity with water, they are considered as active metals.

(ii) Fluorine lies above chlorine in the 17<sup>th</sup> group. This indicates that fluorine has much higher electronegativity than chlorine due to which it tends to gain electron more easily. That's why fluorine is more reactive than chlorine.

**Q. 18. The elements of second and third period of the periodic table are given below:**

Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl

**(i) Which atom is bigger in size Li or Be? Why?**

**(ii) Which one element out of those given above is the most metallic and why?**

**Answer:** (i) Li is bigger in size than beryllium. This is because the atomic size decreases on moving along a period as the effective nuclear charge increases on moving from left to right which tends to pull the electrons towards the nucleus.

(ii) Na is the most metallic element out of the given elements. This is because on moving along a period from left to right, the metallic character decreases and on moving down a group the metallic character increases. Thus Na is most metallic as it can easily lose its valence electron.

**Q. 19 The atomic number of elements A, B, C, D and E are given below.**

Element	A	B	C	D	E
Atomic Number	7	10	12	4	19

**From the above table, answer the following questions.**

**(i) Which two elements are chemically similar?**

**(ii) Which element is an inert gas?**

**(iii) Which element belongs to 3rd period of periodic table?**

**(iv) Which element among these is a non-metal?**

**Answer:** (i) C and D are the two elements which are chemically similar. This is because the electronic configuration of C is 2,8,2 and that of D is 2,2, so both the elements contain same number of valence electrons.

(ii) Element B is an inert gas. This can be concluded by writing its electronic configuration as 2,8. Both the shells are completely filled. Thus it is an inert gas.

(iii) The element E belongs to the 3<sup>rd</sup> period. Its electronic configuration is 2,8,9 from which we can see that there are 3 shells present in it. So it belongs to 3<sup>rd</sup> period.

(iv) Element A is a non-metal. Its atomic number is 7, so its electronic configuration will be 2,5, we can see that it contains 5 valence electrons so it belongs to 15<sup>th</sup> group and will lie on the right side of the second period. On moving from left to right in a period, non-metallic character increases. Thus A is a non-metal.

**Q. 20. What are valence electrons? Does the number of valence electrons increase or decrease on moving from left to right in a period. How does valency of elements vary in the period?**

**Answer:** ● The electrons present in the outermost shell of an element are known as valence electrons.

● The number of valence electrons increases on moving from left to right in a period. This is because on moving from left to right the electrons are added in the same shell.

● The valency of elements first increases in the period and then decreases. For example the trend of valency can be illustrated as follows:

Element	Li	Be	B	C	N	O	F
Valency	1	2	3	4	3	2	1

**Q. 21. The atomic number of three elements A, B and C are 11, 14 and 17 respectively.**

**(i) State the group to which these elements belong in the modern periodic table.**

**(ii) Write the formula of the compound formed when the elements B reacts with C.**

**Answer:** (i) ● The electronic configuration of element A is: 2,8,1. Number of valence electrons=1 So, it belongs to 1<sup>st</sup> group.

● electronic configuration of element B is:2,8,4. It contains 4 valence electrons, so it belongs to 14<sup>th</sup> group.

● electronic configuration of element C is: 2,8,7. It contains 7 valence electrons, so it belongs to 17<sup>th</sup> group.

(ii) The element B is Si and it has a valency of 4. The element C is Chlorine and it has a valency of 1. So the formula of compound when B reacts with C is SiCl<sub>4</sub>.



**Q. 22. The electronic configuration of an element X is 2, 8, 8, 2. To which (a) period and (b) group of the modern periodic table does X belong? State its valency. Justify your answer in each case.**

**Answer:** (a) From electronic configuration, we can observe that the number of shells is 4. Thus it belongs to the 4<sup>th</sup> period.

(b) From electronic configuration, we can observe that the number of valence electrons is 2. Thus, it belongs to 2<sup>nd</sup> group.

Valency also depends on the number of valence electrons. Given element X tends to lose two electrons thus it has a valency of 2.

**Q. 23. Arrange the following elements according to the instructions written in parenthesis.**

**(i) Cu, Mn, Ge, Sc (increasing atomic size)**

**(ii) Fe, Hs, Ru, Os (increasing number of valence shells)**

**(iii) Hf, Cs, Ba, Tl (increasing valency)**

**Answer:** (i) Cu, Mn, Ge, Sc all belong to same period. The order in which they appear in the period in left to right direction is: Sc → Mn → Cu → Ge. The atomic size decreases on moving along a period. This is because of the increase in the effective nuclear charge on moving from left to right which tends to pull the electrons towards the nucleus. Therefore, the increasing order of atomic sizes is: Ge < Cu < Mn < Sc.

(ii) Fe, Hs, Ru, Os all belong to the same group. On moving down a group, the number of shells increases. Thus the increasing order for number of shells is Fe < Ru < Os < Hs.

(iii) Number of valence electrons in given elements is as follows:

Hf → 4

Cs → 1

Ba → 2

Tl → 3

So the order for increasing valency is : Cs < Ba < Tl < Hf

**Q. 24. Four elements P, Q, R, and S have atomic numbers 12, 13, 14 and 15 respectively. Answer the following questions giving reasons.**

**(i) What is the valency of Q?**

**(ii) Classify these elements as metals and non-metals.**

**(iii) Which of these elements will form the most basic oxide?**

**Answer:** (i) The electronic configuration of Q is :2,8,3. It has three valence electrons, so it has a valency of three.

(ii) We can classify an element as a metal or non-metal by looking at its position in periodic table. Those lying on left side of periodic table are metals and those lying on right side are non-metals.

Element	Electronic configuration	Group no.	Metal/non-metal
P	2,8,2	2 <sup>nd</sup>	Metal
Q	2,8,3	13 <sup>th</sup>	Metal
R	2,8,4	14 <sup>th</sup>	Metalloid( have properties of both metal and non-metal)
S	2,8,5	15 <sup>th</sup>	Non-metal

(iii) The element P is most metallic because it can easily lose two electrons and lies on the left side of the periodic table. Metal oxides are basic in nature, therefore oxide of P will be most basic.

**Q. 25. Name**

**(i) two elements having valency 2 with respect to oxygen.**

**(ii) two elements forming oxides of the types  $XO_3$ .**

**(iii) an element having number of electrons double in its L-shell than that present in its M-shell.**

**Answer:** (i) Two elements that can show a valency of two with respect to oxygen are calcium and barium.

(ii) Two elements that can form oxides of type  $XO_3$  are chromium (Cr) and sulphur (S). Formulae of their oxides are:  $CrO_3$  and  $SO_3$ .

(iii) The innermost shell is k shell, followed by L shell and then comes the M shell. We can write an electronic configuration which can satisfy the given condition as: 2,8,4. We

can see that the number of electrons present in L shell is double of the electrons present in M shell. This is possible for an element with atomic no.=14. Thus the element is Si.

**Q. 26. X is an element with atomic number 20.**

**(i) Is it a metal or a non-metal?**

**(ii) Among X or Mg, which one is more reactive?**

**(iii) What is the valency of X?**

**Answer:** (i) The element X has atomic number=20, it means that the element is Ca. It has electronic configuration as: 2,8,8,2. The number of valence electrons is 2 which it can lose easily. Thus element X (Ca) is a metal.

(ii) Mg has atomic number 12 and electronic configuration as: 2, 8, 2. Also, it has a lesser number of shell and thus its valence electrons lie closer to nucleus as compared to X(Ca) which has its valence electrons in 4<sup>th</sup> shell, so Mg is less reactive than X(Ca). Thus X(Ca) is more reactive than Mg.

(iii) Since X contains 2 electrons in last shell and it can readily lose them so its valency is 2.

**Q. 27. X is an element of modern periodic table. It is surrounded by elements having atomic number 17, 34, 36 and 53.**

**(i) What is the atomic number of X?**

**(ii) Predict its position in the periodic table.**

**(iii) Which among these do not belong the same period?**

**Answer:** (i) As we can see it is given that X is surrounded by all other elements given above and there are numbers given 34 and 36. So, X must have atomic number 35. And this can be verified with periodic table where atomic number 35 corresponds to Bromine.

(ii) As atomic no. 36 corresponds to Neon (Ne) having noble gas configuration: 2, 8, 18, 8 which means 18<sup>th</sup> group element so X (Br) with atomic no. 35 will lie in group just before this that is 17<sup>th</sup> group. Also, X (Br) has electronic configuration: 2, 8, 18, 7 which means it has 4 shells or n=4 and lies in 4<sup>th</sup> period. So X (Br) lies in 4<sup>th</sup> period and 17<sup>th</sup> group.

(iii) Electronic configuration of elements with given atomic numbers,

Z=17: 2, 8, 7

Z=34: 2, 8, 18, 6

Z=36: 2, 8, 18, 8

Z=53: 2, 8, 18, 18, 7

It can be easily seen that elements with atomic number 34 and 36 lie in same period as have same number of shells  $n=4$  and all other elements are from different periods.

**Q. 28. The position of five elements in the periodic table are shown below:**

	Group 1	Group 2	Group 15	Group 16
Period 1		A		B
Period 3	C		D	E

**What are the number of valence electrons in B?**

**Identify the element(s) which**

**(i) will have the smallest atomic radius?**

**(ii) will be the most metallic?**

**(iii) will form basic oxide?**

**(iv) will show valency three?**

**(v) will show greatest tendency to gain electron?**

**Answer:** Since, we know that elements in 16<sup>th</sup> group have 6 electrons in their outer most shell i.e. the valence electrons are 6. Therefore, we can say that B has 6 valence electrons.

(Note: For this case ignore the period.)

(i) We know that element in lower period have smaller radius as compared other as they have less no. of shells. Also, going along period the size of atom decreases as the effective nuclear charge on outer electrons increases. So, B will have smallest size as it lies in 1st period and 16th group.

(ii) We know that, the metallic character increases going down the group and decreases going right along the period. Thus C will be most metallic of all.

(iii) Since C and A lie in 1<sup>st</sup> and 2<sup>nd</sup> group so these can readily lose electron and thus can form basic oxides.

(iv) We know that elements of 15<sup>th</sup> group need only three electrons to complete their octet configuration and thus show valency 3. So, D will show valency 3.

(v) We know that tendency to gain electron or electron gain enthalpy increases going right along period and decreases going down the group. Thus, B will show highest tendency to gain electrons

**Q. 29. A non-metal A which is the largest constituent of air combines with hydrogen on heating in the presence of Fe (as catalyst) and forms a gas**

**B. When this gas B is treated with H<sub>2</sub>SO<sub>4</sub>, compound C is formed which is broadly used as chemical fertiliser.**

**(i) Identify A, B and C.**

**(ii) Locate the position of A in the modern periodic table.**

**(iii) Which elements are present before and after the element A?**

**(iv) Write the electronic configuration of element A.**

**Answer:** (i) The largest non-metal constituent of air is nitrogen (N) and it is present as N<sub>2</sub> gas. It reacts with hydrogen in presence of Fe catalyst to give Ammonia (NH<sub>3</sub>). Ammonia reacts with conc. H<sub>2</sub>SO<sub>4</sub> to give ammonium sulphate (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>.

Thus A= Nitrogen (N)

B=Ammonia (NH<sub>3</sub>)

C= Ammonium sulphate (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>

(ii) Element A is Nitrogen. It lies in the 2<sup>nd</sup> period and 15<sup>th</sup> group of the modern periodic table.

(iii) Carbon comes before nitrogen and oxygen comes after nitrogen in the 2<sup>nd</sup> period.

(iv) The atomic number of nitrogen is 7. So, its electronic configuration is 2,5.

**Q. 30. A teacher of Xth class, during teaching explains the importance of the music in our daily life. She was telling to her students that in the Indian system of music, there are seven musical notes in a scale sa, re, ga, ma, pa, da, ni. And in the west notations used are do, re, mi, fa, so, la, ti. The notes in a scale are separated by whole frequency intervals of tones. Every eighth note is similar to**

**the first one and it is first note of next scale. A musician use these notes for composing music of a song.**

**Read the above passage carefully and answer the following questions accordingly.**

**(i) Is the situation discussed above is similar to something in chemistry? Explain.**

**(ii) What are the limitations of the above principle in case of chemistry?**

**(iii) What are the values you will infer from above passage?**

**Answer:** (i) The situation discussed above is similar to the “Newlands’s law of octaves”. Newland arranged the known elements in increasing order of atomic mass. He found that the every eighth element had properties similar to that of first one. He compared it to the octaves found in music.

(ii) The limitations of “Newland’s law of octaves” are as follows:

- This law was only applicable till calcium. After calcium, every eighth element didn’t possess properties similar to first one.
- Newland assumed that no more elements would be discovered in future but new elements were discovered later on which couldn’t fit in this law.
- Newland put two dissimilar elements in the same slot.

(iii) The value we can infer from above passage is that music is important in our lives.

**Q. 31. Every school has assembly Students stand in rows which should be straight, horizontally as well vertical. Each class stands in a single line, with schools. Each class has a name, e.g. class 1, 2, 3... etc. In general, height of students of class 1st is smallest and 12th is biggest. Everyone sings the prayer at the same time.**

**Read the above passage carefully and answer the following questions given below.**

**(i) Do you find similarity between rows of assembly with periodic table? Explain two points.**

**(ii) How can you compare qualities of students with elements of periodic table?**

**(iii) What values are inculcated during assembly of school?**

**Answer:** (i) yes, we find the following similarities between rows of periodic table and that of assembly:

- In periodic table rows, elements are arranged in increasing order of atomic numbers just like in assembly rows students are made to stand in increasing order of their classes.
- Just like the height in assembly rows, the atomic size in rows also changes.

(ii) As the students of a same class have the same academic background similarly elements belonging to same group have same chemical properties.

(iii) The values of good morality and self-belief are inculcated during assembly of school.

## Challengers

**Q. 1. Consider the section of the periodic table:**

Group Number	IA	IIA	IIIA	IVA
Period	1	2	13	14
Second	Li		C	
Third	A	Mg	Al	Si
Fourth	K	B		D

**Identify A, B, C and D.**

	A	B	C	D
(a)	Cs	Be	Ca	C
(b)	Na	Ca	B	Ge
(c)	Na	B	Ca	Ge
(d)	Cs	B	Ca	C

**A. (a)**

**B. (b)**

**C. (c)**

**D. (d)**

**Answer:** A=sodium (Na), B=Calcium (Ca), C= Boron (B), D=Germanium(Ge)

**Q. 2. The correct order of increasing acidic nature of  $\text{SO}_2$ ,  $\text{SiO}_2$ ,  $\text{P}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$  is**

**A.  $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{P}_2\text{O}_3 < \text{SO}_2$**

**B.  $\text{SO}_2 < \text{P}_2\text{O}_3 < \text{SiO}_2 < \text{Al}_2\text{O}_3$**

**C.  $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{P}_2\text{O}_3 < \text{SO}_2$**

**D.  $\text{SiO}_2 < \text{SO}_2 < \text{Al}_2\text{O}_3 < \text{P}_2\text{O}_3$**

**Answer:** The metallic character follows the order:  $\text{Al} > \text{Si} > \text{P} > \text{S}$ . The non-metallic character increases towards sulphur and oxides of non-metals are acidic nature. So the acidic nature increases as: (c)  $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{P}_2\text{O}_3 < \text{SO}_2$

**Q. 3. An element X combines with hydrogen to form a compound  $\text{XH}_3$ . The element X is placed on the right side of the periodic table. Which of the following statement is correct for element X?**

**I. Has two valence electrons.**

**II. Is a metal and is solid.**

**III. Is a non-metal and is a gas.**

**IV. Has five valence electrons.**

**V.  $\text{XH}_3$  reacts with water to form a basic compound.**

**A. I, II and III**

**B. II, III and IV**

**C. III, IV and V**

**D. V, I and II**

**Answer:** The element X is nitrogen which reacts with hydrogen to form  $\text{NH}_3$ . Nitrogen is a non-metal and a gas. It has 5 valence electrons (electronic configuration: 2,5) and reacts with water to form ammonium hydroxide ( $\text{NH}_4\text{OH}$ ) which is basic in nature.



**Q. 4. Listed below are the locations of certain elements in groups and periods of the periodic table. Arrange these elements in the expected order of increasing non-metallic character:**

**I. Element in the fourth period and group IV A**

**II. Element in the third period and group VI A**

**III. Element in the fourth period and group VI A**

**IV. Element in the six period and group III A**

**V. Element in the second period and group VII A**

**The correct order is:**

**A. I < II < III < IV < V**

**B. V < IV < III < II < I**

**C. IV < I < III < II < V**

**D. V < IV < II < I < III**

**Answer:** I refers to the element Ge, II refers to the element S, III refers to the element Se, IV refers to the element Tl, V refers to the element F. Non-metallic character follows the order:  $Tl < Ge < Se < S < F$

**Q. 5. An element X belongs to group 2 and period 3 of the periodic table. The chemical formulae of its nitrate, sulphate and phosphate respectively will be**

**A.  $X(NO_3)_3$ ,  $X_2(SO_4)_3$ ,  $X_2(PO_4)_3$**

**B.  $X_3(NO_3)_2$ ,  $X_2(SO_4)_2$ ,  $X_2(PO_4)_3$**

**C.  $XNO_3$ ,  $XSO_4$ ,  $XPO_4$**

**D.  $X(NO_3)_2$ ,  $XSO_4$ ,  $X_3(PO_4)_2$**

**Answer:** The element X is magnesium. Its valency is 2 because it loses 2 electrons readily to combine with other reactants. Only d) option has the valency 2 for element X.

**Q. 6. An element belongs to group 17. It is present in third period and its atomic number is 17. What is the atomic number of the element belonging to same group and present in fifth period?**

A. 25

B. 33

C. 35

D. 53

**Answer:** The element with atomic number 17 is chlorine. It belongs to 17<sup>th</sup> group. The element belonging to 5<sup>th</sup> period of the same group is iodine which has an atomic number of 53.

**Q. 7. Consider the following figure:**

P	Q	r
Ru	Rh	s
Os	Lr	Pt

**Here, p, q, r and s respectively are:**

A. Fe, Co, Pd, Ni

B. Pd, Co, Ni, Fe

C. Fe, Co, Ni, Pd

D. Fe, Ni, Co, Pd

**Answer:** The given table consists of group no. 8, 9 and 10 respectively. So the element p=Iron, q=Cobalt, r=Nickel and s=palladium.