Unit 03

Periodic Table and Periodicity of Properties

Long Answer Questions

Q1. Describe Dobereiner's triads with example.

Ans. A German chemist Dobereiner observed relationship between atomic masses of several groups of three elements called *triads*. In these groups the central or middle element had atomic mass average of the other two elements.

Example

One triad group example is that of calcium (40), strontium (88) and barium (137). The atomic mass of strontium is the average of the atomic masses of calcium and barium.

Ca = 40

Sr = ? $\quad \frac{40+137}{2} = 88.5 = 88$

Ba = 137

Note

Only a few elements could be arranged in this way. This classification did not get wide acceptance.

Q2. Describe Newlands octaves and also write down its drawback.

Ans. In 1864 British chemist Newland noted that there was a repetition in chemical properties of every eighth element. He stated as if elements were arranged in the increasing order of their atomic masses every eights element repeat the properties of first element.

Drawback of Newlands octaves

His work could not get much recognition as no space was considered for undiscovered element. The noble gases were also not known at that time.

Q3. Explain the contributions of Mendeleev for the arrangement of elements in a periodic table.

Ans. Mendeleev's Periodic table

Russian chemist, Mendeleev arranged the known elements (only 63) in order of increasing atomic masses, in horizontal rows called periods. So that elements with similar properties placed in the same vertical columns. This arrangement of elements was called **Periodic Table.**

Mendeleev's Periodic law

"Properties of the elements are periodic functions of their atomic masses"

Demerits of Mendeleev's periodic table

Although, Mendeleev's periodic table was the first ever attempt to arrange the elements, yet it has a few demerits in it. His failure to explain the position of isotopes and wrong order of the atomic masses of some elements suggested that atomic mass of an element cannot serve as the basis for the arrangement of elements.

Q.4. Write the note on Modern periodic table

Ans. Modern periodic table

Atomic number of an element its more fundamental property than atomic mass in two respects.(a) it increases from element to element regularly (b) It is fixed for every elements. So the discovery of atomic number of an element in 1913 led to change in Mendeleev s periodic law which was based upon on atomic mass.

The modern periodic table is based upon the arrangement of elements according to increasing atomic number. When the elements are arranged according to increasing atomic number from left to right in a horizontal row, properties of elements were found repeating after regular intervals such that elements of similar properties and similar configuration are placed in the same group.

It was observed that after every eight element, ninth element had similar properties to the first element. For example, sodium(Z=11) had similar properties to lithium (Z=3).After atomic number 18,every nineteenth element was showing similar behavior's the long rows of elements were cut into rows of eight and eighteen elements, and placed one above the other so that a table of vertical and horizontal rows was obtained.

Q.5. Write down the significance of long form of periodic table

Ans. Long form of periodic table.

The significance of atomic number in the arrangement of elements in the modern periodic table lies in the fact that as electronic configuration is based upon the atomic number, so the arrangement of elements according to increasing atomic number shows the periodicity (repetition of properties after regular interval) in the electronic configuration of the elements that leads to periodicity in their properties. Hence the arrangement of elements based on their electronic configuration created a long form of the periodic table.

Periods

The horizontal rows of elements in a periodic table are called periods.

Explanation

The elements in a period have continuously increasing atomic number i.e. continuously changing electronic configuration along a period. As a result properties of elements in a

period are continuously changing. The number of valence electron decides the position of an element in a period.

Example

Elements which have 1 electron in their valence shell occupies the left most position in the respective periods, such as alkali metals. Similarly the elements having 8 electrons in their valence shells such as noble gases always occupy the right most position in the respective periods.

Groups

The vertical columns in a periodic table are called groups.

Explanation

These groups are numbered from left to right as 1 to 18.The elements in a group do not have continuously increasing atomic numbers. Rather the atomic numbers of elements in a group increase with irregular gaps.

But the elements of a group have similar electronic configuration i.e. same numbers of electrons are present in the valence shell.

Example

The first group elements have only 1 electron in their valence shells. Similarly group 2 elements have 2 electrons in their valence shells. It is the reason elements of a group have similar properties.

Q.6. Describe the salient's features of long form of periodic table.

Ans. Salient Features of Long Form of Periodic Table:

There are following salient features of long form of periodic table

i. This table consists of seven horizontal rows called periods.
ii. First period consists of only two elements. Second and third period consists of 8 elements each. Fourth and fifth period consist of 18 elements each. Sixth period has 32 elements while seventh period has 23 elements and is incomplete.
iii. Elements of a period show different properties.
iv. There are 18 vertical columns in the periodic table numbered 1 to 18 from left to right, which are called groups.
v. Elements are classified into four blocks depending upon the type of the sub shell which gets the last electron.
vi. The elements of a group show similar properties.

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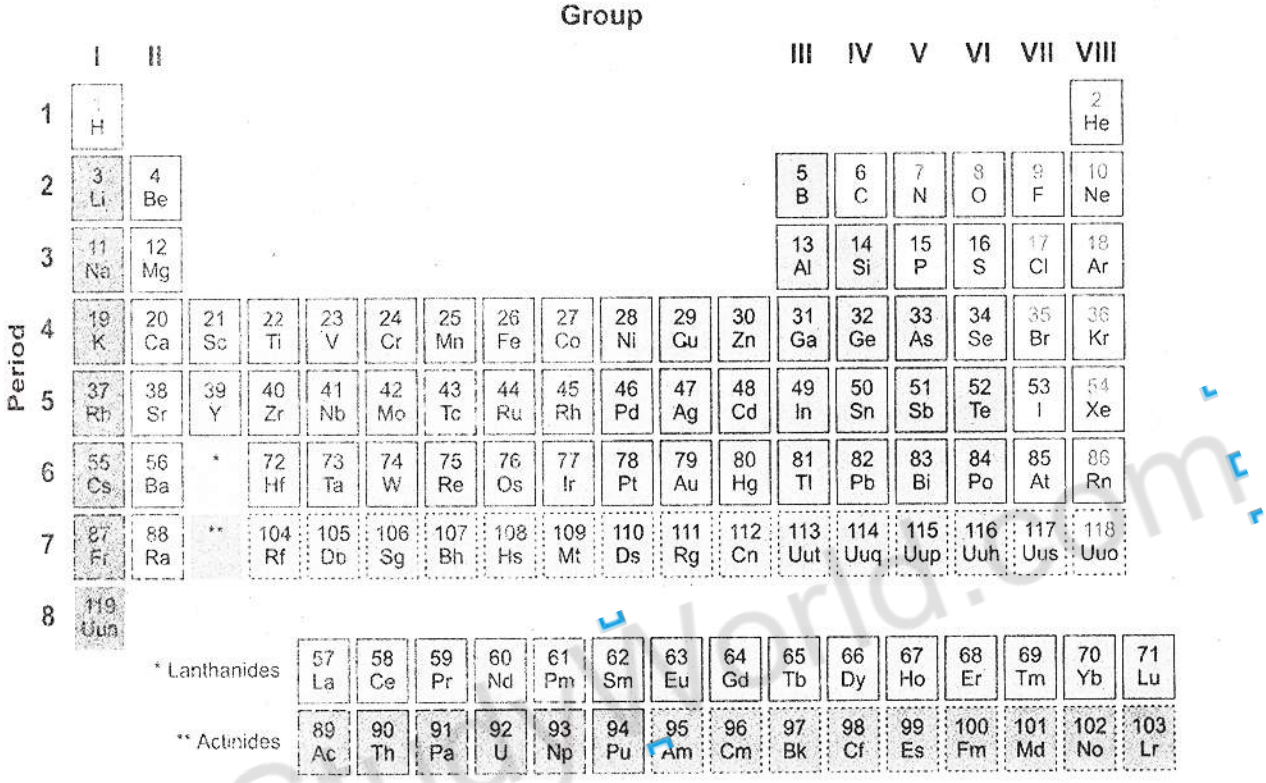


Q.7. Discuss in detail the periods in periodic table.

Ans. First period is called short period. It consists of only two elements hydrogen and helium. Second and third periods are called normal periods. Each of them has eight elements in it. Second period consists of lithium, beryllium, boron, carbon, nitrogen, oxygen, fluorine and ends at neon, a noble gas. Fourth and fifth periods are called long periods. Each one of them consists of eighteen elements.

Whereas, sixth and seventh periods are called very long periods. In these periods after atomic number 57 and 89, two series of fourteen elements each, were accommodated. Because of space problem, these two series were placed separately below the normal periodic table to keep it in a manageable and presentable form.

Since the two series start after Lanthanum (Z=57) and Actinium (Z=89), so these two series of elements are named as Lanthanides and Actinides respectively. Table shows the distribution of elements in periods.

All the periods except the first period start with an alkali metal and end at a noble gas it is to be observed that number of elements in a period is fixed because of maximum number of electrons which can be accommodated in the particular valence shell of the elements.

Table Different periods of the Periodic Table

Period No.	Name of the Period	Number of Elements	Range of Atomic Numbers
1st	Short period	2	1 to 2
2nd	Normal period	8	3 to 10
3rd		8	11 to 18
4th	Long Period	18	19 to 36
5th		18	37 to 54
6th	Very Long Period	32	57 to 86
7th		[23]*	87 to 118*

*Since new elements are expected to discovered, it is an incomplete period

Q8. Discuss the groups present in modern periodic table.

Ans. There are 18 vertical columns in the periodic table numbered 1 to 18 from left to right which are called groups. The elements of a group show similar properties. Some members of important groups in the periodic table are given below:

Group -1 consists of hydrogen, lithium, sodium, potassium, rubidium, cesium and francium.

Group -2 consists of beryllium, magnesium, calcium, strontium, barium and radium.

Group -17 consists of fluorine, chlorine, bromine, iodine and astatine

In a particular group, elements have similar electronic configuration in their valence shells. That is the reason elements of a group are also called a family.

The groups 1,2 and 13 to 17 contain the normal elements. In the normal elements all the inner shells are completely filled with electrons, only the outermost shells are incomplete For example group17 elements (halogens) have 7 electrons in their valence (outermost) shell.

The groups 3 to 12 are called transition elements in these elements 'd' sub shell is in the process of completion.

Table Different Groups of the Periodic Table

Valence electrons	**Group number**	**Family name**	**General Electronic configuration**
1 electron	1	Alkali metals	ns^1
2 electrons	2	Alkaline earth metals	ns^2
3 electrons	13		$ns^2\ np^1$
4 electrons	14	Boron family	$ns^2\ np^2$
5 electrons	15	Carbon family	$ns^2\ np^3$
6 electrons	16	Nitrogen family	$ns^2\ np^4$

7 electrons 8electrons	17 18	Oxygen family Halogen family Noble gases	$ns^2\ np^5$ $ns^2\ np^6$

Q8. What do you mean by blocks in a periodic table and why elements were placed in blocks?

Ans. Elements are classified into four blocks depending upon the type of the sub shell which gets the last electron.

Types of Blocks

There are four blocks in the periodic table named after the name of the sub shell which is in the process of completion by the electrons. These are s, p, d and f blocks as shown in figure. For example, elements of group 1 and 2 have valence electrons in 's' sub shell. Therefore, they are called s-block elements as shown in fig. Elements of group 13 to 18 has their valence electrons in 'p' sub shell

Therefore, they are referred as p-block elements. The d-block lies between the s and p blocks, while f-block lies separately at the bottom. d-block constitutes period 4,5 and 6. Each period consists of ten groups starting from group 3 to group 12. These are called **transition metals**.

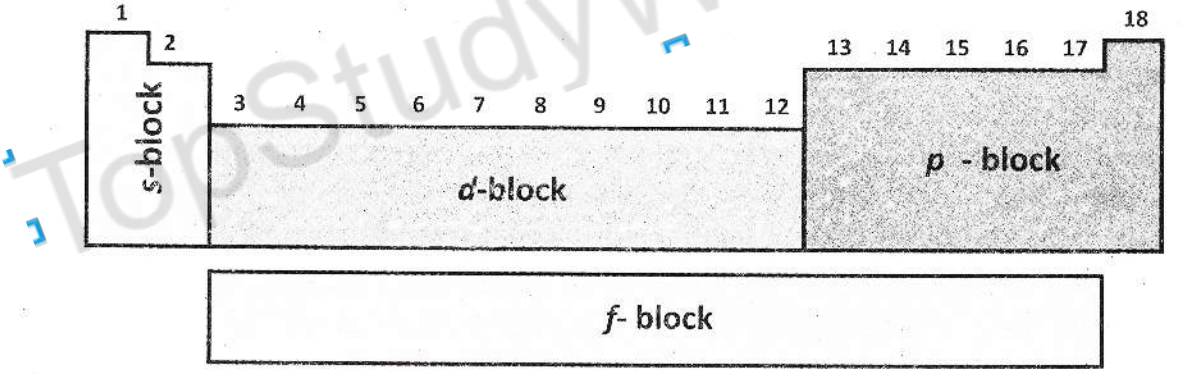


Fig. Modern periodic table showing four blocks.

Q9. Define Atomic size or Atomic Radius .Write down its unit. Explain its trends in group and period.

Ans. Atomic size or Atomic radius

The half of the distance between the nuclei of the two bonded atoms is referred as the atomic radius of the atom

Unit

The unit of atomic radius is nanometer (10^{-9}) and picometer (10^{-12})

Example

The distance between two nuclei of carbon atoms in its elemental form is 154pm and its mean its half 77pm is radius of carbon atom.

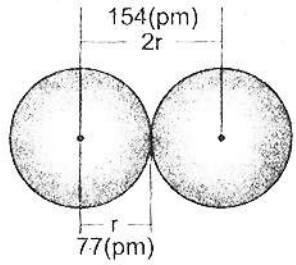


Fig: The radius of carbon atom

Trends of Atomic radius and atomic size in period

In period, the atomic radii gradually decreases from left to right in periods.

Reasons

Because of increase of atomic number the effective nuclear charge increases gradually due to increase of one more protons in the nuclei of the atom. This nuclear force pulls down or contracts the outermost shell towards the nucleus.

2nd period elements	$_3$Li	$_4$Be	$_5$B	$_6$C	$_7$N	$_8$O	$_9$F	$_{10}$Ne
Atomic radii (pm)	152	113	88	77	75	73	71	69

Trends of Atomic radius or atomic size in groups

The atomic radius increases from top to bottom in a group

1st group elements	Atomic radii (pm)
$_3$Li	152
$_{11}$Na	186
$_{19}$K	227
$_{37}$Rb	248
$_{55}$Cs	265

Reasons

Because the increase of one more electronic shell in atoms of successive element which decreases the effective nuclear charge.

Trends of atomic radii in transition elements

The trends of atomic size of transition elements has slight variation, when we considered the transition series in a period the atomic size of the elements first reduces or atom contracts and then there is increase in it when we move from left to right in the period.

Q10. Define Shielding Effect. Explains its trends in periodic table.

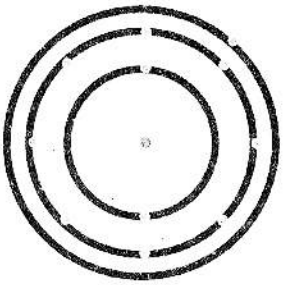
Ans. Shielding Effect

The decrease in the attractive force exerted by the nucleus on the valence shell electrons due to the presence of the electrons lying between the nucleus and valence shell. It is called shielding effect.

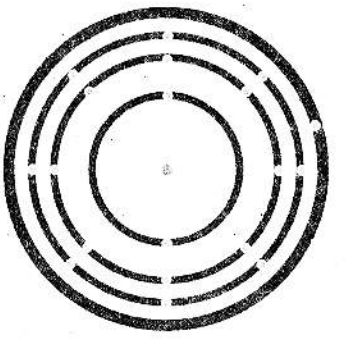
Explanation

The attractions of outer most electrons towards nucleus partially reduced because of presence of inner electrons. As a result an atom experience less nuclear charge than that of the actual charge, which is called effective nuclear charge (Z_{eff}). It means that nucleus felt by the valence shell electrons. This is called shielding effect. With the increase of atomic

number the number of electrons in an atom also increases, that result in increase of shielding effect.



Sodium atom



Potassium atom

Variation of Shielding effect in Group

Shielding effect increases from top to bottom in the periodic table due to increase of atomic size of atoms. Due to greater size of the atom it is easy to take away electron from potassium (Z = 19) than from sodium (Z = 11) atom.

Variation of Shielding effect in Period

Shielding effect decreases when we move from left to right in period because of decreases atomic size gradually in period.

Q11. Define Ionization energy. Write down its unit. Explain its trends in periodic table.

Ans. Ionization Energy

The ionization energy is the amount of energy required to remove the most loosely bound electrons form the valence shell of an isolated gaseous atom.

First Ionization Energy

If there is only 1 electron in the valence shell, the energy required to remove it will be called first ionization energy. For example the first ionization energy of sodium atom is + 495.8 $kJmol^{-1}$.

$$Na \longrightarrow Na^{+} + e^{-} \qquad \Delta H = +495.8\,kJmol^{-1}$$

Unit of ionization energy

It is measured in the units of kilo joule per mole ($kJ\ mol^{-1}$)

Trends of Ionization energy in periods

If we move from left to right in period the value of ionization energy increases

Reason

Because the size of atoms reduces and valence electrons are held strongly by the electrostatic force of attraction there for elements on left side of the periodic table have low value of ionization energy as compared to these on right side of the periodic table.

2nd period elements	^{3}Li	^{4}Be	^{5}B	^{6}C	^{7}N	^{8}O	^{9}F	^{10}Ne
Ionization energy ($kJmol^{-1}$)	520	899	801	1086	1402	1314	1681	2081

Trends in Groups

When we move from top to bottom in group the value of ionization energy gradually decreases.

1st group elements	Ionization energy (kJmol^{-1})
^{3}Li	520
^{11}Na	496
^{19}K	419
^{37}Rb	403
^{55}Cs	377

Reason

Because in the group more and more shells lie between the valence shell and the nucleus of the atoms, these additional shells reduce the electrostatic force felt by the electron present in the outermost shell . Resultantly the valence shell electrons can be taken away easily.

Therefore the value of ionization energy decreases from top to bottom in group.

Q12. Define Electron Affinity. Write down its unit. Explain its trend in periodic table.

Ans. Electron Affinity

The amount of energy released when an electron is added up in the outer most shell of an isolated gaseous atom.

Unit

The unit of electron affinity is kJ mol^{-1}

Explanation

Affinity means attraction therefore electron affinity means tendency of an atom to accept an electron to form an anion

Example

The electron affinity of fluorine is -328 $kJmol^{-1}$ one mole of fluorine release 328 kJ of energy to form one mole of fluoride ions

$$F + le^{-} \longrightarrow F^{-} \qquad \Delta H = -328\ KJmol^{-1}$$

Variation of Electron Affinity in period

Electron affinity increases from left to right in the period

Reason

Because the size of atom decreases in a period, the attraction of the nucleus for the incoming electron increases. That means more is attraction for the electron, more energy will be released. There for electron affinity increases from left to right in period.

Variation in Group

In a group electron affinity values decreases from top to bottom.

Reason

Because the size of atoms increase down the group the shielding effect increases that results in poor attraction for the incoming electron i.e. less energy is released out.

Therefore electron affinity decreases from top to bottom in group.

Q13. Define Electronegativity. Write down its trends in group and period in the periodic table.

Ans. Electronegativity

The ability of an atom to attract the shared pair of electrons towards itself in a molecule is called electronegativity.

Note

It is an important property especially when covalent type of bonding of elements is under consideration.

Trend in period

The trend of electronegativity is same as of ionization energy and electron affinity. It increases in a period from left to right because higher Z_{eff} shortens distance from the nucleus of the shared pair of electrons. Thus enhances the power to attract the shared pair of electrons. For example, electronegativity values of 2nd period are given as follows:

2nd period elements	^{3}Li	^{4}Be	^{5}B	^{6}C	^{7}N	^{8}O	^{9}F
Electronegativity	1.0	1.6	2.0	2.6	3.0	3.4	4.0

Trend in Group

It generally decreases down a group because size of the atom increases. Thus attraction for the shared pair of electrons weakens. For example, electronegativity values of group 17 (halogens) are presented here.

17th group elements	Electro negativity
^{9}F	4.0
^{17}Cl	3.2
^{35}Br	3.0
^{53}I	2.7

Short Answer Questions

Q1. Define periodic table.

Ans. The arrangement of elements in groups and periods on the basis of their similarities properties is called periodic table.

Q2. Define Doberiener triads.

Ans. A German chemist doberiener observed relationship between atomic masses of several groups of three elements called triads. In these groups the central or middle elements had atomic mass average of the other two elements.

Q3. Give example of Doberiener Triads.

Ans. For example one triad group is that of calcium (40) strontium (88) and barium (137) the atomic mass of strontium is the average of the atomic masses of calcium and barium.

Ca 40

Sr $\frac{40+137}{2}=88$

Ba 137

Q4. Describe Newland of octaves.

Ans. In 1864 British chemist Newlands put forward his observations in the form of law of octaves. He noted that there was a repetition in chemical properties of every eight elements if they were arranged by the increasing atomic masses.

Q5. Describe Drawbacks of Newland of octaves.

Ans. Newland work could not get much recognition because

(i) There was no space considered for undiscovered element.

(ii) The Noble gases were also not known at that time.

Q6. Who was Mendeleev?

Ans. Mendeleev (1834-1907) was a Russian chemists and inventor. He was the creator of first version of periodic table.

Q7. Describe Mendeleev's periodic law.

Ans. Properties of the elements are the periodic function of their atomic masses.

Q8. Write down Drawbacks of Mendeleev's periodic table.

Ans. There was following draw backs:

(i) His failure to explain the position of isotopes.

(ii) There was wrong order of the atomic masses of some elements.

Q9. Describe Modern periodic law.

Ans. In 1913 H. Moseley described modern periodic law. "Properties of the elements are the periodic function of their atomic number".

Q10. Write down significance of atomic number.

Ans. Atomic number is more fundamental properties than atomic masses because atomic number of every element is fixed and it is increases regularly from element to element. No two elements can have the same atomic number.

Q11. Why the improvement in Mendeleev's periodic table was made?

Ans. Because atomic number of element is more fundamental property then atomic mass in two respects.

(a) It increases regularly from element to element.

(b) It is fixed for every element.

Q12. Who introduced the name of periodic table?

Ans. In 1869 Mendeleev introduced the name of periodic table.

Q13. Why and how elements are arrange in a period?

Ans. When the elements are arranged according to increasing atomic number from left to right in a horizontal row (period) properties of elements were found repeating after regular intervals.

Q14. Define groups and periods.

Ans. **Groups:** Vertical columns present in the periodic table are called groups. It study from top to bottom.

Period: Horizontal rows present in the periodic table called period. It study from left to right.

Q15. Define group number and period number.

Ans. **Group Number:** It tells about the number of electrons present in the outermost shell of an atom.

Period Number: It tells about the number of electronic shells present in the atoms.

Q16. How many groups and periods present in Modern period table?

Ans. There are 18 groups and 7 periods present in the Modern periodic table.

Q17. How many blocks are present in Modern Period table?

Ans. There are four blocks present in Modern periodic table.

(i) s-block

(ii) p-block

(iii) d-block

(iv) f-block

Q18. How elements are arranged into four blocks?

Ans. On the basis of completion of a particular sub shell, elements with similar sub shells electronic configuration are referred as a block of elements.

Q19. Define normal or representative elements.

Ans. Elements belong to s and p blocks are called normal or representative element.

Q20. Define transition elements.

Ans. Those elements which belong to d and f blocks are called transition elements.

Q21. Who were alchemists?

Ans. Alchemists were groups of scientist who were trying to convert inferior metal to superior metals and trying to get secret of eternal life.

Q22. Write down the names of elements belonging to group 1?

Ans. Group 1 consists of hydrogen, lithium, sodium, potassium, rubidium, cesium, and francium.

Q23. How the properties of elements repeat after regular intervals?

Ans. Properties of elements repeat after regular intervals because of increasing atomic number from left to right.

Q24. In which pattern modern periodic table was arranged?

Ans. Modern periodic table was arranged depends upon atomic number. The arrangement of elements based on their electronic configuration created a long form of periodic table.

Q25. How many elements are in first period and what are their names and symbols?

Ans. First period contains only two elements these elements are

(i) Hydrogen H
(ii) Helium He

Q26. How many elements are placed in 4^{th} period?

Ans. There are 18 elements present in 4^{th} period.

Q27. From which element lanthanide series starts?

Ans. Lanthanide series is started from after lanthanum (Z = 57).

Q28. From which period actinide series is start?

Ans. Actinide series is started from actinium (Z = 89).

Q29. Define lanthanides. In which period it belongs?

Ans. Elements atomic No.58 to 71 are called lanthanides. It belongs to 6^{th} period.

Q30. Define actinides in which period it belongs?

Ans. Elements atomic number 90 to 103 are called actinides. It belongs to 7^{th} period.

Q31. How many elements present in 3^{rd} period? Write their name and symbols.

Ans. There are 8 elements present in 3^{rd} period. Their names and symbols are:

i.	Sodium	Na
ii.	Magnesium	Mg
iii.	Aluminium	Al
iv.	Silicon	Si
v.	Phosphorous	P
vi.	Sulphur	S
vii.	Chlorine	Cl
viii.	Argon	Ar

Q32. How many periods are considered to be normal periods?

Ans. First three periods considered as normal period.

Q33. What is the reason of arranging elements in group?

Ans. Depending upon outermost electrons and electronic configuration elements in period table are arranged in groups.

Q34. What do you mean by period function?

Ans. Periodic functions mean properties of elements repeating after regular intervals such that elements of similar properties and similar configuration are placed in same group.

Q35. Why the elements are called s p-block elements?

Ans. Because, the electronic configurations of elements are ends in s and p sub shells.

Q36. How many members are in group 17? Is there any liquid, what is its name?

Ans. There are six elements present in 17 groups. Yes, Bromine is an element which exists in liquid state.

Q37. Define atomic size and atomic radius.

Ans. The half of the distance between the nuclei of the two bounded atoms is called atomic radius.

Q38. Write down the trends of atomic size in group and period in the periodic table.

Ans. **Group:** In group atomic size of elements increases from top to bottom.

Period: In any period atomic size of elements decreases from left to right in a period.

Q39. Why atomic radius of elements increase down the group?

Ans. The atomic radius increases from top to bottom in a group.

Reason: Because the increase of one more electronic shell in atoms of successive element which decreases the effective nuclear charge.

Q40. What is the reason of atomic size decreases from left to right in a period?

Ans. In period, the atomic radii gradually decrease from left to right in periods.

Q41. Define ionization energy. Write down its unit.

Ans. The ionization energy is the amount of energy required to remove the most loosely bounded electron from the valence shell of an isolate gaseous atom. Its unit is $kJmol^{-1}$.

Q42. What is the trend of ionization energy is periodic table?

Ans. Ionization energy decreasing while moves from top to bottom in any group. It increased from left to right in any period.

Q43. Why ionization energy decreasing from top to bottom in any group?

Ans. Ionization energy decreasing in a group due to increase in atomic size of an atom.

Q44. Why ionization energy increasing in a period?

Ans. Because when we move from left to right in a period atomic size of atom decreases.

Q45. Define electron affinity. Write down its unit.

Ans. The amount of energy released when an electron is added up in the outermost shell of an isolated gaseous atom. Its unit is $kJmol^{-1}$.

Q46. What is the trend of electron affinity in group and period in the periodic table?

Ans. Electron affinity decreases in the group and increases in period.

Q47. Why electron affinity decreases in a group?

Ans. Electron affinity decreases in a group because of increasing atomic size of atom in a group.

Q48. Why electron affinity increases in a period?

Ans. Electron affinity increases in a period because of decrease in atomic size of atom from left to right in a period.

Q49. What are S.I units of atomic radius?

Ans. S.I. unit of atomic radius is picometer and Nanometer.

Q50. Why the 2nd Ionization energy of an element is higher than first one?

Ans. When an electron is remove from an atom mono positive ion is formed. Mono positive ion has one more proton then electrons. Its nucleus has more influence to electrons and more energy is needed to remove second electron. This is why 2nd I.E. has greater value.

Q51. Why the ionization energy of sodium is less than that of magnesium?

Ans. Because both sodium and magnesium belongs to same period when we move left to right in period atomic size decreases and ionization energy increases that is why sodium has low ionization energy because of greater size than magnesium.

Q52. Why it is difficult to remove an electron from halogens?

Ans. Because halogen has smaller atomic size and high electron affinity and electronegative values so it is difficult to remove the electron from halogens.

Q53. What is shielding effect?

Ans. The decrease in the attractive force exerted by the nucleus on the valence shell electrons due to presence of the electrons lying between the nucleus and valence shell is called shielding effect.

Q54. How does shielding effect decrease the forces of electrostatic attractions between nucleus and outermost electrons?

Ans. The electron present between the nucleus and the outermost shell of an atom, reduce the nuclear charge felt by the electrons present in the outermost shell. The attraction of outer electrons towards nucleus is partially reduced because of presence of inner electrons. As a result an atom experience less nuclear charge than that of the actual charge which is called Effective nuclear charge (Z_{eff}).

Q55. Why does the bigger size of atoms have more shielding effect?

Ans. The bigger size of atoms have more shielding effect because in bigger size atoms the number of inner shell and inner shell electrons increases hence the shielding effect of bigger size atoms also increases.

Q56. Why the trend of electron affinity and electronegativity does same in a period?

Ans. The trend of electronegativity same because from left to right in period the size of an atom decreases and the attraction of the nucleus for electron also increases. It means the more nuclear force on electron and more energy is required. Therefore electron affinity and electronegativity value also increases from left to right in a period.

Q57. Define electronegativity.

Ans. The ability of an atom to attract the shaired pair of electrons towards itself in a molecule is called electronegativity.

Q58. Which element has the highest electronegativity?

Ans. Flourine has highest value of electronegativity i.e. 4.0.

Q59. Why noble gases are not very reactive?

Ans. Because, noble gases do have 2 or 8 electrons in their valence shells. It means that all the noble gases have their valence shells completely filled. Their atoms do not have vacant spaces in their valence shell to accommodate extra electrons. Therefore, noble gases do not gain, lose or share electrons. That is why noble gases are not very reactive.

Q60. Why cesium atomic no.55 requires little energy to release its one electron present in the outer most shell?

Ans. Cesium requires little energy to release its outer most electrons because it has greater atomic size and low ionization energy so in cesium atom distance between nucleus and outermost shell is very large.

Q61. How is periodicity of properties depending upon the number of protons in an atom?

Ans. In periodic table the atomic number increases from left to right and nuclear charge will also increase. When nuclear charge changes the properties of elements will also changed.

Q62. What is the different Mendeleev's periodic law and Modern periodic law?

Ans.

Mendeleev's Periodic Law	Modern Periodic Law
Properties of elements are the periodic functions of their atomic masses	Properties of elements are the periodic functions of their atomic number

Q63. Why and how elements are arranged in 4^{th} period?

Ans. The elements are arranged in 4^{th} period because they are all having same electronic shells and elements are arranged in 4^{th} period by increasing atomic number from left to right in a period.

Q64. Why shielding effect of electrons makes cation formation easy?

Ans. The shielding effect of electron makes the cation formation easy because the electron present between the nucleus and the outermost shell of an atom, reduce the nuclear charge felt by the electrons present in the outermost shell. The attraction of outer electrons towards

nucleus is partially reduced because of presence of inner electrons. As a result an atom experiences less nuclear charge than that of the actual charge so it makes the cation formation easy.

Multiple Choice Questions

1. In which century chemists devoted to arrange the elements in a systematic manner:

(a) 16 (b) 17
(c) 18 (d) 19

2. The vertical columns present in the periodic table are called:

(a) groups (b) periods
(c) both a & b (d) none

3. The horizontal lines present in the periodic table are called:

(a) groups (b) periods
(c) both a & b (d) none

4. Who was arranged the elements in group of three?

(a) Doberiener (b) Newland
(c) Mendeleev (d) Moseley

5. Who determined the correct atomic masses of elements in 1860?

(a) Doberiener (b) Cannizaro
(c) Newland (d) All

6. In which year Newland put forward his observation in the form of law of octaves?

(a) 1829 (b) 1864
(c) 1869 (d) 1896

7. How many elements were present in Mendeleev's periodic table?

(a) 50 (b) 55
(c) 60 (d) 63

8. Mendeleev arranged elements in his periodic table on the basis of:

(a) Atomic number
(b) Atomic mass
(c) Atomic volume
(d) All of these

9. In which year Mendeleev described his periodic law?

(a) 1869 (b) 1870
(c) 1859 (d) 1870

10. In which year Moseley described his periodic law?

(a) 1910 (b) 1912
(b) 1913 (d) 1915

11. Moseley arranged the elements in his periodic table on the basis of

(a) atomic number
(b) atomic masses
(c) atomic volume
(d) none

12. In modern periodic table the elements in a group do not have continuously increasing

(a) atomic number
(b) atomic masses
(c) atomic volume
(d) none

13. How many groups are present in the modern periodic table?

(a) 8 (b) 10

(c) 15 (d) 18

14. How many periods are present in the modern periodic table?

(a) 7 (b) 8
(c) 10 (d) 12

15. How many elements present in 1st period.

(a) 1 (b) 2
(c) 8 (d) 18

16. How many elements present in 2nd & 3rd periods?

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

17. How many elements present in 4th & 5th period?

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

18. How many elements present in 6th period?

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

19. How many element present in 7th period.

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

20. Elements of a period show properties.

(a) same (b) different
(c) both a & b (d) none

21. The elements of a group show properties:

(a) same (b) different
(c) both a & b (d) none

22. How many elements blocks present in modern periodic table.

(a) 2 (b) 2
(c) 4 (d) 5

23. Elements are classified into four blocks depending upon the type of the

(a) shell (b) sub shell
(c) atomic mass (d) atomic number

24. Elements of groups 1 & 2 have their valence electrons in sub-shell.

(a) s (b) p
(c) d (d) f

25. Elements of groups 13 to 18 have their valence electros in sub shell.

(a) s (b) p
(c) d (d) f

26. Who were trying to convert inferior metals to superior metals?

(a) Alchemist (b) Scientists
(c) Doctors (d) None

27. Which elements are present in 1st periods?

(a) hydrogen (b) helium
(c) both a & b (d) none

28. Second and third periods are called:

(a) normal period
(b) 1st transition series
(c) 2nd transition series
(d) 3rd transition series

29. Which elements are present in 2nd period.

(a) lithium (b) beryllium
(c) boron (d) all

30. Elements with atomic No.58 to 71 are called:

(a) lanthanides (b) actinides
(c) both a & b (d) none

31. Lanthanide is belonged to period,

(a) 4th (b) 5th
(c) 6th (d) 7th

32. Elements with atomic No.90 to 103 are called:

(a) lanthanide (b) actinides
(c) both a & b (d) none

33. Actinides are belonged to period:

(a) 4^{th} (b) 5^{th}
(c) 6^{th} (d) 7^{th}

34. Lanthanides series is started from the elements

(a) lanthanum (b) actinium
(c) osmium (d) none

35. Atomic number of lanthanum is

(a) 57 (b) 58
(c) 59 (d) 60

36. Actinide series is started from the elements

(a) lanthanum (b) actinium
(c) osmium (d) silver

37. Atomic number of actinium is

(a) 57 (b) 60
(c) 80 (d) 89

38. Group number tells about the

(a) number of valence electrons
(b) shells
(c) both a & b (d) none

39. Period number tells about the

(a) no. of valence electrons
(b) no. of electronic shells
(c) both a & b
(d) none

40. Which period of the modern periodic table is considered as incomplete period?

(a) 4^{th} (b) 5^{th}
(c) 6^{th} (d) 7^{th}

41. Which elements are present in group I?

(a) hydrogen
(b) lithium
(c) sodium
(d) all

42. Group 1 is also called

(a) alkali metal (b) alkaline earth
(c) transition (d) halogens

43. How many electrons present in the valence shell of group 1 elements?

(a) 1 (b) 2
(c) 3 (d) 4

44. The group 1 and 2 and 13 to 17 contain the elements.

(a) normal
(b) transition elements
(c) inner transition of elements
(d) outer transition of elements

45. 17 group elements are known as

(a) alkali metals (b) alkaline earth
(c) halogens (d) noble gases

46. 17 groups elements contains electrons in their outer most shell

(a) 4 (b) 5
(c) 6 (d) 7

47. The element of group 3 to 12 are called

(a) normal elements
(b) transition elements
(c) halogens
(d) noble gases

48. Normal elements are belonged to

(a) s-block (b) p-block
(c) both a & b (d) d & f block

49. All transition elements are belonged to:

(a) s and p block (b) d-block
(c) f-block (d) d & f block

50. All transition elements are

(a) metals (b) non metal
(c) metalloid (d) radioactive

51. Unit of atomic size is

(a) nm (b) pm
(c) kJ mol^{-1} (d) both a & b

52. The distance between the Nuclei of two carbon atoms in its elemental form is

(a) 150pm (b) 152pm
(c) 154pm (d) 156pm

53. When we move left to right in a period atomic number

(a) increases (b) decrease
(c) first increase than decrease
(d) none of these

54. When we move from left to right in a period atomic size

(a) increases (b) decreases
(c) first increases than decreases
(d) none of these

55. When we more from top to bottom in a group atomic size

(a) increases (b) decreases
(c) first decrease than increase
(d) none of these

56. Atomic size of lithium is

(a) 150 pm (b) 151 pm
(c) 152 pm (d) 154

57. Atomic size of Neon is

(a) 60 pm (b) 65 pm
(c) 68 pm (d) 69 pm

58. With increase atomic number, the number of electrons in an atom also

(a) increases (b) decreases
(c) first increase than decrease
(d) none of these

59. When we move from top to bottom in a group shielding effect

(a) increases (b) decreases
(c) no effect (d) none of these

60. When we move from left to right in a period shielding effect

(a) increases (b) decreases
(c) no effect (d) none

61. The minimum amount of energy which is required to remove an electron from the gaseous state of an atom is called

(a) ionization energy
(b) electron affinity
(c) electro negativity
(d) all of these

62. The unit of ionization energy is

(a) nm and pm (b) $kJmol^{-1}$
(c) Newton (d) Pascal

63. When we move from top to bottom ionization energy

(a) increases (b) decreases
(c) no effect (d) none

64. When we move from left to right in a period ionization energy

(a) increases (b) decreases
(c) no effect (d) none

65. The first ionization energy of sodium atom is

(a) +495.8 $Kjmol^{-1}$
(b) –495.8 $Kjmol^{-1}$
(c) +4950.6 $Kjmol^{-1}$
(d) –495.7 $Kjmol^{-1}$

66. The amount of energy released when an electron is added in the outermost shell of an isolated gaseous atom is called:

(a) ionization
(b) electron affinity
(c) electro negativity
(d) none

67. Unit of electron affinity is
(a) pm (b) kJmol
(c) $kJmol^{-1}$ (d) Newton

68. Electron affinity of fluorine in $kJmol^{-1}$ is:
(a) 328 (b) –328
(c) –330 (d) –340

69. The ability of an atom to attract the shared pair of electrons toward, itself in a molecule is called:
(a) Ionization energy
(b) Electron affinity
(c) Electro-negativity
(d) Shielding effect

70. Which element has high value of electro negativity is:
(a) sodium (b) chlroine
(c) flourine (d) bromine

71. The atomic radii of the elements in periodic table.
(a) increases from left to right in a period
(b) increases from top to bottom in a group
(c) do not change from left to right in a period
(d) decreases from top to bottom in a group

72. The amount of energy given out when an electron is added to an atom is called:
(a) lattice energy
(b) ionization energy
(c) electronegativity
(d) electron affinity

73. Mendeleev Periodic Table was based upon the:
(a) electronic configuration
(b) atomic mass
(c) atomic number
(d) completion of a subshell

74. Long form of Periodic Table is constructed on the basis of:
(a) Mendeleev Postulate
(b) atomic number
(c) atomic mass
(d) mass number

75. 4^{th} and 5^{th} period of the long form of Periodic Table are called:
(a) short periods
(b) normal periods
(c) long period
(d) very long period

76. Which one of the following halogens has lowest electronegativity?
(a) flourine (b) chlorine
(c) bromine (d) iodine

77. Along the period, which one of the following decreases:
(a) atomic radius
(b) ionization energy
(c) electron affinity
(d) electronegativity

78. Transition elements are:
(a) all gases (b) all metals
(c) all non-metals (d) all metalloids

79. Mark the incorrect statement about ionization energy:
(a) it is measured in $kJmol^{-1}$

(b) It is absorption of energy
(c) it decreases in a period
(d) it decreases in a group

80. Point out the incorrect statement about electron affinity:

(a) it is measured in $kJmol^{-1}$
(b) it involved release of energy
(c) it decreases in a period
(d) it decreases in a group

Answer Key

1.	d	**2.**	a	**3.**	b	**4.**	a	**5.**	b
6.	b	**7.**	d	**8.**	b	**9.**	a	**10.**	c
11.	a	**12.**	a	**13.**	d	**14.**	a	**15.**	b
16.	b	**17.**	c	**18.**	d	**19.**	d	**20.**	b
21.	a	**22.**	c	**23.**	b	**24.**	a	**25.**	b
26.	a	**27.**	c	**28.**	a	**29.**	d	**30.**	a
31.	c	**32.**	b	**33.**	d	**34.**	a	**35.**	a
36.	b	**37.**	d	**38.**	a	**39.**	b	**40.**	d
41.	d	**42.**	a	**43.**	a	**44.**	a	**45.**	c
46.	d	**47.**	b	**48.**	c	**49.**	d	**50.**	a
51.	d	**52.**	c	**53.**	a	**54.**	b	**55.**	a
56.	c	**57.**	d	**58.**	a	**59.**	a	**60.**	b
61.	a	**62.**	b	**63.**	b	**64.**	a	**65.**	a
66.	b	**67.**	c	**68.**	b	**69.**	c	**70.**	c
71.	b	**72.**	d	**73.**	b	**74.**	b	**75.**	c
76.	d	**77.**	a	**78.**	b	**79.**	c	**80.**	c