Class - VIII

Topic Name:-

Periodic Classification Of Elements

Modern Periodic Table

Teaching Task

Q1) Ans:- 3.

Solution:- The electronic configuration of alkali metals is $(n-1)s^2p^6ns^1$

Q2) Ans:- 2

Solution:- The elements with the atomic number 3 and 11 have same properties because both elements have same valence shell configuration i.e ns^1

E.g:- $Z=3 = Li$. $1s^2 2s^1$ $\quad$ $Na=11$ $1s^2 2s^2 2p^6 3s^1$.

Q3) Ans:- 4.

Solution:- The elements with atomic numbers 3,12 are belongs to s-block because the differentiating electron enters in to s-orbital.

$Li=3 \rightarrow 1s^2 2s^1$ $\quad$ $Mg=12 \rightarrow 1s^2 2s^2 2p^6 3s^1$.

Q4) Ans:- 2.

Solution:- F=9, Cl=17, Br=35, I=53 are belongs to VII A group elements are called halogens

Q5) Ans:- 2.

Solution:- $Fe = 26 = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$.

The differentiating electron enters into 3d sub-level.

Q6) Ans:- 2.

Solution:- $Y = 39$, $Cd = 48$ belongs to 5th period because the differentiating electron enters into 5th shell.

$Y = 39 = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 \underline{5s^2} 4d^1$

$Cd = 48 = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 \underline{5s^2} 4d^8$

Q7) Ans:- 1

Solution:- The atomic numbers of lanthanoids are from 58 to 71.

Q8) Ans:- 2.

Solution:- The 4f level sucessively filled up in lanthanides, also known as rare earths.

Q9) Ans:- 2

Solution:- The most common and known element is uranium, which is used as nuclear fuel when it's converted into plutonium, through a nuclear reaction

They are in actinides series.

Q10). Ans:- 2.

Solution:- The elements with atomic numbers 2, 10, 18, 36, 54, 86 and 118 are collectively known as inert gases because they have stable electronic configuration ns^2np^6.

Q11). Ans:- 1

Solution:- The general electronic configuration $(n-1)d^3ns^2$ indicates that particular elements belong to $\overline{V}B$.

Q12) Ans:- 4.

Solution:- Aluminium belongs to a representative group of elements.

→ Lanthanum belongs to lanthanoids.

→ Argon belongs to noble gas.

→ Chromium belongs to transition elements.

Q13) Ans:- 3

Solution:- Transition metals are often paramagnetic because of the presence of one or more unpaired d-electrons.

Q14). Ans:- 1.

Solution:- The starting element of 4th period is K.

K = 19, Electronic Configuration = $1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^1}$.

The ending element of 4th period is Kr

Kr = 36, Electronic configuration = $1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^2 3d^{10} 4p^6}$

Q15) Ans:- 2

Solution:- Atomic number 34 is Se

E.C = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$.

Period = 4 because differentiating electron enters into 4 shell.

Group = VI A because the no. of valence electron in se is 6.

JEE Advanced Level Questions

Q16) Ans:- 1,2,3

Solution:-

→ The elements in which the electron enters the s-subshell of their outermost energy level are called s-block elements.

→ S-block is situated at the extreme left of the periodic table.

→ This block contains elements of group IA and IIA.

Q17) Ans:- 3,4.

Solution:- d-block elements show variable oxidation states because the differentiating electron enters in two different sets of orbital (n-1)d &ns with a a small energy difference

→ d-block elements can form alloys because their atomic sizes are comparable.

Q18). Ans:- 5 (Both are incorrect)

Solution:- The general electronic configuration of the group 6 elements is $(n-1)d^5ns^1$.

→ 3rd and 11th group elements have different properties.

3rd Group → Metalloids & Metals.

11th Group → Coinage metals.

Q19) Ans:- 2.

Solution:-

→ In 2nd and 3rd periods → 8 elements are present.

→ In 4th and 5th periods → 18 elements are present.

Q20) Ans:- a) 2 b) 3 c) 3 d) 4.

Solution:- Period 1 :- Very short period because which contains only 2 elements.

Period 2&3:- Short periods because they contain 8 elements.

Period 4&5:- Long periods because they contain 18 elements.

Period 6&7:- Very Long periods because they contain 32 elements.

Q21) Ans:- 4.

Solution:- Zn is not a transition metal because all d-block is completely filled.

→ Transition metal means which has incomplete d-orbital.

Q22) Ans:- 4.

Solution:- The metallic nature of S, P-blocks are less compared to d-block.

→ d-block elements have high electric conductivity, luster and the ability to form positive ions by losing electrons.

Learner's Task

Q1) Ans:- 1

Solution:- The modern periodic table is primarily based on the electronic configuration.

Q2) Ans:- 1

Solution:- We know that Atomic no. Z can be related to frequency of X-rays emitting by using $\sqrt{\nu} = a(Z-b)$, a, b are constants.

→ A plot of $\sqrt{\nu}$ against Z gives a straight line.

Q3) Ans:- 2.

Solution:- Mosely's work on X-ray spectra proved that the significance of atomic number for the modern periodic table.

Q4) Ans:- 2

Solution:- The atomicity of noble gases is 1, i.e, each molecule have only one atom.

E.g:- He, Ne, Ar, Kr, Xe etc.

Q5) Ans:- 4.

Solution:- $K = 19 \rightarrow E.C \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$.

→ It has last $4s^1$ configuration. So 'K' belongs to IA group element called as an alkali metal.

Q6) Ans:- 4

Solution:-

1) $7 \rightarrow 1s^2 2s^2 2p^3 \rightarrow$ P block, $15 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^3$ – p block.

2) $6 \rightarrow 1s^2 2s^2 2p^2 \rightarrow$ P block

$12 \rightarrow 1s^2 2s^2 2p^6 3s^2 \rightarrow$ s block.

3) $9 \rightarrow 1s^2 2s^2 2p^5 \rightarrow$ p block.

$17 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^5 \rightarrow$ p block.

4) $3 \rightarrow 1s^2 2s^1$

$12 \rightarrow 1s^2 2s^2 2p^6 3s^2$ } s block.

Q7) Ans:- 3.

Solution:- $1s^2 2s^2 3s^2 3p^6 3d^{10} \underline{4s^{(2)}} \underline{4p^{(5)}} \rightarrow \underline{Br}$

Period – 4, Group → VII A

Q8) Ans:- 2.

Solution:- The element with ns^2np^4 configuration is VI A group called as oxygen family or chalcogens.

Q9) Ans:- 4.

Solution:- The differentiating electron enters into (n-1) d sub-level, the element is called transition element

Q10) Ans:- 1

Solution:- In lanthanides, n, (n-1), (n-2) shells are half filled & incompletely filled.

JEE Main Level Questions

Q1) Ans:- 2.

Solution:- Inner transition elements exhibit different coloured compounds on an account of unfilled f orbitals.

Q2) Ans:- 3.

Solution:- Atomic number = 12.

Mg = 12.

$E.C = 1s^2 2s^2 2p^6 3s^2$

Period → 3.

Group → II A

Q3) Ans:- 2.

Solution:- Representative element has partially filled s and p subtals i.e, there is more room to fill the orbitals.

Q4) Ans:- 3.

Solution:- Given $Z=13$, ie, AL

$1s^2 2s^2 2p^6 3s^2 3p^1 \rightarrow$ Belong III A group.

$Z=14 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^2 \rightarrow$ IV A group.

$Z=32 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2 \rightarrow$ IV A group.

$Z=49 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^1 \rightarrow$ III A group

$Z=20 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 \rightarrow$ II A group.

In and AL belongs to III A group.

Q5) Ans:- 2.

Solution:- $Cr^{+3}=21$, $Fe^{+3}=23$

$Fe^{+3}=23$, $Mn^{+2}=23$

$Fe^{+3}=23$, $Co^{+3}=24$

$Sc^{+3}=18$, $Cr^{+3}=21$.

Fe^{+3} and Mn^{+2} have same electronic configuration because both are iso electronic species.

Q6) Ans:- 1

Solution:- The sequence of filling the electrons in order of sub-energy level is determined by using Afbau's principle only not by the long form of periodic table.

(Q8) Ans:- 2

Solution:- In a period, the elements are arranged strictly in increasing order of their atomic number, so there is a increase in protons number, so charge of protons towards outermost electrons increase. So nuclear charge increases from left to right of period.

(Q9) Ans:- 3

Solution:- Group number = no. of valence electrons

1) 11, 20 → $11 \rightarrow Na \rightarrow 1s^2 2s^2 2p^6 3s^1 \rightarrow$ IA group.

$20 \rightarrow Ca \rightarrow 1s^2 2s^2 2p^6 3s^2 \rightarrow$ II A group

2) $13 \rightarrow AL \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^1 \rightarrow$ III A group

$30 \rightarrow Zn \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} \rightarrow$ II B group.

3) $13 \rightarrow AL \rightarrow$ III A group.

$31 \rightarrow Ga \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^2} 3d^{10} \underline{4p^1} \rightarrow$ III A group.

4) $14 \rightarrow Si \rightarrow$ IV A group.

$33 \rightarrow As \rightarrow$ V A group.

AL & Ga belongs to III A group

(Q10) Ans:- 2

Solution:- ALL the elements in a group having the same no. of valence electrons & hence have a similar outer electronic configuration.

JEE Advanced level Questions

Q11) Ans:- 2, 3

Solution:- The periodic table is divided into s, p, d, f blocks

→ The elements in modern periodic table are arranged in increasing order of atomic number.

Q12) Ans:- 1, 2, 3.

Solution:-

→ It reflects the sequence of filling the electrons in the order of sub-energy levels s, p, d & f.

→ It helps to predict the stable valency states.

→ It reflects the trends in physical & chemical properties of elements.

Q13) Ans:- 2

Solution:-

→ The sixth period of the periodic table is longest period, with a maximum of 32 elements.

→ The no. of elements in period is twice that of orbitals available for 2nd period.

no. of orbitals of s subshell = 1

no. of orbitals of p subshell = 3

total = 4.

Total no. of elements = 2 × 4 = 8 elements.

Q14) Ans:- 3.

Solution:- In long form of periodic table the position of hydrogen is still uncertain.

→ The arrangement of periodic table not able to remember without practice.

Matrix Matching

Q15) Ans:- a) 4 b) 3 c) 2 d) 1

Solution:-

a) Shortest period → 4) H to He.

b) Short period → 3) Li to Ne

c) Long period → 2) Rb to Xe.

d) Longest period → 1) Cs to Rn.

Q16) Ans:- a) 4 b) 3 c) 2 d) 5, 1.

Solution:-

a) First transition series → 4) $3d^{1-10}\,4s^{1-2}$

b) Second transition series → 3) $4d^{1-10}\,5s^{1-2}$

c) Third transition series → 2) $5d^{1-10}\,6s^{1-2}$

d) Fourth transition series → 5) 6d Series
1) Incomplete period

Q17) Ans:- 4.

Solution:- s and p block elements, except noble gases are known as representative elements. General electronic configuration of representative elements is $ns^{1-2}np^{0-5}$.

Q18) Ans:- 2.

Solution:- General electronic configuration of noble gases ns^2np^6.

$Ne = 10 = 1s^2 2s^2 2p^6$.

Integer Type

Q19) Ans:- 32

Solution:- The longest period is 6th period, it consists of 32 elements.

Q20) Ans:- 118

Solution:- If the 7th period is completed last element is $Og = 118 = [Rn]\ 5f^{14} 6d^{10} 7s^2 7p^6$.