

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

Eg:- $Z=3 = \text{Li}$
 $1s^2 2s^1$

$\text{Na}=11$
 $1s^2 2s^2 2p^6 3s^1$

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.

$\text{Li}=3 \rightarrow 1s^2 2s^1$

$\text{Mg}=12 \rightarrow 1s^2 2s^2 2p^6 3s^1$

Q4) Ans:- 2.

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

Q5) Ans:- 2.

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

The differentiating electron enters into 3d sub-level.

Q6) Ans:- 2.

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

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

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

Q7) Ans:- 1

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

Q8) Ans:- 2.

Solution:- The 4f level successively 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 is 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 $ns^2 np^6$.

Q11). Ans:- 1

Solution:- The general electronic configuration $(n-1)d^3 ns^2$ indicates that particular elements belong to VB.

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.

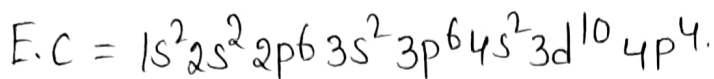
K = 19, Electronic Configuration = $1s^2 2s^2 2p^6 3s^2 3p^6 \underline{4s^1}$.

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



Period = 4 because differentiating electron enters into 4 shell.

Group = VIA because the no. of valence electrons 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 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:- $K=19 \rightarrow E.C \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$.

$\rightarrow$ 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, $15 \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^3 \rightarrow$ 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) $3 \rightarrow 1s^2 2s^1$

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

Q7) Ans:- 3.

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

Period - 4, Group $\rightarrow \underline{\text{VII A}}$

Q8) Ans:- 2.

Solution:- The element with ns^2np^4 configuration is VIA 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 or incompletely filled.

JEE Main level Questions

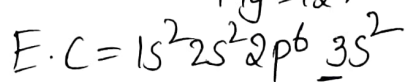
Q1) Ans:- 2.

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

Q2) Ans:- 3.

Solution:- Atomic number = 12.

Mg = 12.



Period $\rightarrow 3$.

Group $\rightarrow \text{IIA}$

Q3) Ans:- 2.

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

Q4) Ans:- 3.

Solution:- Given $Z=13$, i.e., AL

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

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

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

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

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

In and AL belongs to IIIA 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 Aufbau'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 an increase in proton number, so charge of protons towards outermost electrons increases. So nuclear charge increases from left to right of period.

Q9) Ans:- 3

Solution:- Group number = no. of valence electrons

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

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

2) 13 $\rightarrow$ Al $\rightarrow 1s^2 2s^2 2p^6 3s^2 3p^1 \rightarrow$ IIIA group.

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

3) 13 $\rightarrow$ Al $\rightarrow$ IIIA group.

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

4) 14 $\rightarrow$ Si $\rightarrow$ IVA group.

33 $\rightarrow$ As $\rightarrow$ VA group.

Al & Ga belongs to IIIA 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 = $2 \times 4 = 8$ 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

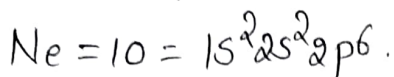
Q17)

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 .



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 $\text{Og} = 118 = [\text{Rn}] 5f^{14} 6d^{10} 7s^2 7p^6$.