8.MODERN PERIODIC TABLE
SOLUTIONS
TEACHING TASK
JEE MAINS LEVEL QUESTIONS

1. Which of the following electronic configurations in the outermost shell is characteristic of alkaline earth metals?

A) $(n-1)d^{1^\circ}ns^2$ B) ns^2np6ns^1 C) ns^2np^6 D) ns^2

Answer:D

Solution:Alkaline earth metals (Group 2) have ns^2 as their outermost electronic configuration

2. Which pair of elements is expected to show similar chemical behavior?

A) 8, 16 B) 12, 20 C) 9, 18 D) 14, 21

Answer:A,B

Solution:Atomic numbers 8(O) and 16 (S) are Chalcogens, so they show similar chemical behavior.

Atomic numbers 12 (Mg) and 20 (Ca) are both alkaline earth metals (Group 2), so they show similar chemical behavior.

3. Which pair of atomic numbers represents elements that both belong to the p block?

A) 5, 15 B) 3, 11 C) 7, 17 D) 4, 24

Answer:A,C

Solution:A) 5 (Boron, p-block) & 15 (Phosphorus, p-block)

C) 7 (Nitrogen, p-block) & 17 (Chlorine, p-block)

4. Elements with atomic numbers 8, 16, 34, 52 are collectively known as:

A) Halogens B) Chalcogens C) Noble gases D) Alkali metals

Answer:B

Solution:Elements with atomic numbers 8 (O), 16 (S), 34 (Se), 52 (Te) belong to Group 16 (Chalcogens).

5. In cobalt atom (Z = 27), the differentiating electron enters which sublevel?

A) 4p B) 3d C) 4d D) 5s

Answer:B

Solution:Cobalt (Z=27) has the configuration [Ar] $3d^7$ $4s^2$, so the differentiating electron enters the 3d sublevel.

6. The elements with atomic numbers 57 to 66 belong to the:

A) Third period B) Fifth period C) Sixth period D) Seventh period

Answer:C

Solution:Elements 57 (La) to 71 (Lu) are lanthanides, which belong to the 6th period.

7. The atomic numbers of actinides range from:

A) 58 to 71 B) 21 to 30 C) 89 to 103 D) 39 to 48
Answer:C
Solution:Actinides range from atomic number 89 (Ac) to 103 (Lr).

8. The 5f orbitals are progressively filled in:
A) Lanthanides B) Actinides
C) Transition metals D) Noble gases
Answer:B
Solution:5f orbitals are progressively filled in actinides.

9. Most of the synthetic and radioactive elements are found among:
A) p-block elements B) Actinides
C) s-block elements D) First transition series
Answer:B
Solution:Most synthetic and radioactive elements are found in the actinide series.

10. Elements with atomic numbers 10, 18, 36, 54, and 86 are collectively called:
A) Noble gases B) Alkaline earth metals
C) Transition metals D) Halogens
Answer:A
Solution:Elements with atomic numbers 10 (Ne), 18 (Ar), 36 (Kr), 54 (Xe), and 86 (Rn) are noble gases (Group 18).

11. The general configuration $(n-1)d^4ns^2$ indicates that the element belongs to group:
A) VIB B) VB C) IIIB D) IVB
Answer:A
Solution:The configuration $(n-1)d^4ns^2$ corresponds to Group 6 (VIB) in the transition series (e.g., Chromium).

12. Which of the following is a representative element?
A) Beryllium B) Iron C) Neodymium D) Uranium
Answer:A
Solution:Beryllium (Be) is a representative element (s-block), while the others are transition/rare-earth elements.

13. Transition elements show paramagnetic behavior due to:
A) High electronegativity B) Presence of unpaired d-electrons
C) Large atomic size D) Strong metallic bonding
Answer:B
Solution:Transition elements show paramagnetism due to unpaired d-electron

14. The starting and ending configurations of the fifth period elements are:
A) $5s^1$ to $5s^24d^{1\circ}5p^6$ B) $5s^2$ to $5p^6$
C) $5s^24d^1$ to $5s^24d^{1\circ}5p^6$ D) $5s^1$ to $4d^65p^6$

Answer:A
Solution:The 5th period starts with Rb ($5s^1$) and ends with Xe ($5s^24d^{10}5p^6$).

15. If an element Y has atomic number 52, it belongs to the _____ period and _____ group.
A) 6th period and VIA group B) 5th period and VIA group
C) 6th period and VIIA group D) 5th period and IVA group
Answer:B
Solution:Element 52 (Tellurium, Te) belongs to the 5th period and Group 16 (VIA).

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

16. Which of the following is correct about s-block elements?
A) The elements in which the electron enters the s-subshell of their outermost energy level are called s-block elements.
B) This block is situated at the extreme left of the periodic table.
C) This block contains elements of groups IA and IIA.
D) The general electron configuration of these elements is ns^2 np6.
Answers: A, B, C
Solution:s-block: Groups 1 & 2, ns^{1-2}, leftmost side.

17. Which of the following is correct for d-block elements?
A) These elements are situated at the extreme right side of the periodic table.
B) General electronic configuration of these elements is $(n-1)d^{1-10}$ ns^{1-2}.
C) They show variable oxidation states.
D) These block elements form alloys.
Answers: B,C,D
Solution:d-block: Transition metals, $(n-1)d^{1-10}$ ns^{1-2}, form alloys, variable oxidation states.

STATEMENT TYPE

A) Statement-I, Statement-II both are true and Statement-II is the correct explanation of Statement-I.
B) Statement-I, Statement-II both are true but Statement-II is not the correct explanation of Statement-I.
C) Statement-I is true, Statement-II is false.
D) Statement-I is false, Statement-II is true.

18. Statement I : In general, the outer electronic configuration of the elements of group 4 (or IV B) is $(n-1)d^2ns^2$.
Statement II : The 1st and 12th group pair of elements will have similar
Answer:C
Solution:Group 4 (IVB) has $(n-1)d^2$ ns^2 configuration.
Group 1 (alkali metals) $\neq$ Group 12 (Zn, Cd, Hg) in properties.

19. Statement I : The number of elements in the 5th and 6th period is equal.
Statement II : The number of elements in the 3rd and 4th period is equal.
Answer:E
Solution:5th period (18) $\neq$ 6th period (32) in element count.
3rd period (8) $\neq$ 4th period (18) in element count.

Matrix Matching Type

20.

Column-I	**Column-II**
Period number	**Nature of period**
a) 4	**1) Very long period**
b) 3	**2) Long period**
c) 2	**3) Short period**
d) 1	**4) Very short period**
	5) Incomplete period

Answer:a-2,b-3,c-3,d-4
Solution:

Period number	Nature of period
a) 4	2) Long period
b) 3	3) Short period
c) 2	3) Short period
d) 1	4) Very short period

COMPREHENSION TYPE
These are the elements whose outermost and penultimate shells are incompletely filled. Elements that have incompletely filled or partly filled dorbitals in either their elemental state or any possible oxidation state are classified as transition elements. Their properties are intermediate between s-block and p-block elements.
21. Fe is not a transition metal. Because
A) outermost and penultimate shells are incompletely filled.
B) outermost and penultimate shells are completely filled.
C) penultimate shells are completely filled.
D) outermost shells are completely filled.
Answer:D
Solution:Iron (Fe, Z=26) has the electronic configuration: [Ar] $3d^6$ $4s^2$.
Transition metals must have incompletely filled d-orbitals in any oxidation state.
In Fe, the 4s orbital is completely filled ($4s^2$), but the 3d orbital is incomplete ($3d^6$).
The question statement is incorrect (Fe is a transition metal), but if we assume the statement is true, the only possible justification is that the outermost shell ($4s^2$) is fully filled (Option D).

22. The metallic nature of transition metals is
A) intermediate to s-block and p-block elements.

B) more than s-block elements.
C) less than p-block elements.
D) more than s-block and p-block elements.
Answer: A
Solution:Metallic character decreases across the periodic table (left $\rightarrow$ right).
s-block (Group 1 & 2): Most metallic (e.g., Na, K).
Transition metals (d-block): Intermediate metallic nature (e.g., Fe, Cu).
p-block: Least metallic (e.g., C, N, O).

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)

1. The basis for the classification of elements in the modern periodic table is:
A) Atomic number **B) Atomic weight**
C) Atomic volume **D) Atomic mass**
Answer:A
Solution:The modern periodic table is arranged based on increasing atomic number (Z), not atomic weight/mass (Mendeleev's table was based on atomic mass).

2. The plot of atomic number (Z) versus the energy level of the electron is:
A) Straight line **B) Exponential curve**
C) Hyperbolic curve **D) Curve with negative slope**
Answer:A
Solution:

$E = \frac{-13.6}{n^2} \times z^2$

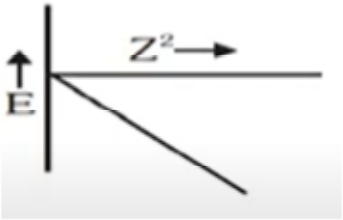
E Vs z^2

$y = mx + c$

$m = -\frac{13.6}{n^2}$ ....i.e. negative slope

So, the graph will be in the form of straight line with negative slope.

Correct graph will be



3. The modern periodic table is based on the atomic number of elements. The experiment that proved the significance of the atomic number was:
A) Rutherford's scattering experiment B) Moseley's work on X-ray spectra
C) Thompson's work on electron discovery D) Dalton's atomic theory
Answer:B
Solution:Henry Moseley (1913) showed that the frequency of X-rays emitted by elements depends on their atomic number (Z), not atomic mass.

4. The atomicity of noble gases (like Neon and Argon) is:
A) 2 B) 1 C) 4 D) 6
Answer:B
Solution:Noble gases exist as monoatomic (single-atom) molecules (Ne, Ar, Kr, etc.) because they are chemically inert.

5. The element with atomic number 20 is:
A) Alkali metal B) Noble gas C) Chalcogen D) Alkaline earth metal
Answer:D
Solution: Element 20 is Calcium (Ca), which belongs to Group 2 (alkaline earth metals).

6. A pair of atomic numbers which belong to the s-block elements is:
A) 5, 12 B) 2, 6 C) 10, 16 D) 3, 11
Answer:D
Solution:3 (Li): [He] $2s^1$
11 (Na): [Ne] $3s^1$
Both are Group 1 (alkali metals, s-block).

7. The element with electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$ belongs to:
A) 4th period, VIIA group B) 3rd period, IVA group
C) 4th period, VIII group D) 5th period, VIIIA group
Answer:C
Solution:The configuration is [Ar] $3d^8\ 4s^2 \rightarrow$ Nickel (Ni, Z=28).
It belongs to the 4th period and Group 10 (VIII group in old IUPAC).

8. The element with the outer electron configuration $ns^2\ np^4$ is a:
A) Alkaline earth metal B) Chalcogen C) Halogen D) Noble gas
Answer:B
Solution:$ns^2\ np^4$ is the configuration of Group 16 (Chalcogens: O, S, Se, etc.).

9. If the differentiating electron enters the (n–1) d-sublevel, the element is a:
A) Transition element B) Noble gas C) Alkali metal D) Representative element
Answer:A
Solution:Transition metals have partially filled d-orbitals $[(n-1)d^{1-10}\ ns^{1-2}]$.

10. Atoms with three of their outermost orbits incompletely filled with electrons are present in:
A) Lanthanides **B) Representative elements**
C) S-block elements **D) Transition elements**
Answer:A
Solution:Lanthanides and actinides have electrons in (n–2)f, (n–1)d, and ns
$\rightarrow$three outer shells partly filled

JEE MAINS LEVEL QUESTIONS

11. Inner transition elements exhibit different colored compounds on account of unfilled... orbitals:
A) s **B) f** **C) d** **D) p**
Answer:B
Solution: Inner transition elements (lanthanides & actinides) show colors due to electronic transitions in partially filled f-orbitals.

12. The element with atomic number 12 belongs to ___ Group and ___ Period:
A) IA, Third **B) IIIA, Third** **C) IIA, Third** **D) IIA, Second**
Answer:C
Solution:Z=12 is Magnesium (Mg) with configuration [Ne] $3s^2$.
Belongs to Group 2 (IIA) and 3rd period.

13. The outermost orbit of an element "X" is partially filled with electrons in both 's' and 'p' subshells. Then that element is:
A) An inert gas **B) A representative element**
C) A transition element **D) An inner transition element**
Answer:B
Solution:Representative elements (s & p-block) have valence electrons in ns and np orbitals.

14. Which is the atomic number of another element present in the same group as the element with Z = 13?
A) Z = 14 **B) Z = 32** **C) Z = 49** **D) Z = 20**
Answer:C
Solution:Z=13 is Aluminum (Al) in Group 13 (IIIA).
Other Group 13 elements: B (5), Ga (31), In (49), Tl (81).
Thus, Z=49 (Indium) is correct.

15. Which of the following pairs of ions have the same electronic configuration?
A) Cr^{3+}, Fe^{3+} **B) Fe^{3+}, Mn^{2+}** **C) Fe^{3+}, Co^{3+}** **D) Sc^{3+}, Cr^{3+}**
Answer:B
Solution:Fe^{3+} (Z=26): [Ar] $3d^5$

Mn^{2+} (Z=25): [Ar] $3d^5$
Both have the same $3d^5$ configuration.

16. The statement that is false for the long form of the periodic table is:
A) It reflects the sequence of filling the electrons in the order of sub-energy levels s, p, d, and f
B) It helps to predict the stable valency states of the elements
C) It reflects trends in physical and chemical properties of the elements
D) It helps to predict the relative ionicity of the bond between any two elements
Answer:D
Solution:The periodic table shows trends but does not directly predict bond ionicity (electronegativity difference is needed).

17. In a period, elements are arranged in strict sequence of:
A) Decreasing charges in the nucleus B) Increasing charges in the nucleus
C) Constant charges in the nucleus D) Equal charges in the nucleus
Answer:B
Solution:Across a period, atomic number (nuclear charge) increases.

18. Which one of the following pairs of atomic numbers represents elements belonging to the same group?
A) 11, 20 B) 13, 30 C) 13, 31 D) 14, 33
Answer:C
Solution:Z=13 (Al) and Z=31 (Ga) both belong to Group 13 (IIIA).

19. All elements of the same group will have:
A) Same electron configuration B) Similar outer electron configuration
C) Same ionization potential value D) Different chemical properties
Answer:B
Solution:Elements in a group share similar valence electron configurations, leading to similar chemical properties.

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

20. Which of the following statements are correct merits of the long form of the periodic table?
A) It eliminates the confusion between even and odd series of III, IV, and V periods of Mendeleev's periodic table.
B) This periodic table can be divided into four blocks, namely s, p, d, and fblock elements.
C) In this table, the classification of elements is based on atomic number, which is a more fundamental property of the elements.
D) None of the above.
Answer:A,B,C
Solution:Modern table fixes Mendeleev's issues, uses blocks, and relies on Z.

21. The statement that is true for the long form of the periodic table is:
A) It reflects the sequence of filling the electrons in the order of sub-energy levels s, p, d, and f.
B) It helps to predict the stable valency states of the elements.
C) It reflects trends in physical and chemical properties of the elements.
D) None of the above.
Answer:A,B,C
Solution:Periodic Table follows Aufbau order, predicts valency, and shows trends.

STATEMENT TYPE

A) Statement-I, Statement-II both are true and Statement-II is the correct explanation of Statement-I.
B) Statement-I, Statement-II both are true but Statement-II is not the correct explanation of Statement-I.
C) Statement-I is true, Statement-II is false.
D) Statement-I is false, Statement-II is true.

22. Statement I : In the long form of the periodic table, the position of the noble gases is fixed in Group 18.
Statement II : The periodic table is organized based on increasing atomic number.
Answer:B
Solution:Statement I is TRUE - Noble gases are indeed placed in Group 18 in the modern periodic table.
Statement II is TRUE - The modern periodic table is arranged by increasing atomic number (Moseley's law).
However, Statement II does NOT explain why noble gases are in Group 18 - it's a general principle of table organization, not specific to noble gases.

23. Statement I : The number of elements in each period is equal to the number of orbitals in the corresponding energy level.
Statement II : The shortest period is the second period.
Answer:E
Solution: Both statements contain inaccuracies about period lengths and orbital-electron relationships. The first period is the shortest, and the element count relates to electron capacity rather than just orbital count.

MATRIX MATCHING TYPE

24. Column-I Column-II
a) Shortest period 1) Cs to Rn
b) Short period 2) Rb to Xe
c) Long period 3) Li to Ne
d) Longest period 4) H to He
5) H to Ne

Answer: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

25. Column-I Column-II
a) First transition series 1) Incomplete series
b) Second transition series 2) $5d^{1-10}6s^{1-2}$
c) Third transition series 3) $4d^{1-10}5s^{1-2}$
d) Fourth transition series 4) $3d^{1-10}4s^{1-2}$
5) 6d series
Answer:a-4,b-3,c-2,d-1,5
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 series

COMPREHENSION TYPE:

The periodic table groups elements based on the electronic configuration of their outermost electrons. This configuration dictates the chemical reactivity and position of an element in the table. For example, elements with their last electron entering p-orbitals are classified as p-block elements. These include nonmetals, metalloids, and some metals, and are found on the right side of the periodic table. They show diverse properties and include groups such as halogens and noble gases.

26. Which of the following belongs to the p-block of the periodic table?
A) Boron (B) B) Magnesium (Mg) C) Potassium (K) D) Calcium (Ca)
Answer:B
Solution:Boron (Z=5) has configuration: $1s^2\ 2s^2\ 2p^1 \rightarrow$ Last electron enters p-orbital.
Other options:
Mg (Z=12): [Ne] $3s^2 \rightarrow$ s-block
K (Z=19): [Ar] $4s^1 \rightarrow$ s-block
Ca (Z=20): [Ar] $4s^2 \rightarrow$ s-block

27. Which of the following is not a characteristic outer configuration of a p-block element?
A) ns^2np^2 B) ns^2np^5 C) ns^2nd^1 D) ns^2np^6
Answer:C
Solution:p-block configurations are ns^2np^{1-6} or ns^2np^6 (for noble gases).

"nd^1" is invalid because:
d-orbitals belong to transition metals (d-block), not p-block.

28. Which group of elements in the p-block is known for being highly reactive nonmetals?
A) Group 18 B) Group 1 C) Group 17 D) Group 2
Answer:C
Solution:Halogens (F, Cl, Br, etc.) are highly reactive nonmetals (need 1 electron to complete octet).

29. The general outer electronic configuration of p-block elements is:
A) ns^2 B) ns^2np^{1-6} C) $ns^2(n-1)d^{10}$ D) $ns^2np^5nd^1$
Answer:B
Solution: General p-block configuration is ns^2np^{1-6}

INTEGER TYPE

30. Number of elements in longest period is _____
Answer:32
Solution:The 6th period is the longest period in the periodic table.

It includes:

2 s-block elements (Cs, Ba)

14 lanthanides (La-Lu, 4f-block)

10 d-block elements (Hf-Hg)

6 p-block elements (Tl-Rn)

Total = 2 + 14 + 10 + 6 = 32 elements.

31. If 7th period is also completed, then the final element of this period would be with an atomic number is _____
Answer:118
Solution:The 7th period follows the same pattern as the 6th period but includes actinides (5f-block).
If fully completed, it would have:
2 s-block (Fr, Ra)
14 actinides (Ac-Lr, 5f-block)
10 d-block (Rf-Cn)
6 p-block (Nh-Og)
The last element (Oganesson, Og) has Z = 118.

KEY

				TEACHING TASK					
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
D	A,B	A,C	B	B	C	C	B	B	A
11	12	13	14	15					
A	A	B	A	B					
			JEE ADVANCED LEVEL QUESTIONS						
16	17	18	19	20		21	22		
A,B,C	B,C,D	C	E	a-2,b-3,c-3,d-4		D	A		
				LEARNERS TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ'S)						
1	2	3	4	5	6	7	8	9	10
A	A	B	B	D	D	C	B	A	A
			JEE MAINS LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
B	C	B	C	B	D	B	C	B	
			JEE ADVANCED LEVEL QUESTIONS						
20	21	22	23	24		25		26	27
A,B,C	A,B,C	B	E	a-4,b-3,c-2,d-1		a-4,b-3,c-2,d-1,5		B	C
28	29	30	31						
C	B	32	118						