1 PERIODIC TABLE AND ELECTRONIC CONFIGURATION

TEXT BOOK QUESTIONS & ANSWERS

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1. What is the basis of classification of elements in the periodic table?

Ans. Atomic Number

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2. Atomic number of sodium is 11, Electronic configuration – 2,8,1

   Group Number — …….. Period number — ……

Ans. Group Number — 1 Period number — 3

3. Is the group 1 element a metal or a nonmetal?

Ans. Metal

4. Write the electronic configuration of sodium and argon and complete the Table.

Ans.

Element	Shell		
	K	L	M
$_{11}$Na	2	8	1
$_{18}$Ar	2	8	8

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5. How many electrons are present in the M shell, the outermost shell of argon?

Ans. 8

6. What is the maximum number of electrons that can be accommodated in the M Shell?

Ans. 18

7. The ‘K’ shell, which is the first shell, has 1 subshell. The next ‘L’ shell has 2, and so on. What will be the number of subshells in the ‘M’ shell and ‘N’

   M = …… , N = …….

Ans. M = 3, N = 4

8. Which subshell is common to all shells?

Ans. S

9. Complete the Table 1.3

Ans.

Shell number	1	2		3			4			
Subshell	s	s	p	s	p	d	s	p	d	f
Representation of ubshells	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f

10. Complete the Table 1.4

Ans.

Shell number	1	2		3			4			
Maximum number of electrons that can be accommodated in each shell	2	8		18			32			
Subshell	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f
Maximum number of electrons that can be accommodated in each subshell	2	2	6	2	6	10	2	6	10	14

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11. What is the maximum number of electronics that can be accommodated in the 's'?

Ans. 2

12. What may be the maximum number of electrons to be filled in the 'p' subshell?

Ans. 6

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The atomic number of hydrogen is 1.

13. How many electrons are present?

Ans. 1

14. In which shell is the electron filled?

Ans. 'K' shell

15. In which subshell?

Ans. S

16. How many electrons are present in helium ($_2$He)?

Ans. 2

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17. Complete the subshell electronic configuration?

Ans. $1s^2$

18. Write the electronic configuration of Lithium ($_3$Li)

Ans. $1s^2\ 2s^1$

19. Complete the electronic configuration of beryllium?

Ans. Be [Z = 4] - $1s^2\ 2s^2$

20. Write the electronic configuration of Boron

Ans. B [Z = 5] - $1s^1\ 2s^2\ 2p^1$

21. Write the electronic configuration of Carbon

Ans. C [Z = 6] – $1s^2\ 2s^2\ 2p^2$

22. Complete the Table 1.6

Ans.

Element	No. of electrons	Subshell electronic configuration
$_7$N	7	$1s^2\ 2s^2\ 2p^3$
$_9$F	9	$1s^2\ 2s^2\ 2p^5$
$_{11}$Na	11	$1s^2\ 2s^2\ 2p^6\ 3s^1$
$_{13}$Al	13	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$
$_{17}$Cl	17	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
$_{18}$Ar	18	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

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23. How was the shell wise electronic configuration of potassium written?

Ans. 2, 8, 8, 1

24. Compare the energies of Is and 2s subshells. Which one has lower energy?

Ans. 1s < 2s

25. Among the 3s & 3p subshells which has higher energy?

Ans. 3s < 3p

26. Among the 3d & 4s subshells which has higher energy?

Ans. 4s < 3d

27. Write down the subshells in the increasing order of their energies.

Ans. 1s <2s <2p <3s <3p <4s <3d <4p

28. Write the subshell wise electronic configuration of potassium.

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$

29. The electronic configuration of scandium ($_{21}$Sc) is

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1\ 4s^2$

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30. Write the electronic configuration of $_{22}Ti$, $_{23}V$, the two elements after Sc.

Ans. $_{22}Ti$ — $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$

$_{23}V$ — $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3\ 4s^2$

31. Which is the noble gas preceding sodium ($_{11}Na$)?

Ans. Neon (Ne)

32. Write its subshell electronic configuration.

Ans. $_{10}Ne$ – $1s^2\ 2s^2\ 2p^6$

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33. Subshell electronic configuration of sodium?

Ans. $_{11}Na$ – $1s^2\ 2s^2\ 2p^6\ 3s^1$

34. Using the symbol of neon, write the subshell electronic configuration of sodium?

Ans. [Ne] $3s^1$

35. Complete the Table 1.7

Ans.

Element	Subshell electronic configuration
$_{21}Sc$	[Ar] $3d^1\ 4s^2$
$_{20}Ca$	[Ar] $4s^2$
$_{12}Mg$	[Ne] $3s^2$
$_{27}Co$	[Ar] $3d^7\ 4s^2$
$_{30}Zn$	[Ar] $3d^{10}\ 4s^2$

36. Write the subshell electronic configuration of $_{24}Cr$.

Ans. $_{24}Cr$ - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$

37. On the basis of this, identify the correct electronic configuration of $_{29}Cu$ from those given below:

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$ – False

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$ – True

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38. If the subshell wise electronic configuration of an atom is $1s^2\ 2s^2\ 2p^6\ 3s^2$, find answers to the following:

(i) How many shells are present in this atom?

(ii) Which are the subshells of each shell?

(iii) Which is the subshell to which the last electron was added?

(iv) What is the total number of electrons in the atom?

(v) What is its atomic number?

Ans. (i) 3 (ii) K — Is, L — 2s, 2p, M — 3s

(iii) 3s (iv) 12 (v) 12

39. How can the subshell electronic configuration of Mg written in a short form?

Ans. [Ne] $3s^2$

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40. Complete the Table given below.

Ans.

Element	Atomic Number	Subshell electronic configuration	The subshell to which the last electron is added	Block
$_3Li$	3	$1s^2\ 2s^1$	s	s
$_{12}Mg$	12	$1s^2\ 2s^2\ 2p^6\ 3s^2$	s	s
$_7N$	7	$1s^2\ 2s^2\ 2p^3$	p	p
$_{21}Sc$	21	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1\ 4s^2$	d	d

41. Which is the subshell of lithium to which the last electron was added?

Ans. S

42. What about the subshell to which the last electron of nitrogen was added

Ans. p

43. What is the relation between the subshell to which the last electron was added and the block to which the element belongs?

Ans. The subshell in which the last electron enters represent the block in which the element belongs.

44. Write the subshell electronic configuration of the following elements and find the blocks to which they belong.

a. $_4Be$: …….. b. $_{26}Fe$…….. c. $_{18}Ar$: ……

Ans. a. $_4Be$: $1s^2\ 2s^2$ — s block

b. $_{26}Fe$: $Is^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2$ — d block

c. $_{18}Ar$: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$ — p block

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45. Complete the Table.

Ans.

Element	Subshell electronic configuration	Number of the outer most shell	Period number
$_4Be$	$1s^2\ 2s^2$	2	2
$_6C$	$1s^2\ 2s^2\ 2p^2$	2	2
$_{11}Na$	$1s^2\ 2s^2\ 2p^6\ 3s^1$	3	3
$_{19}K$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$	4	4

46. Complete the Table .

Ans.

Element	Subshell electronic configuration	No. of electrons present in the last subshell	Group number
Li	$1s^2\ 2s^1$	1	1
Na	$1s^2\ 2s^2\ 2p^6\ 3s^1$	1	1
Mg	$1s^2\ 2s^2\ 2p^6\ 3s^2$	2	2
Ca	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$	2	2

47. What is the relation between number of electrons present in the last ‘s’ subshell and their group number?

Ans. The number of electrons in the outermost ‘s’ subshell = The group number

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48. When the s block elements react, do they donate or accept electrons?

Ans. They donate electrons.

49. Which type of chemical bond is usually formed?

Ans. Ionic bonds

50. How many electrons are donated by the first group elements in chemical reactions ?-

Ans. One

51. How many electrons are donated by the second group elements in chemical reaction?

Ans. Two

52. Complete the table 1.11

Ans.

Group	Valency	Oxidation state	Symbol of ions	Chemical formula of oxides
1^{st} group [X]	1	+1	X^{1+}	X_2O
2^{nd} group [Y]	2	+2	Y^{2+}	Y O

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53. 's' block elements are present at the extreme left side of the periodic table. Relating to their position, what other characteristics can be listed out?

Ans.
- More metallic characters
- Less ionization energy
- Less electronegativity
- Lose of electrons in chemical reaction
- Compounds are mostly ionic
- Oxides and hydroxides are basic in nature

54. Which are the group included in the p block

Ans. 13, 14, 15, 16, 17, 18

55. In which subshell did the filling of the last electron take place?

Ans. p subshell

56. Complete the table.

Ans.

Element	No. of p electrons	Group Number
$_{5}B$	1	1 + 12 = 13
$_{7}N$	3	3 + 12 = 15
$_{10}Ne$	6	6 + 12 = 18

The outermost subshell wise electronic configuration of an element Y (Symbol is not real) is $3s^2\ 3p^4$.

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57. To which period and group does this element belongs to?

Ans. Period = 3, Group = 16

58. Write down the outermost subshell electronic configuration of the element coming just below it in the same group?

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^4$

59. Find out examples of elements in such different states with the help of the periodic tables?

Ans. Solid – Li, Be, B, C, Na, Mg, Al, Si

Liquid – Br

Gas – H, He, N, O, F, Ne

60. Which element has the highest ionization energy in each period?

Ans. Group 18 elements.

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61. The elements having the highest electronegativity is in the p block. Find its name and position?

Ans. Fluorine (F), Period – 2, p block, Group 17

62. Analyze the general characteristics of the p block elements and prepare a note on this?

Ans. The outermost p subshell of the p block elements contains 1 to 6 electrons.

Elements showing positive oxidation state and negative oxidation state are members of this block.

There are metals and nonmetals in these blocks.

Elements in the solid, liquid and gaseous states are present in p block.

63. Complete the table 1.14

Ans.

Element	Outermost electronic configuration	Complete subshell electronic configuration	Atomic number Z	Period	Group	Block
X	$3S^2$	$1s^2\ 2s^2\ 2p^6\ 3s^2$	12	3	2	s
Y	$3s^2\ 3p^5$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3s^5$	17	3	17	p

64. Which element has a valency 1?

Ans. Y

65. Which element shows metallic character?

Ans. X

66. Which element has the highest ionization energy?

Ans. Y

67. Write the chemical formula of the compound formed by the combination of X and Y and label the oxidation states?

Ans. Compound: $X Y_2$ Oxidation state: X^{2+}, Y^{1-}

68. Where is the position of d block elements in the periodic table?

Ans. 3^{rd} Group to 12^{th} Group

69. From which period onwards does the d block begin?

Ans. 4

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70. Put a tick mark ✓' against the statements below, which are applicable to d block elements.

Ans. 1. '✓' These are metals.

2. '✓' The last electron is filled in the penultimate shell.

3. '✓' In the case of these elements in the 4^{th} period, the last electron is filled in 4s.

4. '✓' These are found in groups 3 to 12 of the periodic table.

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71. Complete the table 1.16

Ans.

Compound	Oxidation state of Fe	Symbol of Fe ions
$FeCl_2$	+2	Fe^{2+}
$FeCl_3$	+3	Fe^{3+}

72. How does Fe change to Fe^{2+}?

Ans. By losing 2 electrons from 4s valence subshell.

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73. Write down the subshell electronic configuration of Fe^{2+}.

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6$

There is only a small difference of energy between the outermost s subshell and the penultimate d subshell of transition elements.

74. If so, which will be the subshell from which iron loses the third electron?

Ans. From 3d sub-shell

75. Write the electronic configuration of Fe^{3+} on the basis of this.

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$

76. Write the subshell electronic configuration of Manganese (Mn).

Ans. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

77. Complete the table 1.17

Ans.

Compound	**Oxidation state of Mn**	**Subshell electronic configuration of Mn ions**

$MnCl_2$	+2	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$
MnO_2	+4	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$
Mn_2O_3	+3	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^4$
Mn_2O_7	+7	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

78. Examine these compounds available. Find more colored compounds and extend the list.

Ans.
- Copper sulfate $CuSO_4.5H_2O$ – blue,
- Copper nitrate $Cu(NO_3)_2.6H_2O$ – pink.
- Potassium permanganate $KMnO_4$ – violet.
- Ferrous sulfate $FeSO_4.7H_2O$ – Green,
- Ferrous nitrate $(Fe(NO_3)_2.6H_2O$ – light green

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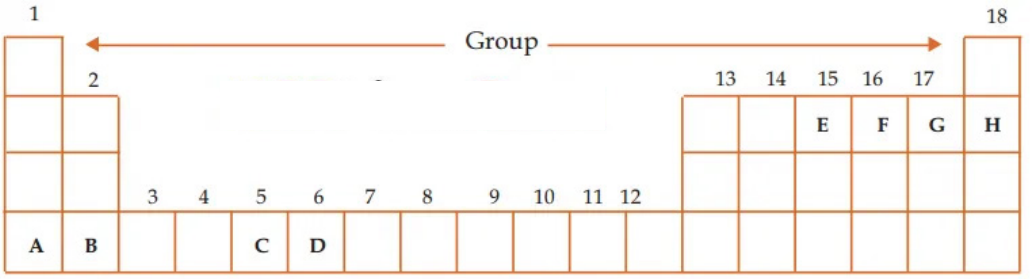
79.



(i) List out the dements of the s block?

(ii) Which elements shows +2 oxidation state?

(iii) Which elements contains 5 electrons in the outermost shell?

(iv) Which are the elements in which the last electron enters the d subshell?

(v) Which are the elements in which the last electron enters the d subshell?

(vi) Which element has the highest ionization energy?

(vii) Which is the highly reactive nonmetal?

(viii) Which elements show -2 oxidation state?

Ans. (i) A, B (ii) B, C, D (iii) E (iv) G

(v) C, D (vi) H (vii) G (viii) F

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80. The outermost electron configuration of an element in this is $2s^2\ 2p^6$

(i) Which is the element?

(ii) Write down the complete subshell electronic configuration?

(iii) Write any two characteristics of this element?

(iv) Write the chemical formula of the compound formed between A and G.

Ans. (i) Ne

(ii) $1s^2\ 2s^2\ 2p^6$

(iii) • Noble element / gases.

• The outermost shell is completely filled

(iv) A G

LET US ASSESS

1. Based on the hints given, find out the atomic number and write down the subshell electronic configuration of elements (Symbols used are not real).

   i. A – period 3 group 17 ii. B – period 4 group 6

Ans. A_{17} — $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ B_{24} — $1S^2\ 2s^2\ 2p^6\ 3S^2\ 3p^6\ 3d^5\ 4S^1$

2. When the last electron of an atom was filled in the 3d subshell, the subshell electronic configuration was recorded as $3d^8$ Answer the questions related to this atom.

   1. Complete subshell electronic configuration 2. Atomic number

   3. Block 4. Period number 5. Group number

Ans. 1. Complete subshell electronic configuration: $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^8$, $4s^2$

   2. Atomic number: 28 3. Block : d

   4. Period number: 4 5. Groupnumber : 8 + 2 = 10

3. Pick out the wrong ones from the subshell electronic configuration given below.

   a. $1s^2\ 2s^2\ 2p^7$ b. $1s^2\ 2s^2\ 2p^2$

   c. $1s^2\ 2s^2\ 2p^5\ 3s^2$ d. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$ e. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$

Ans. Wrong electronic configuration

   a. $1s^2\ 2s^2\ 2p^7$ (2p maximum 6 electrons only)

   c. $1s^2\ 2s^2\ 2p^5\ 3s^1$ (electrons are filled in 3s only after filling 6 electrons in 2p)

   d. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^1$ (electrons are filled in 3d only after filling 2 electrons in 4s)

4. The element X in group 17 has 3 shells. If so,

   a. Write the subshell electronic configuration of the element.

   b. Write the period number,

   c. What will be the chemical formula of the compound formed if the element X reacts with element Y of the third period which contains one electron in the p subshell?

Ans. a. Three shells are K, L, M. The subshells are 1s 2s 2p 3s 3p 3d

Group number: 17 Electrons in last shell: 7

Shell electronic configuration: 2,8,7

Sub-shell electronic configuration $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^5$

b. Period-3

c. Y – Third period ∴ shells – 3

1 electron in p – subshell

Total electrons in valence shell = 2 +1 = 3 (2 electrons in s + 1 electron in p)

Valency of x – 1(1 electron is recieved – electro negative atom)

Valency of y – 3 (3 electrons are lost – electro positive atom)

Therefore they combine to form compounds with chemical formula YX_3

(Symbol of electropositive element first followed by electro negative element).

5. The element Cu with atomic number 29 undergoes chemical reaction to formation with oxidation number +2.

a. Write down the subshell electronic configuration of this ion.

b. Can this element show variable valency? Why?

c. Write down the chemical formula of one compound formed when this element reacts with chlorine ($_{17}$Cl).

Ans. a. $_{29}Cu$ — $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$

Cu^{2+} — $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9$

b. Yes. One electron can be lost from 4s subshell and can'exist as Cu^+ ion, It is a d-block element.

c. Copper react with chlorine to form two compounds Cu^+, Cu^{2+} ions react with chlorine to form CuCl and $CuCl_2$ respectively.

6. Certain subshells of an atom are given. 2s 2d 3f 3d 5s 3p

a. Which are the subshells that are not possible?

b. Give the reason.

Ans. a. Not possible sub-shells are 2d, 3f

b. d – subshell is not possible in 2nd shell

f – subshell is not possible in 3rd shell

EXTENDED ACTIVITIES

1. Prepare the comprehensive table which indicates the name, symbol, electron

configuration, subshell configuration of elements having atomic number 1 to 36?

Ans.

Atomic number	Element	Symbol	Electronic configuration	Subshell electronic configuration
1	Hydrogen	H	1	$1s^1$
2	Helium	He	2	$1s^2$
3	Lithium	Li	2'1	$1s^2\ 2s^1$
4	Beryllium	Be	2'2	$1s^2\ 2s^2$
5	Boron	B	2, 3	$1s^2\ 2s^2\ 2p^1$
6	Carbon	C	2, 4	$1s^2\ 2s^2\ 2p^2$
7	Nitrogen	N	2, 5	$1s^2\ 2s^2\ 2p^3$
8	Oxygen	O	2, 6	$1s^2\ 2s^2\ 2p^4$
9	Fluorine	F	2, 7	$1s^2\ 2s^2\ 2p^5$
10	Neon	Ne	2, 8	$1s^2\ 2s^2\ 2p^6$
11	Sodium	Na	2, 8, 1	$1s^2\ 2s^2\ 2p^6\ 3p^1$
12	Magnesium	Mg	2, 8, 2	$1s^2\ 2s^2\ 2p^4\ 3s^2$
13	Aluminium	Al	2, 8, 3	$1s^2\ 2s^2\ 2p^4\ 3s^2\ 3p^1$
14	Silicon	Si	2, 8, 4	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
15	Phosphorus	P	2, 8, 5	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
16	Sulfur	S	2, 8, 6	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
17	Chlorine	Cl	2, 8, 7	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
18	Argon	Ar	2, 8, 8	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
19	Potassium	K	2, 8, 8, 1	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
20	Calcium	Ca	2, 8, 8, 2	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
21	Scandium	Sc	2, 8, 8, 3	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1\ 4s^1$
22	Titanium	Ti	2, 8, 8, 4	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$
23	Vanadium	V	2, 8, 8, 5	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3\ 4s^2$
24	Chromium	Cr	2, 8, 8, 6	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$
25	Manganese	Mn	2, 8, 8, 7	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$
26	Iron	Fe	2, 8, 8, 8	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2$
27	Cobalt	Co	2, 8, 8, 8, 1	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7\ 4s^2$
28	Nickel	Ni	2, 8, 8, 8, 2	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$
29	Copper	Cu	2, 8, 8, 3	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$
30	Zinc	Zn	2, 8, 8, 8, 4	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2$
31	Gallium	Ge	2, 8, 8, 8, 5	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^1$
32	Germanium	Ge	2, 8, 8, 8, 6	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^2$
33	Arsenic	As	2, 8, 8, 8, 7	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^3$
34	Selenium	Se	2, 8, 8, 8, 8	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^4$
35	Bromine	Br	2, 8, 8, 8, 8, 1	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^5$
36	Krypton	Kr	2, 8, 8, 8, 8, 2	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^4$

2. Some information related to the elements of the p bllock in the 17th group of the periodic table are given in the table below. Complete the table and analyze the following questions?

Ans.

Element	Symbol	State of STP	Chemical reactivity with hydrogen	Common oxidation	Chemical formula of hydrides
Fluorine	F	Gases	Vigourous reaction	-1	HF
Chlorine	Cl	Gases	Vigourous reaction	-1	HCl
Bromine	Br	Liquid	Slow reaction	-1	HBr
Iodine	I	Solid	Very slow reaction	-1	HI

a. What is the family names of elements belonging to the 17^{th} group?

b. What is their common valency?

c. Which element has the highest electro negativity ?

d. Which element has the highest ionization energy?

e. List out the name and chemical formula of the compounds formed by these elements with S block elements?

Ans. a. Halogen b. 1

c. F d. F

e.
- sodium chloride – NaCl
- potassium chloride – KCl
- magnesium chloride- $MgCl_2$
- calcium chloride- $CaCl_2$
- magnesium fluoride- MgF_2
- calcium fluoride – CaF_2
- sodium iodide – Nal
- potassium iodide – KI
- potassium bromide – KBr
- potassium fluoride – KF

ADDITIONAL QUESTIONS AND ANSWERS

1. Complete the table of details about shells and subshells.

Shell	K_1	L_2	M_3	N_4
Subshell				
No. of electrons				

a. No of electrons in KLMN shell.

b. No of electrons in each shell.

Shell	s	p	d	f
No. of electrons				

c. Which subshell is common to all sub-shells?

d. Write names of subshells in accordance with increasing energy level,

e. Identify the incorrect subshell electronic configuration.

– $1s^2$ – $ls^2\ 2p^6$ – $ls^2\ 2s^2\ 2p^6$ – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

Ans.

Shell	K_1	L_2		M_3			N_4			
Subshell	s	s	p	s	p	d	s	p	d	f
No. of electrons	2	2	6	2	6	10	2	6	10	14

a. K – 2 ; L – 8 ; M – 18 ; N – 32

b

Shell	s	p	d	f
No. of electrons	2	6	10	14

c. s - Subshell

d. 1s <2s <2p <3s <3p <4s <3d <4p <5s <4d <5p <6s <4f <5s

e. $1s^2\ 2p^6$

2. Atomic number of iron is 26. It exhibits Fe^{2+}, Fe^{3+} oxidation state. Write the subshell electronic configuration.

	Subshell electronic configuration
Fe	
Fe^{2+}	
Fe^{3+}	

Ans.

	Subshell electronic configuration
Fe	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2$
Fe^{2+}	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6$
Fe^{3+}	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$

3. (a) Manganese, a d-block element exhibits different oxidation state. Why?

(b) Include chemical formula of more compounds of manganese in the table, write their ; oxidation state and subshell electronic configuration.

Compounds	Oxidation state	Subshell electronic configuration
$MnCl_2$		
MnO_2		
$KMnO_4$		

(c) Write the oxidation number and subshell electronic configuration K, Cl and O.

Ans. (a) Manganese shows different oxidation states because in manganese 4s and 3d subshell electrons take part in chemical reactions.

(b)

Compounds	Oxidation state	Subshell electronic configuration
$MnCl_2$	+ 2	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^5$
MnO_2	+ 4	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^3$
$KMnO_4$	+ 7	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6$
Mn_2O_3	+ 7	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^4$
Mn_2O_7	+ 7	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6$

(c)

Compounds	Oxidation state	Subshell electronic configuration
K	+1	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6$
Cl	-2	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^1$
O	-2	$1s^2\,2s^2\,2p^6$

4. Find out atomic number, group, block period using subshell electronic configuration and then complete the table.

Subshell electronic configuration	Atomic number	Group	Block	Period
$1s^2\,2s^2\,2p^6$				
$1s^2\,2s^2\,2p^6\,3s^1$				
$1s^2\,2s^2\,2p^6\,3s^2\,3p^2\,3d^5\,4s^1$				
	25			
	28			
	26			

Ans.

Subshell electronic configuration	Atomic number	Group	Block	Period
$1s^2\,2s^2\,2p^6$	10	18	p	2
$1s^2\,2s^2\,2p^6\,3s^1$	11	1	s	3
$1s^2\,2s^2\,2p^6\,3s^2\,3p^2\,3d^5\,4s^1$	24	6	d	4
$1s^2\,2s^2\,2p^6\,3s^2\,3p^2\,3d^5\,4s^2$	25	7	d	4
$1s^2\,2s^2\,2p^6\,3s^2\,3p^2\,3d^8\,4s^2$	28	10	d	4
$1s^2\,2s^2\,2p^6\,3s^2\,3p^2\,3d^6\,4s^2$	26	8	d	4

5. Write down the characteristics of s, d, p, f block elements

Ans. s-block elements:

Elements in which last electron enters into s-subshell are called s-block elements. It contains group I elements (Alkali metals) and group II elements (Alkaline earth

metals).

1st group elements lose one electron during chemical combination. Therefore its oxidation state is +1.

2nd group elements lose two electrons from valence shell during chemical combination and their oxidation state is +2.

The highest shell number in a sub-shell electronic configuration is the period number of that element.

1. Group number characteristics = no.of electrons in valence sub-shell.

2. s block ionization energy & electro negativity decreases downwards.

3. Metallic character & reactivity increases downwards.

4. Lose electrons during chemical combination and they form ionic compounds.

Their oxides and hydroxides are basic.

Their atomic radii are high in a period.

p-block elements:

- Last electron enters into p-subshell.
- Group 13 -18 elements.
- Highly reactive elements are non-metals – group 17,
- These are elements with positive and negative oxidation state.

Group number of p-block elements = electrons in last p-subshell + 12

d-block elements:

- Last electron enters into penultimate d-subshell
- Known as transition elements.
- Metals
- Shows similarity in group and period.
- Variable oxidation states.
- Form coloured compounds.

f-block elements:

- Last electron enters into antepenultimate f sub-shell.
- Contains Lanthanoids and Actinoids.
- Variable oxidation state.
- Most of the Actinoids are radioactive.
- Most of the elements are artificial.
- U, Th, Pu are used in nuclear reactors.
- Some elements are used as catalyst in pet-roleum industry.

6. Write down subshell electronic configuration of Cu^{1+} and Cu^{2+}

Ans. Cu^{1+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$ Cu^{2+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9$

7. How many 's' subshell electrons are in $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^2$

Ans. 6 Electrons

8. 11,17,10 are the atomic number of elements X, Y, and Z.

a. Write down their subshell electronic configuration, group, block, period,

b. Write the molecular formula of the compound formed when any two of the above elements are combined.

c. Write down the oxidation numbers of the elements in those compounds. Write the subshell electronic configuration of both ions.

Ans. a.

Compounds	Subshell	Group	Block	Period
X	$1s^2\,2s^2\,2p^6\,3s^1$	11	s	3
Y	$1s^2\,2s^2\,2p^6\,3s^2\,3p^5$	17	p	3
Z	$1s^2\,2s^2\,2p^6$	18	p	2

b. X Y

c.

Compounds	Oxidation state	Subshell electronic configuration
X	1+	$1s^2\,2s^2\,2p^6$
Y	1-	$1s^2\,2s^2\,2p^6\,3s^2\,3p^6$

9. Element 'X' is having atomic number 28, it gives two electrons to element 'Y'.

a. Write down the electronic configuration of 'X' and its ion

b. In which block 'X' belongs?

c. Write down the characteristics of that block

Ans. a. X_{28} – $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^8\,4s^2$ X^{2+} – $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^8$

b. d block Compound

c. 1. It exhibits variable oxidation states 2. Forms coloured compounds

3. Last electron enters d subshell

10.

Sc - [Ar] $3d^1 4s^2$	Ca - [Ar] $4s^2$
Mg - [Ne]$3s^2$	Co - [Ar]$3d^7\,4s^2$

a. Write down the group and period of each element.

b. What are the use of writing electronic configuration this fashion?

Ans. a .

Element	Group	Period
Sc	3	4

Ca	2	4
Mg	2	3
Co	9	4

b. Group and period of the element can be identified easily. In the Same way long electron configuration can be avoided.

6. $_{24}Cr$ – [Ar] $3d^5\ 4s^1$ $_{29}Cu$ – [Ar] $3d^{10}\ 4s^1$

Why chromium and copper exhibits such electronic configuration ?

Ans. Half filled and completely filled subshells are most stable. Change in the electronic configuration of $_{24}Cr$ &, $_{29}Cu$ is due to .this. The electrons in these elements are arranged in such away to give these elements stability.

11. The electronic configuration of the elements A, B, C, D are given below.

A – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$ B – $1s^2\ 2s^2\ 2p^6\ 3s^2$

C – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ D – $1s^2\ 2s^2\ 2p^6\ 3s^1$

a. Which of these elements show +2 oxidation state?

b. Which metal belongs to 17^{th} group?

c. Which is the period number of the element A ? What is the basis of your findings?

d. Which of these elements can form basic Oxides?

Ans. a. B b. C c. Period number: 3, Period number = No.of shells d. B, D

12. Two compounds of iron are given below.

$FeSO_4$, $Fe_2(SO_4)_3$ (The oxidation state of sulfate radical is -2)

a. Which of these compounds show +2 oxidation state for Fe?

b. Which compounds has Fe^{3+} ion?

c. Write the subshell electronic configuration of Fe^{3+} ion.

d. Why do transition elements show variable oxidation states?

Ans. a. $FeSO_4$ b. $Fe_2(SO_4)_3$ c. Fe^{3+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$

d. The energy difference between the outer most ‘s’ subshell and penultinate ‘d’ subshell is very small. Hence under suitable conditions, the electrons in ‘d’ subshell also take part in chemical reaction.

13. Identify the incorrect electronic configurations and correct them.

(i) $1s^2\ 2s^2\ 2p^3$ (ii) $1s^2\ 2s^2\ 2p^6\ 3s^1$ (iii) $1s^2\ 2s^2\ 2p^6\ 2d^7$ (iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^4$

Ans. (iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

(iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^2$

14. Complete the table.

Outermost electronic configuration	Group Number	Oxidation state
$3s^2\ 3p^4$	16	....a....
$3s^1$	...b...	+1
$2s^2\ 2p^5$	...c...	...d...
$3d^{10}\ 4s^2$	...e...	...f...

Ans. a. – 2 b. 1 c. 17 d. – 1 e. 12 f. +12

15. a. Two compounds XY_2, XZ_4 are given. The oxidation state of Z is 1. What will be the oxidation state of Y ?

b. Write the molecular formula of the compound formed by Y when it combines with aluminum (Al) having oxidation state +3.

Ans. a. Y = – 2 (oxidation state of X is +4) b. Al_2Y_3

16. Pick out the statements which suit to f-block elements.

a. All of them are naturally occurring elements.

b. Uranium and Thorium are f block elements.

c. Last electrons is filled in the shell pre-ceding the outermost shell.

d. last electrons are filled up in the antepenultimate shell.

e. Includes some radioactive elements.

f. Some of them are used as catalyst in petroleum industry.

Ans. b, d, e, f

17. The atomic number of four elements are given below. (The symbols are not real)

A – 8 B – 10 C – 12 D – 18

a. Write the sub-shell electronic configuration of the elements,

b. Which of them are inert gases?

c. Write the chemical formula of the compound formed by two elements other than inert gases.

Ans. a. A – $1s^2\ 2s^2\ 2p^4$ B – $1s^2\ 2s^2\ 2p^6$

C – $1s^2\ 2s^2\ 2p^6\ 3s^2$ D – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

b. B, D

c. CA, (C_2A_2 is simplified and written as CA)

18. The subshell electronic configuration of two elements ends as follows. (Symbols are not real)

P – $3s^2$ Q – $3p^4$

a. Write the complete subshell electronic configuration.

b. Find out the oxidation state of each element.

c. The chemical formula of the compound formed by these elements is PQ. Is this statement correct? Justify your answer.

Ans. a. P – $1s^2\ 2s^2\ 2p^6\ 3s^2$ Q – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

b. P = +2, Q = – 2 : c. Right, valency of both P and Q is '2'

19. Match the following.

Block	Outer most electronic configuration	Characteristics
s	$3p^5$	Most of the compounds are coloured
p	$3d^4\ 4s^2$	Includes Lanthanoids (6th period)
d	$4f^1\ 5d^1\ 6s^2$	Highest atomic radius in the respective period
f	$3s^1$	High electronegativity

Ans.

Block	Outer most electronic configuration	Characteristics
s	$3p^1$	Most of the compounds are coloured
p	$3d^5$	Includes Lanthanoids (6th period)
d	$4d^4\ 4s^2$	Highest atomic radius in the respective period
f	$3s^1$	Highelectro negativity

20. The atomic number of two elements are given below.

Si – 14 Ni – 28

a. Write the subshell electronic configuration of these elements.

b. Find out the group and period of each element.

Ans. a. Si – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ Ni – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$

b. Si – Period Number – 3, Group number – 14

Ni – Period Number – 4, Group number – 10

21. The element 'X' has 4 shells and its 3d subshell has 6 electrons. (Symbol is not real)

a. Write the complete electronic configuration of the element.

b. What is its group number? Which is the block?

c. Write any two characteristics of the block to which element X belongs to.

d. From which subshell the electrons are lost when the element X shows +2 oxidation state.

Ans. a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^6\ 4s^2$

b. Group number – 8, Block – d

c. All of them are metals, d – block elements are placed in group 3 to group 12

d. s – Sub shell

22. The outermost electronic configuration of the element A is $2s^2\ 2p^2$.(Symbol is not real)

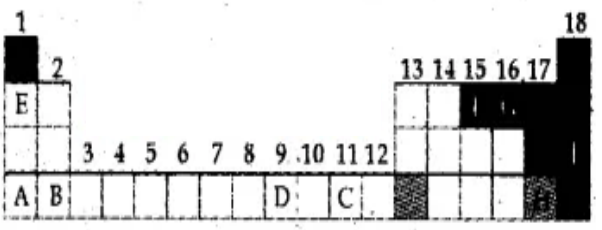
a. Find out the group number and block of the element.

b. Write the chemical formula of the compound formed by A when it combines with chlorine.

c. Write the complete electronic configuretion of the element just below 'A' in the j periodic table.

Ans. a. Group number – 14, Block – P b. ACl_4 c. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

23. The figure of an incomplete periodic table is given below.



a. Which one of these elements shows -2 oxidation state?

b. Which of these elements have 3 electrons in their outermost p subshell?

c. Which element has the highest atomic radius? Which one has the least?

d. Which of these elements show variable oxidation state?

e. Which of these elements has the highest ionization energy?

Ans. a. G b. F

c. The element having highest atomic radius – A, lowest Atomic radius – H

d. D, C e. H

24. Examine the given electronic configurations.

A – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2$ B – $1s^2\ 2s^2\ 2p^6\ 3s^1$

C – $1s^2\ 2s^2\ 2p^1\ 3s^2\ 3p^6$ D – $1s^2\ 2s^2\ 2p^6\ 3s^2$

E – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$

a. Which of these elements belongs to 4^{th} period?

b. Which elements belongs to the same group ?

c. Which element doesn't participate in chemical reactions generally ?

d. Which element has highest metallic character ?

Ans. a. A, E b. B, E c. C d. E

25. The atomic number of the elements X and Y are 20, 26 respectively. When these elements combine with chlorine, three compounds XCl_2, YCl_2, YCl_3 are formed.

a. What is the specialty of the oxidation number of Y, compared to that of X?

b.Explain the reason for this, on the basis of the subshell based electronic configuration.

Ans. a. Element X has constant oxidation state. Y shows variable oxidation states.

b. $X_{20} = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$

$X_{26} = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$

Y is a transitional element. In chemical reactions only two elections in ' s' subshell or besides 's' subshell electrons 'd' sub shell electrons also take part.

26. Arrange the following sub-shells in the increasing order of energy 5p, 2s, 4f, 3s, 4s, 3d, 6s

Ans. 2s < 3s < 4s < 3d < 5p < 6s < 4f

27. Last electron in f-block elements goes to

a. Which shell? Outer shell/Penultimate shell /Antepenultimate shell

b. Which sub-shell? Outer f-subshell Penultimate f-subshell/Antepenulti mate f-subshell.

Ans. a. Antepenultimate shell b. Antepenultimate f-sub-shell

28. Sub-shell electronic configuration of X is given : $1s^2\ 2s^2\ 2p^5$

a. The element Y is coming just below the element in same group. Then write the sub-shell electronic configuration of Y.

b. Write the sub-shell electronic configuration of the element next to X in same period.

Ans. a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$ b. $Is^2\ 2s^2\ 2p^6$

29. Find the wrong electronic configurations from the following. What is wrong in these?

a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$ b. $1s^2$

c. $1s^2\ 2s^1\ 2p^6$ d. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

Ans. (a) and (c) are wrong electronic con figurations.

In (a) one electron from 4s is to be transferred to 3d since completely filled configurations are more stable. So the correct electronic configuration is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$

In (c) electrons are filled in 2p only after filling electrons in 2s.

30. Group and period number of two elements are given.

P – group 17, period – 3 Q – group 2, period – 3

a. Write the sub-shell electronic configuration of each.

b. Write the chemical formula of the compound formed by their combination.

Ans. a. P – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$ Q – $1s^2\ 2s^2\ 2p^6\ 3s^2$

b. Q is electropositive. P is electro negative; ∴ Chemical formula QP_2

31. Write the reason for the statement given below.

a. d-block elements in the same period show similarity.

b. Transition elements show variable oxidation state.

Ans. a. Valence shell electrons of d-block elements in same periods are almost same. Valence shell electrons are entering in chemical reaction. Therefore they shows similarity.

b. Energy of electrons in s-subshell and inner d- subshells are almost same. Therefore s- electrons or s and d electrons take part in chemical reaction and show variable oxidation state.

32. Write the sub-shell electronic configuration of following elements. Predict the block, group and period. (Symbols are not real)

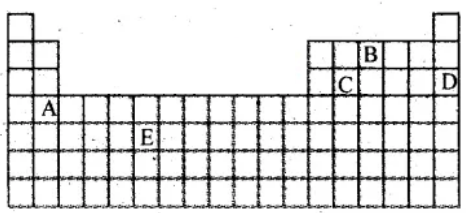
a. M – 27 b. N – 19 c. P – 15

Ans. a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7\ 4s^2$ block – d; group – 9; period – 4.

b. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$ block – s; group – 1; period – 4

c. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ block – p; group – 15; period – 3

33. Observe the model of periodic table.



a. Which element is having S electrons in valence shell?

b. Which elements are having 2 electrons in valence sub-shell?

c. Which element is having last electron in3p?

d. Which element ends with electronic configuration $4d^5$, $5s^1$?

Ans. a. B; b.A, C; c. C, D; d. E

34. Atomic number of some elements are given.

A – 15, B – 8, C – 11, D – 18, E – 20, F – 34, G – 10

a. Which are the elements in same period?

b. Which are the elements in same group?

Ans. A -$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ (group -15 period – 3)

B – $1s^2\ 2s^2\ 2p^4$ (group –16 period – 2)

C – $1s^2\ 2s^2\ 2p^6$ 31 (group – 1 period – 3)

D – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$ (group – 18 period – 3)

E – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$. (group – 2 period – 4)

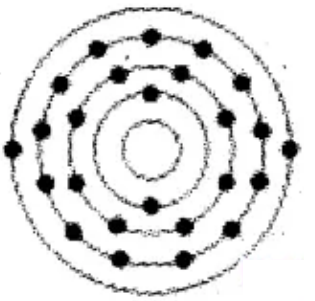
F – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^4$ (group – 16 period – 4)

G – $1s^2\ 2s^2\ 2p^6$ (group – 18 period – 2)

a. A, D same period ; B, G same period

b. B, F same group ; D, G same group

35. Look at the Bohr model of X-atom.



a. Write the sub-shell electronic configuration of this atom.

b. Mention the compounds in which d-subshell electrons are taking part in chemical reaction during their formation.

XCl_2, XO_2, X_2O_7

c. Write the electronic configuration of X ions in the above three compounds.

Ans. a. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$

b. XCl_2 – ion X^{2+} (electrons in 4s only)

XO_2 – ion X^{+4} (2 electrons in 4s and 2 electrons in 3d)

X_2O_7 – ion X^{7+} (2 electrons in 4s and 5 electrons in 3d)

So, XO_2, X_2O_7

c. X^{2+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$ X^{4+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3$

X^{7+} – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

36. Select the suitable one from the following columns A, B, C

A	B	C
Fe	high atomic weight	semi meta
F	Actinoids	s-block
[Xe] $4f^1\ 5d^1\ 6s^2$	p-block	Lanthanoids
Cs	transition elements	Non - metal

Ans.

A	B	C
Fe	transition elements	Colour
F	p block	Non - metal
[Xe] $4f^1\ 5d^1\ 6s^2$	f-block	Lanthanoids
Cs	high atomic weight	s-block

37. Pick the wrong statement from the following.

a. Elements with atomic number 5 belong to group 15.

b. Electronic configuration of scandium (Atomic number 21) is 2,8,8,3.

c. d-block elements are known as transition elements.

d. All s-block elements are metals.

Ans. a. Wrong. It belongs to group 13.

b. Wrong. Electronic configuration : 2, 8, 9, 2 ($1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^1\ 4s^2$)

c. Correct d. Correct

PREVIOUS YEAR QUESTIONS AND ANSWERS

1. What is the maximum number of electrons that can be accommodated in 'f' subshell?

(2, 6, 10, 14) **(2021)**

Ans. 14

2. (a) From the given subshell electronic configuration, write the correct electronic configuration of Chromium ($_{24}Cr$).

(i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^4\ 4s^2$ (ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$.

(b) What is the reason of this selection? **(2021)**

Ans. a. (ii) b. Half Filled d orbitals

3. The chemical formula of two different chloride of iron (Fe) are given below.

(i) Ferrous Chloride - $FeCl_2$ (ii) Ferric Chloride - $FeCl_3$.

[Hint : Oxidation State of chlorine atom (Cl) = -1

Atom Number of iron (Fe) = 26]

(a) In which compounds iron (Fe) shows + 2 oxidation state?

(b) Write the Subshell electronic configuration of Fe^{3+}.

(c) Why does iron show different oxidation states? **(2021)**

Ans. a. $FeCl_2$ b. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$

c. The outermost electrons are in 3d and 4s, they are comparable energy or it have least energy difference.

4. Outermost Subshell electronic configuration of two elements X and Y are given .

   $X = 3s^2$ $Y = 3s^2 3p^5$. (Symbols are not real)

   (a) What is the valency of the element X?

   (b) Which element shows metallic character?

   (c) Write the chemical formula of the compound formed by the combination of X and Y. **(2021)**

Ans. a. 2 b. X c. XY_2

5. The Subshell electronic configuration of an element is given : $1s^2 2s^2 2p^6 3s^2$.

   (a) Write the atomic number of this element

   (b) To which block this element belong?

   (c) Identify the period number and group number of this element. **(2021)**

Ans. a. 12 b. s block c. Period number → 3, Group number → 2

6. What is the maximum number of electrons that can be accommodated in '*f*' subshell?

   (2, 6, 10, 14) **(2020)**

Ans. 14

7. (a) Select the correct subshell electronic configuration of $_{24}Cr$ from the following:

   (i) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$ (ii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

   (b) Write the reason for selecting this configuration. **(2020)**

Ans. (a) $1s^2 2s^2 2P^6 3s^2 3P^6 3d^5 4s^1$

(b) Half filled 'd' subshell (d^5) is more stable.

8. The outer most subshell electronic configuration of an element is $3d^5 4s^2$.

   (a) Write the complete subshell electronic configuration of this element.

   (b) Write the atomic number of the element. (c) Identify its block and Period.

   (d) This element shows variable oxidation state. Why? **(2020)**

Ans. (a) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$

(b) 25

(c) Block - d, Period - 4

(d) There is not much difference in the energies of outermost 's' subshell and penultimate 'd' subshell. So electrons from the outermost's' subshell and penultimate 'd' subshell take part in chemical reactions.