



CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

QUANTUM NUMBERS AND GENERAL CHEMISTRY

6

1. Slater's rule is used to calculate the shielding constant (σ) in multielectron system and the electronic configuration the element in the following order and groupings :

$(1s)$, $(2s, 2p)$, $(3s, 3p)$, $(4s, 4p)$, $(4d)$, $(4f)$, $(5s, 5p)$, *etc.*

the effective nuclear charge experienced by the outer shell electrons of

He is :

A. 0.35

B. 0.65

C. 1.65

D. none of these

Answer: d

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1. the effective nuclear charge (Z_{eff}) takes into account the interelectronic repulsions in multielectron atoms Slater's rules help us in evaluating z_{eff} for various species Apply Slater's Rules to answer the following questions :

Z_{eff} for 3d electrons of Zn = x

Z_{eff} for 3d electrons of Zn^{2+} = y Z_{eff} for 4s electrons of Zn = z

Choose the correct options (S) :

A. $x > y$

B. $y > z$

C. $X=Y$

D. All of these

Answer: d

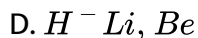
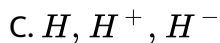
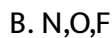
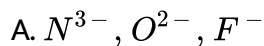


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1. Isoelectronic species have same number of valence electrons or same number of total electrons as well as same number of atoms .

Identify the set of isoelectronic species :



Answer: a



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1. imagine a universe in which :

(A) Principal quantum n can have values from 1,2,3,..... ∞ .

(b) Azimuthal quantum no. l can have values from 1 to $n+1$ corresponding to A,B,C,D,E,F,.....

(c) magnetic quantum no m can have integral values from $-\frac{l}{2}$ to $+\frac{l}{2}$ (including zero if possible).

(d) spin quantum no s can have 6 possible values .

All rules of filling remains intact .

what will be the shell and subshell for an element with $Z=36$?

A. $2A$

B. $1B$

C. 1C

D. 2B

Answer: a



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10

1. information :

(a) principal quantum no n is defined as 1,2,3,.....

(b) Azimuthal quantum no l is defined as 1 to $n - 1$ in integral steps .

(c) magnetic quantum no m is defined as $-\frac{l}{2}$ to $+\frac{l}{2}$ (including zero) in integral steps).

(d) spin quantum no s has six possible values $\left(-\frac{1}{2}, -\frac{1}{2}, +\frac{1}{2}, +\frac{1}{2}, +\frac{3}{2}, +\frac{3}{2} \right)$.

(e) the subshell corresponding to $l=1,2,3,4,5,.....$ designated as F, G, H, I, J, K.... respectively ,

(f) the values of m for given values of l give the number of orbitals in a sub-shell .

(g) the principle for filling of E^- in the shells remains unchanged .

the 2nd period would begin with :

A. Ga

B. As

C. Cs

D. Sc

Answer: a

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11

1. if values of quantum number can be considered as follow : $n=1,2,3,\dots,\infty$

∞

$l = 0$ to $(n-1)$

$m = -l$ to $+l$ (interfral values including zero)

$$s = \frac{1}{2}, + \frac{1}{2}$$

According to above consideration the maximum number of electrons associataed with 3rd shell is :

A. 50

B. 32

C. 40

D. 60

Answer: a



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Straight Objective Type

1. Two pure organic compounds melt at 112°C and 114°C , respectively, if equal quantites of them are mixed, at what temperature will the mixture begin to melt ?

A. Below $112^{\circ}C$

B. At $112^{\circ}C$

C. Between $112^{\circ}C$ and 114°

D. Above $114^{\circ}C$

Answer: a

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2. Which pair consists of species that are isoelectronic

A. $Na^{+} K^{+}$

B. Cl, Cl^{-}

C. Fe^{2+}, Mn^{2+}

D. Ar, Ca^{2+}

Answer: d

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3. Nucleus of an element contains 9 protons Its valency would be :

A. 1

B. 3

C. 2

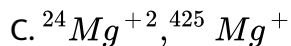
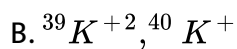
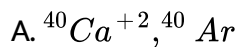
D. 5

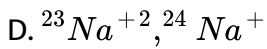
Answer: a



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4. Which of the following species are isotopic as well as isoelectronic ?





Answer: b



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5. Two particles (X) and(Y) have the composition as shown in the table :

particle	number of electrons	number of neutrons	Number of protons
(X)	18	16	16
(Y)	18	18	17

the particle (x) and(Y) are:

- A. Isotopes of each other
- B. isobars of each other
- C. isotones of each other
- D. Isoelectronic ions

Answer: d



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6. A certain positive ion A^{+2} has 22 mass number of most abundant isotope of A?

A. 42

B. 38

C. 40

D. None of these

Answer: c



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7. which species carry the maximum charge?

A. proton

B. β -particle

C. α -particle

D. Hydronium ion

Answer: c



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8. The ratio between the neutrons present in nitrogen atom and silicon atoms with number 14 and 28 is :

A. 7:3

B. 3:7

C. 1:2

D. 1:1

Answer: c



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9. Which of the following nuclear reactions will generate an isotope?

A. neutron particle emission

B. Positron emission

C. α -particle emission

D. β -particle emission

Answer: a



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10. The number of neutrons in dipositive zinc ion with mass number 70 is.

A. 34

B. 40

C. 36

D. 38

Answer: b



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11. An ionic compound that attracts atmospheric water so strongly that a hydrate is formed is said to be :

- A. dilute
- B. hygroscopic
- C. immisible
- D. Miscible

Answer: b



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12. Pick out among the following species the one which is not isoelectronic with CO_2 .

- A. N_3^-
- B. $(CNO)^-$



Answer: d

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13. X^{2+} is isoelectronic with sulphur and has $(z + 2)$ neutrons (Z is atomd no of X^{2+}) Hence ionic mass of X^{2+} is

A. 34

B. 36

C. 38

D. 40

Answer: c

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14. Z/e ratio for N^{3-} , O^{2-} and F^{-} respectively will be :

A. 0.7,0.8 and 0.9

B. 0.9 ,0.8 and 0.7

C. 7,8 and 9

D. 9,8 and 7

Answer: a



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15. which of the following group does not represent the isoelectronic species?

A. CH_4 , H_2O , NH_3 , HF

B. PH_3 , SiH_4 , HS^{-} , Ar

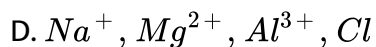
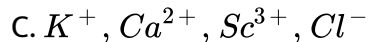
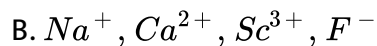
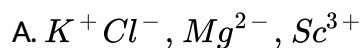
C. OH^{-} , H_2O , NH_2^{-} , F^{-}

D. H_2S , K^{+} , Ar , Cl

Answer: d

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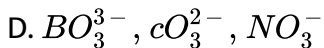
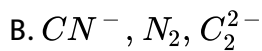
16. Which one of the following sets of ions represents the collection of isoelectronic species?



Answer: c

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17. Of the following sets ,which one does not contain isoelectronic species ?

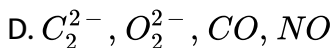
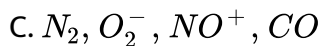
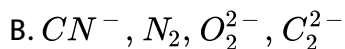
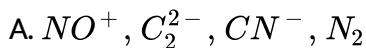


Answer: c



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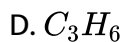
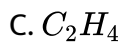
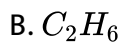
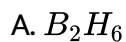
18. which one of the following set of ions represent a collection of isoelectronic species?



Answer: a

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19. The pair NH_3 and BH_3 is isoelectronic with



Answer: b

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20. Which of the following species has some number of electrons as F^\ominus ?



D. All of these

Answer: d



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21. The increasing order of specific charge for the following substances electron (e), proton (p) unipositive helium atom (h), neutron (n) and α -particle is correctly represented in which of the following options.

A. e, n, p, h, α

B. n, h, α, p, e

C. n, α, h, p, e

D. None of these

Answer: b



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22. The ratio of the e/m values of a proton and an α -particle is:

A. 2:1

B. 1:1

C. 1:2

D. 1:4

Answer: a



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23. Which of the following pairs have identical values of e/m ?

A. A proton and a neutron

B. A proton and deuterium,

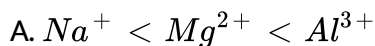
C. Deuterium and α -particle

D. An electron and γ -rays

Answer: c

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24. the correct increasing order of $\frac{e}{m}$ ratio of the given particles is :



Answer: a

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25. The element having no neutron in the nucleus of its atom is-

(a). hydrogen

(b). nitrogen

(c). helium

(d). boron

A. hydrogen

B. Nitrogen

C. helium

D. Boron

Answer: a



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26. The ration of the e/m (specific charge) values of an electron and an α – particle is

A. 2:1

B. 1:1

C. 1:2

D. 1 : 1

Answer: d



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27. A monoatomic ion that has 18 electrons and + 2 charge:

A. Has 16 ptotons

B. Has the symbol Ar^{2+}

C. has 18 neutroons

D. is isoeoelectronnic with Ar

Answer: d



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28. what is the total number of valence electrons in the chlorate ion , ClO_3^- ?

- A. 24
- B. 26
- C. 28
- D. 32

Answer: b



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29. which list includes species with the same number of electrons?

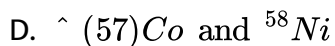
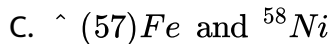
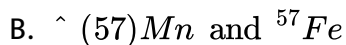
- A. Mg , Ca , Sr
- B. Li^+ , Na^+ , K^+
- C. K^+ , Cl^- , S^{2-}
- D. Fe^{2+} , CO^{2+} , Ni^{2+}

Answer: c



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30. which pair of symbols represent nucler with the same number of neutrons ?



Answer: d



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31. A meterial Safety Date sheet (MSDS) provides what types (S) of information anout a chemical ?

(P) First aid measures

(Q) Handling and storage tips

A. P only

B. Q only

C. Both P and Q

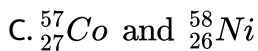
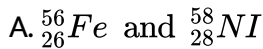
D. Neither P nor Q

Answer: c



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32. which pair of symbols represent nuclei that have the same number of neutrons ?



D. ${}^{57}_{28}\text{Ni}$ and ${}^{58}_{28}\text{Ni}$

Answer: a



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33. which ion not isoelectronic with Ar?

A. S^{2-}

B. K^+

C. SC^{2+}

D. Ti^{4+}

Answer: c



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34. the ion $^{55}\text{Mn}^{2+}$ contains which combination of protons, neutrons and electrons?

	protons	neutrons	Electrons
A	25	30	23
B	25	55	23
C	27	30	25
D	30	25	28

A. A

B. B

C. C

D. D

Answer: a

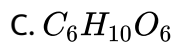
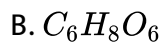
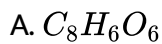
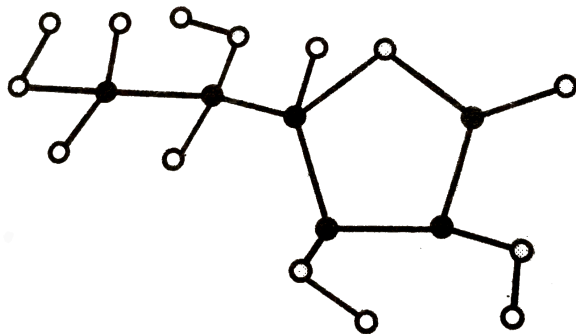


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35. Examine the model of vitamin C and determine the molecular formula

.In the model shown, the black

black sphere = C atom, white sphere = H atom, red sphere = O atom



D. None of these

Answer: b

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36. Molten potassium chloride conducts electricity due to the presence of :

A. Free electrons

B. Free molecules

C. Free potassium and chlorine atoms

D. Free potassium and chloride ions

Answer: d

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37. the material used in photoelectric cells contains ,

A. Cs

B. Si

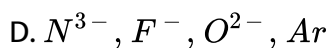
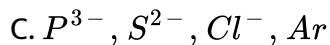
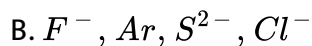
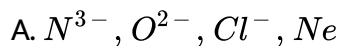
C. Sn

D. Ti

Answer: a

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38. If the mass of proton is doubled and that of neutron is halved the molecular weight of CO_2 consisting only isoelectronic series?



Answer: b



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39. which of the following combination contains only isoelectronic series?

A. 3,2,0

B.

C. 2,0,0

D. 1,1,0

Answer: c



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B

1. which set of wuantum number (n,l,m) is forbidden?

A. 3,2,0

B. 3,1,-1

C. 2,0,0

D. 1,1,0

Answer: d



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2. which characteristic of an atomic orbital is most closely associated with the magnetic quantum number m_l ?

- A. Size
- B. shape
- C. Occupancy
- D. Orientation

Answer: d



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3. How many orbitals are in an f sublevel ($l=3$) ?

- A. 3
- B. 5
- C. 7
- D. 14

Answer: c

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4. which set of quantum number correspond t an eletron in a 4d orbital?

A. $n=4, l=1, m_l = -1, m_s = +\frac{1}{2}$

B. $n=4, l=2, m_l = -2, m_s = -\frac{1}{2}$

C. $n=4, l=3, m_l = 3, m_s = \frac{1}{2}$

D. $n=4, l=3, m_l = -1, m_s = -\frac{1}{2}$

Answer: b

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5. which set of quantum unnumber is not allowed ?

	n	l	m_l	m_s
A.	1	0	0	$+\frac{1}{2}$

B. $2 \quad 2 \quad 1 \quad -\frac{1}{2}$

C. $3 \quad 1 \quad 1 \quad -\frac{1}{2}$

D. $4 \quad 3 \quad -3 \quad +\frac{1}{2}$

Answer: b



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6. How many orbitals have the quantum numbers :

A. 7

B. 3

C. 1

D. 0

Answer: c



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7. If the principal quantum has a value of 3, what are the permitted values of the quantum number l ?

A. 2, 1, 0

B. 3, 2, 1, 0

C. 2, 1, 0, -1, -2

D. 3, 2, 1, 0, -1, -2, -3

Answer: d



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8. all of the energy levels listed are allowed except:

A. $3f$

B. $4d$

C. $5p$

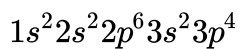
D. $7s$

Answer: a



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9. A sulphur atom in its ground state has the electrons configuration



How many orbitals are occupied by at least one electron ?

A. 12

B. 9

C. 8

D. 5

Answer: b



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10. the shapes of are determined by which quantum number (s) ?

P. n

Q. l

R. m_1

A. P only

B. Q only

C. R only

D. Q and R only

Answer: b



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11. which set of quantum numbers (n, l, m_1, m_2) is permissible for an electron in an atom?

A. $1, 0, 0, -\frac{1}{2}$

B. $1, 1, 0, + \frac{1}{2}$

C. $2, 1, 2, + \frac{1}{2}$

D. $3, 2, - 2, 0$

Answer: a



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12. what is the maximum number of electrons that can occupy $n=3$ energy level ?

A. 6

B. 8

C. 10

D. 18

Answer: d



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13. which quantum number determines the number of angular nodes in an atom's orbital ?

A. n

B. l

C. m_l

D. m_s

Answer: b

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14. which set of quantum numbers (n, l, m_l, m_s) is not permitted by the rules of quantum mechanics?

A. $1, 0, 0, \frac{1}{2}$

B. $2, 1, -1, -\frac{1}{2}$

C. 3, 3, 1, $-\frac{1}{2}$

D. 4, 3, 2, $\frac{1}{2}$

Answer: c



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15. Given this set of quantum numbers for a multi -electron atom :2,0,0,1/2 what is the next higher allowed set of n and l quantum numbers for this higher allowed set of n and l quantum numbers for this atom in its ground state ?

A. n=2, l=0

B. n=2, l=1

C. n=3, l=0

D. n=3, l=1

Answer: b



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16. For nitrogen atom, if 5th electron has quantum numbers $n=2$, $l=1$, $m=-1$, $s = +\frac{1}{2}$. then, what will be the correct option for 6th electron's quantum numbers?

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17. which of the following quantum will have higher numerical value among the other three corresponding quantum numbers for a given subshell?

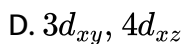
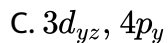
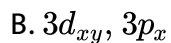
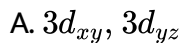
- A. Spin quantum number
- B. Azimuthal quantum number
- C. Magnetic quantum number
- D. Principal quantum number

Answer: d



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18. pair of orbitals which have identical orientation and common nodal plane (s) :



Answer: a::d



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19. Choose the correct option for the quantum numbers of the last electron of $3p^6$

A. $4, 0, 0, +\frac{1}{2}$

B. 3, 1, -1, $-\frac{1}{2}$

C. 4, 1, 0, $-\frac{1}{2}$

D. 3, 0, 1, $\frac{1}{2}$

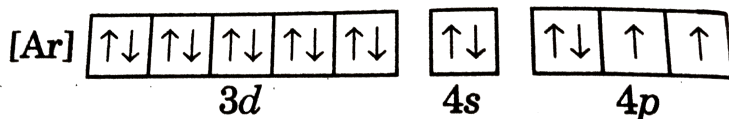
Answer: b

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20. Select set of quantum numbers which is possible for maximum number of electrons in an atom:

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21. Which is a possible set of quantum numbers for the unpaired electrons in the orbital box diagram below?



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22. Principal azimuthal , and magnetic quantum numbers are respectively related to

- A. size ,shape and orientation
- B. shape ,size and orientation
- C. Size orientation and shape
- D. none of the above

Answer: a

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23. Degenerate atomic orbitals have :

- A. equal energy in absence of magnetic field
- B. nearly equal energy

C. different energy

D. equal in presence of magnetic field

Answer: a



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24. How many maximum electrons can be described by the quantum number $n=5, l=2$ in a particular atom?

A. 2

B. 6

C. 10

D. 14

Answer: c



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25. Any p- orbital can accommodate upto:

- A. Four electrons
- B. two electrons with parallel spin
- C. six electrons
- D. Two electrons with opposite spin

Answer: d



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26. which type of orbital is designated by $n=2, l=3, m_l = -2$?

- A. 4P
- B. 4d
- C. 4f
- D. None of these

Answer: d



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27. which of the following statements regarding subshell filling for s neutral atom is /are

Correct

(P) Electrons are assigned to the 4s subshell before they are assigned to the 3d subshell

(Q) electrons are assigned to the 4f subshell they are assigned to the 6s subshell

(R) electrons are assigned to the 4d subshell before they are assigned to the 5p subshell

A. P only

B. Q only

C. P and R

D. P,Q and R

Answer: c



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28. Out of the following orbitals which have nodal plane perpendicular to the plane orbital ?

A. $3d_{z^2}$

B. $4x^2 - y^2$

C. 5s

D. All of these

Answer: b



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29. total number of possible unique sets of four quantum numbers in the 5th shell of an atom, if it is completely filled :

A. 20

B. 5

C. 25

D. 50

Answer: d

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30. Which combinations of quantum number n, l, m, s for the electron in an atom does not provide a permissible solution of the wave equation ?

A. $3, 2, -2, -\frac{1}{2}$

B. $3, 3, 1, +\frac{1}{2}$

C. $4, 2, 1, +\frac{1}{2}$

D. $2, 1, 1, -\frac{1}{2}$

Answer: b

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31. Maximum number of orbitals are present for which of the following set quantum number ?

A. $l=2, m=2$

B. $l=3, m=0$

C. $l=0, m=0$

D. $l=3, m=0$

Answer: c

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32. $m=-1$ is not possible for :

A. $3p_x$ orbital

B. $4d_{x^2-y^2}$ orbital

C. 2s orbital

D. 4f orbital

Answer: c

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33. the highest probability of finding the electron in an orbital having values of quantum numbers $n=3$ $l=1$ and $m=1$.

A. in between any two axis out of three

B. On any two axis simultaneously ,perpendicular to each other

C. On any one axis out of the three at a time

D. on all the three axis simultaneously at a time

Answer: a

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34. the maximum number of electrons that can be accommodated in the M^{th}) shell is :

- A. 2
- B. 8
- C. 18
- D. 32

Answer: c



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35. If an electron has spin quantum number of $= \frac{1}{2}$ and magnetic quantum number of -1 it cannot be present in:

- A. f- orbital
- B. d- orbital
- C. p- orbital

D. s- orbital

Answer: d

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36. when the quantum number n, l, m, s are represented by $3, 3, 2, = \frac{1}{2}$

the correct representation is:

A. 3s

B. 3d

C. 3f

D. impossible set of quantum number

Answer: d

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37. for a 6s electron the vales of n,l,m,s respectiivelty could be :

A. 6, 4, 4, $-\frac{1}{2}$

B. 1, 00, 0, $+\frac{1}{2}$

C. 6, 1, 0, $-\frac{1}{2}$

D. 6, 0, 0, $+\frac{1}{2}$

Answer: d



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38. Which of the following sets of quantum numbers represents an impossible arrangement?

A. 3, 2, -2 , $+\frac{1}{2}$

B. 4, 0, 0, $+\frac{1}{2}$

C. 3, 2, -3 , $+\frac{1}{2}$

D. 5, 3, 0, $+\frac{1}{2}$

Answer: c

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39. Principal quantum number of an atom represents :

- A. size of the orbit
- B. Spin angular momentum
- C. Orbital angular momentum
- D. space orientation of the orbital

Answer: a

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40. d_{z^2} Orbital has :

- A. has lobes along z- axis and a ring along xy plane

- B. two lobes along z-axis and two lobes along xy -plane
- C. two lobes along z-axis and two a ring along yz -plane
- D. two lobes and a ring along z-axis

Answer: a

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41. Which of the following statement is correct in relation to the hydrogen atom :

- A. 3s ,3p and 3p orbitals all have the same energy
- B. 3s and 3p orbitals are of lower energy than 3d orbital
- C. 3p orbital is lower in energy than 3d orbital
- D. 3s orbital is lower in energy than 3p orbital

Answer: a

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42. In case of $D_{x^2-y^2}$ orbital :

- A. probability of finding the electron along x-axis is zero
- B. probability of finding the electron along y-axis is zero
- C. probability of finding the electron is maximum along x and y-axis
- D. probability of finding the electron is zero in xy plane

Answer: c



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43. which of the following set of quantum number is correct for the an electron 4f orbital ?

A. $n=4, l=3, m=+4, s = +\frac{1}{2}$

B. $n=4, l=4, m=-4, s = -\frac{1}{2}$

C. $n=4, l=3, m=+1, s = +\frac{1}{2}$

$$D. n=3, l=2, m=-2, s = + \frac{1}{2}$$

Answer: c

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44. which orbital is non - sirectinal ?

A. S

B. P

C. D

D. F

Answer: a

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45. For which orbital angular probability distribution is maximum at an angle of 45° to the axial direction ?

A. $d_{x^2-y^2}$

B. d_{x^2}

C. d_{xy}

D. p_x

Answer: c



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46. If n and l are respectively the principal and azimuthal quantum numbers , then the expression for calculating the total number of electrons in any energy level is :



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47. The quantum numbers $+\frac{1}{2}$ and $-\frac{1}{2}$ for the electron spin represent

A. Rotation of the electron in clockwise and anticlockwise direction respectively

B. activity

C. Magnetic moment mechanical spin states which have no classical analogue

D. Two quantum mechanical, spin states which have no classical analogue

Answer: d



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48. Number of nodal plane (S) present in $s, p_x, P_y p_z$ are respectively:

A. 0,1,1,1

B. 0,2,1,1

C. 0,2,2,2

D. 0,0,0,0

Answer: a



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49. Which of the following set of quantum numbers is not valid ?

A. $n = 3, l = 2, m = 2, s = +\frac{1}{2}$

B. $n = 2, l = 0, m = 0, s = -\frac{1}{2}$

C. $n = 4, l = 2, m = -1, s = +\frac{1}{2}$

D. $n = 4, l = 3, m = 4, s = -\frac{1}{2}$

Answer: d



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50. IF spin quantum number have the values $+1/2, 0$ and $-1/2$ but all other quantum number have values as they have, then the maximum number of electrons in 5^{th} orbit should be

- A. 25
- B. 50
- C. 75
- D. 33

Answer: c

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51. The correct option regarding size of orbitals is :

- A. $2p > 3p > 4p > 5p$
- B. $2p = 3p < 4p = 5p$
- C. $2p < 3p < 4p < 5p$

$$D. 2p = 3p = 4p = 5p$$

Answer: c



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52. which of the following is an impossible set of quantum number ?

A. $n = 3, l = 2, m = 0, s = +\frac{1}{2}$

B. $n = 3, l = 2, m = -2, s = +\frac{1}{2}$

C. $n = 3, l = 2, m = -3, s = +\frac{1}{2}$

D. $n = 3, l = 2, m = -1, s = -\frac{1}{2}$

Answer: c



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53. Calculate the total number of electrons for $n = 3, l = 2$ and $m = -2$

A. 2

B. 6

C. 10

D. 18

Answer: a



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54. Which set of quantum numbers could represent an electron in a 5f orbital ?

A. $l = 4, m_1 = 2$

B. $l = 2, m_1 = -3$

C. $l = 3, m_1 = 4$

$$D. l = 3, m_1 = 0$$

Answer: d



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55. which orbital possesses one angular node and one radial node ?

A. 2s

B. 2p

C. 3p

D. $3d_{xy}, 4d_{xz}$

Answer: c



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56. The correct set of four quantum numbers for valence electrons of rubidium atom ($Z=37$) is

A. $5, 0, 0, +\frac{1}{2}$

B. $5, 1, 0, +\frac{1}{2}$

C. $5, 1, 1, +\frac{1}{2}$

D. $6, 0, 0, +\frac{1}{2}$

Answer: a



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57. which of the following options consists of only those orbitals which have number of radial nodes exactly same as their angular nodes ?

A. $1s, 2p, 3d$

B. $1s, 2s, 3s$

C. $1s, 3p, 5d$

D. $4f$, $5g$, $6h$

Answer: c



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58. Each of the following atomic orbitals is possible except :

A. $1s$

B. $2p$

C. $3f$

D. $4d$

Answer: c



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59. which set of quantum number si not possible ?

A. $n = 1, l = 1, m_l = +1, m_s = -\frac{1}{2}$

B. $n = 3, l = 2, m_l = +1, m_s = +\frac{1}{2}$

C. $n = 4, l = 4, m_l = -1, m_s = +\frac{1}{2}$

D. $n = 5, l = 2, m_l = 2, m_s = -\frac{1}{2}$

Answer: c

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60. which is an acceptable set of quantum number for an electron ?

A. $1, 1, 0, \frac{1}{2}$

B. $2, 1, 0, 0$

C. $2, 1, -1, -\frac{1}{2}$

D. $3, 2, -3, -\frac{1}{2}$

Answer: c

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61. which orbital has most radial modes ?

A. 4s

B. 4p

C. 4d

D. 4f

Answer: a



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62. the energy of an electron in hydrogen atom is determined solely by its:

A. principal quantum number

B. azimuthal quantum number

C. $(n+1)$ value

D. none of these

Answer: a

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63. which of the following sets of quantum numbers n, l, m_l, m_s correspond to a valence electron in a neutral atom of arsenic (As) ?

A. $3, 0, 0, +\frac{1}{2}$

B. $3, 2, 1, -\frac{1}{2}$

C. $4, 0, 0, +\frac{1}{2}$

D. $4, 2, 1, -\frac{1}{2}$

Answer: c

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64. Read carefully four statements:

(P) S- subshell consists of one orbital

(Q) p- orbital consists of three subshells

(R) d- subshell can accommodate maximum of ten electrons

(S) H-orbital can accommodate maximum of two electrons

Choose the correct statements :

A. P,Q,R and S

B. P and R

C. Q and S

D. P,R and S

Answer: d



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65. Which of the following pairs of d-orbitals will have electron density along the axes ?

A. d_{xy}, d_{yz}

B. $d_{x^2-y^2}, d_{xy}$

C. d_{xz}, d_{z^2}

D. $d_{x^2-y^2}, d_{z^2}$

Answer: d

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66. How many maximum number of electrons are present in an element ($z=35$) which have quantum, number values ?

$$l \leq 2, \quad |m| < 2, \quad s = +\frac{1}{2}$$

A. 15

B. 16

C. 18

D. 13

Answer: b

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67. the lobes of which orbital (s) lies in the nodal plane of d_{x^2} :

A. $d_{x^2 - y^2}$

B. d_{xy}

C. d_{yz}

D. none of these

Answer: d

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68. which of the following orbitals have at least one common nodal plane

?

A. p_z and d_{xz}

B. $d_{x^2-y^2}$ and s

C. $d_{x^2-y^2}$ and d_{xy}

D. d_{z^2} and p_z

Answer: a

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C

1. What are the values of the orbital angular momentum of an electron in the orbitals $1s$, $3s$, $3d$ and $2p$:-

(a). $0, 0\sqrt{6h}, \sqrt{2h}$

(b). $1, 1\sqrt{4h}, \sqrt{2h}$

(c). $0, 1\sqrt{6h}, \sqrt{3h}$

(d). $0, 0\sqrt{20h}, \sqrt{6}$

A. $0, 0, \sqrt{6h}, \sqrt{2h}$

B. $1, 1, \sqrt{4h}, \sqrt{2h}$

C. $0, 1, \sqrt{6h}, \sqrt{3h}$

D. $0, 0, \sqrt{20h}, \sqrt{6h}$

Answer: a



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2. The orbital with zero orbital angular momentum is.

A. s

B. p

C. d

D. f

Answer: a



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3. The orbital angular momentum of an electron in $2s$ -orbital is

A. $+\frac{1}{2} \frac{h}{2\pi}$

B. zero

C. $\frac{h}{2\pi}$

D. $\sqrt{2} \frac{h}{2\pi}$

Answer: b



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4. For an electron, with $n=3$ has only one radial node.

The orbital angular momentum of the electron will be :

A. 0

B. $\sqrt{6} \frac{h}{2\pi}$

C. $\sqrt{2} \frac{h}{2\pi}$

D. $3\left(\frac{h}{2\pi}\right)$

Answer: c

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5. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)}\frac{h}{2\pi}$. What is the momentum of an s-electron?

A. $+\frac{1}{2}, \frac{h}{2\pi}$

B. zero

C. $\frac{h}{2\pi}$

D. $\sqrt{2}\frac{h}{2\pi}$

Answer: b

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6. which of the given statement(s) is /are false ?

(P) orbital angular momentum of the azimuthal quantum number as lowest for this principle quantum number is $\frac{h}{\pi}$,

(Q) if $n=3, l=0, m=0$ for the last valence shell electron, then the possible atomic number may be 12 or 13.

(R) total spin of electrons for the atom $_{25}\text{Mn}$ is $\pm \frac{7}{2}$.

(S) spin magnetic moment of inert gas is zero.

A. P,Q and R

B. Q and R only

C. P and S only

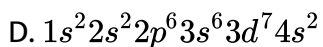
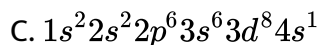
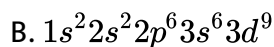
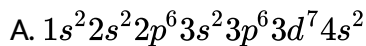
D. None of these

Answer: a



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1. what is the ground state electronic configuration of a $_{27}$ CO atom in the gas phase ?

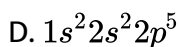
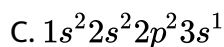
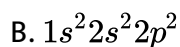
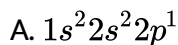


Answer: a



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2. which must represent an atom in an excited state?



Answer: c

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3. which quantum numbers represent the orbitals being filled in the ground state for the elements Sc (21) to Zn (30)?

A. $n = 3, l = 1$

B. $n = 3, l = 2$

C. $n = 4, l = 1$

D. $n = 4, l = 2$

Answer: b

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4. the electron configuration of cobalt ($Z=27$) is $1s^2 2s^2 2p^6 3p^6 3d^7 4s^2$ How many unpaired electrons are in a gaseous CO^{3+} ion in its ground state?

atom in its ground state?

A. 0

B. 2

C. 4

D. 6

Answer: c



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5. which set of quantum numbers (n, l, m_1, m_2) is possible for the outermost electron in a strontium atom in its ground state ?

A. , 5, 0, 0, $-\frac{1}{2}$

B. , 5, 0, 1, $\frac{1}{2}$

C. , 5, 1, 0, $\frac{1}{2}$

D. , 5, 1, 1, $-\frac{1}{2}$

Answer: a

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6. which element has atoms with exactly four valence electrons in its ground state ?

A. Ca

B. Cr

C. Si

D. S

Answer: c

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7. Gas -phase atoms of which element have an occupied 5d orbital in their ground state ?

A. Ag (Z=47)

B. Ba (Z=56)

C. Eu(Z=63)

D. Ir (Z=77)

Answer: d



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8. which gas -phase atom in its ground state could have an electron with quantum number : $n=3, l=2, M_l = 0, m_s = -\frac{1}{2}$?

A. Na

B. Mg

C. P

D. Ti

Answer: d

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9. which change(s) in electron structure occur when a Mn atom is converted to a Mn^{2+} ion in the gas phase ?

(P) the number of occupied energy levels decreases.

(Q) the number of half-filled orbitals decreases .

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: a

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10. what is the total number of electrons in a single phosphorus atom in its ground state ?

A. 3

B. 5

C. 9

D. 15

Answer: c



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11. which os the electrons confuration for an Fe (III) ion in its ground state?

A. $[Ar]3d^5$

B. $[Ar]3d^6$

C. $[Ar]4s^23d^3$

D. $[Ar]4s^23d^6$

Answer: a

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12. which is the symbol for an element whose ground state atoms have the same total numbers of s electrons and p electrons ?

- A. $_{(5)}B$
- B. $_{(6)}C$
- C. $_{(12)}Mg$
- D. $_{(18)}Ar$

Answer: c

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13. which orbital fills completely immediately before the 4f ?

- A. 6s
- B. 5p

C. 5d

D. 4d

Answer: a

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14. the possible set of quantum numbers (n,l,m,s) of the last electron of unipositive potassium ion :

A. 5, 0, 0, $-\frac{1}{2}$

B. 5, 0, 1, $\frac{1}{2}$

C. 5, 1, 0, $\frac{1}{2}$

D. none of these

Answer: d

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15. How many orbitals contain one or more electrons in an isolated ground state iron atom ($Z=26$)?

A. 13

B. 14

C. 15

D. 16

Answer: c



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16. According to the aufbau principle, which is the sequential order of filling subshells in a ground atom are completely filled ?

A. 3s 3p 3d

B. 3p 4s 3d

C. 3d 4s 4p

D. 4p 4d 4f

Answer: b



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17. How many orbitals in ground state oxygen atom are completely filled ?

A. 1

B. 2

C. 3

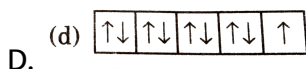
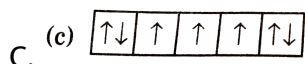
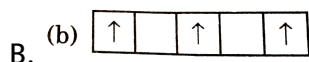
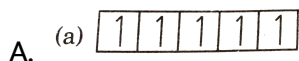
D. 4

Answer: c



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18. which electrons distribution in d- -shbshell is not observrd in any neutral elemet of 3d series ?



Answer: d

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19. Consider the ground state Cr atom ($Z = 24$). The number of electron with the azimuthal number $l = 1$ and 2 , respectively are

A. 16 and 4

B. 12 and 5

C. 12 and 4

D. 16 and 5

Answer: b



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20. The total number of electrons in Cr atom for which $m=0$:

A. 1

B. 8

C. 12

D. 16

Answer: c



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21. How many maximum possible set (s) of quantum no. are possible for 6th electron of Fe ?

- A. 1
- B. 3
- C. 6
- D. 10

Answer: c



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22. The maximum no. of electrons in phosphorus atom for which $n+l+m=3$ will be :

- A. 6
- B. 5
- C. 4

D. 3

Answer: b

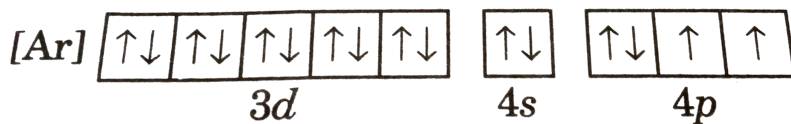
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23. If $n = 6$, the correct sequence for filling of electrons will be.

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24. Which element has the following ground state electrons configuration

?



A. Se

B. As

C. S

D. Ge

Answer: a

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25. Hund's rule states that the most stable arrangement of electrons :
(for a ground state electron configuration)

- A. has three electrons per orbital ,each with identical spins
- B. has m_1 values greater than or equal to +1
- C. has the maximum number of unpaired electrons all with same spin
in degenerate orbital
- D. has two electrons per orbital , each with opposing spine

Answer: c

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26. the pauli exclusion principle states that :

- A. no two electrons in an atom can have the same four quantum numbers
- B. electrons can have either $\pm \frac{1}{2}$ spins
- C. electrons with opposing spins are attracted towards each other
- D. none of the above

Answer: A



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27. which of the following is correct set of quantum numbers for the last electron entering in Fe ?

- A. $n \quad l \quad m \quad s$
4 0 0 $+\frac{1}{2}$
- B. $n \quad l \quad m \quad s$
3 2 -1 $+\frac{1}{2}$
- C. $n \quad l \quad m \quad s$
3 2 -2 $-\frac{1}{2}$

$$D. \begin{array}{cccc} n & l & m & s \\ 3 & 2 & -3 & -\frac{1}{2} \end{array}$$

Answer: c



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28. Among the following , the configuration $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$ is valid for the :

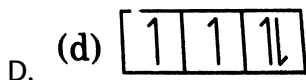
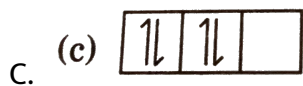
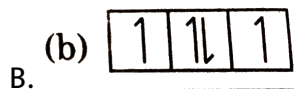
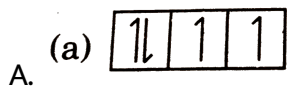
- A. ground state of chlorine
- B. excited state of chlorine
- C. excited state of argon
- D. excited state of S^{2-} ion

Answer: c



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29. which of the following electrons configuraation violate Hund's rule for a p^4 system of an isolated gaseous species ?



Answer: c



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30. The first excited state of Cl^- will have degeneracy of :

A. 1

B. 3

C. 5

D. 9

Answer: c



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31. the percentage of orbitals occupied by electrons out to total orbitals present upto the outermost shell of Fe atom :

A. 0.5

B. 0.7

C. 0.25

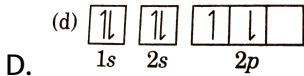
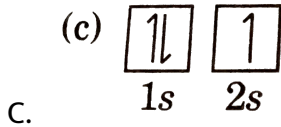
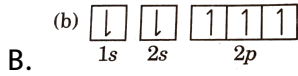
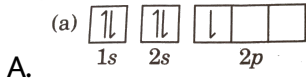
D. 0.35

Answer: a



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32. which of the following is violation of (n+1) rule ?

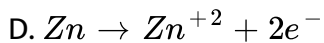


Answer: b

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33. in which of the following change both the electrons are removed from same orbital ?





Answer: d

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34. The explanation for the presence of three unpaired electrons in the nitrogen atom can be given by -

- A. Pauli's exclusion principle
- B. Hund's rule
- C. Aufbau's principle
- D. Uncertainty principle

Answer: b

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35. The number of d-electron retained in Fe^{2+} (At no. of $Fe = 26$) ion is.

A. 3

B. 4

C. 5

D. 6

Answer: d



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36. in a multi-electron atom, which of the following orbitals described by the three quantum numbers magnetic and electric field ?

(P) $n = 1, l = 0, m = 0$ (q) $n = 2, l = 0, m = 0$

(r) $n = 2, l = 1, m = 1$, (S) $n = 3, l = 2, m = 1$

(t) $n = 3, l = 2, m = 0$,,

A. (s) and (t)

B. (r) and (s)

C. (q) and (r)

D. (P) and (q)

Answer: a



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37. Which of the following set of quantum numbers represents the highest energy of an atom ?

A. $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

B. $n = 3, l = 1, m = 1, s = +\frac{1}{2}$

C. $n = 3, l = 2, m = 1, s = +\frac{1}{2}$

D. $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

Answer: c



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38. The correct set of quantum number for the unpaired electron of chlorine atom is

	n	l	m
a.	2	1	0
b.	2	1	0
c.	3	1	1
d.	3	0	0

- A. $n \ l \ m$
2 1 0
- B. $n \ l \ m$
2 1 +1
- C. $n \ l \ m$
3 1 +1
- D. $n \ l \ m$
3 0 0

Answer: c



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39. After np orbitals are filled, the next orbital filled will be :-

(a). $(n + 1)s$

(b). $(n + 2)p$

(c). $(n + 1)d$

(d). $(n + 2)s$

A. $(n+1)s$

B. $(n+2)p$

C. $(n+1)d$

D. $(n+2)s$

Answer: a



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40. Total number of electrons having $n + l = 3$ in $Cr(24)$ atom in its ground state is.

- A. 8
- B. 10
- C. 12
- D. 6

Answer: a



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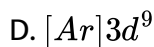
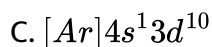
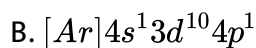
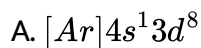
41. The possible value of l and m for the last electron in the Cl^- ion are :

- A. 1 and 2
- B. 2 and +1
- C. 3 and +1
- D. 1 and -1

Answer: d

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42. Which of the following is electronic configuration of Cu^{2+} ($Z = 29$) ?



Answer: d

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43. Given is the electronic configuration of element X

$K \quad L \quad M \quad N$

2 8 11 2

The number of electrons present with $l = 2$ in an atom of element X is.

A. 3

B. 6

C. 5

D. 4

Answer: a



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44. Which of the following elements will have the same total number of electrons in 's' as well as 'd' subshells in the ground state electronic configuration

A. Zn

B. Ni

C. Cr

D. Cu

Answer: b



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45. Quantum numbers of same electrons are given below on the basis of it ,arrange them from lowest to highest energy order:

$n \quad l \quad m \quad s$

$$(P) \quad 4 \quad 1 \quad 0 \quad \frac{1}{2}$$

$$(Q) \quad 5 \quad 0 \quad 0 \quad -\frac{1}{2}$$

$$(R) \quad 6 \quad 2 \quad 0 \quad +\frac{1}{2}$$

$$(S) \quad 6 \quad 3 \quad -1 \quad +\frac{1}{2}$$

A. $P < Q < R < S$

B. $Q < R < P < S$

C. $Q < R < S < P$

D. $S < Q < R < P$

Answer: a



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46. "Electron pairing cannot occur in p,d and f-orbitals until each orbital of a given subshell contains one electron " this is known as:

- A. Aufbau's rule
- B. Pauli's exclusion principle
- C. Hund's rule
- D. Fajan's rule

Answer: c

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47. Which of the following set of quantum numbers incorrect for last electron of fluorine atom ?

A. $n = 2, l = 1, m = 0, s = \frac{1}{2}$

B. $n = 2, l = 1, m = 0, s = -\frac{1}{2}$

C. $n = 2, l = 0, m = 0, s = +\frac{1}{2}$

$$D. n = 2, l = 1, m = 1, s = \frac{1}{2}$$

Answer: a

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48. Hund's rule of maximum spin multiplicity is not application for :

A. d

B. p

C. f

D. s- orbital

Answer: d

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49. Aufbau principle does not give correct arrangement of filling up of atomic orbitals in :

- A. Cu and Zn
- B. Co and Zn
- C. Mn and Cr
- D. Cu and Cr

Answer: d

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50. Which of the following sequences is correct as per Aufbau principle ?

- A. $3s > 3d < 4s < 3d$
- B. $1s < 2p < 3s < 3d$
- C. $2s > 5d < 4s < 5d$
- D. $2s > 2p < 3d < 3p$

Answer: b

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51. Find configuration which does not follow Hund's rule of maximum multiplicity for p- subshell .

A. $2p_x^1, 2p_y^1, 2p_z^1$

B. $2p_x^2, 2p_y^2, 2p_z^2$

C. $2p_x^1, 2p_y^2, 2p_z^0$

D. $2p_x^2, 2p_y^1, 2p_z^2$

Answer: c

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52. If spin quantum number has 4 values instead of two then identify the incorrect statements.

- A. First period will be shortest with 4 elements
- B. Fourth period can have maximum 36 elements
- C. Each orbital can have maximum 4 electrons.
- D. For a given value of n (principal quantum number) number of electrons will be $2n^2$

Answer: d

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53. Assuming Hund's Rule is not necessarily followed for a d^5 configuration then what could be the maximum and minimum multiplicity possible ?

A. 6,2

B. 5,1

C. $\frac{5}{2}, \frac{1}{2}$

D. 6,1

Answer: a

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54. In ground state of phosphorous atom ($Z=15$), the numbers occupied sub-shells and occupied orbitals are respectively :

A. 3,3

B. 5,9

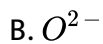
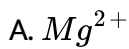
C. 5,5

D. 3,6

Answer: b

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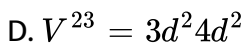
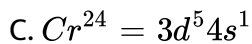
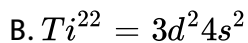
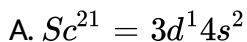
55. which among the following species has the same number of electrons in its outermost as well as penultimate shell ?



Answer: d

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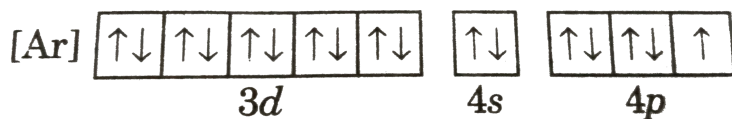
56. which of the following is wrong outer electronic configuration ?



Answer: d

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57. What is a possible set of quantum numbers for the unpaired electron in the orbital box diagram below ?



- A. $n = 1, l = 1, m_1 = -1, m_s = +\frac{1}{2}$
- B. $n = 4, l = 1, m_1 = -1, m_s = +\frac{1}{2}$
- C. $n = 4, l = 2, m_1 = -2, m_s = +\frac{1}{2}$
- D. $n = 4, l = 0, m_1 = 0, m_s = +\frac{1}{2}$

Answer: b



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58. The quantum number of four electrons (e_1 to e_4) are given below :-

	n	l	m	s
e_1	3	0	0	$+1/2$
e_2	4	0	0	$1/2$
e_3	3	2	2	$-1/2$
e_4	3	1	-1	$1/2$

The correct order of decreasing energy of these electrons is :

A. $e_4 > e_3 > e_2 > e_1$

B. $e_2 > e_3 > e_4 > e_1$

C. $e_3 > e_2 > e_4 > e_1$

D. none fo these

Answer: c



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59. If nitrogen atoms had electronic configuration is ? It would have energy lower than that of the normal ground state configuration

$1s^2 2s^2 2p^3$ because the electrons would be clear to the nucleus yet $1s^2$ is not observed because it violates ?

- A. Heisenberg uncertainty principle
- B. Hund's rule
- C. Pauli's exclusion principle
- D. Bohr postulate of stationary orbits

Answer: c



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60. The quantum number , $n=1, l=1, m_l = 0$ could represent a valence electron in which atom in its ground state ?

- A. Fe
- B. In
- C. Pd

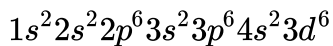
D. Se

Answer: d

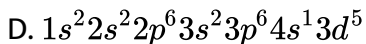
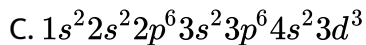
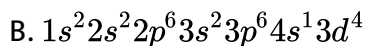
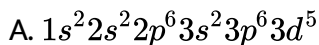


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61. A gas phase atom with the electronic configuration



loses three electrons, what is the electron configuration of the resulting gas phase ion?

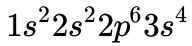


Answer: a



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62. A sulphur atom in its ground state has the electrons configuration



How many orbitals are occupied by at least one electron ?\

A. 3

B. 5

C. 8

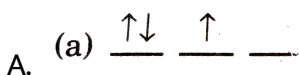
D. 9

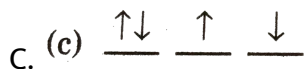
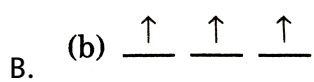
Answer: d



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63. which of the following does NOT represent the arrangement of electrons in the p Subshell in the ground state of any gas -phase phase atom ?





Answer: a

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64. A M^{+2} ion derived from a metal in the first transition metal series has four electrons in 3d subshell, what element may it be:

A. S

B. Cr

C. Mn

D. Se

Answer: b

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65. Total number of electrons in Cu atom having $m_l = 0$:

- A. 9
- B. 13
- C. 10
- D. 6

Answer: b



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66. which of the following statement is correct ?

- A. Lanthanum is the first element of Lanthanide
- B. Actinium violates the Aufbau's principle
- C. Chromium violates the Pauli's exclusion principle

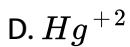
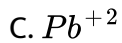
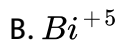
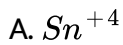
D. Total 10 exchange pairs are possible for d- electrons in Zn

Answer: b



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67. which of the following cation has only two electrons in its last shell ?



Answer: c



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1. A ground state gaseous atom for which element has the greatest number of unpaired electrons?

A. As

B. Br

C. Ge

D. Se

Answer: a



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2. How many unpaired electrons are present in a ground state?

A. 6

B. 4

C. 2

D. 0

Answer: b



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3. How many unpaired electrons are there in Ni^{2+} ?

A. 0

B. 2

C. 4

D. 6

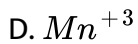
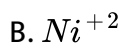
Answer: b



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4. Identify the cation having maximum magnetic moment :

A. Zn^{+2}

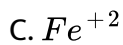
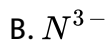


Answer: d



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5. Which of the following have maximum number of unpaired electrons ?

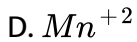
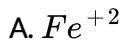


Answer: c



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6. Ions which have maximum total spin multiplicity ?

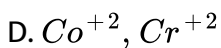
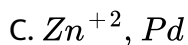
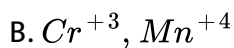
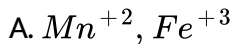


Answer: d



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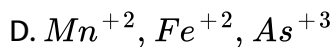
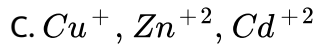
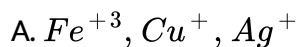
7. In which of the following ,the two species have different value of spin magnetic moment ?



Answer: d

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8. In which of the following set of species have same magnetic nature and same magnetic moment ?



Answer: c

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9. Which of the following has maximum number of unpaired electron (atomic number of Fe 26)

A. Fe

B. Fe(II)

C. Fe (III)

D. FE(IV)

Answer: c



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10. An ion (Mn^{a+}) has the magnetic moment equal to 4.9 B.M` What is the value of (a) :

A. 3

B. 4

C. 2

D. 5

Answer: a

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11. The spin-only magnetic moment [in units of Bohr magneton, (μ_B of Ni^{2+}) in aqueous solution would be (atomic number of $Ni = 28$)

A. 2.83

B. 4.9

C. 0

D. 1.73

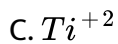
Answer: a

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12. which of the following ions has the maximum magnetic moment ?

A. Mn^{+2}

B. Fe^{+2}

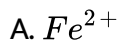
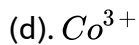
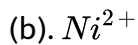
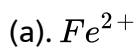


Answer: a



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13. The value of the magnetic moment of a particular ion is 2.83 Bohr magneton. The ion is :-



Answer: b

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14. What is the total spin value in case of $_{26}\text{Fe}^{3+}$ ion ?

A. +1 or -1

B. +2 or -2

C. +2.5 or -2.5

D. +3 or -3

Answer: c

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15. Magnetic moment of Fe^{a+} ($Z = 26$) is $\sqrt{24}BM$. Hence number of unpaired electron and value of 'a' respectively are :

A. 4,2

B. 2,4

C. 3,1

D. 0,2

Answer: a



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16. Which of the following ions has the maximum number of unpaired d-electrons ?

A. Zn^{2+}

B. Fe^{2+}

C. Ni^{3+}

D. Cu^{+}

Answer: b

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17. The total spin resulting from a d^7 configuration is :

A. 1

B. 2

C. $\frac{5}{2}$

D. $\frac{3}{2}$

Answer: d

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18. Which of the following having same value of magnetic moment?

A. Mn^{2+} and Na^+

B. Fe^{3+} and Fe^{2+}

C. Zn^{2+} and Cl

D. Zn^{2+} and Na^+

Answer: d

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19. which of the following species are paramagnetic in nature ?

A. Sc^{3+}

B. Mn^{2+}

C. Cu^+

D. Zn^{2+}

Answer: b

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20. Calculate the spin multiplicity for H-atom .

A. 10

B. 2

C. $\frac{5}{2}$

D. 11

Answer: b

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21. Magnetic moment of $_{30}\text{Zn}^{2+}$ ion is same as :

A. $_{29}\text{Cu}^{1+}$

B. $_{21}\text{Sc}^{3+}$

C. $_{28}\text{Ni}^{4+}$

D. (a) and (b) both

Answer: d

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22. Find the species having highest value of magnetic moment in their ground state.



Answer: c



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23. Magnetic moment of $V(Z = 23)$, $Cr(Z = 24)$, and $Mn(Z = 25)$ are x , y , z respectively hence

A. $x = y = z$

B. $x < y < z$

C. $x < z < y$

D. $z < y < x$

Answer: c



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24. Gaseous atoms of which of these elements contain one or more unpaired electrons ?

$Ge(Z = 32)$, $As(Z = 33)$, $Se(Z = 34)$

A. As only

B. Ge and As only

C. Ge and Se only

D. Ge ,As and Se

Answer: d



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25. Which gas phase ion in its ground state has the greatest number of unpaired electrons ?



Answer: c



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26. which gas phase atom in its ground state has exactly three unpaired electrons ?



C. Co

D. Se

Answer: c



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27. Which gaseous ion has exactly three unpaired electrons?

A. Fe^{3+}

B. Ni^{2+}

C. Ti^{+}

D. V^{2+}

Answer: d



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28. For the transition metal with the electron configuration $1s^2 2s^2 2p^6 4s^2 3d^6$, How many unpaired electrons are present in its +2 ion in the ground state ?

A. 0

B. 2

C. 4

D. 6

Answer: c



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29. Which gas phase atom has no unpaired electrons in its ground state ?

A. Li

B. Be

C. B

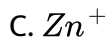
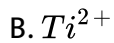
D. C

Answer: b



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30. Find the species from the following option (s) having lowest magnetic moment value .



Answer: d



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31. Chloro compound of vanadium has only spin magnetic moment of 1.73 BM. This vanadium chloride has the formula :- (at no. of V=23)



Answer: c



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32. Ratio of magnetic moment of the ions Co^{2+} and Cr^{3+} is :

A. $\sqrt{15}$

B. 1

C. 3

D. 2

Answer: b

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F

1. the energies of the 3s, 3p and 3d orbitals in a multi-electron atom increase in that order, to which factor(s) can this order be attributed?

(P) the relative penetrations of these orbitals near the nucleus.

(Q) the relative average distance of the electron from the nucleus.

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: c

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2. the screening constant of last electron of which element will be maximum :

A. 24

B. 18

C. 23

D. 22

Answer: b



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3. Shielding constant of last electron for which element will be maximum :

A. H

B. H^-

C. He

D. Li

Answer: d

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4. Which of the following pair has the same value of screening constant for 3s electron ?

A. Cl and Mg

B. mg and Ca

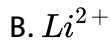
C. N and Na

D. K and Ca

Answer: d

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5. Screening effect is not observed in :



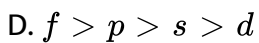
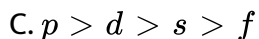
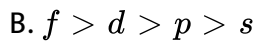
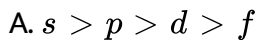
D. in all cases

Answer: d



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6. The order of screening effect of electrons of s , p , d and f orbitals of a given shell of an atom on its outer shell electrons is:



Answer: a



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7. Z_{eff} for 4s electron in $_{30}\text{Zn}$ is:

A. 1.65

B. 4

C. 12.85

D. 4.35

Answer: d



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8. the value of Z_{eff} for Li^+ is x and the value of z_{eff} for H-atom is y then value of (x+y) is s:

A. 3.4

B. 3.7

C. 2.3

D. none of these

Answer: b

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9. Select the incorrect statement:

A. $Z_{eff}(Na^+) < Z_{eff}(Mg^{+2})$

B. $Z_{eff}(He) < Z_{eff}(Be^{+2})$

C. $Z_{eff}(Mg) = Z_{eff}(Ca)$

D. $Z_{eff}(Al^{+3}) < Z_{eff}(Na^+)$

Answer: d

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10. For an element, with the electrons configuration $1s^2 2s^2 2p^6 3s^2$ one of the 3s electrons will be shielded from nuclear charge most effectively by

A,

A. 1s electron

B. 2s electron

C. 2p electron

D. 3s electron

Answer: a



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11. Find the shielding constant (σ) for the first electron entering into H :

A. 0.7

B. 1

C. 0.35

D. 0.3

Answer: d

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12. Select the correct statement regarding Slater rules .

A. Z_{eff} on 4s electron is more than 3d electron because it is filled completely before 3d

B. In P atom, 1s electrons are more shielded than 2p electrons

C. In Zn atom, 3d electrons provide effective shielding to 3s electrons

D. In Zn, Z_{eff} on 3s and 3p electron is equal

Answer: d

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13. Z_{eff} for 4s electron in $_{30}\text{Zn}$ is:

A. 11.25

B. 18.75

C. 25.65

D. 4.35

Answer: b



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14. The $Z_{\text{effective}}$ of 3^{rd} period element according to Slater's rule is :

(where n is the number of outermost shell electron)

A. $1.55 + 0.65n$

B. $1.35 + 0.65n$

C. $1.55 + 0.35n$

D. $1.45 + 0.30n$

Answer: a

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15. Option in which shielding constant (According to Slater's rule) is 0.85 by each electron in all inner shell (s) :

- A. For outer most electron of Li
- B. For outer most electron of Na
- C. Both (a) and (b)
- D. None of these

Answer: a

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Reasoning Type

1. Statement : Specific charge of α -particles is twice to that of proton .

Explanation : Specific charge is given by e/m

A. statement -1 is true statement -2 is true statement -2 is correct

explanation for statement -1

B. statement -1 is true statement -2 is true statement -2 is not a

correct explanation for statement -1

C. statement -1 is true statement -1

D. statement -1 and statement -2 both are false .

Answer: d



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2. Assertion (A) : For $n = 3$, l may be 0, 1 and 2 and m may be 0, ± 1 and 0, ± 1 , and ± 2

Reason (R) : For each value of n , there are 0 to $(n - 1)$ possible value of l
for each value of l , there are $0 \rightarrow \pm l$ value of m

A. statement -1 is true statement -2 is true statement -2 is correct

explanation for statement -1

B. statement -1 is true statement -2 is true statement -2 is not a

correct explanation for statement -1

C. statement -1 is true statement -1

D. statement -1 and statement -2 both are false .

Answer: a



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3. Statement : The possible number of electrons in a subshell is $(4l + 2)$.

Explanation : The possible number of orientations of a subshell are $(2l + 1)$.

- A. statement -1 is true statement -2 is true statement -2 is correct explanation for statement -1
- B. statement -1 is true statement -2 is true statement -2 is not a correct explanation for statement -1
- C. statement -1 is true statement -1
- D. statement -1 and statement -2 both are false .

Answer: a

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4. Statement-1 : The groundstate configuration of Cr is $[\text{Ar}] 3d^5 4s^1$

Statement-2 : The energy of atom is lesser in $3d^5 4s^1$ configuration compared to $3d^4 4s^2$ configuration.

- A. statement -1 is true statement -2 is true statement -2 is correct explanation for statement -1

- B. statement -1 is true statement -2 is true statement -2 is not a correct explanation for statement -1
- C. statement -1 is true statement -1
- D. statement -1 and statement -2 both are false .

Answer: a

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5. statement -1:- Minimum principal quantum number of an orbital belonging to g sub - shell is 5

Statement -2:- For a given value of principal quantum number (n), l may have values 0 to (n-1) only .

A. statement -1 is true statement -2 is true statement 2 is correct explanation for statement -1

B. statement -1 is true statement -2 is true statement -2 is not a correct explanation for statement -1

C. statement -1 is true statement -1

D. statement -1 and statement -2 both are false .

Answer: a



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6. Statement -1:- For $n=2$ the values of l may be $0, 1$ and m may be $0, \pm 1$.

Statement -2 :- for each value of n , there are 0 to $(n-1)$ possible values of l
for each value of l there are 0 to ± 1 values of m .

A. statement -1 is true statement -2 is true statement -2 is correct

explanation for statement -1

B. statement -1 is true statement -2 is true statement -2 is not a

correct explanation for statement -1

C. statement -1 is true statement -1

D. statement -1 and statement -2 both are false .

Answer: a

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Multiple Objective Type

1. which of the following statement (s) is (are) correct ?

- A. the electronic configuration of Cr is $[\text{Ar}]3d^5 4s^{-1}$ (Atomic number of Cr=24)
- B. The magnetic quantum number may have negative values .
- C. In silver atom ,23 electrons ,have a spin of one type and 24 of opposite type (atomic number of Ag=47).
- D. d_{z^2} orbital has total 6 lobes .2 large lobes along Z-axis , while 4 very small lobes in Xy plane . Along X and Y axis

Answer: a,b,c

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2. Which of the following statement is//are correct for an electron of quantum numbers $n = 4$ and $m = 2$?

- A. the value of l may be 2
- B. the value of l may be $+\frac{1}{2}$
- C. the value of s may be 0,1,2
- D. the values of l may be 0,1,2

Answer: abc



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3. Which is true about an electron-

- (a). rest mass of electron is $9.1 \times 10^{-28}g$
- (b). mass of electron increases with the increase in velocity

(c). molar mass of electron is $5.48 \times 10^{-4} \text{ g/mole}$

(d). e/m of electron is $1.7 \times 10^8 \text{ coulomb/g}$

A. Rest mass of electron is $9.1 \times 10^{-28} \text{ g}$

B. Mass of electron increases with the increase in velocity

C. Molar mass of electron is $5.48 \times 10^{-4} \text{ g/mole}$

D. e/m of electron is $1.7 \times 10^8 \text{ coulomb/g}$

Answer: a,b,c



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4. if element ${}_{25}X + y$ has spin magnetic moment 1.732 B.M then:

A. number of unpaired electrons =1

B. unnumber of unpaired electrons =2

C. $Y=4$

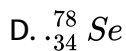
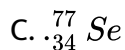
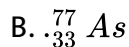
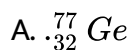
D. $Y=6$

Answer: a,b,c,d



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5. An isotope of Ge^{76}_{32} is



Answer: a,d,



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6. When alpha particle are sent through a thin metal foil ,most of them go straight through the foil because

- A. alpha particles are much heavier than electrons
- B. alpha particles are positively charged
- C. most part of the atom is an empty space
- D. alpha particles move with high speed

Answer: a,c

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7. Choose the correct configuration among the following :

- A. $Cr(Z = 24)[Ar]3d^54s^1$
- B. $Cu(Z = 29)[Ar]3d^{10}4s^1$
- C. $Pd(Z = 46)[Kr]4d^{10}5s^0$
- D. $Pt(Z = 78)[Xe]4f^{14}5d^96s^1$

Answer: a,b,c,d

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8. the configuration $[Ar]3d^{10}4s^24p^4$ is similar to that of :

- A. Boron
- B. oxygen
- C. sulphur
- D. aluminium

Answer: c



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9. In which of these options do both constituents of the pair have the same magnetic moment-

- A. Mn^{2+} and Cu^+
- B. Co^{2+} and Ni^{2+}
- C. Mn^{4+} and Co^{2+}

D. Mg^{2+} and Sc^{+}

Answer: (a,c)



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10. Many elements have non-integral atomic masses because

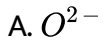
- A. they have isotopes
- B. they isotopes have non-intergral masses
- C. their isotopes have different masses
- D. the consituents neutrons ,protein and combine to give fractional masses

Answer: c



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11. Which of the following is iso-electronic with neon-



Answer: a,b



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12. the number of d- electrons in Mn^{2+} is equal to that of :

A. p- electrons in N

B. s- electrons ion Na

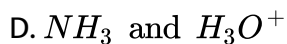
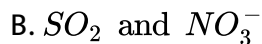
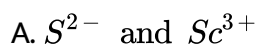
C. d- electrons in Fe^{+3}

D. p- electrons in O_{-2}

Answer: b,c

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13. which of the following pair(s) represents (s) the isoelectronic species ?



Answer: ab,c,d,

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14. which of the following elements have equal value of $l \times m$, where l

\Rightarrow maximum possible value of azimuthal quantum number, $m \Rightarrow$

maximum quantum number [consider values of 'l' and 'm' for filled orbitals only]?

A. Na

B. Ca

C. Al

D. Ga

Answer: a,b,c,



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15. Which of the following order is /are incorrect ?



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16. in which of the following orbitals , there si non- zero probaility of finding the electron in the xy plane ?

A. p_x

B. d_{yz}

C. $d_{x^2-y^2}$


D. p_z


Answer: a,c,


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17. the ground state valence shell electrons configuration of nitrogen atom can be represented as :

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: a,d,

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18. Number of nodal planes in $3d_{xy}$ orbital is same as that in :

- A. $3p_y$ orbital
- B. $4d_{xy}$ orbital
- C. $3d_{x^2-y^2}$ orbital
- D. $3d_{yz}$ orbital

Answer: b,c,d,

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19. Select the correct match of species against its property

- | species | Property |
|----------|-----------------------------------|
| (a) Fe | spin multiplicity=5 |
| (b) Cr | spin only magnetic moment =6.93BM |
| (c) Cu | Paramagnetic |
| (d) Co | spin only magnetic moment =3.87BM |

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20. select the impossible set of quantum numbers

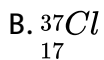
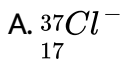
- A.
$$\begin{array}{cccc} n & l & m & s \\ (a) & 4 & 0 & -1 + \frac{1}{2} \end{array}$$
- B.
$$\begin{array}{cccc} n & l & m & s \\ (b) & 3 & 3 & +2 - \frac{1}{2} \end{array}$$
- C.
$$\begin{array}{cccc} n & l & m & s \\ (c) & 3 & 1 & 0 - \frac{1}{2} \end{array}$$
- D.
$$\begin{array}{cccc} n & l & m & s \\ (d) & 2 & 1 & -1 + \frac{1}{2} \end{array}$$

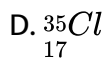
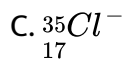
Answer: a,b



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21. Species X with mass number 37 contains 11.1 % more neutrons as compared to electrons , then what is the incorrect representation of element x?





Answer: b,c,d,

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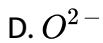
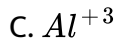
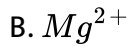
22. Ozone is isoelectronic with :



Answer: a,b,c,

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23. Identify those which are isoosteric with each other :

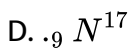
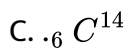
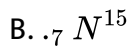
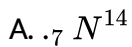


Answer: a,b,c,d



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24. identify the element which are isotones of ${}_8O^{16}$:



Answer: b,c,d,

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25. N_2 is isoelectronic with :

A. CO

B. NO^+

C. C_2H_2

D. CH_4

Answer: a,b

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26. what is the degeneracy of :

1st excited state of $Cl=X$

2nd excited state of $Cl=y$

1st excited state of $H=Z$

Find the value of $y+z-x=t$

t is the degeneracy of :

A. 2nd excited state of H^-

B. 1st excited state of Li

C. 1st excited state of Li^+

D. 2nd excited state of He

Answer: a,b,d



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27. which of the following statement are correct about orbitals ?

A. A large number of orbitals are possible in an atom

B. Orbitals can be distinguished by their size shape and orientation

- C. An orbital of smaller size means there is more chance of finding it near the nucleus
- D. shape and orientation means that there is more probability of finding the electrons along certain direction than along others

Answer: a,d,

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28. Select correct option(s) for ${}_{16}^{32}\text{S}^{-2}$:

- A. atomic number =16
- B. number of neutrons =16
- C. mass number =32
- D. total number of electrons =18

Answer: a,b,c,d

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29. Which of the following species having same value of σ^* (Screening constant) for 2s electrons?

A. F

B. Na

C. Cl

D. Zn

Answer: a,b,c,d



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Comprehension Type

1. Azimuthal quantum number (l): it describes the shape of electron cloud and the number of sub-shells in a shell .

it can have values from 0 to $(n-1)$

value of l subshell

0 s

1 p Number of orbitals in a subshell = 2l + 1

2 d

3 f

$$\text{Orbital angular momentum } L = \frac{h}{2\pi} \sqrt{l(l+1)}$$

$$h\sqrt{l(l+1)} \quad \left[h = \frac{h}{2\pi} \right] \text{ magnetic quantum number (m) :}$$

it describes the orientations of the orbitals. It can have values from -l to +l including zero i.e. total (2l+1) values. Each value corresponds to an orbital. s- subshell has one orbital, p- subshell three orbitals (P_x , P_y and P_z) d- subshell five orbitals (D_{yz} , d_{yz} , d_{zx} , $d_{x^2-y^2}$, d_{z^2} and f- subshell has seven orbitals.

Spin quantum number (s) :

It describes the spin of the electron, it has values $+\frac{1}{2}$ and $-\frac{1}{2}$. Signifies clockwise spinning and anticlockwise rotation of electron about its own axis. Spin of the electron produces spin angular momentum equal to

$$S = \sqrt{s(s+1)} \frac{h}{2\pi}, \text{ where } s = +\frac{1}{2}$$

$$\text{total of the an atom} = +\frac{n}{2} \text{ or } -\frac{n}{2}$$

Where n is the number of unpaired electrons.

the magnetic moment of an atom

$$\mu_s = \sqrt{n(n+2)} B.M$$

n- number of unpaired electron s

B.M (Bohr magneton)

A d- block element has total spin value of $+3$ or -3 then the magnetic moment of the element is approximately:

A. 2.83 B.M

B. 3.87 B.M.

C. 5.9 B.M

D. 6.93 B.M

Answer: d



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2. Azimuthal quantum number (l): it describes the shape of electron cloud and the number of sub- shells in a shell .

it can have values from 0 to $(n-1)$

value of l subshell

0 s

1 p Number of orbitals in a subshell = $2l + 1$

2 d

3 f

$$\text{Orbital angular momentum } L = \frac{h}{2\pi} \sqrt{l(l+1)}$$

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it describes the orientations of the orbitals. It can have values from $-l$ to $+l$ including zero i.e. total $(2l+1)$ values. Each value corresponds to an orbital. s- subshell has one orbital, p- subshell three orbitals (P_x, P_y and P_z) d- subshell five orbitals ($D_{yz}, d_{yz}, d_{zx}, d_{x^2-y^2}, d_{z^2}$ and f- subshell has seven orbitals.

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Where n is the number of unpaired electrons.

the magnetic moment of an atom

$$\mu_s = \sqrt{n(n+2)} B.M$$

n- number of unpaired electron s

B.M (Bohr magneton)

Magnetic moment of ${}_{25}\text{Mn}^{x+}$ is $\sqrt{15}$ then the value of x is :

A. 1

B. 2

C. 3

D. 4

Answer: d



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3. Azimuthal quantum number (l): it describes the shape of electron cloud and the number of sub- shells in a shell .

it can have values from 0 to (n-1)

value of l subshell

0 *s*

1 *p*

2 *d*

3 *f*

Number of orbitals in a subshell = $2l + 1$

Orbital angular momentum $L = \frac{h}{2\pi} \sqrt{l(l+1)}$

$h\sqrt{l(l+1)}$ $\left[h = \frac{h}{2\pi} \right]$ magnetic quantum number (m) :

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It describes the spin of the electron, it has values $+\frac{1}{2}$ and $-\frac{1}{2}$. Signifies clockwise spinning and anticlockwise rotation of electron about its own axis. Spin of the electron produces spin angular momentum equal to

$$S = \sqrt{s(s+1)} \frac{h}{2\pi}, \text{ where } s = +\frac{1}{2}$$

$$\text{total of the atom} = +\frac{n}{2} \text{ or } -\frac{n}{2}$$

Where n is the number of unpaired electrons.

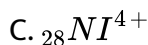
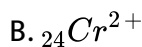
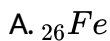
the magnetic moment of an atom

$$\mu_s = \sqrt{n(n+2)} B.M$$

n- number of unpaired electrons

B.M (Bohr magneton)

Magnetic moment of ${}_{26}\text{Fe}^{2+}$ ion is same as :



D. All of these

Answer: d

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4. Azimuthal quantum number (l): it describes the shape of electron cloud and the number of sub-shells in a shell .

it can have values from 0 to (n-1)

value of l subshell

0 s

1 p Number of orbitals in a subshell = $2l + 1$

2 d

3 f

Orbital angular momentum $L = \frac{h}{2\pi} \sqrt{l(l+1)}$

$h \sqrt{l(l+1)}$ $\left[h = \frac{h}{2\pi} \right]$ magnetic quantum number (m) :

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$$\text{total of the an atom} = +\frac{n}{2} \text{ or } -\frac{n}{2}$$

Where n is the number of unpaired electrons .

the magnetic moment of an atom

$$\mu_s = \sqrt{n(n+2)} B. M$$

n- number of unpaired electrons

B.M (Bohr magneton)

orbital angular momentum of an electron is $\sqrt{3} \frac{h}{\pi}$ then , the number of different orientations of this orbital in space are:

B. 5

C. 7

D. 9

Answer: c



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5. Azimuthal quantum number (l): it describes the shape of electron cloud and the number of sub-shells in a shell .

it can have values from 0 to (n-1)

value of l subshell

0 s

1 p

2 d

3 f

Number of orbitals in a subshell = $2l + 1$

Orbital angular momentum $L = \frac{h}{2\pi} \sqrt{l(l + 1)}$

$h\sqrt{l(l + 1)}$ $\left[h = \frac{h}{2\pi} \right]$ magnetic quantum number (m) :

it describes the orientations of the orbitals .It can have values from -l to + l including zero i.e total $(2l+1)$ values . Each value corresponds to an

s-orbital s- subshell has one orbital , p - subshell three orbitals

(P_x , P_y and P_z) d- subshell five orbitals (D_{yz} , d_{yz} , d_{zx} , $d_{x^2-y^2}$, d_{z^2} and

f- subshell has seven orbitals .

Spin quantum number (s) :

It describes the spin of the electron , it has values $+\frac{1}{2}$ and $-\frac{1}{2}$ Signifies

clock wise spinning and anticlock wise rotation of electron about its Own

axis . Spin of the electron produces spin angular momentum equal to

$$S = \sqrt{s(s + 1)} \frac{h}{2\pi}, \text{ where } s = +\frac{1}{2}$$

$$\text{total of the an atom} = +\frac{n}{2} \text{ or } -\frac{n}{2}$$

Where n is the number of unpaired electrons .

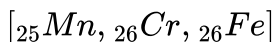
the magnetic moment of an atom

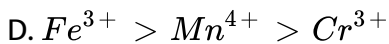
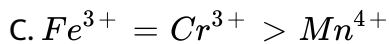
$$\mu_s = \sqrt{n(n + 2)} B. M$$

n- number of unpaired electrons

B.M (Bohr magneton)

the correct order of the magnetic moment is :





Answer: a



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Comprehension Type 2

1. Quantum number is address of an electron in any atom . They are of four types :

- (A) Principal quantum number (n)
- (b) Azimuthal quantum number (l)
- (c) Magnetic quantum number (m)
- (d) spin quantum number (s)

principal quantum tells us the number of shells . Azimuthal quantum number tells is the name of sub - shell . / For s,p,f;l = 0,1,2,3 respectively .Magnetic quantum number represents the orientation of sub shell and

spin quantum number represents the quantum spin states .

Element A has principal quantum number 2 for last electron and it has 3 electrons in valence shell and element B has principal quantum number 3 for last electron and it has 7 electrons in valence shell . the single central atom) will be :

A. 120°

B. 90°

C. 180°

D. 60°

Answer: a



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Comprehension Type 3

1. Quantum number is address of an electron in any atom . They are of four types :

(A) Principal quantum number (n)

(b) Azimuthal quantum number (l)

(c) Magnetic quantum number (m)

(d) spin quantum number (s)

Principal quantum number tells us the number of shells. Azimuthal quantum number tells us the name of sub-shell. For $s, p, f, d = 0, 1, 2, 3$ respectively.

Magnetic quantum number represents the orientation of sub-shell and spin quantum number represents the quantum spin states.

Which option is not correct according to quantum number?

A. $n = 2, l = 0, m = 0, s = -\frac{1}{2}$

B. $n = 1, l = 1, m = 0, s = -\frac{1}{2}$

C. $n = 2, l = 1, m = 0, s = +\frac{1}{2}$

D. $n = 3, l = 2, m = 0, s = -\frac{1}{2}$

Answer: b



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2. Quantum number is address of an electron in any atom . They are of four types :

Principal quantum number (n)

Azimuthal quantum number (l)

(c) Magnetic quantum number (m)

(d) spin quantum number (s)

Principal quantum (n) :

(a) Denoted by n.

(b) it can have any positive integer values like 1,2,3,.....

Azimuthal quantum number or angular momentum quantum number or subsidiary quantum number (l)

(a) Denoted by l.

(B) l can have any value from 0,1,2,... to (n-1) for each value of n

value of l	0	1	2	3	4	5	Magnetic quantum number (m
Notation of subshell	s	p	d	f	g	h	

or M_l): (a) Denoted by m or m_l

(B) it can have any value from -l to +l including 0, for each value of l.

Spin quantum number (s or m_s) :

The value of s is $+\frac{1}{2}$ and $-\frac{1}{2}$ which two quantum spin states .

Maximum electrons in $n=3$ in Fe atom are :

- A. 6
- B. 12
- C. 14
- D. 8

Answer: c



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Comprehension Type 4

1. Quantum number is address of an electron in any atom . They are of four types :

Principal quantum number (n)

Azimuthal quantum number (l)

(c) Magnetic quantum number (m)

(d) spin quantum number (s)

principal quantum number (n) :

(a) Denoted by n .

(b) it can have any positive integer values like 1,2,3,.....

Azimuthal quantum number or angular momentum quantum number or subsidiary quantum number (l)

(a) Denoted by l .

(B) l can have any value from 0,1,2,... to $(n-1)$ for each value of n

value of l 0 1 2 3 4 5 Magnetic quantum number (m
Notation of subshell s p d f g h
or M_l): (a) Denoted by m or m_1

(B) it can have any value from $-l$ to $+l$ including 0, for each value of l .

Spin quantum number (s or m_s) :

The value of s is $+\frac{1}{2}$ and $-\frac{1}{2}$ which two quantum spin states .

Maximum number of electrons in Ne atom with $s = -\frac{1}{2}$ is:

A. 4

B. 5

C. 6

D. 7

Answer: b



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Comprehension Type 5

1. Quantum number is address of an electron in any atom. They are of four types :

Principal quantum number (n)

Azimuthal quantum number (l)

(c) Magnetic quantum number (m)

(d) spin quantum number (s)

Principal quantum (n) :

(a) Denoted by n .

(b) it can have any positive integer values like 1,2,3,.....

Azimuthal quantum number or angular momentum quantum number or subsidiary quantum number (l)

(a) Denoted by l .

(B) l can have any value from 0,1,2,... to (n-1) for each value of n

value of l

0 1 2 3 4 5

Notation of subshell

s p d f g h

Magnetic quantum number (m

or M_l): (a) Denoted by m or m_l

(B) it can have any value from -l to +l including 0, for each value of l.

Spin quantum number (s or m_s):

The value of s is $+\frac{1}{2}$ and $-\frac{1}{2}$ which two quantum spin states .

Maximum number of electrons in Na with l=0:

A. 5

B. 6

C. 7

D. 8

Answer: a



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2. Wave function of electrons in atoms are called atomic orbitals. Atomic orbitals are labelled as three quantum numbers n, l, m.

which orbitals have two directional lobes , which can point in three possible directions ?

- A. All orbitals which have $n=2$
- B. All orbitals which have $l=2$
- C. All orbitals which $m= -1/0 +1$
- D. All orbitals which have $l=1$

Answer: d



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Comprehension Type 4

1. Quantum number area assigned to get complete information of electrons regarding their energy angular momentum ,spectral lines etc.

Four quantum number are known i.e principal quantum numbers which tell the distance shell and its angular momentum .Azimuthal and of course shape of orbital , Magnetic quantum number deals with study of

orientations or degeneracy of a subshell . spin quantum number defines the spin of electrons designated as $+\frac{1}{2}$ or $-\frac{1}{2}$ represented by $+\frac{1}{2}$ and $-\frac{1}{2}$ respectively .

Electrons are filled in orbitals and Hund's rule of maximum multiplicity .

Two unpaired electrons present in carbon atom are different with respect to their :

- A. principal quantum number
- B. azimuthal quantum number
- C. Magnetic quantum number
- D. spin quantum number

Answer: c



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Comprehension Type 5

1. Quantum number area assigned to get complete information of electrons regarding their energy angular momentum ,spectral lines etc.

Four quantum number are known i.e principal quantum numbers which tell the distance shell and its angular momentum .Azimuthal and of course shape of orbital , Magnetic quantum number deals with study of orientations or degeneracy of a subshell . spin quantum number defines the spin of electrons designated as $+\frac{1}{2}$ or $-\frac{1}{2}$ represented by $+\frac{1}{2}$ and $-\frac{1}{2}$ respectively .

Electrons are filled in orbitals and Hund's rule of maximum multiplicity .

Number of electrons having the quantum numbers $n=4, l=0,$

$s = -\frac{1}{2} \in \text{Zn}^{+2}$ ion is /are :

A. 1

B. 0

C. 2

D. 5

Answer: b



Comprehension Type 6

1. Quantum number area assigned to get complete information of electrons regarding their energy angular momentum ,spectral lines etc.

Four quantum number are known i.e principal quantum numbers which tell the distance shell and its angular momentum .Azimuthal and of course shape of orbital , Magnetic quantum number deals with study of orientations or degeneracy of a subshell . spin quantum number defines the spin of electrons designated as $+\frac{1}{2}$ or $-\frac{1}{2}$ represented by $+\frac{1}{2}$ and $-\frac{1}{2}$ respectively .

Electrons are filled in orbitals and Hund's rule of maximum multiplicity .

spin angular momentum for unpaired electron in sodium (Atomic No =11)

is :

A. $\frac{\sqrt{3}}{2}$

B. $0.866 \frac{h}{2\pi}$

C. $-\frac{\sqrt{3}}{2} \frac{h}{2\pi}$

D. none of these

Answer: b

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Comprehension Type 6

1. Wave function of electrons in atoms are called atomic orbitals. Atomic orbitals are labelled as three quantum numbers n, l, m .

Select the invalid set of quantum numbers for any electron in the ground state electronic configuration of potassium:

A. $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

B. $n = 3, l = 1, m = 0, s = +\frac{1}{2}$

C. $n = 3, l = 2, m = 0, s = +\frac{1}{2}$

D. $n = 2, l = 1, m = -1, s = -\frac{1}{2}$

Answer: c



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Match The Column

1. Match column -I with column -II and select the correct answer using the codes given below in the lists (n, l and m are respectively the principal azimuthal and magnetic quantum no.)

column-I

- (a) number of values of l for the an energy level(n)
- (b) values of l for a particular type of orbit
- (c) Number of values of m for l=2
- (d) values of m

column-II

- (p) 0.1.2.... . (n - 1)
- (q) +l to -l therpou
- (r) 5
- (s) n



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2.

column-I

- (a) Same number of unpaired electrons are present in
- (b) same number of electrions in s and p subshells.
- (c) Same number of electrons with l=1

column-II

- (p) $Na^+ . Mg^{2+}$
- (q) $F^- . Mg . O$
- (r) Mg, Ne, O^{2-}

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3. (l and m are respectively the azimuthal and magnetic quantum numbers)

column-I

- (a) total number of values of (l) for a shell
- (b) values of (l) for a shell
- (c) total number of values of (m) for a subshell
- (d) values of (m) for a subshell

column-II

- (p) $0, 1, \dots, (n - 1)$
- (q) $+l, \dots, +2, +1$
- (r) $(2l + 1)$
- (s) n

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4.

column-I

- (a) No. of electrons in Na (11) having $m=0$
- (b) No. of electrons in s (16) having $(n+1)=3$
- (c) No. of maximum possible electrons having $s = +\frac{1}{2}$ spin in Cr (24)

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5.

column-I	column-II
(a) Fe^{2+}	(p) Set of quantum no. for last e^- is $n = 2, l = 1$,
(b) Mn^{+4}	(q) magnetic moment (μ) = zero
(c) Zn^{+2}	(r) Spin multiplicity (SM) = 4
(d) Na^+	(s) total no. of exchange pairs in 3d - subshell = 10
	(t) paramagnetic species

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6.

column-I	column-II
(a) change on electrons (magnitude)	(p) $1.6022 \times 10^{-19} C$
(b) ed/m_e	(q) $1.758820 \times 10^{11} CKg^1$
(c) mass of proton $. m_p$	(r) $1.00867u$
(d) Mass of neutron m_n	(s) $1.00727u$
	(t) $4.8 \times 10^{-10} esu$

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7.

column-I

- (a) the property of metal that allows it to be drawn into wire
- (b) A single particle composed of two or more identical atoms
- (c) A Property that can be observed without changing the chemical formula
- (d) A subshell that cannot be broken down into simple substances



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8.

column-I

column-II

- | | |
|---|----------------------------------|
| (a) 31.4 % more neutrons as compared to protons | (p) ${}^7_{14}\text{N}$ |
| (b) 11.1 % more neutrons than electrons | (q) ${}^{56}_{26}\text{Fe}^{3+}$ |
| (c) 30.4 % more neutrons than electrons | (r) ${}^{37}_{17}\text{Cl}^-$ |
| (d) Same number of neutrons and protons | (s) ${}^{81}_{35}\text{Br}$ |



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Subjective Type

1. find out the maximum value of $n+l+m$ for 5d electron .



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2. An electron resides in a subshell which has 7 numbers associated with this subshell has minimum possible value find the sum of n and l for this electron.



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3. Calculate the total number of electrons for Mn having $n+l+m=2$



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4. Find the number of electrons are there in NI^{2+} ion which are having the (+1) value of magnetic quantum number (m) ?



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5. How many unpaired electrons are there in Ni^{2+} ?

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6. the maximum number of electrons that can be accommodated in all the orbitals for which $l=3$ is

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7. in species X^{2+} , the mass number is 20 and number of neutrons are 10, then calculate the number of electrons in species X^{2+} .

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8. the magnetic moment value of species X is 4.48 B.M find out the number of unpaired electrons in X.

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9. Find the difference between Z_{eff} of 4s and 3d electrons of Sc.

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10. Calculate the total number of p-orbitals electrons present in Ag (47) atoms.

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11. The mass number of element 'X' is 'A' . If X^{4-} contains 10 electrons and 6 neutrons , then the value of $\frac{A}{3}$ is

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12. Calculate the value of Z_{eff} on 3d electrons of Sc .

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13. calculate the difference between the Z_{eff} experienced by outermost electrons in Na and K.

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14. for a hydrogenic atom find out the total number of electrons that are filled in between 9s and 9p subshell if spin quantum number has values $\left(-\frac{1}{2}, 0, +\frac{1}{2}\right)$.

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15. Find the number of electrons in Pd having $n \times l = 0$ and $|m| > 1$

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16. (p) if azimuthal quantum number value is 3, the maximum value of spin multiplicity is x.

(Q) if values of principal quantum number azimuthal quantum number ,magnetic of unpaired electrons present in copper will be :

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17. $n+l +m$ for the valence electrons of rb will be (where n,l,m , are principal quantum number azimuthal quantum number magnetic quantum number respectively):

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18. If aufbau's rule is not followed and electrons filling if done shell after shell ,then number of unpaired electrons present in copper will be ,

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19. Maximum number of electrons having quantum numbers

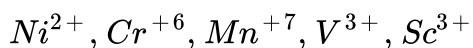
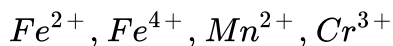
$$n = 5, |m_1| = 2, m_s = -\frac{1}{2}$$

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20. The first excited state of Cl^- will have the energy of :

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21. the number of species which are diamagnetic amongst the following :



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22. H -atom have infinite shells , write total number fo shells which does not contain f- subshell .

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23. Calculate z_{eff} for last valence shell electrons in fluorine (F). Give answer after multiplying by 10.

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24. In a multi-electric atom, maximum number of degenerate orbitals present in 3rd shell :

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25. How many maximum electrons are present in a d-orbital ?

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26. A certain anion carries -9.6×10^{-10} coulombs of static electric charge. Calculate the number of electrons whose charges are present on it.

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27. An element has same number of neutrons as total number of protons or electrons, what will be the neutron excess?

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28. An element is represented by (A,Z) e.g. NI_{28}^{60} can be written as (60,28)

Among the following find the total number of possible isotopic pairs formed by the given atoms (232,84),(228,90),(228,90),(214,82), ${}_{92}^{218}U$, (216,84), ${}_{92}^{210}U$, (213,84).

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29. Find the number of elements which are isobars of ${}_{92}U^{238}$

${}_{93}Th^{234}$, ${}_{90}Th^{232}$, ${}_{93}Np^{237}$, ${}_{96}Cm^{247}$

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30. Find the number of isobaric pairs for the elements represented by (A,Z)

(232,90),(228,88),(228,89),(214,82),(218,84),(210,81),(216,85),(207,82),(211,83):

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31. find the number of elements which are isobars of ${}_{89}\text{Ac}^{227}$. An element is represented as (A,Z)

(231,91),(223,87),(227,90),(223,88), (219,85),(215,83),(215,84),(207,82),(211,83),

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32. not considering the electronic spin the degeneracy of the degeneracy of the second excited state of H^- is :

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33. Find the maximum number of electrons which can have $m_s > 0$, but $m_l < 0$ for $n=4$



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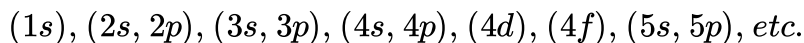
34. Find the number of sets of isosters



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Others

1. Slater's rule is used to calculate the shielding constant (σ) in multielectron system and the electronic configuration the element in the following order and groupings :



in which of the following element outer shell s electrons and penultimate shell d electron does not experience same Z effective value ?

A. La

B. Y

C. Sc

D. Zn

Answer: d



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2. the effective nuclear charge (Z_{eff}) takes into account the interelectronic repulsions in multielectron atoms. Slater's rules help us in evaluating z_{eff} for various species. Apply Slater's Rules to answer the following questions :

Z_{eff} for 3d valence of Zn = x

Z_{eff} for 3d valence of Zn^{2+} = y. Z_{eff} ("eff") for valence of Zn = z

choose the correct option (s) :

A. $a > c$

B. $a > b$

C. $b > c$

D. Both (A) and (b)

Answer: d

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3. Isoelectronic species have same number of valence electrons or same number of total electrons as well as same number of atoms

Identify the pair of isoelectronic species among the following :

A. N_2O , CO_2

B. N_2 , CO

C. O_3 , $NOLi_3$

D. Both (a) and (b)

Answer: d

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4. imagine a universe in which :

(A) Principal quantum n can have values from 1,2,3,..... ∞ .

(b) Azimuthal quantum no. l can have values from 1 to $n+1$ corresponding to A,B,C,D,E,F,.....

(c) magnetic quantum no m can have integral values from $-\frac{l}{2}$ to $+\frac{l}{2}$

(including zero if possible).

(d) spin quantum no s can have 6 possible values .

All rules of filling remains intact .

what will be the atomic no of the element in which 1st e^- fills 2 nd shell completely ?

A. 38

B. 57

C. 76

D. 96

Answer: d



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5. imagine a universe in which :

(A) Principal quantum n can have values from 1,2,3,..... ∞ .

(b) Azimuthal quantum no. l can have values from 1 to $n+1$ corresponding to A,B,C,D,E,F,.....

(c) magnetic quantum no m can have integral values from $-\frac{l}{2}$ to $+\frac{l}{2}$ (including zero if possible).

(d) spin quantum no s can have 6 possible values .

All rules of filling remains intact .

what is the maximum e^- capacity of a shell for which $n = 4$?

A. 32

B. 96

C. 114

D. 64

Answer: c



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6. imagine a universe in which :

(A) Principal quantum n can have values from 1,2,3,..... ∞ .

(b) Azimuthal quantum no. l can have values from 1 to $n+1$ corresponding to A,B,C,D,E,F,.....

(c) magnetic quantum no m can have integral values from $-\frac{l}{2}$ to $+\frac{l}{2}$

(including zero if possible).

(d) spin quantum no s can have 6 possible values .

All rules of filling remains intact .

what will be the last shell for an element having $Z=117$?

A. $n=3$

B. $n=4$

C. $n=5$

D. $n=6$

Answer: b



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7. information :

(a) principal quantum no n is defined as 1,2,3,.....

(b) Azimuthal quantum no l is defined as 1 to $n - 1$ in integral steps .

(c) magnetic quantum no m is defined as $-\frac{1}{2}$ to $+\frac{1}{2}$ (including zero) if any, in integral steps).

(d) spin quantum no s has six possible values $\left(-\frac{1}{2}, -\frac{1}{2}, -\frac{1}{2}, +\frac{1}{2}, +\frac{1}{2}, +\frac{1}{2}\right)$.

(e) the subshell corresponding to $l=1,2,3,4,5,.....$ designated as F, G, H, I, J, K, ... respectively ,

(f) the values of m for given values of l give the number of orbitals in a sub-shell .

(g) the principle for filling of E^{-} in the shells remains unchanged .

for the element having atomic no 43 last e^{-} enters in:

A. 1G

B. 2G

C. 2F

D. 1H

Answer: d



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8. information :

(a) principal quantum no n is defined as 1,2,3,.....

(b) Azimuthal quantum no l is defined as 1 to $n - 1$ in integral steps .

(c) magnetic quantum no m is defined as $-\frac{l}{2}$ to $+\frac{l}{2}$ (including zero if l is even, in integral steps).

(d) spin quantum no s has six possible values $\left(-\frac{1}{2}, -\frac{1}{2}, +\frac{1}{2}, +\frac{1}{2}, +\frac{3}{2}, +\frac{3}{2} \right)$.

(e) the subshell corresponding to $l=1,2,3,4,5,.....$ designated as F, G, H, I, J, K.... respectively ,

(f) the values of m for given values of l give the number of orbitals in a sub-shell .

(g) the principle for filling of e^- in the shells remains unchanged .

the no of orbitals and maximum no of e^- that can be filled in a l -subshell respectively will be :

A. 6,36

B. 5,30

C. 4,24

D. 7,24

Answer: a

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9. if values of quantum number can be considered as follow : $n=1,2,3,\dots$

∞

$l = -$ to $(n-1)$

$m = -l$ to $+l$ (integral values including zero)

$$s = \frac{1}{2}, + \frac{1}{2}$$

According to above consideration the maximum number of electrons that can be accommodated in g-orbital of the fourth shell is :

A. 18

B. 9

C. 2

D. 22

Answer: c



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