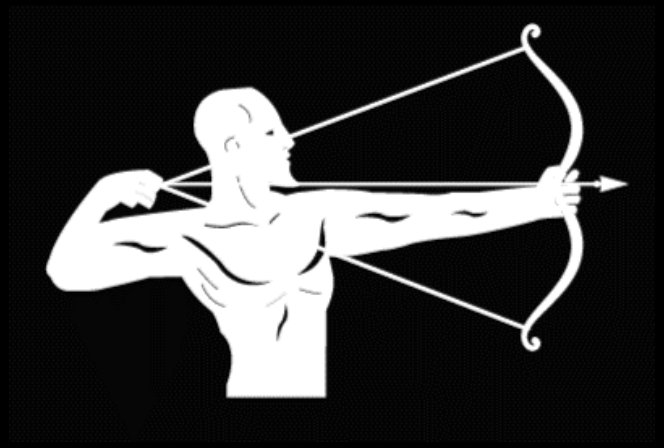


NEET BATCH

CHAPTER - STRUCTURE OF ATOM

DPP-10

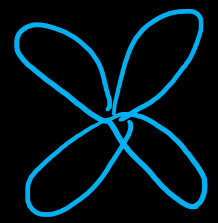
Q.1 Which one of the following orbitals is spherical in shape?

(A) 4s
(B) 3p
(C) 3d
(D) 4f

Solution:

s orbital →  → spherical

p orbital →  → dumb-bell

d orbital →  → double dumb-bell

f orbital → complex.

Q.2 The number of electrons present in 3d of $Cu^{\oplus}$ is

(A) 20 (B) 10
(C) 16 (D) 24

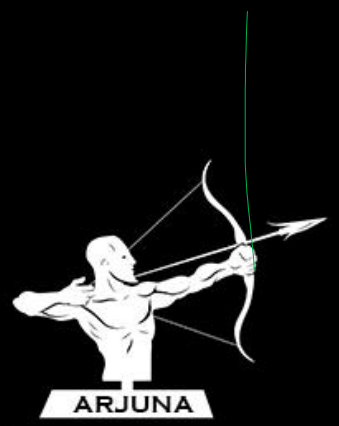
Solution: $Cu\ (Z=29) = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \underbrace{4s^2\ 3d^9}_{\text{less energy gap}}$ ✗

1 Electron from 4s goes to 3d orbital, due to extra stability of fully filled d-orbital which has more exchange energy and symmetry.

$Cu\ (Z=29) = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ \underbrace{3d^{10}\ 4s^1}$ ✓

After filling of electrons, energy of 4s become more than 3d due to effective nuclear charge ∴ Electron is removed from 4s.

$Cu^+ = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}$



Q.3 The maximum number of electrons that can be accommodated in $d_{x^2 - y^2}$ orbital is

(A) 10
(B) 5
(C) 2
(D) 1

Solution: Each orbital can accomodate a maximum of 2 electrons in opposite spin.

TL

$d_{x^2-y^2}$ represents 1 orbital ∴ it can accomodate max. of 2 electrons

TL

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

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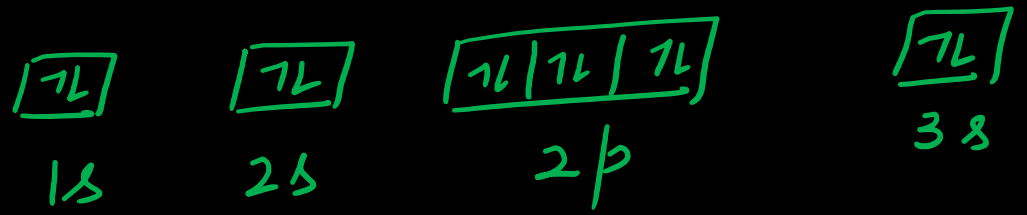
Q.4 The number of unpaired electrons in magnesium atom is

Mg (Z = 12)

(A) 0
(B) 1
(C) 2
(D) 3

Solution:

Mg (Z = 12) = $1s^2\ 2s^2\ 2p^6\ 3s^2$



No unpaired electron

Q.5 The correct sequence of energy of orbitals of multielectron species is

(A) 4p < 3d < 4s ✗

(B) 4s < 4p < 3d ✗

(C) 4s < 3d < 4p

(D) 3d < 4s < 4p

$(n+l)$ rule.

Higher value of $(n+l)$ gives high energy orbital

$(n+l)$ value ∝ Energy

Solution:

value of n ←

4p → $n = 4$, $l = 1$ → $n+l = 4+1 = 5$

3d → $n = 3$, $l = 2$ → $n+l = 3+2 = 5$

4s → $n = 4$, $l = 0$ → $n+l = 4+0 = 4$

4p and 3d have same value of $(n+l)$. Now, we will compare value of n.

Higher value of n corresponds to high energy orbital

4p > 3d

Energy order: 4p > 3d > 4s

value of l

s = 0

p = 1

d = 2

Q.6 The maximum number of unpaired electrons present in p_x orbital is

(A) 2
(B) 1
(C) 4
(D) 3

Solution: p_x represents 1 orbital and each orbital can accomodate maximum of 2 electrons

$\boxed{\uparrow\downarrow}$ → paired electrons

$\boxed{\uparrow}$ → unpaired electrons

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Q.7 The number of electrons present in 'M' shell of silicon is (Z = 14)

(A) 2
(B) 4
(C) 6
(D) 8

Solution:

$n = 1 \rightarrow$ K shell

$n = 2 \rightarrow$ L shell

$n = 3 \rightarrow$ M shell

Si° (Z = 14)

$1s^2\ 2s^2\ 2p^6\ |\ 3s^2\ 3p^2$

↳ n = 3

no. of electrons in n = 3 ⇒ 2 + 2

= 4

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Q.8 The ion that is isoelectronic with CO is

↳ same no. of electrons

(A) CN^- (B) N_2^+

(C) O_2^- (D) N_2^-

negative sign → 1 e⁻ is added

Positive sign → 1 e⁻ is removed

Solution:

CO → 6 + 8 = 14 electrons

(A) CN^- → 6 + 7 + 1 = 14 electrons

(B) N_2^+ → 7 + 7 − 1 = 13 "

(C) O_2^- → 8 + 8 + 1 = 17 "

(D) N_2^- → 7 + 7 + 1 = 15 "

Q.9 Which of the following configuration is correct for iron? (Z = 26)

(A) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$

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

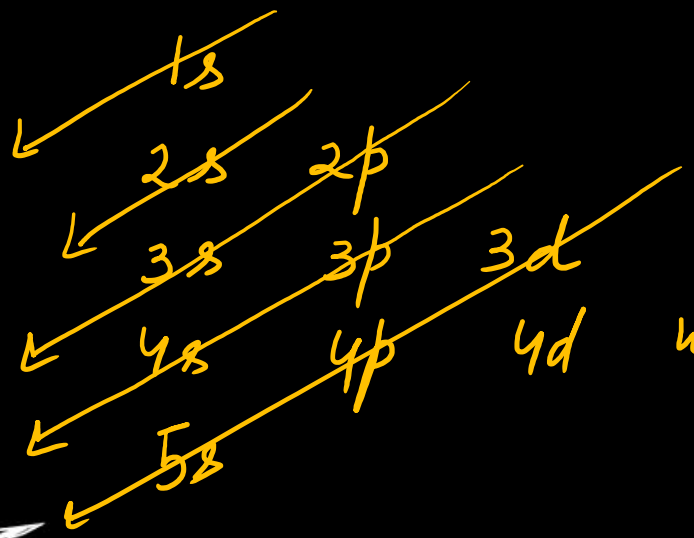
(C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$

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

Acc. $(n+\ell)$ rule, configuration is :

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

Solution:



Q.10 Which of the following has maximum number of unpaired d-electrons?

(A) N^{3+}
(B) Fe^{2+}
(C) Zn^{+}
(D) Cu^{+}

After filling of e⁻s energy of 4s > 3d. Hence e⁻ is removed from 4s.

Solution:

(A) N^{3+} → $1s^2 2s^2$ → no d electrons
no. of electrons $(7-3) = 4$

(B) Fe^{2+} → $[Ar]\ 3d^6$
$1s^2 2s^2 2p^6 3s^2 3p^6$ | $3d^6$
$(Z = 26)$ $(\text{no. of } e^- = 26 - 2 = 24)$

→ | ↿⇂ | 1 | 1 | 1 | 1 |
4 unpaired electrons.

(C) Zn → $[Ar]\ 3d^{10} 4s^2$
Zn^{2+} → $[Ar]\ 3d^{10}$ → completely filled → no unpaired electrons.

| ↿⇂ | ↿⇂ | ↿⇂ | ↿⇂ | ↿ | ↿ | → 3d.

(D) Cu → $[Ar]\ 3d^{10} 4s^1$
Cu^+ → $[Ar]\ 3d^{10}$ → completely filled → no unpaired electrons

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THANK YOU ☺