

[FlexiPrep: Downloaded from flexiprep.com \[https://www.flexiprep.com/\]](https://www.flexiprep.com/)

For solved question bank visit [doorsteptutor.com](https://www.doorsteptutor.com)

[\[https://www.doorsteptutor.com\]](https://www.doorsteptutor.com) and for free video lectures visit [Examrace](https://youtube.com/c/Examrace/)
[YouTube Channel \[https://youtube.com/c/Examrace/\]](https://youtube.com/c/Examrace/)

JEE (Based on NTA Guidelines-IIT Engg.) Mains Chemistry Coaching Programs

 Video Course 2024 (0 Lectures [0 Mins]): Offline Support

[Click Here to View & Get Complete Material](#)

[\[https://www.doorsteptutor.com/Exams/JEE/Mains/Chemistry/Lectures/\]](https://www.doorsteptutor.com/Exams/JEE/Mains/Chemistry/Lectures/)

Rs. 100.00

1 Month Validity (Multiple Devices)

 Online Tests (1 Tests [30 Questions Each]): NTA Pattern, Analytics & Explanations

[Click Here to View & Get Complete Material](#)

[\[https://www.doorsteptutor.com/Exams/JEE/Mains/Chemistry/Online-Test-Series/\]](https://www.doorsteptutor.com/Exams/JEE/Mains/Chemistry/Online-Test-Series/)

Rs. 100.00

3 Year Validity (Multiple Devices)

Chemistry Class 11 NCERT Solutions: Chapter 2 Structure of Atom Part 9

Q: 25. An electron is in one of the 3d orbitals. Give the possible values of n , l and m_l for this electron.



Answer:

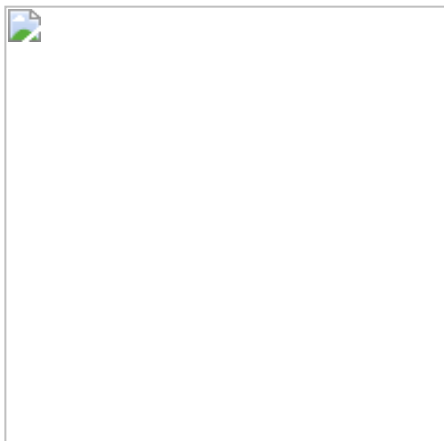
For the $3d$ orbital:

Principal quantum number (n) = 3

Azimuthal quantum number (l) = 2

Magnetic quantum number (m_l) = -2, -1, 0, 1, 2

Q: 26. An atom of an element contains 29 electrons and 35 neutrons. Deduce (i) the number of protons and (ii) the electronic configuration of the element.

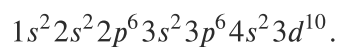


Answer:

(i) For an atom to be neutral, the number of protons is equal to the number of electrons.

\therefore Number of protons in the atom of the given element = 29

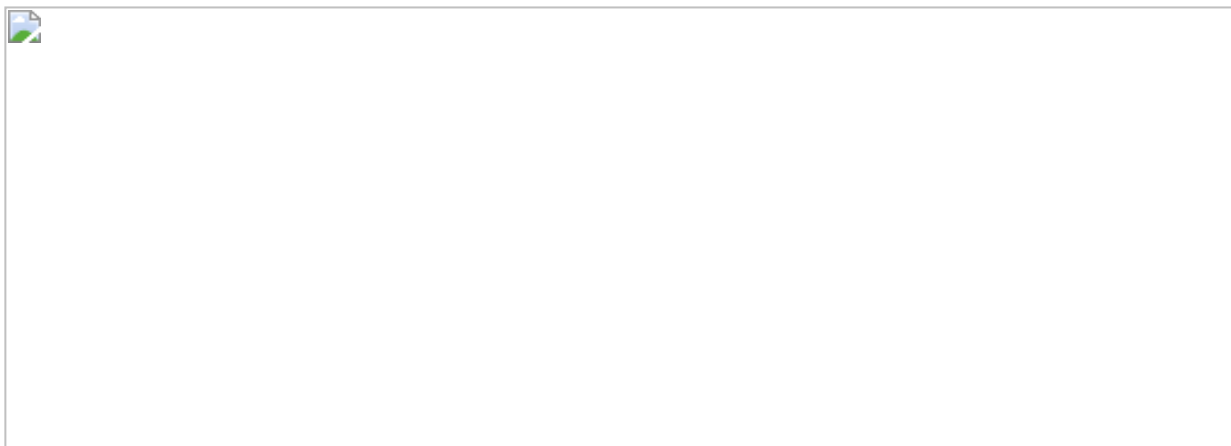
(ii) The electronic configuration of the atom is



Q: 27. Give the number of electrons in the species H_2^+ , H_2 and O_2^+

Answer:



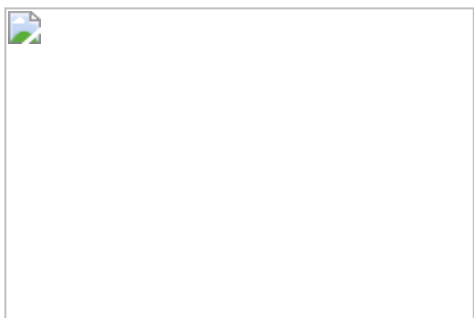


Number of electrons present in hydrogen molecule (H_2) = $1 + 1 = 2$

\therefore Number of electrons in H_2^+ = $2 - 1 = 1$

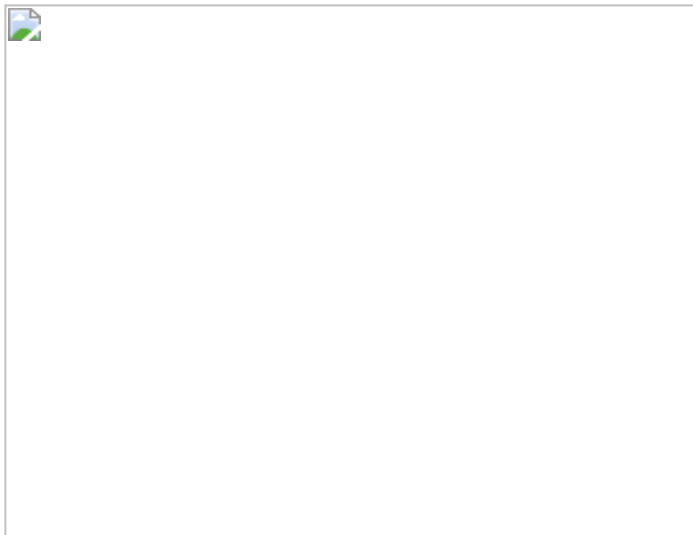
O_2^+ :

Number of electrons present in oxygen molecule (O_2) = $8 + 8 = 16$



\therefore Number of electrons in O_2^+ = $16 - 1 = 15$

Q: 28 (i) An atomic orbital has $n = 3$. what are the possible values of l and m_l ?



(ii) List the quantum numbers m_l and l of electrons for 3d orbital.

(iii) Which of the following orbitals are possible?

$1p, 2s, 2p$ and $3f$

Answer:

(i) $n = 3$ (Given)

For a given value of n , l can have values from 0 to $(n - 1)$

\therefore For $n = 3$

$l = 0, 1, 2$

For a given value of l , m_l can have $\left(\begin{matrix} 2 \\ +1 \end{matrix} \right)$ values.

For $l = 0, m = 0$

$l = 1, m = -1, 0, 1$

$l = 2, m = -2, -1, 0, 1, 2$

\therefore For $n = 3$

$l = 0, 1, 2$

$m_0 = 0$

$m_1 = -1, 0, 1$

$m_2 = -2, -1, 0, 1, 2.$

(ii) For 3d orbital, $l = 2$

For a given value of l , m_l can have $(2l + 1)$ values i.e., 5 values

\therefore For $l = 2$

$$m_l = -2, -1, 0, 1, 2$$

(iii) Among the given orbitals only 2s and 2p are possible. 1p and 3f cannot exist.

For p-orbital, $l = 1$.

For a given value of n , l can have values from zero to $(n - 1)$.

\therefore For l is equal to 1, the minimum value of n is 2.

Similarly,

For f-orbital, $l = 3$

For $l = 3$, the minimum value of n is 4.

Hence, 1p and 3f do not exist.

Q: 29. Using s, p, d notations, describe the orbital with the following quantum numbers.

(a) $n = 1, l = 0$;

(b) $n = 3, l = 1$

(c) $n = 4, l = 2$;

(d) $n = 4, l = 3$.

Answer:

(a) $n = 1, l = 0$ (Given)

The orbital is 1s

(b) For $n = 3$ and $l = 1$

The orbital is $3p$.

(c) For $n = 4$ and $l = 2$

The orbital is $4d$.

(d) For $n = 4$ and $l = 3$

The orbital is $4f$.

Q: 30. Explain giving reasons, which of the following sets of quantum numbers are not possible.

$$a \quad n = 0 \quad l = 0 \quad m_l = 0 \quad m_s = +\frac{1}{2}$$

$$b \quad n = 1 \quad l = 0 \quad m_l = 0 \quad m_s = -\frac{1}{2}$$

$$c \quad n = 1 \quad l = 1 \quad m_l = 0 \quad m_s = +\frac{1}{2}$$

$$d \quad n = 2 \quad l = 1 \quad m_l = 0 \quad m_s = -\frac{1}{2}$$

$$e \quad n = 3 \quad l = 3 \quad m_l = -3 \quad m_s = +\frac{1}{2}$$

$$f \quad n = 3 \quad l = 1 \quad m_l = 0 \quad m_s = +\frac{1}{2}$$

Answer:

(a) The given set of quantum numbers is not possible because the value of the principal quantum number (n) cannot be zero.

(b) The given set of quantum number is possible.

(c) The given set of quantum numbers is not possible.

For a given value of n , ' l ' can have values from zero to $(n-1)$.

For $n = 1, l = 0$ and not 1.

(d) The given set of quantum numbers is possible.

(e) The given set of quantum numbers is not possible.

For $n = 3$

$l = 0$ to $(3 - 1)$

$l = 0$ to 2 i.e., 0, 1, 2

(f) The given set of quantum numbers is possible.