



## Chemistry Class 11 NCERT Solutions: Chapter 2 Structure of Atom Part 8

Q: 23 (i) Write the electronic configurations of the following ions: (a)  $H^-$  (b)  $Na^+$  (c)  $O^{2-}$  (d)  $F^-$

(ii) What are the atomic numbers of elements whose outermost electrons are represented by (a)  $3s^1$  (b)  $2p^3$  and (c)  $3p^5$ ?

(iii) Which atoms are indicated by the following configurations?

(a)  $[He]2s^1$  (B)  $[Ne] 3s^2 3p^3$  (C)  $[Ar]4s^2 3d^1$ .

<p>Atomic Number: 8 Name: <b>oxygen-16 ion</b> Symbol: <math>^{16}_{8}O^{2-}</math> mass # 16 #p 8 #n 8 #e 10 Electronic Configuration: <math>1s^2 2s^2 2p^6 3s^0</math></p>		<p>Physical Properties: <b>nonmetal anion</b> <b>negative ion</b> <b>2- charge</b> Chemical Properties: <b>combines w/ cations</b> Lewis Dot: <math>[\ddot{O}]^{2-}</math></p>	<p>Atomic Number: 11 Name: <b>sodium-23 ion</b> Symbol: <math>^{23}_{11}Na^{1+}</math> mass # 23 #p 11 #n 12 #e 10 Electronic Configuration: <math>1s^2 2s^2 2p^6 3s^0</math></p>		<p>Physical Properties: <b>metal cation</b> <b>positive ion</b> <b>1+ charge</b> Chemical Properties: <b>combines w anions</b> Lewis Dot: <math>[Na]^{1+}</math></p>
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Image of Oxygen and Sodium Ion

Answer:

(i)

(A)  $H^-$  ion

The electronic configuration of H atom is  $1s^1$ .

A negative charge on the species indicates the gain of an electron by it.

$$\therefore \text{Electronic configuration of } H^- = 1s^2$$

(B)  $Na^+$  ion

The electronic configuration of Na atom is  $1s^2 2s^2 2p^6 3s^1$ .

A positive charge on the species indicates the loss of an electron by it.

$$\therefore \text{Electronic configuration of } Na^+ = 1s^2 2s^2 2p^6 3s^0 \text{ or } 1s^2 2s^2 2p^6$$

(C)  $O^{2-}$  ion

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The electronic configuration of O atom is  $1s^2 2s^2 2p^4$ .

A negative charge on the species indicates the gain of an electron by it.

$$\therefore \text{Electron configuration } O^{2-} \text{ ion} = 1s^2 2s^2 2p^6$$

(d)  $F^-$  ion

The electronic configuration of  $F^-$  atom is  $1s^2 2s^2 2p^5$

$$\therefore \text{Electron configuration } F^- \text{ ion} = 1s^2 2s^2 2p^6$$

(ii)

(A)  $3s^1$

Completing the electron configuration of the element as

$$1s^2 2s^2 2p^6 3s^1.$$

$\therefore$  Number of electrons present in the atom of the element

$$= 2 + 2 + 6 + 1 = 11$$

$\therefore$  Atomic number of the element = 11

(B)  $2p^3$

Completing the electron configuration of the element as

$$1s^2 2s^2 2p^3.$$

$\therefore$  Number of electrons present in the atom of element =  $2 + 2 + 3 = 7$

$\therefore$  Atomic number of the element = 7

(C)  $3p^5$

Completing the electron configuration of element as

$$1s^2 2s^2 2p^5.$$

$\therefore$  Number of electrons present in the atom of the element =  $2 + 2 + 5 = 9$

$\therefore$  Atomic number of the element = 9

(iii)

(A)  $[He]2s^1$

The electronic configuration of the element is  $[He] 2s^1 = 1s^2 2s^1$ .

$\therefore$  Atomic number of the element = 3

Hence, the element with the electronic configuration  $[He] 2s^1$  lithium (Li).

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The electronic configuration of the element is  $[\text{Ne}]3s^2 3p^3 = 1s^2 2s^2 2p^6 3s^2 3p^3$ .

$\therefore$  Atomic number of the element = 15

Hence, the element with the electronic configuration  $[\text{Ne}]3s^2 3p^3$  is phosphorus (P).



The electronic configuration of the element is  $[\text{Ar}] 4s^2 3d^1 = 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$ .

$\therefore$  Atomic number of the element = 21

Hence, the element with the electronic configuration  $[\text{Ar}]4s^2 3d^1$  is scandium (Sc).

Q: 24 what is the lowest value of n that allows g orbitals to exist?

Answer:

For g – orbitals,  $l = 4$ .

As for any value 'n' of principal quantum number, the Azimuthal quantum number (l) can have a value from zero to (n-1).

$\therefore$  For  $l = 4$ , minimum value of  $n = 5$

## Azimuthal Quantum Number

$l$	Sublevel	Orbital Shape
0	sharp - s	spherical
1	principal - p	dumbbell-shaped
2	diffused - d	cloverleaf
3	fundamental - f	too complex

Image Showing Azimuthal Quantum Number.