



## **STRUCTURE OF ATOM**

### **OBJECTIVE TYPE QUESTIONS**

1. The nucleons are
  - I. Protons and electrons
  - II. Neutrons and electrons
  - III. Protons and neutrons
  - IV. None of these
2. The atomic number of sodium is 11 and its mass number is 23. It has
  - I. 11 neutrons and 12 protons
  - II. 12 protons and 11 electrons
  - III. 11 electrons and 12 neutrons
  - IV. 12 electrons and 11 neutrons
3. The electronic configuration of Magnesium is
  - I. 2, 8, 2
  - II. 2,8,8,2
  - III. 2, 8,
  - IV. 8,2, 2
4. The isotope used to remove the brain tumours and treatment of cancer is
  - I. U-235
  - II. Na-24
  - III. Iodine
  - IV. C0-60
5. The isotopes of an element have:
  - I. same number of neutrons
  - II. Same atomic number
  - III. Same mass number
  - IV. None of these

### **ASSERTION AND REASONING**

6. Assertion: Atom is electrically neutral.  
Reason: Equal number of protons and electrons are present in an atom.
7. Assertion: Inert elements show zero valency.  
Reason: Atoms of inert element have fully filled outermost orbit.

**VERY SHORT ANSWER TYPE QUESTIONS (1 MARK)**

8. If 'K' and 'L' shells of an atom are completely filled, then what would be its valency?
9. For chlorine,  $Z = 17$ ,  $A = 35$ . Give the number of protons, electrons and neutrons in chlorine atom.
10. The K and L shells of an atom are completely filled. Find the number of electrons present in it. State the name of the element. . (CBSE 2012, 2013)

**SHORT ANSWER TYPE QUESTIONS (2 mark questions)**

11. Define the terms (a) isotope, (b) isobar
12. A certain particle X has 17 protons, 17 electrons and 18 neutrons  
(i) what is the mass number of X?  
(ii) What is atomic number of X ?  
(iii) What is valency of X?  
(iv) Identify the element.
13. What are valence shell and valence electrons ? (CBSE 2013)
14. The total number of nucleons in the atoms of calcium and argon is 40 and the atomic numbers of calcium and argon are 20 and 18 respectively. Name the pair of these two elements and also find out the number of neutrons present in the nucleus of argon atom. (CBSE 2013)
15. An atom has 2 electrons in M-shell. What is the atomic number of the element? (CBSE 2014)
16. The composition of two atoms A and B is given :

Atom A	Atom B
17 protons	17 protons
18 neutrons	20 neutrons
17 electrons	17 electrons

- (a) What are the mass numbers and atomic numbers of A and B?  
(b) What is the relation between the two chemical species ?  
(c) Which element or elements do they represent?
17. Out of elements  ${}^{34}\text{X}_{17}$  and  ${}^{40}\text{Y}_{18}$ , which is chemically more reactive and why?

**LONG ANSWER TYPE QUESTIONS (5 MARKS)**

18. An atom of an element has two electrons in outermost M-shell. State its  
(a) Electronic configuration  
(b) Number of protons  
(c) Atomic number  
(e) Valency

(f) Name (CBSE 2011)

19. Explain why:

(a) These isotopes of hydrogen have identical chemical properties.

(b) These isotopes are electrically neutral

(c) These isotopes differ in their masses. (CBSE 2011, 2016)

20. In the following table, the mass number and the atomic number of certain elements are given:

Elements	A	B	C	D	E
Mass no.	1	7	14	40	40
Atomic no.	1	3	7	18	20

(a) Select the pair of isobars from the above table.

(b) What would be the valency of the element C listed in the above table?

(c) Which two sub-atomic particles are equal in number in a neutral atom? (CBSE 2011)

### BOARD BASED QUESTIONS

21. Complete the following table:

Atom	Mass no.	Atomic no.	No. of neutrons
$^{60}\text{Co}_{27}$			
$^{23}\text{Na}_{11}$	23	11	
$^{37}\text{Cl}_{17}$			20

22. Define valency by taking examples of silicon and oxygen.

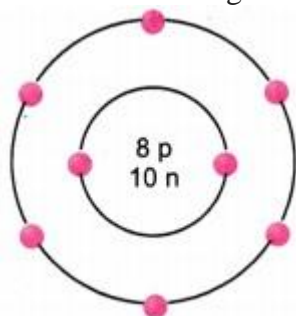
23. The atomic number of lithium is 3. Its mass number is 7.

(a) How many protons and neutrons are present in a lithium atom?

(b) Draw the diagram of a Lithium atom.

24. The given figure depicts the atomic structure of an atom of an element 'X'.

Write the following information about the element 'X'.



(a) Atomic number of 'X'

(b) Atomic mass of 'X'

(c) Valence electrons

(d) Valency of 'X'

25. Helium atom has 2 electrons in its valence shell but its valency is not 2. Explain.

26. The atomic number of lithium is 3. Its mass number is 7.

(a) How many protons and neutrons are present in a lithium atom?

(b) Draw the diagram of a lithium atom.

### PARAGRAPH BASED QUESTIONS

The **atomic number** or **proton number** (symbol  $Z$ ) of a chemical element is the number of protons found in the nucleus of every atom of that element. The atomic number uniquely identifies a chemical element. It is identical to the charge number of the nucleus.

In an uncharged atom, the atomic number is also equal to the number of electrons.

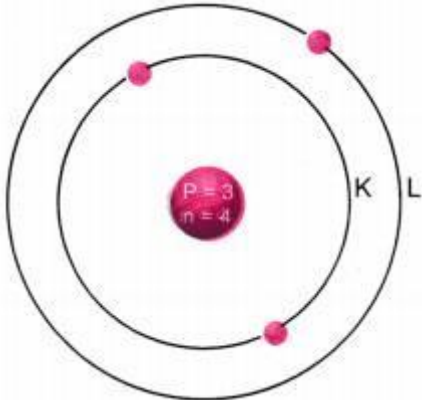
In the following table, the mass number and atomic number of certain elements are given:

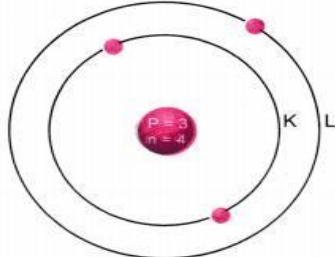
Elements	Mass No.	Atomic No.
A	2	1
B	3	1
C	3	2
D	6	3
E	9	4
F	11	5
G	19	9
H	23	11

27. How many neutrons are present in F?
28. Which atoms are isotopes of the same element?
29. Which atom will form singly positively charged ion?
30. Which is the atom of an inert gas?
31. Which will form singly negatively charged ion?
32. Which of these has 11 electrons?

Q.No	Answers
1	III. Protons and neutrons
2	III. 11 electrons and 12 neutrons
3	I. 2,8,2
4	IV. CO-60
5	II. Same atomic number
6	Both are correct
7	Both are correct
8	Valency of the atom = zero.
9	In chlorine atom (Cl) Number of protons ( $Z$ ) = 17 Number of neutrons = $A - Z = 35 - 17 = 18$
10	Number of electrons present: K(2), L(8) = 10. The element is neon (Ne).

11	<p>Isotopes may be defined as : the different atoms of the same element having same atomic number but different mass numbers.</p> <p>Isobars may be defined as the atoms belonging to the different elements with same mass numbers but different atomic numbers.</p>
12.	<p>(i) Mass no. of X = No. of p + No. of n = 17 + 18 = 35</p> <p>(ii) Atomic no. of X = No. of p = 17</p> <p>(iii) Electronic configuration of X = 2, 8, 7</p> <p>Valency of X = (8 – 7) = 1</p> <p>(iv) Name of element X = Chlorine (Cl).</p>
13	<p>Valence shell is the outermost shell in an atom. The electrons present in it are called valence electrons.</p>
14	<p>The elements which have same no. of nucleons but different atomic numbers are called isobars. Therefore, calcium (Ca) and argon (Ar) represent a pair of isobars.</p> <p>No. of neutrons in the nucleus of Ar = 40 – 18 = 22.</p>
15	<p>K and L shells of the atom are filled and M shell has two electrons. Therefore, Total number of electrons in the atom = 2 + 8 + 2 = 12</p> <p>Atomic number (Z) of the element = 12.</p>
16.	<p>a) Mass number of A = 17 + 18 = 35 u</p> <p>Mass number of B = 17 + 20 = 37 u</p> <p>(b) The two chemical species exist as pair of isotopes since they have the same number of protons and electrons.</p> <p>(c) They represent the element chlorine.</p>
17	<p>The elements <math>^{34}\text{X}_{17}</math> is more reactive because its outermost shell is incomplete.</p>
18	<p>(a) Since the atom has two electrons in outermost M-shell, this means that K and L shells are already filled. Therefore, electronic configuration is 2(K) ,8(L) ,2(M)</p> <p>(b) Number of protons = Number of electrons = 12</p> <p>(c) Atomic number = Number of protons = 12</p> <p>(e) Valency of the element = Number of outermost electrons = 2</p> <p>(f) The element is magnesium (Mg)</p>
19	<p>(a) The isotopes have identical chemical properties because all of them have one electron in the only shell (K-shell)</p> <p>(b) The isotopes are electrically neutral because each one has one proton and one electron.</p> <p>(c) The isotopes differ in their masses because they differ in their mass numbers (1,2 and 3 respectively).</p>
20	<p>(a) Elements D and E are pair of isobars since they have same mass no. = 40</p> <p>(b) The electronic configuration of the element C with Z = 7 is 2, 5.</p> <p>It has five valence electrons. Its valency can be either 5 or 3 (8 – 5) = 3.</p> <p>(c) In a neutral atom, the number of electrons in the extra-nuclear portion is equal to the number of protons in the nucleus.</p>

21	<table border="1"> <thead> <tr> <th data-bbox="363 210 501 271">Atom</th> <th data-bbox="501 210 742 271">Mass no.</th> <th data-bbox="742 210 1002 271">Atomic no.</th> <th data-bbox="1002 210 1382 271">No. of neutrons</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 271 501 353"><math>{}_{27}^{60}\text{Co}</math></td> <td data-bbox="501 271 742 353">60</td> <td data-bbox="742 271 1002 353">27</td> <td data-bbox="1002 271 1382 353"><math>60 - 27 = 33</math></td> </tr> <tr> <td data-bbox="363 353 501 436"><math>{}_{11}^{23}\text{Na}</math></td> <td data-bbox="501 353 742 436">23</td> <td data-bbox="742 353 1002 436">11</td> <td data-bbox="1002 353 1382 436"><math>23 - 11 = 12</math></td> </tr> <tr> <td data-bbox="363 436 501 517"><math>{}_{17}^{37}\text{Cl}</math></td> <td data-bbox="501 436 742 517">37</td> <td data-bbox="742 436 1002 517">17</td> <td data-bbox="1002 436 1382 517"><math>37 - 17 = 18</math></td> </tr> </tbody> </table>	Atom	Mass no.	Atomic no.	No. of neutrons	${}_{27}^{60}\text{Co}$	60	27	$60 - 27 = 33$	${}_{11}^{23}\text{Na}$	23	11	$23 - 11 = 12$	${}_{17}^{37}\text{Cl}$	37	17	$37 - 17 = 18$
Atom	Mass no.	Atomic no.	No. of neutrons														
${}_{27}^{60}\text{Co}$	60	27	$60 - 27 = 33$														
${}_{11}^{23}\text{Na}$	23	11	$23 - 11 = 12$														
${}_{17}^{37}\text{Cl}$	37	17	$37 - 17 = 18$														
22	<p>Valency is the combining capacity of an atom.</p> <p>Atomic number of oxygen = 8          Atomic number of silicon = 14          Electronic configuration of oxygen = 2, 6          Electronic configuration of silicon = 2, 8, 4          Valency of oxygen = 2          Valency of silicon = 4</p>																
23	<p>(a) Number of neutrons = Mass number – atomic number          Number of neutrons = <math>7 - 3 = 4</math>          Number of protons = atomic number  <math>\therefore</math> Number of protons = 3</p> <p>(b) Structure of a lithium atom</p>  <p>The diagram shows a central nucleus with a pink circle containing 'P = 3' and 'n = 4'. Two concentric circles represent electron shells. The inner shell is labeled 'K' and contains three pink dots representing electrons. The outer shell is labeled 'L' and contains one pink dot representing an electron.</p>																
24	<p>a) Atomic number = Number of protons = 8          (b) Atomic mass = Number of protons + Number of neutrons  <math>= 8 + 10 = 18 \text{ u}</math>          (c) Valence electrons = 6          (d) Valency of 'X' = <math>8 - 6 = 2</math></p>																
25	<p>Helium atom has 2 electrons in its valence shell and its duplet is complete.          Hence, the valency is zero.</p>																
26	<p>(a) Number of neutrons = Mass number – atomic number          Number of neutrons = <math>7 - 3 = 4</math>          Number of protons = atomic number  <math>\therefore</math> Number of protons = 3</p> <p>(b) Structure of a lithium atom</p>																

	
27	Number of neutrons in F equal to $11 - 5 = 6$
28	A and B are isotopes of the same element
29	D and H can form singly positive ions.
30	Element C is inert gas.
31	G will form singly negatively charged ion.
32	H has 11 electrons.