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|  | INDIAN SCHOOL AL WADI AL KABIR |  |
| CLASS: IX | DEPARTMENT: SCIENCE 2025 – 26 SUBJECT: CHEMISTRY | DATE: 13/11/2025 |
| WORKSHEET NO: 03 WITH ANSWERS | CHAPTER / UNIT: STRUCTURE OF ATOM | NOTE: A4 FILE FORMAT |
| CLASS & SEC: | NAME OF THE STUDENT: | ROLL NO. |

I. OBJECTIVE TYPE QUESTIONS

- Which subatomic particle carries a positive charge?
 - Proton
 - Neutron
 - Electron
 - Nucleus
- Which of the following is not iso electronic?
 - S^{2-}
 - Cl^-
 - Ca^{2+}
 - Al^{3+}
- Which of the following cannot be the maximum number of electrons in a given shell?
 - 2
 - 8
 - 6
 - 18
- The atomic number of calcium is 20, and its mass number is 40. It has
 - 20 neutrons and 40 protons
 - 20 protons and 40 electrons
 - 20 electrons and 20 neutrons
 - 20 electrons and 40 neutrons
- The nucleus of an atom is composed of:
 - Protons and neutrons
 - Electrons and neutrons
 - Protons and electrons
 - Electrons and nucleons
- The number of protons present in the nucleus of an atom is
 - Atomic mass

- b) Atomic number
 - c) Mass number
 - d) Neutron number
7. Which element is inert in nature?
- a) Element with 2 electrons
 - b) Element with 9 electrons
 - c) Elements with 12 electrons
 - d) Elements with 20 electrons
8. Isotopes of an element have
- (a) Same number of protons
 - (b) Different chemical properties
 - (c) Different number of protons
 - (d) Different atomic numbers
9. An atom with 5 protons and 4 neutrons will have a valency of
- a) 3 b) 7 c) 1 d) 4
10. The electron distribution in the magnesium atom is
- a) 2, 8, 3 b) 2, 8, 2 c) 8, 2, 3 d) 2, 3, 8

ASSERTION-REASONING QUESTIONS

For the following questions, two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the options

(i), (ii), (iii) and (iv) as given below:

- (i) Both A and R are true, and R is the correct explanation of the Assertion.
- (ii) Both A and R are true, but R is not the correct explanation of the Assertion.
- (iii) A is true but R is false.
- (iv) A is false, but R is true.

11. **Assertion-** The Number of neutrons is always equal to the number of protons of the atom.

Reason - Atoms are made up of protons, electrons, and neutrons.

12. **Assertion:** valency is the combining capacity of the element.

Reason: valency of sodium (Na) is 1

13. **Assertion:** Inert elements show zero valency.

Reason: Atoms of inert elements have a fully filled outermost orbit.

14. **Assertion:** Positive ions are formed by removing electrons from an atom.

Reason: In positive ions, the number of electrons is less than the number of protons.

II SHORT ANSWER TYPE QUESTIONS (TWO MARKS)

15. Explain with examples. (a) atomic number (b) mass number
16. What is electronic configuration? Explain with an example.

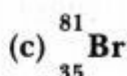
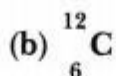
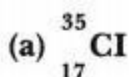
17. An atom of an element has 7 electrons in its L shell.
- What is its atomic number?
 - Identify the element.
18. What is an octet? How do elements reach an octet?
19. Make a schematic atomic structure of Magnesium and Phosphorus.

III SHORT ANSWER TYPE QUESTIONS (THREE MARKS)

20. Which of the two would be the chemically more reactive element X of atomic number 18 or element Z of atomic number 16, and why?
21. The ion of an element has 3 positive charges. The mass number of the atom is 27, and the number of neutrons is 14. What is the number of electrons in the ion?
22. How will you find the valency of chlorine, Sulphur and magnesium?

IV LONG ANSWER QUESTIONS (FIVE MARKS)

23. The atomic number of Ar is 18, and the mass number is 40.
- How many protons and neutrons are present in an argon atom?
 - Draw the diagram of an argon atom
 - Why is argon considered to be a noble gas?
24. Complete the table on the basis of information available in the symbols given below [NCERT Exemplar]



| Element | n_p | n_n |
|---------|-------|-------|
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25. (i) State the method of determining the valency of an element if its atomic number is given.
 (ii) Determine the valency of the following elements, the atomic numbers of which are given in brackets.
 Chlorine (17), Sulphur (16), Aluminium (13)
26. Composition of the nuclei of two atomic species 'X' and 'Y' are given below:

| | X | Y |
|----------|---|----|
| Protons | 8 | 8 |
| Neutrons | 8 | 10 |

Give the mass number of 'X' and 'Y'. What is the relationship between the two species?

V. PREVIOUS YEAR QUESTIONS

27. 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?
28. What are isotopes? State their characteristics, and give the uses of isotopes?

VI. CASE-BASED QUESTIONS

Radioactivity pops up fairly often in the news. For instance, you might have read about it in discussions of nuclear energy, the Fukushima reactor tragedy, or the development of nuclear weapons. It also shows up in popular culture: many superheroes' origin stories involve radiation exposure, for instance, or, in the case of Spider-Man, a bite from a radioactive spider. But what exactly does it mean for something to be radioactive?

Radioactivity is actually a property of an atom. Radioactive atoms have unstable nuclei, and they will eventually release subatomic particles to become more stable, giving off energy—radiation—in the process. Often, elements come in both radioactive and nonradioactive versions that differ in the number of neutrons they contain. These different versions of elements are called isotopes, and small quantities of radioactive isotopes often occur in nature. For instance, a small amount of carbon exists in the atmosphere as radioactive carbon-14, and the amount of carbon-14 found in fossils allows palaeontologists to determine their age.

29. What is an isotope?
 30. Write any two isotopes of hydrogen.
 31. Write the name of an isotope used in the treatment of cancer.

ANSWERS

OBJECTIVE TYPE QUESTIONS

MULTIPLE CHOICE QUESTIONS

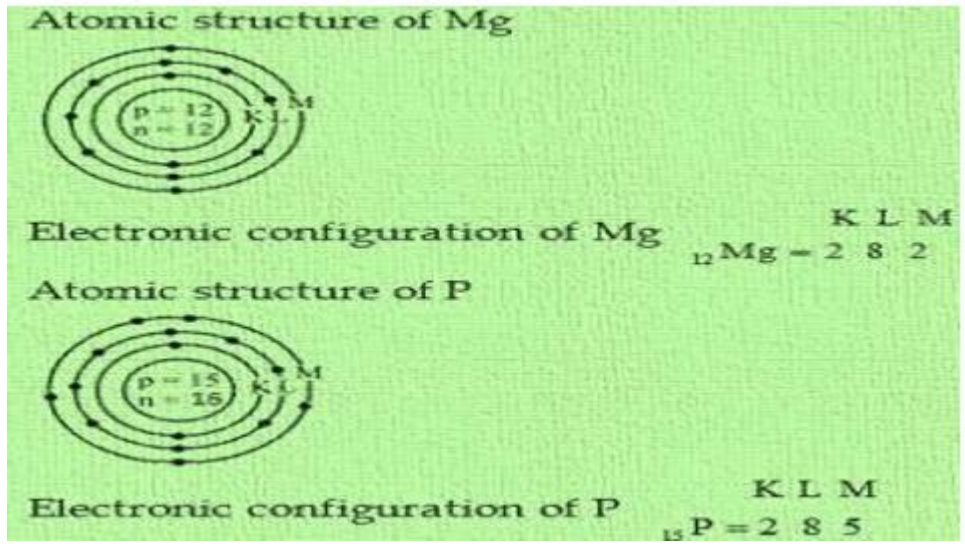
| Q. No. | Answers |
|--------|----------------------------------|
| 1 | (a) protons |
| 2 | (d) Al^{3+} |
| 3 | (c) 6 |
| 4 | (c) 20 electrons and 20 neutrons |
| 5 | (a) Protons and neutrons |

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| 6 | b) Atomic number |
| 7 | a) Element with 2 electrons. |
| 8 | a) Same number of protons |
| 9 | a) 3 |
| 10 | b) 2, 8, 2 |

ASSERTION-REASONING QUESTIONS

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| 11 | (iv) A is false, but R is true. |
| 12 | (ii)Both A and R are true, and R is not the correct explanation of the Assertion. |
| 13 | (i)Both A and R are true, and R is the correct explanation of the Assertion. |
| 14 | (i)Both A and R are correct, and Reason is the correct explanation for Assertion |

TWO MARKS QUESTIONS

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| 15 | <p>(a) Atomic number: it is equal to the number of protons/electrons.eg, the atomic number of hydrogen is 1 since it has one proton.</p> <p>(b) Mass number: it is equal to the total number of protons and neutrons. The mass number of hydrogen is 1 because it has one proton and does not have neutrons.</p> |
| 16 | Electronic configuration: It describes how electrons are distributed within the atomic orbitals /shells of an atom in the increasing order of their energy levels. E.g., carbon with atomic number 6, the configuration is 2, 4. |
| 17 | <p>(i)Atomic number is (2+ 7=9): Here K shell is already filled.</p> <p>(ii) The element is fluorine.</p> |
| 18 | When an atom has 8 electrons in the outermost shell, it has an octet. An element can attain an octet by losing, gaining or sharing electrons. |
| 19 |  |

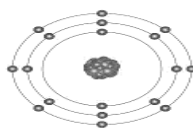
THREE MARKS QUESTIONS

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| 20 | Element X with atomic number 18 has an electronic configuration 2,8,8. Its octet is complete, it is an inert gas and the least reactive. Element Z with atomic number 16 has electronic configuration 2,8,6.it can gain two electrons easily, therefore it is more reactive. |
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| 21 | 3 positive charges 27 mass number 14 neutrons Mass number of any atom = No. of protons + No. of neutrons $27 = \text{No. of protons} + 14$ No. of protons = 13 No. of protons in an atom = No. of electrons in atom = 13 No. of electrons in ion = $13 - 3 = 10$ |
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| 22 | Cl has 17 electrons. Its electronic configuration is 2,8,7.it can gain 1 electron to become stable. So valency is equal to 1. S has 16 electrons Its electronic configuration is 2,8,6.it can gain 2 electrons to become stable. So valency is equal to 2.. Mg has 12 electrons. Its electronic configuration is 2,8,2. It can lose 2 electrons to become stable like a noble gas. So valency is equal to 2. |
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LONG ANSWER TYPE QUESTIONS

| 23 | <p>(a) Protons – 18 neutrons = (40-18) = 22</p> <p>(b)</p> <div style="text-align: center;"></div> <p>(c) It has completed an octet/ 8 electrons are in the valence shell. Hence, they are stable and least reactive.</p> | | | | | | | | | | | | | | | | |
|-----------|--|--------------------------|------------|--------------------------|---------|----------|----|---------|---|---------|----|---------|----|-----------|----|---------|---|
| 24 | <table border="1"><thead><tr><th>Element</th><th>n_p</th><th>n_n</th></tr></thead><tbody><tr><td>Cl</td><td>17</td><td>18</td></tr><tr><td>C</td><td>6</td><td>6</td></tr><tr><td>Br</td><td>35</td><td>46</td></tr></tbody></table> | Element | n_p | n_n | Cl | 17 | 18 | C | 6 | 6 | Br | 35 | 46 | | | | |
| Element | n_p | n_n | | | | | | | | | | | | | | | |
| Cl | 17 | 18 | | | | | | | | | | | | | | | |
| C | 6 | 6 | | | | | | | | | | | | | | | |
| Br | 35 | 46 | | | | | | | | | | | | | | | |
| 25 | <p>(i) The number of electrons gained, lost or shared to make the octet of electrons (in the outermost shell), gives us directly the combining capacity of the element, that is, the valency.</p> <p>(ii)</p> <table><tr><th>Elements</th><th>Atomic no.</th><th>Electronic configuration</th><th>Valency</th></tr><tr><td>Chlorine</td><td>17</td><td>2, 8, 7</td><td>1</td></tr><tr><td>Sulphur</td><td>16</td><td>2, 8, 6</td><td>2</td></tr><tr><td>Aluminium</td><td>13</td><td>2, 8, 3</td><td>3</td></tr></table> | Elements | Atomic no. | Electronic configuration | Valency | Chlorine | 17 | 2, 8, 7 | 1 | Sulphur | 16 | 2, 8, 6 | 2 | Aluminium | 13 | 2, 8, 3 | 3 |
| Elements | Atomic no. | Electronic configuration | Valency | | | | | | | | | | | | | | |
| Chlorine | 17 | 2, 8, 7 | 1 | | | | | | | | | | | | | | |
| Sulphur | 16 | 2, 8, 6 | 2 | | | | | | | | | | | | | | |
| Aluminium | 13 | 2, 8, 3 | 3 | | | | | | | | | | | | | | |

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| 26 | <p>Mass number of 'X' = Number of protons + Number of neutrons $= 8 + 8 = 16$</p> <p>Mass number of 'Y' = Number of neutrons + Number of protons $= 10 + 8 = 18$</p> <p>Relationship between X and Y: The atomic number of both the elements is the same, but their atomic masses are different. Hence, they are isotopes of each other.</p> |
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PREVIOUS YEAR QUESTIONS

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| 27 | <p>(a) Elements D and E are a pair of isobars since they have the same mass no. = 40</p> <p>(b) The electronic configuration of the element C with $Z = 7$ is 2, 5. 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> |
| 28 | <p>Atoms of the same element with the same atomic number but different mass numbers are isotopes.</p> <p>Characteristics:</p> <p>(1) Physical properties of the isotopes are different, e.g. mass, density.</p> |

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| | <p>(2) Chemical properties of the isotopes are the same due to the same number of electrons.</p> <p>Uses:</p> <p>(1) Uranium isotope is used as a fuel in a nuclear reactor (U-235). (2) Cobalt-60 is used for the treatment of cancer. (3) Iodine isotope is used in the treatment of goitre.</p> |
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CASE-BASED QUESTIONS

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| 29 | Atoms of the same element with the same atomic number but different mass numbers are isotopes. |
| 30 | Protium, Deuterium |
| 31 | Cobalt-60 |

Prepared by:
Ms Jainsha Saji

Checked by:
HOD Science