

Chemistry Worksheets Class 9 on Chapter 4 Structure of the Atom with Answers- Set 1

Q-1: What is the distinction between atomic mass and mass number?

Answer: The mass number is a whole number because it is the sum of the number of protons and neutrons, whereas atomic mass is fractional because it is the average relative mass of its atoms when compared to the mass of an atom of the C-12 isotope, which is taken as 12.

Q-2: Calculate the approximate charge in coulombs and mass in kilograms of the sodium-23 nucleus.

Answer: Nucleus of a Na(sodium) atom has 11 protons and 12 neutrons.

Charge on one proton = 1.60×10^{-19} coulombs.

Therefore, charge on 11 protons (that is, charge on nucleus) = $11 \times 1.60 \times 10^{-19} \text{ C} = 17.6 \times 10^{-19} \text{ C}$

Mass of proton is approximately equal to mass of neutron which is equal to $1.67 \times 10^{-27} \text{ kg}$

Therefore, mass of the nucleus = $23 \times 1.67 \times 10^{-27} \text{ kg} = 38.41 \times 10^{-27} \text{ kg}$

Q-3: Proton was discovered by

- a) Thomson's
- b) Goldstein
- c) Rutherford
- d) Chadwick

Answer: b) Goldstein

Q-4: Rutherford's scattering experiment led to the discovery of

- a) Electrons
- b) Nucleus
- c) Atom
- d) alpha-particles

Answer: b) Nucleus

Q-5: When α -rays strike a thin gold foil, very few α -particles are deflected back. What does it show?

Answers: This demonstrates the presence of a very small, heavy body within the atom known as the nucleus and the positive charge of the atom occupies very little space.

Q-6: The nucleus of deuterium contains

- a) $1p + 1e^-$
- b) $2p + 0n$
- c) $1p + 1n$
- d) $2p + 2n$

Answer: a) and c)

Explanation: Deuterium is a hydrogen isotope made up of one proton, one neutron, and one electron.

Q-7: Which of the following electron-related statements is false?

- a) It is a component of cathode rays
- b) It is a negatively charged particle
- c) An electron has the same mass as a neutron.
- d) It is a fundamental constituent of all atoms.

Answer: c) An electron has the same mass as a neutron.

Explanation: The mass of an electron is very very small as compared to the mass of a neutron.

Q-8: How will you determine the valency of the following?

- a) Calcium
- b) Oxygen
- c) Neon

Answer: The number of electrons gained, lost, or shared to form the octet of electrons in the outermost shell gives us the element's combining capacity directly. The combining capacity of an element is referred to as its valency.

- a) Because calcium has two electrons in its outermost shell, it must lose two electrons to achieve the octet configuration. As a result, its valency is 2.
- b) Because oxygen has 6 electrons in its outer shell, it will gain 2 electrons to achieve stability. As a result, its valency is 2.
- c) The valence shell of neon contains 8 valence electrons. It is stable. As a result, its valency is zero because it will not gain or lose electrons.

Q-9: Which of the following does not exhibit path deflection when passing through an electric field?
Proton, electron, cathode rays, neutrons, alpha particles

Answer: Neutron

Explanation: A neutral particle is a neutron. As a result, when it passes through an electric field, it will not be deflected.

Q-10: Find the number of valence electrons in the following

- a) Na^+

- b) Cl^-
d) C

Answers: The valence shell is the final shell into which the electron enters. And such electrons are called valence electrons.

- a) The electronic configuration of Na^+ is 2,8. It has eight valence electrons.
b) The electronic configuration of Cl^- is , 2,8,8. It has 8 valence electrons
c) The electronic configuration of C is , 2,4. It has 4 valence electrons

Q-11: What are the various uses of isotopes?

Answers:

- (i) In nuclear reactors, an isotope of uranium is used as fuel.
(ii) A cobalt isotope is used in cancer treatment.
(iii) Iodine isotopes are used in the treatment of goitre.

Q-12:

- a) What is Thomson's model of atom?
b) Why are Bohr's orbits called stationary orbits?

Answer:

a) Thomson proposed that an atom is a sphere of positive electricity with embedded electrons that are enough to neutralise the positive charge. The atom's stability was explained as a result of a balance between repulsive forces between electrons and their attraction to the centre of the positive sphere. This model is compared to a watermelon with embedded seeds. This is why this model is also known as the water melon model.

- b) This is due to the fixed energies of the orbits in which the electrons revolve

Q-13: Complete the following table:

Particle	Atomic number	Neutrons	Protons	Electrons	Mass number
Aluminium ion	13			10	
Nitrogen atom		7		7	
Phosphorus Atom			15		31
Bromine		45			80
Calcium ion		20	20		

Answer:

Particle	Atomic number	Neutrons= Mass number-Atomic number	Protons = Atomic number	Electrons	Mass number
Aluminium ion(Al^{3+})	13	14	13	10	27
Nitrogen atom	7	7	7	7	14
Phosphorus Atom	15	16	15	15	31
Bromine	35	45	35	35	80
Calcium ion(Ca^{2+})	20	20	20	18	40

Q-14: Which of the following electron configurations is correct for a magnesium atom?

- a) 2,8
- b) 2,2,8
- c) 2,8,2
- d) 8,2,2

Answer: c) 2,8,2

Explanation:

The atomic number of magnesium is 12. The number of protons in a neutral atom equals the number of electrons. The number of protons is measured by the atomic number. It means that the K,L,M,N shells must be filled with 12 electrons. As a result, the correct configuration is: 2,8,2.

Q-15: What is the maximum number of electrons that an M-shell can hold?

- a) 8
- b) 18
- c) 16
- d) 32

Answer: b) 18

Explanation: The formula $2n^2$ gives the maximum number of electrons present in a shell, where 'n' is the orbit number or energy level index, 1,2,3,....

M-shell represents the 3rd orbit, that is, $n=3$

Therefore, maximum number of electrons = $2(3)^2=18$

Q-16:

Assertion: All isotopes of the given element show the same type of chemical behaviour

Reason: The chemical properties of an atom are controlled by the number of electrons in the atom.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true and R is not the correct explanation of A.
- c) A is true and R is false
- d) Both A and R are false

Answers: a)

Explanation: Any element's isotopes have the same atomic number and thus the same number of protons and electrons. Because electrons participate in the chemical reaction, atoms with the same number of electrons exhibit the same chemical behaviour.

Q-17: In each of the following cases, identify the element:

- i) An element's trivalent anion with ten electrons
- ii) An element's trivalent cation with ten electrons

What is the name of the relationship between the two ions?

Answers:

- i) Nitrogen, Its trivalent anion is N^{3-}
- ii) Aluminium, its trivalent cation is Al^{3+}

They are isoelectronic because they have the same number of electrons.

Q-18: Fill in the blanks

- a) Elements are defined by the number of _____ they possess.
- b) _____ is the combining capacity of an atom.
- c) The mass of a proton is _____ - unit.
- d) The chemical properties of isobars are _____
- e) According to Dalton's atomic theory an atom is _____ and _____

Answers:

- a) protons
- b) Valency
- c) one
- d) different
- e) indivisible, indestructible

Q-19: What do you mean by canal rays?

Answer: Canal rays are positively charged radiations made up of particles with the same magnitude but opposite sign as the electron. They are, in other words, a beam of positive ions produced by certain types of gas discharge tubes.

Q-20: Write the correct symbol for the atom with the given atomic number(Z) and atomic mass(A).

i) $Z=9$, $A=19$

II) $Z=92$, $A=233$

III) $Z=3$, $A=7$

Answer:

I) ${}_9^{19}\text{F}$

II) ${}_{92}^{233}\text{U}$

III) ${}_3^7\text{Li}$