CBSE TEST PAPER-01

CLASS - XI CHEMISTRY

(Structure of Atom)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

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1. Name the sub – atomic particles of an atom. [1]
2. Name the scientist who first formulated the atomic structure. [1]
3. What is the e/m ratio of an electron? [1]
4. What is the charge (e) of an electron? [1]
5. What is the mass (m) of an electron? [2]
6. (i) What is the mass of a proton? [1]

(ii) What is the charge of a proton? [1]

7. (i) What is the mass of a neutron? [1]

(ii) What is the charge of a neutron? [1]

8. Which experiment led to the discovery of electrons and how? [2]
9. Give the main properties of canal ray experiment. [2]

CBSE TEST PAPER-01

CLASS - XI CHEMISTRY [ANSWERS]

Ans1. Electron, proton and neutron.

Ans2. John Dalton, a British teacher in 1808 first proposed a firm scientific basis known as Dalton's atomic theory.

Ans3. According to Thomson's experiment, e/m ratio for an electron is $1.76\times10^{8}cg^{-1}$

Ans4. From Millikan's experiment, the charge of an electron (e) is $-1.602\times10^{-19}C.$

Ans5. mass of an electron (m) = $\frac{e}{\left(e/m\right)}$

$$=\frac{1.602\times10^{-19}C}{1.76\times10^{8}Cg^{-1}}$$

$$=9.10\times10^{-28}g$$

$$=9.1\times10^{-31}kg$$

So, the mass of an electron is $=9.1\times10^{-31}kg$ or $1/1837$ th of the mass of a hydrogen atom.

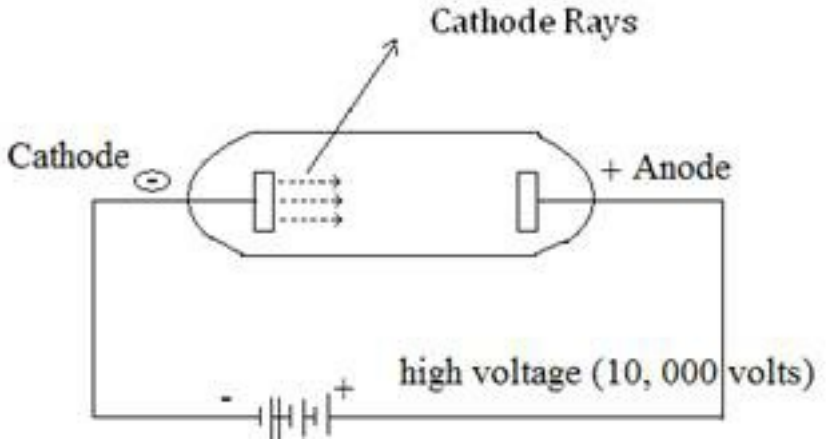
Ans6. (i) The mass of a proton is $1.676\times10^{-27}kg$ or 1.676×10^{-24}

(ii) The charge of a proton is $+1.602\times10^{-19}C$

Ans7. (i) The mass of a neutron is $1.676\times10^{-24}g$

(ii) Neutron is electrically neutral i.e. it has no charge as an electron or a proton has.

Ans8. The cathode ray discharge tube experiment performed by J.J. Thomson led to the discovery of negatively charged particles called electron.



A cathode ray tube consists of two thin pieces of metals called electrodes sealed inside a glass tube with sealed ends. The glass tube is attached to a vacuum pump and the pressure inside

the tube is reduced to 0.01mm. When fairly high voltage (10, 000V) is applied across the electrodes, invisible rays are emitted from the cathode called cathode rays. Analysis of this rays led to the discovery electrons.

Ans9. The canal ray experiment led to the discovery of –

(i) The anode rays, travel in straight line

(ii) They are positively charged as they get deflected towards the –ve end when subjected to an electric and magnetic field.

(iii) They depend upon the nature of gas present in the cathode tube.

(iv) The charge to mass ration (e/m) of the particle is found to depend on the gas from which they originate.

(v) They are also material particles

The analysis of these proportions led to the discovery of positively charged proton.

CBSE TEST PAPER-02

CLASS - XI CHEMISTRY

(Structure of Atom)

General Instruction:

- All questions are compulsory.
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1. Name the scientist who first gave the atomic model. [1]
2. What is an isotope? [1]
3. What are isobars? [1]
4. What are isotones? [1]
5. What is an atomic number? [1]
6. What is a mass number? [1]
7. Find out atomic number, mass number, number of electron and neutron in an element $^{40}_{20}\times$? [2]
8. Give the main features of Thomson's Model for an atom. [2]
9. Give the drawbacks of J.J. Thomson's experiment. [1]
10. What did Rutherford conclude from the observations of $\alpha - ray$ scattering experiment? [2]
11. Why Rutherford's model could not explain the stability of an atom? [1]

CBSE TEST PAPER-02

CLASS - XI CHEMISTRY [ANSWERS]

Ans1. J.J. Thomson, in 1898 first proposed the atomic model called raising-pudding model.

Ans2. Atoms of the same elements having same atomic number but different mass number are called isotopes.

$eg: {}_{1}^{1}H, {}_{1}^{2}H \ and \ {}_{1}^{3}H$

${}_{17}^{35}Cl, {}_{17}^{37}Cl \ / \ {}_{6}^{12}C, {}_{6}^{13}C, {}_{6}^{14}C$

Ans3. Atoms of different elements which have same mass number but different atomic nos.

eg: ${}_{6}^{14}C, {}_{7}^{14}N$

${}_{18}^{40}Ar, {}_{19}^{40}K, {}_{20}^{40}Ca$

Ans4. Atoms of different elements which contains the same number of neutron.

eg. ${}_{6}^{14}C, {}_{7}^{15}N, {}_{8}^{16}O$

Ans5. Atomic number is defined as the number of protons presents in the nucleus of an atom or the number of electron present in a neutral atom of an element.

Ans6. Maas number of an element is the sum of number of proton and neutron present in the nucleus of an atom.

Ans7. The mass no. of $\times$ is 40

The atomic no. of $\times$ is 20

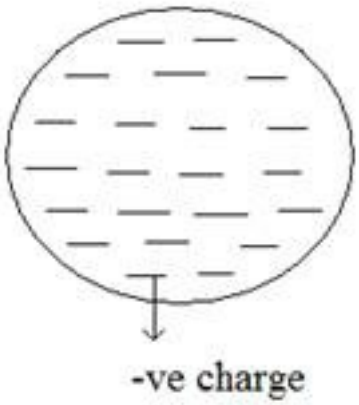
No. of proton is = Z – A = 40 – 20 = 20

No. of electron its (A) = 20

No. of proton is (A) = 20

Ans8. J.J. Thomson proposed that an atom consists of a spherical sphere (radius of about 10^{-10}m)in which the positive charges are uniformly distributed the electrons are embedded into it in such a manner so as to give stable electrostatic arrangement.

This model is also called raisin pudding model.



Ans9. (i) It could not explain the origin of the spectral lines of hydrogen and other atoms,
(ii) It failed to explain scattering of $\alpha - particles$ in Rutherford's scattering experiment.
Ans10. Rutherford proposed the nuclear model of an atom as
(i) The positive charge and most of the mass of an atom was concentrated in an extremely small region. He called it nucleus.
(ii) The nucleus is surrounded by electrons that move around the nucleus with a very high speed in orbits.
(iii) Electron and nucleus are held together by electrostatic forces of attraction.
Ans11. According to the electromagnetic theory of Maxwell, charged particles when accelerated should emit electromagnetic radiation. Therefore, an electron in an orbit will emit radiation; the orbit will then continue to shrink which does not happen in an atom.

CBSE TEST PAPER-03

CLASS - XI CHEMISTRY

(Structure of Atom

General Instruction:

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1. Give the range of wavelength of the visible spectrum. [1]
2. State the two developments that led to the formation of Bohr's model of atom. [1]
3. What is an electromagnetic radiation? [1]
4. Calculate the wavelength corresponding to a frequency of 98.8MHz. [2]
5. Define black body radiation. [1]
6. Define quantum. [1]
7. Give the relation of energy (E) and frequency (v) as given by Planck. [2]
8. Calculate the frequency and energy of a photon of radiation having wavelength 3000 $\overset{0}{A}$. [2]
9. What did Planck's theory explain? [1]
10. On what frequency does the frequency from a black body depend? [1]

CBSE TEST PAPER-03

CLASS - XI CHEMISTRY [ANSWERS]

Ans1. 400nm to 750nm

Ans2. (1) Dual character of the electromagnetic radiations i.e. wave like and particle like properties, and

(2) Atomic spectra explained only by assuming quantized electronic energy levels in atoms.

Ans3. When electrically charged particles moves under acceleration, alternating electrical and magnetic fields are produced and transmitted. These fields are transmitted in the form of wave called electromagnetic waves or radiations.

Ans4. Wavelength, $\lambda = \frac{c}{v}$

Substituting $c = 3 \times 10^8 m / \sec$

And $v = 98.7 MHz$

$= 98.7 \times 10^6 cyles / ses$

$\left(\because 1MHz = 10^6 cycles / \sec\right)$

$$\therefore \lambda = \frac{3 \times 10^8 m / \sec}{98.7 \times 10^6 / \sec} = 3.0395 m$$

Ans5. The ideal body, which emits and absorbs all frequencies, is called a black body and the radiation emitted by such a body is called black body radiation.

Ans6. Quantum is the smallest quantity of energy that can be emitted or absorbed in the form of electromagnetic radiation.

Ans7. The energy of quantum (E) is directly proportional to the frequency (v) of the radiation.

$E \alpha v$

$or, E = hv$

$or, E = \frac{hv}{\lambda}$ $where\ v = \frac{c}{\lambda} and$

$c = velocity\ and \lambda = wavelenght.$

'h' Planck's constant = $6.626 \times 10^{-34} JS.$

Ans8. (i) Frequency, $v = \frac{c}{\lambda}$

We know, $c = 3 \times 10^8 m/s$

$\lambda = 3000 \overset{0}{A} = 3000 \times 10^{-10} m.$

$\therefore \nu = \frac{3 \times 10^8 m/s}{3000 \times 10^{-10} m} = \frac{3 \times 10^8 m/s}{3 \times 10^3 \times 10^{-3}}$

$= \frac{1 \times 10^8}{1 \times 10^{-7}} \sec^{-1} = 1 \times 10^{15} \sec^{-1}$

(ii) Energy of the photon E = hv

We know, $E = 6.625 \times 10^{-34} \times 10^{15}$

$= 6.625 \times 10^{-19} joules$

Ans9. Planck was able to explain the distribution of intensity in the radiation from black body as function of frequency or wavelength at different temperature.

Ans10. The exact frequency distribution of the emitted radiation from a black body depends only on its temperature.