



CHEMISTRY

BOOKS - BHARATI BHAWAN CHEMISTRY (HINGLISH)

ATOMIC STRUCTURE



1. The atomic number of an element is 12. How many protons and electrons are there in an

atom of the element ?

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2. The nucleus of an atom of an element contains 11 protons and 12 neutrons . Determine the atomic number and mass number of the element.

3. The atomic number and the mass number of an element M are 12 and 24 respectively . Calculate the number of neutrons in an atom of the element.

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4. An element has 2 electrons in the M shell.

What is the atomic number of the element ?

5. Which of the two elements would be more reactive, element A of atomic number 36 or element B of atomic number 19 ?

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6. The valency of hydrogen is 1, magnesium, 2 aluminium 3 and carbon 4 . Can you see any connection between the valency of an element and the number of electrons it has in its outermost electron shell ? What would you predict the valencies of helium (He), phosphorus (P), sulphur (S) and neon (Ne) to

be ?



7. What is the number of valence electrons in the atom of an element A having atomic number 17 ? Name the valence shell of this atom.

8. Natural chlorine consists of two isotopes : 75% ${}^{35}_{17}Cl$ and 25% ${}^{37}_{17}Cl$. Calculate the average atomic mass of chlorine .

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9. A naturally occuring sample of lithium contains 7.42% of ${}^{6}Li$ and 92.58% ${}^{7}Li$. The relative atomic mass of ${}^{6}Li$ is 6.015 and that of ${}^{7}Li$ is 7.016. Calculate the atomic mass of a naturally occuring sample of lithium.





Objective Questons

- **1.** α Particels are
 - A. negatively charged particles
 - B. positively charged particles
 - C. neutral particles
 - D. positively charged particles having no

mass.

Answer: B



2. The element having no neutron in the nucleus of its atom is-

(a). hydrogen

(b). nitrogen

(c). helium

(d). boron

A. hydrogen

B. nitrogen

C. helium

D. boron

Answer: A

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3. In the helium atom, the number of electrons

in the L shell is

B. 2

C. 8

D. 6

Answer: A

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4. The particles present in the nucleus of an

atom are-

(a). the proton and the electron

(b). the electron and the neutron

(c). the proton and the neutron

(d). none of these

A. the proton and the electron

B. the electron and the neutron

C. the proton and the neutron

D. none of these

Answer: C

5. When a gas at reduced pressure is subjected to an electric discharge, the rays originating from the negative electrode are

A. anode rays

B. cathode rays

C. X-rays

D. radioactive rays

Answer: B

6. In Rutherford's gold foil experiment most of the α -particles pass through the gold foil without any deviation from their paths . This indicates that

- A. the atom is spherical
- B. there is a positively charged nucleus at
 - the centre of the atom
- C. the entire of mass of the atom is

concentrated at the nucleus of the atom

D. most of the atom is an empty space

Answer: D



7. The number of proton, neutrons and electrons in the nucleus of $._{11} Na^{23}$ are respectively

A. 23

B. 11

C. 34

D. 12





8. The charge/mass (e/m) ratio is maximum for

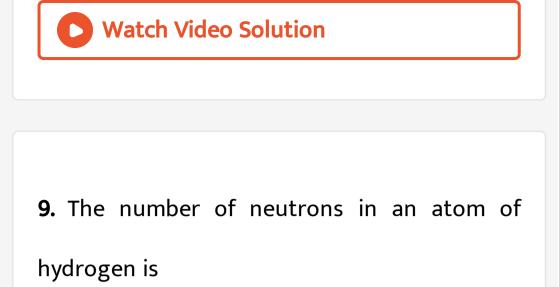
A. proton

B. neutron

C. electron

D. positron

Answer: C



- A. 1
- B. 2
- C. 0
- D. 3

Answer: C





10. The two elements A and B have the same atomi mass but their atomic numbers are 19 and 20 respectively. A and B are

A. isotopes

B. isobars

C. isomers

D. polymers







- **11.** Isotopes of an element are the atoms which have
 - A. the same number of protons in their nuclei
 - B. the same number of protons in their

nuclei

C. the same mass number

D. different number of electrons in their

orbits.

Answer: B



12. Elements having the same number of valence electrons in their atoms have similar

A. combining capacities

B. Chemical properties

C. atomic sizes

D. metallic characters

Answer: B

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13. The electronic configuration of an atom is

2,8,2 . The number of valence electrons in the atom is

B. 12

C. 8

D. 2

Answer: D

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Fill In The Blanks

1. Electrons are Charged particles.



2. The mass of a proton is amu.

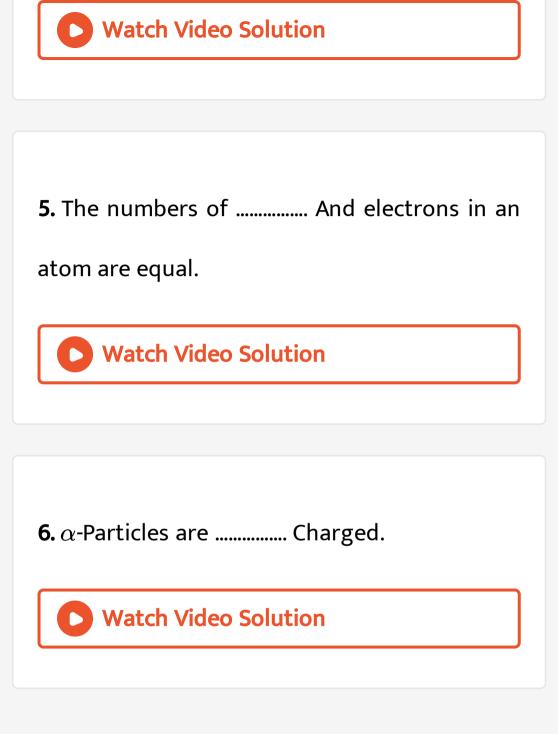
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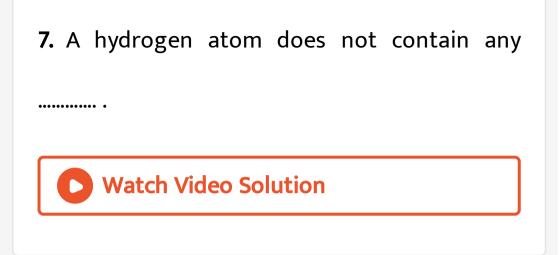
3. The proton is charged.

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4. is a fundamental particle which has no

charge.

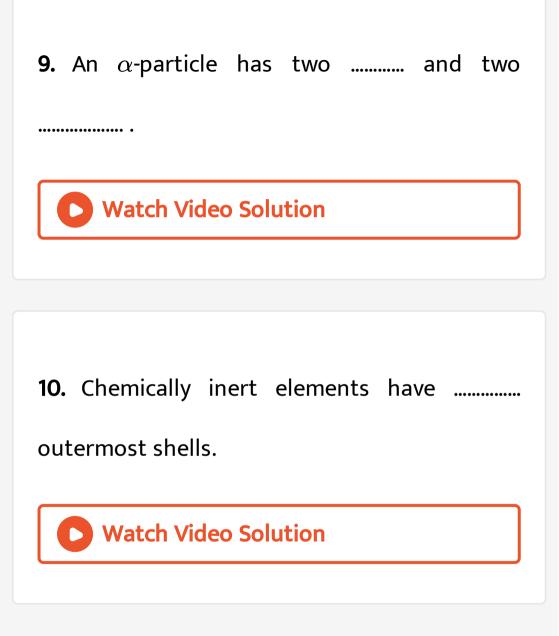




8. The atomic number of an element is equal

to the number of





11. Electrons in the outermost shell of an atom

are called

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12. Rutherford's nuclear model was modified

by

13. Electrons are responsible for the

chemical properties of an atom.

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Mark The Statement True T Or False F

1. Electrons are positively charged.

2. Isotopes of an element have the same atomic number.
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3. The number of protons and neutrons is

always equal in an atom of an element.

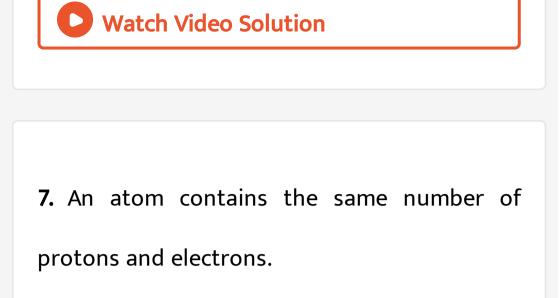
4. It was John Dalton who discovered the presence of the nucleus in an atom.
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5. Protrons and neutrons have almost the

same mass.



6. Hydrogen $\begin{pmatrix} 1\\ 1 \end{pmatrix}$ are isobars.

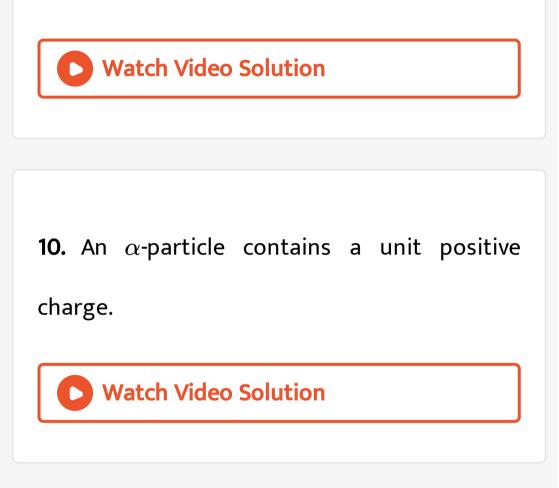


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8. Electron in an atom remains static at a fixed

distance from the nucleus .

9. The nucleus of an atom is neutral.



11. Helium is a noble gas with 2 electrons in its

outermost shell. Its valency is 0.





Very Short Answer Questions

1. Name the fundamental particles present in

an atom.

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2. Does the nature of cathode rays depend on

the nature of the cathode.

3. From which electrode do cathode rays

originate?



4. What happens to cathode rays when they

are subjected to an electric field?



5. What is the charge of an electron ? How many electrons make a coulomb of charge? Watch Video Solution 6. Where is the mass of an atom concentrated? Watch Video Solution

7. The particles present in the nucleus of an atom are-

(a). the proton and the electron

(b). the electron and the neutron

(c). the proton and the neutron

(d). none of these

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8. Where are the electrons in an atom found ?

9. What characteristic feature is seen in the configurations of chemically inactive elements



10. What is the maximum number of electrons

that can be accommodated in a shell? Write

formula.

?

11. Which atom contains only two fundamental

particles ?

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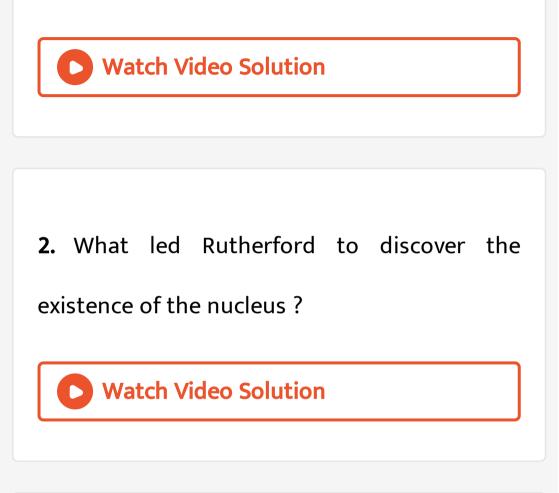
12. Which particle has constant charge to mass

ratio for all matter?

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Short Answer Questions

1. What is the nuclear model of the atom ?



3. Define atomic number.

4. Define a mass number ?



5. What are valence shell and valence

electrons?

6. Both ${}^{35}Cl$ and ${}^{37}Cl$ have the same valency . Why ?

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7. Why did Rutherford select a gold foil in his

lpha-ray scattering experiment ?

8. What would you conclude from the observation that cathode rays rotate a light paddle wheel placed in their path ?



9. what is the drawback of Rutherford's nuclear model of the atom ?



10. Calculate the atomic number of an element whose atomic nucleus has mass number 23 and neutron number 12. What is the symbol of the element ?

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11. Explain how is it that oxygen can be represented by the symbols ${}^{16}_{8}O$ and ${}^{8}_{8}O$ at the same time ?



1. What are cathode rays and how do they differ from positive rays ?

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2. Give experimental evidence to show that the entire mass of an atom is practically concentrated in its nucleus

3. Give experimental evidence to show that the

nucleus of an atom is positively charged.

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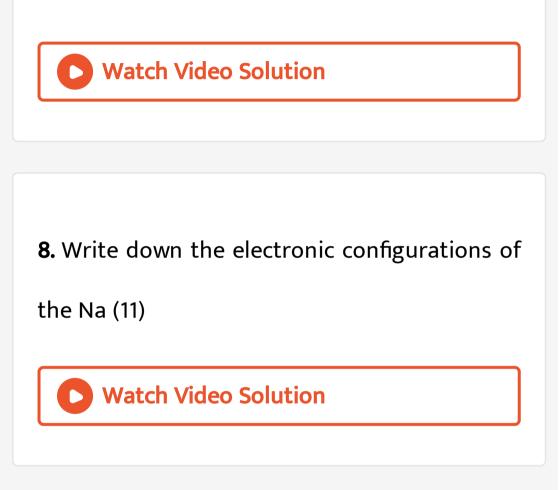
4. Describe Rutherford's α -ray scattering experimental and mention the observations derived from it. Cite and defect of Rutherford's model of the atom.

5. Derive a relatioship between the atomic number, mass number and number of neutrons in an atom.

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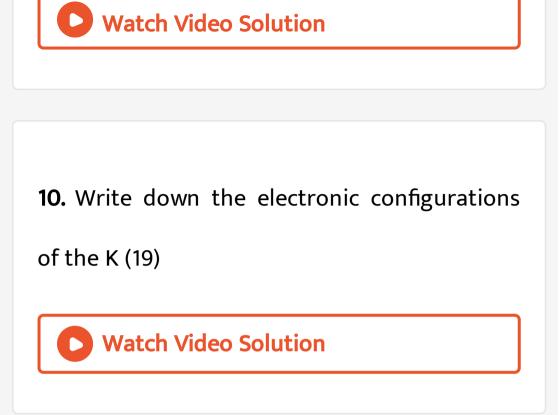
6. DISCOVERY OF ELECTRONS

7. Describe Bohr model of the atom.



9. Write down the electronic configurations of

the Cl^- (18)



11. What are isotopes and what are their characteristics ? Name two isotopes of hydrogen .

12. In bromine , the two isotopes are 49.7% $^{79}_{35}Br$ and $50.3\%\,^{81}_{35}Br$. Calculate the atomic mass of bromine .

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Numericals

1. A sample of an element X contains two isotopes $._8^{16} X$ and $._8^{18} X$. If the average atomic mass of this sample of the element be

16.2 u, calculate the percentage of the two

isotopes in this sample.



2. The atomic number of sodium is 11. How many protons are there in the nucleus of sodium atom ? How manu electrons does an atom of sodium contain ? How many electrons and protons does an ion of sodium which has a charge of +1 contain ?



3. Calculate the atomic number and the mass number of the element whose nucleus contains 11 protons and 12 neutrons.

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4. Give the number of neutrons in an atom of

the isotope $\frac{107}{47}Ag$.

5. Natural chlorine contains chlorine in the

form of the isotope

 $^{35}Cl(75.5~\%$) and $^{37}Cl(24.5~\%$). Calculate

the average atomic mass of natural chlorine.

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6. A naturally occurring sample of copper consists of 69.2% of ${}^{63}Cu$ is 62.93 and that of ${}^{65}Cu$ is 64.93 . Find the atomic mass of a naturally occurring sample of copper .

A Objective Questions I Match

1. Match the names of scientists given in column A with their contributions in column B.





2. Match the terms given in column A with their related terms given in column B.





li Fill In The Blanks

1. The on a proton is equal in magnitude

but opposite in sign to that of an



3. The are arranged in the empty space

around the of the atom .



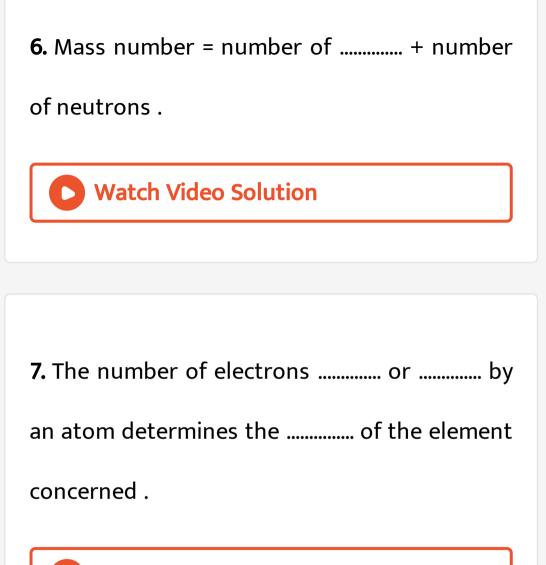
4. Helium and chlorine have atomic number 2 and 17 respectively. Their corresponding valencies are and



5. The first shell of an atom cannot contain

more than electrons .

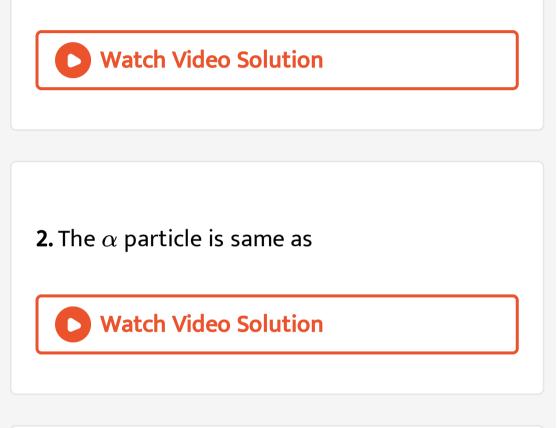




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lii Write Yes Or No

1. Is the atom as a whole positively charged ?



3. Are the number of protons and electrons in

an atom equal ?





4. Are elements identified by their atomic

masses?

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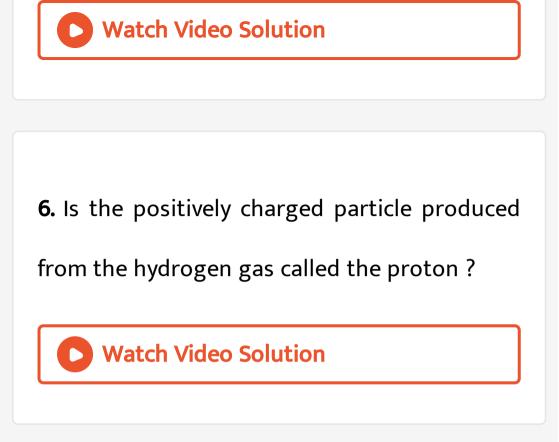
5. Isotopes of an element have :

(a) the same physical properties

(b) different chemical properties

(c) different number of neutrons

(d) different atomic numbers



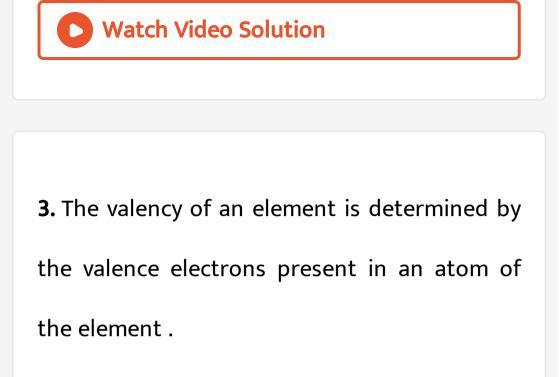
7. Do electrons in a particular orbit in an atom

possess a fixed amount of energy?

1. Thomson's model of the atom explains the arrangement of fundamental particles in the atom.

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2. Rutherford concluded from his α -ray scattering experiment that there exists a heavy and dense body at the centre of the nucleus.



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4. The two isotopes of carbon, C-12 and C-14,

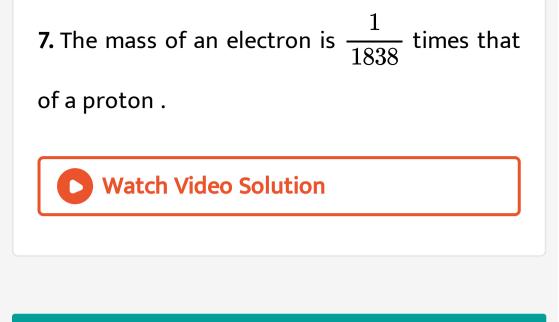
possess the same physical properties .



5. The cathode rays are produced when a gas at a very low pressure is subjected to an electric discharge .

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6. The atomic masses are always whole numbers .



V Multiple Choice Questions Pick The Correct Option S

1. Which of the following statements is (are) in conformity with Thomson's model of an atom

?

A. An atom is a uniform sphere of positive

charges with electrons embedded in it.

B. An atom is electrically neutral.

C. The mass of an atom is concentrated at

the centre of the atom .

D. Positive and negative charges in an atom

do not interact with each other .

Answer: A::B

2. Which of the following statements about the unreactive nature of noble gases is (are) true ?

A. The inner shells of noble gas atoms are

filled to capacity.

B. Noble gas atoms cannot give up

electrons to or accept electrons from

other atoms .

C. The valence shells of the atoms of noble

gases are filled to capacity.

D. None of these

Answer: B::C

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3. The presence of nulceus in an atom was first detected by

A. Dalton

B. Niels Bohr

C. Thomson

D. Rutherford

Answer: D

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4. What is the valency of the element with atomic number 36 and mass number 84 ?

A. 2

B.4

C. 0

D. 3

Answer: C

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5. Which of the following electronic configurations represents the atom of aluminium ?

A. 2,8,2

B. 2,8,4

C. 2,8,3

D. 2,8,7

Answer: B::D



6. Which of the following conclusions were

drawn from the α -rays scattering experiment?

A. The atom as a whole is positively charged.

B. The mass of the atom is concentrated at the centre of the atom . called the nucleus. C. The empty space around the nucleus is occupied by electrons in well-defined orbits.

D. The atoms as a whole may be assumed

to be an empty space.

Answer: A:B:C:D

7. Which of the following statements is (are) incorrect ?

A. Atomic number = number of neutrons +

number of electrons

B. Mass number = number of protons +

number of neutrons

C. Atomic number = number of neutrons

D. Atomic mass = number of neutrons

Answer: A::C:D



8. Which of the following statements about the anode rays is (are) wrong ?

A. The anode rays originate from the cathode .

B. The anode rays are deflected towards

the negative plate of an electric field.

C. The e/m ratio for the particles of the

anode rays is the same for all gases used

in the discharge tube .

D. The anode rays can rotate a light paddle

wheel placed in their path.

Answer: C

9. The numbers of protons , neutrons and electrons present in an atom of argon are , respectively,

A. 18,18 and 22

B. 22,18 and 18

C. 18,22 and 18

D. 18,16 and 18

Answer: C

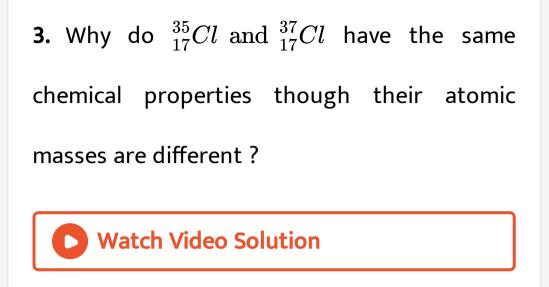
1. Name the element whose atom contains

only one proton and one electrons.

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2. Which atom contains only two fundamental

particles ?



4. The foil of which metal was used by Rutherford in his α -ray scattering experiment?



5. The atomic number of calcium is 20. What is

the number of electrons in its M-shell ?

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6. Name the scientist who proposed the concept of the distribution of electrons in discrete energy levels.

7. The atoms of two element A and B contain the same number of protons but different number of neutrons in their nuclei. What kind

of element are A and B?

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8. Which isotope is used in nuclear reactors ?

9. Which isotope is used to diagnose restricted circulation of blood ?
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10. What are isobars? Are the physical and

chemical properties of isobars similar?

11. What is the valency of the element with mass number 4 and atomic number 2?Watch Video Solution

12. Show by a diagram the distribution of electrons in sodium ion.

13. An element A is represented by ${}^{31}_{18}A$. Find the number of neutrons present in the nucleus of an atom of the element .



14. An atom of an element has two electrons in its outermost shell. Find the nature and value

of charge on the ion produced when these

tow electrons are lost .



15. Which one of the three fundamental particles is present in the cathode rays ?

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C Short Answer Questions

1. Why are noble gas unreactive ?

2. The atom of an element (not helium) contains two electrons in its valence shell . How will the atom complete its octet ?

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3. The mass number of fluorine is 19 and its atomic number is 9. Calculate the number of protons , electrons and neutrons in the fluorine atom. How will the fluorine atom form an ion ?

4. What is an electron? Give the values of charge and mass of an electron.



5. Though electrons are negatively charged , they do not move towards the positively charged nucleus and finally not fall on it . Why ?

6. Why are Bohr orbits called stationary states

?



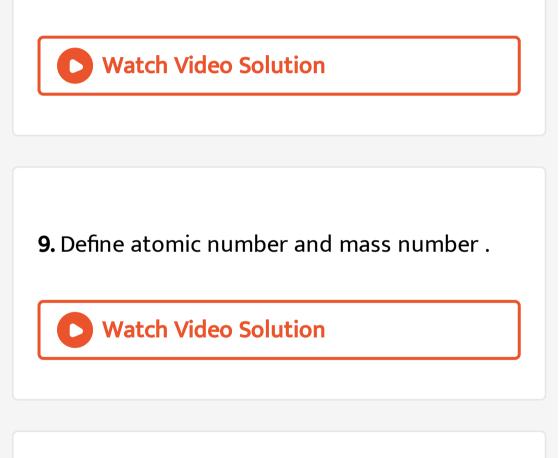
7. How was the neutrons discovered ? Mention

the characteristics of neutrons.



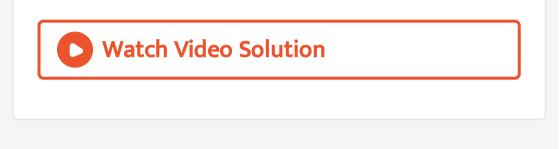
8. What are valence electrons ? Discuss any

two significance of valence electrons.



10. What are isotopes ? Give one example .

11. How are cations and anions formed ?

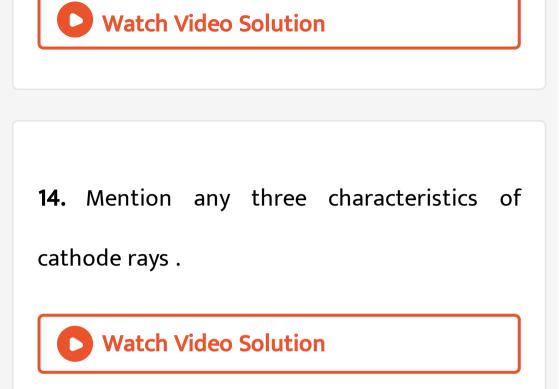


12. Most elements have fractional atomic

masses. ' Explain.



13. What are isobars ? Give one examples .



15. Give three points of distinaction between

isotopes and isobars.

16. Describe an experiment to show that cathode rays are made up of material particles.

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17. Compare the charge to mass ratio $(e \, / \, m)$

for the cathode rays and the anode rays .

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D Long Answer Questions

 Describe in brief the experiments to demonstrate that cathode rays
 (i) travel along straight path ,
 (ii) are made up of material particles ,
 (iii) are negatively charged .

2. Discuss in chronological order the

development of the structure of atom .

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3. Write two conclusions which have been derived from Rutherford's α -ray scattering experiment .ll

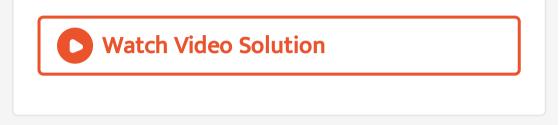


4. Mention the main postulates of Bohr theory

with respect to the structure of atom .

5. Explain the following : (i) mass number , (ii)

atomic number and (iii) isotopes .



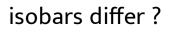
6. Does Rutherford's model suffer from some

limitations ? If yes, discuss them .

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7. What are isotopes ? Discuss the isotopes of

any two elements . How do isotopes and



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8. What observations in α-rays scattering experiment conducted by Rutherford led to the following inferences?
(i) Most of the space in the atom is empty.
(ii) The entire mass of the atom is cncentrated

in the nucleus .

(iii) The nucleus carries positive charge .



9. DISCOVERY OF ELECTRONS



10. Explain in brief the Bohr-Bury scheme of

the distribution of electrons in orbits .

11. Describe an activity to show that cathode

rays travel in straight lines .

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12. Crossword Puzzle

Solve the crossword puzzle as per the

guidelines given in the table below.



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