Solution

THE FUNDAMENTAL UNIT OF LIFE

Class 09 - Science

Section A

1.

(b) 20.98% and 79.02%

Explanation:

$10.8 = \frac{10.013x+(100-x)11.009}{100}$

$\Rightarrow$ 1080 = 10.013x + 1100.9 - 11.009x

$\Rightarrow$ x = 20.98%

$\therefore$ Abundance of B-10 = 20.98%

Abundance of B-11 = 100 - 20.98 = 79.02%

2.

(b) Na^+, O^{2-}, Ne

Explanation:

An Isoelectronic series is a group of atoms/ions that have the same number of electrons.

Examples: N^{3-}, O^{2-}, F^-, Ne, Na^+, Mg^{2+}, Al^{3+}

This series each have 10 electrons.

P^{3-}, S^{2-}, Cl^-, Ar, K^+, Ca^{2+}, Sc^{3+}

This series each have 18 electrons.

3.

(b) III

Explanation:

III option is correct as most of the alpha particles are undeflected while a few alpha particles are deflected through small and large angles.

4. **(a)** i and iv only

Explanation:

Atomic number = Number of protons

W	Y	U	X	V
17	18	19	35	53

Increasing order of atomic number

Mass number = Number of protons + Number of neutrons

W	U	Y	X	V
35	39	40	80	127

Increasing order of mass number

5.

(d) Al

Explanation:

Number of electrons = 2 + 8 + 3 = 13.

The atomic number 13 belongs to the element Aluminum (Al).

6.

(b) $^{31}_{15}X$

Explanation:

An element that contains 15 electrons is Phosphours(P).
Now mass of this element = No. of electrons = No. of neutrons = 15 = 16 = 31.
So, the representation of the element is ${}^{31}_{15}X$.

7.

(b) the mass and the positive charge of an atom are concentrated in the nucleus.
Explanation:
The Rutherford's Model of an Atom is as follows:

i. Most of the part in an atom is empty.
ii. There is a positively charged center in an atom, which contains nearly the whole mass of the atom. The center is called the nucleus.
iii. The size of the nucleus is very small compared to an atom.
iv. Electrons revolve around the nucleus.

8.

(c) X and Y have different physical properties.
Explanation:
X and Y have same number of protons but different number of neutrons i.e., same atomic number but different mass numbers hence, these are isotopes. Isotopes have same chemical properties but different physical properties.

9.

(b) 1
Explanation:
Atomic number = Number of protons = 3
Mass number = Number of protons + number of neutrons =3 + 4 = 7
Electronic configuration of the atom is 2,1(K,L)
Hence, its valency is 1.

10. **(a)** E = 10, P = 9, N = 10
Explanation:
Atomic number = 9
Mass number = 19
No of electron = No. of neutrons = 19 – 9 = 10
No. of proton = 19 – 10 = 9

11.

(b) 12, 13 and 24.32
Explanation:
No. of protons in ${}^{26}Mg$ = 12
No. of neutrons in ${}^{25}Mg$ = 13
Relative atomic mass of Mg
$= \frac{(24\times 78.99)+(25\times 10)+(26\times 11.01)}{100}$
$= \frac{1895.76+250+286.26}{100} = 24.32$

12.

(c) charge as well as mass
Explanation:
A cathode ray is a beam of electrons and electrons have mass. When cathode rays are passed through an electric field created by applying a potential across the plates P1 and P2, it is found that the cathode rays particles get deflected towards the positive plate. This indicates that the cathode rays particles carry a negative charge on them. So, Cathode rays have a charge as well as mass.

13.

(b) The positively charged particles of atom move with very high velocity.

Explanation:

Conclusion of Rutherford's scattering experiment:

i. Most of the space inside the atom is empty because most of the α-particles passed through the gold foil without getting deflected.
ii. Very few particles were deflected from their path, indicating that the positive charge of the atom occupies very little space.
iii. A very small fraction of α-particles were deflected by very large angles, indicating that all the positive charge and mass of the gold atom were concentrated in a very small volume within the atom.
iv. Since a very less number of alpha particles deflected, hence the volume of the nucleus is very less compared to the whole atom. The size of the nucleus is less than 2×10^{-14} m while the size of an atom is around 10^{-10} m.
So, the positively charged particles of atom move with very high velocity do not include the conclusion of Rutherford's scattering experiment.

14.

(b) 0

Explanation:

Helium (He) has two electrons in its atom. The cation (He^{2+}) is formed through the loss of 2 electrons from the outer-most shell of the atom. Hence, the number of electrons in He^{2+} will be 0.

15.

(d) (i), (ii) and (iv)

Explanation:

Dalton's theory explained the law of conservation of mass, the law of constant composition, and the law of multiple proportions. Dalton's theory did not talk about any law of radioactivity.

16.

(b) A deuterium and an α - particle.

Explanation:

Deuterium and an α - alpha particle has identical e/m ratio. They both emit and absorb at the same frequencies. The e/m ratio of an alpha particle is 4.82245111×10^{7} C/kg which is identical with deuterium.

17.

(d) Different number of neutrons

Explanation:

Elements having same atomic number but different atomic masses are known as Isotopes. Isotope have the same number of protons (and electrons), but different numbers of neutrons.

18.

(c) remains constant

Explanation:

The $\frac{charge}{mass}$ on the type of ray one is passing. Since we are talking about electron the cathode ray particles are nothing but a beam of electrons. Since the charge, as well as mass, is constant for electron no matter any gas we take in during the experiment in the discharge tube. So, their charge/mass ratio remains constant for electron.

19. **(a)** Deuterium

Explanation:

Hydrogen element has three isotopes: protium, deuterium, and tritium having the same atomic number of 1 but different mass number 1, 2, 3 respectively. Deuterium is isotopes of hydrogen which contain the same number of electrons, protons, and neutrons.

20.

(c) 10

Explanation:

Mass number (A) of the element = 27

Number of neutrons in the atom = 14

Hence, the number of electrons in the atom

= Mass number (A) - number of neutrons in the atom

= 27 - 14 = 13

Since the ion of the element has 3 positive charges, so the number of electrons in the ion is 13 - 3 = 10.

The number of electrons in the ion is 10.

21.

(c) $C_6H_8N_2$

Explanation:

Ratio of elements C, H and N = 9 : 1 : 3.5

Whole number ratio of elements C, H and N = 18 : 2 : 7

Element	Ratio	Atomic mass	Atomic ratio	Simplest atomic ratio
C	18	12	$\frac{18}{12} = 1.5$	$1.5 \times 2 = 3$
H	2	1	$\frac{2}{1} = 2$	$2 \times 2 = 4$
N	7	14	$\frac{7}{14} = 0.5$	$0.5 \times 2 = 1$

Thus, empirical formula of the compound = C_3H_4N Empirical formula mass of the compound

$= 12 \times 3 + 1 \times 4 + 1 \times 14 = 36 + 4 + 14 = 54$

$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{108}{54} = 2$

Molecular formula = n $\times$ empirical formula

$= (C_3H_4N)_2 = C_6H_8N_2$

22.

(c) ${}_6C^{14}$

Explanation:

Carbon-14, ${}_6C^{14}$, or radiocarbon, is a radioactive isotope of carbon with an atomic nucleus containing 6 protons and 8 neutrons. Its presence in organic materials is the basis of the radiocarbon dating method.

23.

(d) (b) and (c) are correct

Explanation:

Different ions are formed by an atom through the gain or loss of electrons. Hence, the number of protons and neutrons remains the same.

24.

(d) The two oxygen atoms are isotopes

Explanation:

The two oxygen atoms have the same number electrons but different number of neutrons. So, two oxygen atom have same atomic number but different atomic masses. Elements having same atomic number but different atomic masses are known as Isotopes.

So, the two oxygen atoms are isotopes is true statement.

25.

(d) ${}_1^3H$

Explanation:

Number of neutron of ${}^{3}_{1}H$ = 3 – 1 = 2

Number of proton of ${}^{3}_{1}H$ = 1

N/p ratio ${}^{3}_{1}H = \frac{2}{1}$ = 2

N/P ratio of ${}^{235}_{92}U$ = 1.55

N/P ratio of ${}^{14}_{6}C$ = 1.33

N/p ratio of ${}^{222}_{88}Ra$ = 1.52

26.

(d) Chemical properties of elements

Explanation:

The number and arrangement of electrons in the outermost shell, or valence shell, produce the chemical properties of an atom. Atoms with filled valence shells are stable. Examples of stable atoms are Helium (He) with 2 valence electrons in the first shell. Neon (Ne) with 8 valence electrons in the second shell. Atoms with less than eight valence electrons tend to lose, gain, or share electrons with other atoms to have 8 valence electrons and become stable. There are, of course, exceptions to this "Octet Rule". Na has 1 valence electron. Na loses this electron (or Na is oxidized) and becomes the stable cation Na^+ with 8 valence electrons. Na^+ is the most abundant cation in seawater and extracellular fluid.

27.

(d) J.J. Thomson

Explanation:

J.J Thomson was the first one to give atom's model. Which is also called plum pudding model/ watermelon model/ Raisin model as in his atom's structure he said that atom is a positively charged sphere with negative charge embedded in it like black seeds embedded in watermelon.

28. **(a)** Atomic nucleus

Explanation:

Rutherford's alpha-particle scattering experiment was responsible for the discovery of the atomic nucleus. It was discovered in 1911 by **Ernest Rutherford** based on the 1909 Geiger–Marsden gold foil experiment.

29.

(b) Number of neutrons + Number of protons

Explanation:

Atomic number: The total number of protons in the nucleus of an atom gives us the atomic number of that atom. It is represented by the letter Z. All the atoms of a particular element have the same number of protons, and hence the same atomic number. Atoms of different elements have different atomic numbers.

Mass number: The number of protons and neutrons combined give us the mass number of an atom. It is represented using the letter ‘A.’ As both protons and neutrons are present in the nucleus of an atom, they are together called nucleons.

30. **(a)** Anion

Explanation:

An **anion** is formed by gaining electron(s) from other atoms. Hence, an anion contains more electrons than protons. On the other hand, a cation is formed through the loss of an electron(s). A neutral atom will have the same number of negatively-charged electrons as well as positively-charged protons.

31. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

32.

(d) A is false but R is true.

Explanation:

Electrons moving in the same orbit will not lose or gain energy. On jumping from higher to lower energy level, the electron will lose energy.

33.

(d) A is false but R is true.

Explanation:

The Octet rule states that the maximum number of electrons that the outermost shell of an electrically neutral and chemically stable atom can have is 8.

However, there is an exception: If the atom has only one shell, it can hold only 2 electrons. For example, hydrogen and helium can have only 2 electrons (duplet).

34.

(c) A is true but R is false.

Explanation:

A German scientist, E. Goldstein in 1886, modified the discharge tube and passed an electric current through it. He found that the positively charged rays were emitted from the anode in the discharge tube. These rays were called canal rays.

35.

(d) A is false but R is true.

Explanation:

Isobars are not identical in chemical properties because they have same mass number and different atomic numbers.

36.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Atom is electrically neutral because the number of protons (positively charged particle) is equal to the number of electrons (negatively charged particle).

37.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The positive charge has to be concentrated in a very small volume (nucleus) that repelled and deflected the positively charged α-particles.

38. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

39.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

The valency of an element represents the combining capacity of the element. It can also be defined as the number of electrons lost, gained, or shared by its atom during a chemical combination. The outermost shell or orbit of an atom is known as the valence shell or valence orbit.

40. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Rutherford’s atomic model could not explain how moving electrons could remain in their orbits. Any charged particle during acceleration would radiate energy, and while revolving, it would lose its energy and eventually fall into the nucleus. This means that the atom would be highly unstable. But, the matter is composed of stable atoms. Thus, the major drawback of Rutherford’s atomic model was that it could not explain the stability of atoms.

Section B

41. From the given symbol of 'X', we have mass number = 31 and atomic number = 15.

No. of protons = Atomic number = 15 ... (1)

Mass number = 31

or No. of protons + No. of neutrons = 31

or Number of neutrons = 31 - Number of protons

or Number of neutrons = 31 - 15 [From (1)]

or Number of neutrons = 16

The number of neutrons present in the nucleus of an element ${}^{31}_{15}X$ is **16**.

42. The total of α-particles used for bombardment = 1 mole = 6.022 $\times 10^{23}$ particles.

Percentage of α-particles deflected more than 50° = 1% of a-particles. (Given)

Percentage of α-particles deflected less than 50° = 100 - 1 = 99%

Actual number of particles deflected at an angle less than 50°= $\frac{99}{100} \times$ 6.022 $\times 10^{23} = \frac{596.178}{100} \times 10^{23}$ = 5.96 $\times$ 10^{23}

43. For the scattering experiment, Rutherford wanted a metal sheet which could be as thin as possible. Gold is the most malleable of all known metals. It can easily be converted into very thin sheets. Hence, Rutherford selected a gold foil for his alpha-ray scattering experiment.

44. Limitations of Thomson's model of an atom

(i) Thomson's model of the atom fails to explain Rutherford's α-particle scattering experiment in which most of the fast moving α-particles passed straight through the gold foil.Only Some of the α-particles were deflected by the foil by small angles.Which clearly established atom has a lot of empty space and positive charge is concentrated in a very small volume within the atom.

(ii) It did not have any experimental evidence in its support.

(iii) It could not account for the scattering of α-particles through large angles.

45. Atom (a) has zero valency since it has 8 electrons in the valence shell and has achieved a stable configuration. Atom (b) has a valency of 1 since it has 7 electrons in the valence shell.

Atom (b) can accept on more electron in order to achieve a stable (octet) configuration.

46. **When a α-particle is released, the atomic number decreases by 2-units and mass number decrease by 4- units.**

So, C element -emits a α-particle so,

${}^{A}_{Z}C \rightarrow {}^{A-4}_{Z-2}C + {}^{4}_{2}He$

The resultant element will have its atomic number decreases by 2 units and the mass number decreases by 4 units.

When a β particle is released by 1 unit and mass number remains the same.

B element emits a β-particle, so,

${}^{A}_{Z}B \rightarrow {}^{A}_{Z+1}B + {}^{0}_{-1}e$

The atomic number of B increases by 1 unit and mass number remains same.

47. An element is represented as ${}^{A}_{Z}X$ where ***X*** is the symbol of the element;

Z = Atomic number; **A** = Mass Number.

Z = Atomic Number = Number of protons = Number of electrons

A = Mass Number = Number of protons + Number of neutrons

	Ion	**Number of electrons**	**Z**	**N**	**A**
a)	${}^{86}Rb^{+}{}_{37}$	36	37	49	86
b)	${}^{24}Mg^{2+}{}_{12}$	10	12	12	24
c)	${}^{80}Br^{-}{}_{35}$	36	35	45	80

48. The relative atomic mass is the average mass of the naturally occurring stable isotopes of an element.Chlorine exist as two stable isotopes i.e. ^{35}Cl and ^{37}Cl in ratio 3:1 respectively.Therefore Relative atomic mass of chlorine is taken as average of both stable isotopes.

Natural chlorine always contains about $\frac{3}{4} \times {}^{35}_{17}Cl$ and $\frac{1}{4} \times {}^{37}_{17}Cl$

Therefore, relative atomic mass of chlorine = $\frac{3}{4} \times$ 35 + $\frac{1}{4} \times$ 37 = 35.5

49. Isotopes of hydrogen are: Protium $_1H^1$ (1 proton, 0 neutron), Mass no. :1,

Deuterium $_1H^2$ (1 proton, 1 neutron), Mass no.: 2

Tritium $_1H^3$ (1 proton, 2 neutrons), Mass no.: 3

50. Let the percentage of B – 10 isotope = *x*

∴ the percentage of B – 11 isotope = 100 – *x*

From the information, the average atomic mass of boron = $\frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100}$

But the given average atomic mass of boron = 10.8 u

$\therefore \frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100} = 10.8u$

$10x + 1100 - 11x = 10.8 \times 100$

$-x + 1100 = 1080$

$-x = 1080 - 1100$

$-x = -20$

$x = 20$

∴ Percentage abundance of B – 10 isotope = 20%

Percentage abundance of B – 11 isotope = 100 – 20 = 80%

51. Since 6 electrons are already present in the outermost shell of the atom, this element requires two more electrons in order to acquire the noble gas configuration. When the atom accepts 2 more electrons , the charge on the ion formed would be -2.
52. Number of electrons in Al = Number of protons in Al = Atomic number (Z) of Al = 13

    Number of electrons in Al^{3+} = 13 - 3 = **10**

    Number of electrons in Cl = Number of protons in Cl = Atomic number (Z) of chlorine = 17

    Number of electrons in Cl^- = 17 + 1 = **18**
53. Helium has two electrons (duplet configuration) in its only energy shell, while neon and argon have eight electrons (octet configuration) in their valence shells. As these have the maximum number of electron in their valence shells, they do not have any tendency to combine with other elements. Hence, they have zero valency.
54. No, these are not identical because the isobars have different atomic numbers as well as different electronic configurations. Isotope compound have same number of electrons. Isotopes have same chemical properties as the number of electrons present in them are same because only electrons participate in chemical reactions. While isobar compounds have same mass number but different atomic number and chemical properties depend upon number of electrons so isobars have different chemical properties.
55. When the single electron present in the outer most shell of the atom of an element X is removed, the atom loses negative charge and forms a positively charged ion with +1 charge. The value of the net charge on the ion will be equal to the amount of charge present on one electron.
56. The atomic masses of most of the elements are in fractions and not whole numbers. For example atomic mass of chlorine is 35.5. The reason for fraction atomic masses is that most of the elements exist in the form of two or more isotopes. These isotopes have different relative masses. In such cases atomic mass of the element is equal to the average of relative masses of various isotopes of the element. While taking average the results appear as fractions.

    As an illustration, let us consider the case of chlorine. Chlorine exists in the form of two isotopes Cl-35 and Cl-37, and their relative abundance is about 75% and 25% respectively. The average atomic mass of Cl can be calculated as given below:

    Atomic mass of Cl = $\frac{35 \times 75 + 37 \times 25}{100}$ = 35.5

    Thus, atomic mass of Cl is 35.5, which is a fraction.
57. As per **Thomson's model of an atom**, the number of electrons (negatively-charged particles) inside an atom is equal to the number of protons (positively-charged particles). The amount of charge on an electron and that on a proton is equal in magnitude. Hence, the positive and negative charges are balanced by each other. The balancing of equal and opposite charges makes the **atom neutral as a whole**.
58. Isotopes are atoms of the same element having the same atomic number and different mass number. Isotopes of an element have the same atomic number because they contain the same no. of protons (and electrons). Isotopes of an element have different mass no. because they contain different no. of neutrons.

    There are 3 isotopes of hydrogen:-

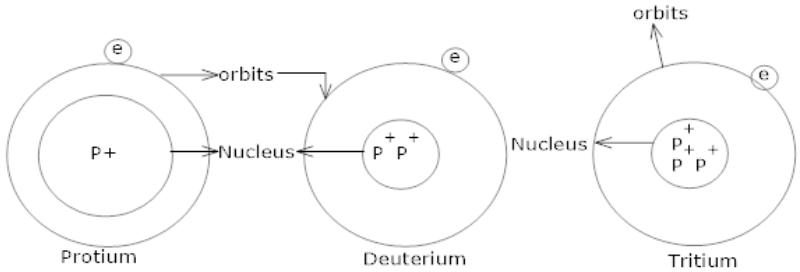
    i. Protium =. ${}_1^1H$ Protium does not have a special symbol.

    ii. Deuterium =. ${}_1^2H$ .The special symbol of deuterium is D.

    iii. Tritium = ${}_1^3H$. The special symbol of tritium is T.

    p^+ = Proton

    e^- = electron.



59. a. **Atomic Number** is defined as the total number of protons present in one atom of an element.It is denoted by the letter **Z. The atomic number of element = Number of protons in one atom of an element.**
    b. **The mass number** is defined as the total number of protons and neutrons present in one atom of an element.It is denoted by the letter **A**. **Mass number = No. of protons + No. of neutrons**
60. Only valence electrons of an atom take part in bond formation with different atoms. In the atom of element 'X', there are only two electrons since atomic number is 2 and the number of electrons is equal to the number of protons. Thus, K shell for this atom is fully filled. Hence, its valency is zero. Atoms of element 'X' will not react with other atoms of different elements.
61. **For carbon atom**
    Number of electrons = Atomic number = 6
    Electron distribution : 2 (K - shell) ; 4(L - shell)
    For sodium atom :
    Number of electrons = Atomic number = 11
    Electron distribution: 2 (K - shell) ; 8(L - shell) ; 1 (M - shell)
62. The molecular mass of sucrose $C_{12}H_{22}O_{11}$ is**:**
    = 12(12) + 22(1) + 11(16)
    = 144 + 22 + 176
    = 342 g/mol

342g of sucrose contains	C	H	O
	144g	22g	176g
100g of sucrose contains	$\frac{100\times144}{342}$	$\frac{22\times100}{342}$	$\frac{176\times100}{342}$
	42.11g	6.43g	51.46g

The composition by mass of sucrose is Carbon = 42.11 percent, Hydrogen = 6.43 percent and Oxygen = 51.46 percent.

Section C

63.

Proton	Neutron	Electron
(i) It is positively-charged sub-atomic particle.	(i) It is neutral sub-atomic particle.	(i) It is negatively-charged sub-atomic particle.
(ii) Its mass is equivalent to a hydrogen atom i.e. 1 a.m.u	(ii) It mass is equal to the mass of a proton.	(ii) Its mass is 1/1838 of the mass of a proton.
(iii) It is present inside the nucleus of an atom.	(iii) It is also found inside the atomic nucleus.	(iii) It is found outside the nucleus of an atom.

64. The mass and charge of the nucleus of an atom of any element is found to be whole number multiple of the mass and charge of a proton. Hence, protons are constituents of all atoms.
65. The mass number of X = Number of protons + Number of neutrons = 6 + 6 = 12
    The mass number of Y = Number of protons + Number of neutrons = 6 + 8 = 14
    Since the number of protons (6) in the two species is the same and the atomic mass of the two species is different (12 and 14), the given atomic species are isotopes of the same element (with atomic number Z = 6).
66. i. Valency = 0 [∵ number of valence electrons = 8]
    ii. Valency = 5 [∵ number of valence electrons = 3]
    iii. Valency = 2 [∵ number of valence electrons = 6]
67. i. D and E have the same mass number but different atomic numbers. Hence, they are a pair of isobars.
    ii. Electronic configuration of C is 2(K), 5(L). Hence, its valency is three because it gains three electrons to attain a stable electronic configuration.

iii. For a neutral atom, Number of electrons = Number of protons

Thus, electrons and protons are equal in numbers in a neutral atom.

68. i.

Particles	Discoverer
Electrons	J.J. Thomson
Protons	Rutherford
Neutrons	Chadwick

ii. View point in support of scientist as he discourages superstition.

69. i. Sample A has more protons than electrons. Hence, it is a cation.

ii. Sample B and C have same mass number (Mass number = Number of protons + number of neutrons = 37) but different atomic numbers (i.e. 18 and 17respectively). Hence, they are a pair of isobars.

iii. Samples C and D have same atomic number but different mass numbers. Hence, they are a pair of isotopes.

70. i.

Particle	**Atomic number**	**Mass number**
A	3	3 + 4 = 7
B	9	9 + 8 = 17
C	8	8 + 8 = 16
D	8	8 + 10 = 18

ii. Particles C and D as they have same number of protons, i.e. same atomic number but different mass number.

71. i. Mg^{2+} ion is mentioned in the given figure.

ii. The electronic configuraton of Mg^{2+} ion = 2, 8 and that of $_{12}Mg$ atom = 2, 8, 2

iii. Number of protons in Mg atom = 2 + 8 + 2 = 12

72. The tabular form is as below:

Element	Atomic Number (= no. of p)	Mass Number {= no. of (p+n)}	Number of Electrons (= no. of p)	Electronic Configuration	Valency
X	5	5 + 6 = 11	5	2, 3	3
Y	8	8 + 10 = 18	8	2, 6	2
Z	15	15 + 16 = 31	15	2, 8, 5	3, 5

Section D

73. i. As atom and nucleus is considered to be spherical.Volume of the sphere = $\frac{4}{3}\pi r^3$

Let R be the radius of the atom and r be that of the nucleus.

Here, $\frac{R}{r} = 10^5$ (Given)

$\Rightarrow$ R = 10^5 r

Volume of the atom of radius 'R' = $\frac{4}{3}\pi R^3$

Volume of atom = $\frac{4}{3}\pi (10^5 r)^3$ ($\because$ R = 10^5r)

Or, Volume of the atom = $\frac{4}{3}\pi r^3 \times 10^{15}$

Now, Volume of the nucleus = $\frac{4}{3}\pi r^3$

Therefore, Ratio of the size of atom to that of nucleus = $\frac{\frac{4}{3}\times 10^{15}\times \pi r^3}{\frac{4}{3}\pi r^3} = 10^{15}$

ii. If the atom is represented by the planet Earth (R_e = 6.4 $\times 10^6$m), then the radius of the nucleus would be

$r_n = \frac{R_e}{10^{15}} = \frac{6.4\times 10^6 m}{10^5}$ = 6.4 $\times$ 10m = 64 m.

74. i. a. As most of the α-particles passed straight through the gold foil.

b. A few of the α-particles which are positively charged get deflected due to the positive charge of the nucleus.

ii. a. Number of neutrons = mass number - atomic number = 32 - 16 = 16

b. The electronic configuration of the element will be as follows:

K	L	M
2,	8,	6

Hence, the number of electrons in the outermost shell is 6.

iii. According to Rutherford's model of an atom, positively charged protons are present in the nucleus of an atom.

75. 1 mole of H atoms = 1 g

1 mole of H atoms = 6.022×10^{23} atoms.

Mass of 6.022×10^{23} atoms of H = 1 g

Therefore, Mass of one atom of H = $\frac{1}{6.22\times10^{23}}g$

= 1.66×10^{-24} g

1 mole of silver atoms = 108 g

1 mole of silver contains 6.022×10^{23} atoms

Therefore, 6.022×10^{23} atoms of silver = 108 g

Therefore, Mass of one atom or silver atom = $\frac{108}{6.022\times10^{23}}g$

= 1.793×10^{-22}g

Ratio between masses of silver and hydrogen atoms = $\frac{1.793\times10^{-22}g}{1.66\times10^{-24}g}$

1.080×10^{2}