4. Structure of Atom

Very Short Answer Type Questions-Pg-191

1. Question

Which subatomic particle is not present in an ordinary hydrogen atom?

Answer

The subatomic particle is not present in an ordinary hydrogen atom is neutron.

2. Question

Name the scientists who described the arrangement of electrons in an atom.

Answer

The scientists who described the arrangement of electrons in an atom was J.J. Thomson

3. Question

What is the maximum number of electrons which can be accommodated in the K shell of an atom?

Answer

The maximum number of electrons which can be accommodated in the K shell of an atom is 2.

4. Question

What is the maximum number of electrons which can be accommodated in the L shell of an atom?

Answer

The maximum number of electrons which can be accommodated in the L shell of an atom is 8.

5. Question

What is the maximum number of electrons an M shell of the atom can accommodate?

Answer

The maximum number of electrons an M shell of the atom can accommodate is 18.

6. Question

What is the maximum number of electrons that can go into the N shell of an atom?

Answer

The maximum number of electrons that can go into the N shell of an atom is 32.

7. Question

What is the maximum number of electrons which can be accommodated in the:

(a) innermost shell of an atom?

(b) outermost shell of an atom?

Answer

(a) The maximum number of electrons which can be accommodated in the innermost shell of an atom is 2.

(b) The maximum number of electrons which can be accommodated in the outermost shell of an atom is 8.

8. Question

Name the three subatomic particles present in an atom.

Answer

The three subatomic particles present in an atom are electron, proton and neutron.

9. Question

Name the negatively charged particle present in the atoms of all the elements.

Answer

The negatively charged particle present in the atoms of all the elements is electron.

10. Question

Name the scientist who discovered electron.

Answer

J.J. Thomson was the scientist who discovered electrons.

11. Question

What is the usual symbol for (a) an electron (b) a proton, and (c) a neutron?

Answer

e^-, p^+, n are the usual symbol for electron proton and neutron respectively.

12. Question

State whether the following statements are true or false:

(a) Thomson proposed that the nucleus of an atom contains protons and neutrons.

(b) The cathode rays obtained from all the gases consist of negatively charged particles called electrons.

(c) The anode rays obtained from all the gases consist of positively charged particles called protons.

Answer

(a) False, this statement is not true.

(b) True. Yes, the cathode rays obtained from all the gases consist of negatively charged particles called electrons.

(c) False, The anode rays obtained from all the gases consist of positively charged particles called protons is not a true statement.

13. Question

Name the central part of an atom where protons and neutrons are held together.

Answer

The central part of an atom where protons and neutrons are held together is nucleus.

14. Question

What are the various letters used by Bohr to represent electron shells in an atom?

Answer

The various letters used by Bohr to represent electron shells in an atom are K, L, M and N.

15. Question

Name the particles which actually determine the mass of an atom.

Answer

The particles which actually determine the mass of an atom is proton.

16. Question

Name the positively charged particle present in the atoms of all the elements.

Answer

The positively charged particle present in the atoms of all the elements are protons.

17. Question

What is the electronic configuration of a hydrogen atom?

Answer

The electronic configuration of a hydrogen atom is 1.

18. Question

How many times is a proton heavier than an electron?

Answer

A proton is 1840 times heavier than an electron.

19. Question

Name the gas which produces anode rays consisting of protons in the discharge tube experiment.

Answer

The gas which produces anode rays consisting of protons in the discharge tube experiment was hydrogen.

20. Question

Which part of an atom was discovered by Rutherford's alpha particle scattering experiment?

Answer

The part of an atom was discovered by Rutherford's alpha particle scattering experiment was nucleus.

21. Question

What is the positive charge on the nucleus of an atom due to?

Answer

The positive charge on the nucleus of an atom is due to the presence of protons.

22. Question

State the number of electrons present in the outermost shell of the atom of the following elements:

(i) Neon (ii) Chlorine

Answer

(i) In neon the number of electrons present in the outermost shell of the atom is 8.

(ii) Chlorine the number of electrons present in the outermost shell of the atom is 7.

23. Question

Which shell of an atom can accommodate a maximum of:

(a) 8 electrons?

(b) Chlorine

Answer

(a) 8 electrons can be accommodated in L shell.

(b) 32 electrons can be accommodated in N shell.

24. Question

Name the shell of an atom which can accommodate a maximum of:

(a) 2 electrons

(b) 18 electrons

Answer

(a) the shell of an atom which can accommodate a maximum of 2 electrons is L.

(b) the shell of an atom which can accommodate a maximum of 18 electrons is M.

25. Question

Which subatomic particle whose relative charge is:

(i) Chadwick?

(ii) Thomson?

(iii) Goldstein?

Answer

(i) neutrons by Chadwick.

(ii) electrons by Thomson.

(iii) protons by Goldstein.

26. Question

Name the subatomic particle whose relative charge is:

(a) +1 (b) -1 (c) 0

Answer

(a) +1 represent protons.

(b) -1 represent electron.

(c) o represents neutrons.

27. Question

Fill in the blanks in the following statements:

(a) The number of protons in the nucleus of an atom is called its …….. .

(b) The total number of protons and neutrons in the nucleus of an atom is called its …….. .

(c) An atom has atomic mass number 23 and atomic number 11. The atom has ……. Electrons.

(d) An atom of an element has 11 protons, 11 electrons and 12 neutrons. The atomic mass of the atom is …….. .

(e) If the nucleus of an atom has atomic number 17, mass number 37 abd there are 17 electrons outside the nucleus, the number of neutrons in it is …….. .

(f) Almost all the mass of an atom is concentrated in a small region of space called the …….. .

(g) Cathode rays are a beam of fast moving …….. .

(h) The anode rays obtained form hydrogen gas consist of particles called …….. .

(i) The maximum number of electrons that can be accommodated in L shell are …….. .

(j) The maximum number of electrons that can go into the M shell is ……..

(k) The subatomic particle not present in a hydrogen atom is ……. .

(l) The electron has …….. charge, the proton has …….. charge, and the neutron has …….. charge.

Answer

(a) The number of protons in the nucleus of an atom is called its atomic no.

(b) The total number of protons and neutrons in the nucleus of an atom is called its mass no. .

(c) An atom has atomic mass number 23 and atomic number 11. The atom has 11 Electrons.

(d) An atom of an element has 11 protons, 11 electrons and 12 neutrons. The atomic mass of the atom is 23.

(e) If the nucleus of an atom has atomic number 17, mass number 37 abd there are 17 electrons outside the nucleus, the number of neutrons in it is 20.

(f) Almost all the mass of an atom is concentrated in a small region of space called the nucleus.

(g) Cathode rays are a beam of fast moving electrons.

(h) The anode rays obtained form hydrogen gas consist of particles called protons.

(i) The maximum number of electrons that can be accommodated in L shell are 8.

(j) The maximum number of electrons that can go into the M shell is 18

(k) The subatomic particle not present in a hydrogen atom is neutron.

(l) The electron has negative. charge, the proton has positive charge, and the neutron has no charge.

Short Answer Type Questions-Pg-192

28. Question

What is an electron? State its relative mass and charge.

Answer

A negatively charged particle found in the atoms off all elements is known as electrons.

1/1840 u is the relative mass of an electron.

An electron carries a charge of -1.

29. Question

What is the absolute mass and charge of an electron?

Answer

9×10^{-28} Kg is the absolute mass of electron.

30. Question

Give the evidence for the existence of nucleus in an atom.

Answer

In Rutherford's scattering experiment the deflection of fast moving particles through small and large angles is the evidence for the presence of nucleus in an atom.

31. Question

What important information is furnished about the nucleus of an atom by the alpha particle scattering experiment of Rutherford?

Answer

Important information furnished about nucleus in Rutherford's alpha-particle scattering experiment is:

1) A positively charged particle in an atom is nuleus.

2) According to the information from the experiment nucleus of an atom is very hard and dense.

3) As compared to the size of an atom as a whole nucleus is very small in size.

32. Question

How was it shown that an atom has a lot of empty space within it?

Answer

The most of the space in an atom is empty this can be seen from the Rutherford's alpha- particle scattering experiment as most of the alpha-particles passed straight through the gold foil without any deflection.

33. Question

Why is an atom neutral inspite of the presence of charged particles in it?

Answer

AN atom is neutral inspite of the of the presence of the charged particles in it because of the presence of nutrons.

34 A. Question

Which of the nuclear particles is present in the same fixed number in the atoms of any particular element?

Answer

The nuclear particles is present in the same fixed number in the atoms of any particular element is proton.

34 B. Question

What do we call this number which is characteristic of a particular element?

Answer

The characteristic of any particular is its atomic no.

35. Question

What is a proton? State its relative mass and charge.

Answer

A positively charged particle in atom of any particular element is known as proton.

1u is the relative mass of the prton.

+1 C is the relative charge of the protons.

36. Question

What is the absolute mass and charge of a proton?

Answer

1.6×10^{-27} Kg is the absolute mass of proton. And 1.6×10^{-19} C is the absolute charge on the proton.

37. Question

How does a proton differ from an electron?

Answer

A proton differ from an electron:

1) Protons have positive charge on it while electron have negative charge on it.

2) Electrons are lighter then protons.

38. Question

State two observations which show that atom is not indivisible.

Answer

The two observations which shows that atom is not indivisible are:

1) the stream of cathode rays in the gas discharge tube shows the presence of negatively charged subatomic particles called electrons from the J.J. Thomson's experiment.

2) the faint red glow in the gas discharge tube shows the presence of positively charged subatomic particles called protons this is known from Goldstein's experiment.

39. Question

All the gases form cathode rays and anode rays when electricity is passed through them:

(i) What does the formation of cathode rays tell us about the atoms?

(ii) What does the formation of anode rays tell us about the atoms?

Answer

(i) The presence of negatively charged electrons in all the atoms is told by the cathode ray formation.

(ii) The presence of positively charged protons in all the atoms is told by the formation of anode rays.

40. Question

What do you understand by the tern ‘electronic configuration” of an element? Write down the electronic configuration of oxygen (At. No. = 8).

Answer

In the various shell of the atom there are arrangements of electrons which is known as electronic configuration. Oxygen whose atomic number is 8 have the E.C 2,6

41 A. Question

What is the nucleus of an atom and what is the nature of charge on it?

Answer

At the center of the atom a small positively charged particle is present this is known as nucleus. The nucleus is positively charged particle.

41 B. Question

Name the scientist who discovered the nucleus of atom

Answer

The scientist who discovered the nucleus of atom is Rutherford.

42. Question

Name the particles used by Rutherford in his experiment on the discovery of nucleus. Also state the charge on these particles.

Answer

The particle used by Rutherford in his experiment on the discovery of nucleus is known as alpha particle. +2 is the charge of the alpha particle.

43. Question

An element has atomic number 13 and an atomic mass of 27.

(a) How many electrons are there in each atom of the element?

(b) How are these electrons distributed in the various energy levels?

Answer

(a) In each atom of an element the no. of electron is 13.

(b) These electrons distributed in the various energy levels like K-2, L-8, M-3. Its electronic configuration is 2, 8, 3.

44. Question

Write the distribution of electrons in an atom of element whose atomic number is 18. What is special about the outermost electron shell (or valence shell) of the atom of this element?

Answer

The atomic no. of the element is 18, so the adjustment of electrons as per in K, L, M shell is like 2, 8, 8 respectively. The outermost shell of this element is completely filled.

45. Question

What is a neutron? State its relative mass and charge.

Answer

A neutral particle found in the nucleus of an atom is known as neutrons. Neutron has no charge on it with a relative mass of 1u.

46. Question

Compare an electron, a proton and a neutron in respect of their relative masses and charges.

Answer

The relative mass of electron is 1/1840 u, and the relative mass of proton and the neutron is 1 u each.

47. Question

What is a proton? How does it differ from a neutron?

Answer

A positively charged particle found in the atoms of all the elements is known as proton. Whereas neutron is found in the nucleus of an atom and is neutral in behavior.

48. Question

Compare an electron and a proton in respect of mass and charge.

Answer

Electron has relative mass of 1/1840 u and it has a charge of -1 u on it. Whereas proton has relative mass of 1u and it also has +1 u charge over it.

49. Question

Compare a proton and a neutron in respect of mass and charge.

Answer

Proton has relative mass of 1u and it has +1 u charge over it. Whereas neutron also have relative mass of 1u but it do not have any charge over it.

50. Question

How does an electron differ from a neutron?

Answer

The electron differ from a neutron because, electron has relative charge of -1 u whereas neutron has no relative charge.

Also, electron has relative mass of 1/1840 u and neutron has relative mass of 1 u.

51. Question

State the location of electrons, protons and neutrons in an atom.

Answer

In an atom neutrons are in the center of the atom. The electrons revolves in the outermost orbit of the energy shell, whereas the protons are positioned in between the neutrons and electrons.

52. Question

Fill in the following blanks:

Atomic Number	Mass Number	Protons	Neutrons	Electrons	Symbol
10	22	……..	……..	…….	……..

Answer

Atomic Number	Mass Number	Protons	Neutrons	Electrons	Symbol
10	22	10	12	10	Ne

53. Question

Fill in the following blanks in respect of an atom of an element:

No. of Protons	No of neutrons	Mass Number	Atomic number	No. of electrons	Symbol
11	12	……..	……..	…….	……..

Answer

No. of Protons	No of neutrons	Mass Number	Atomic number	No. of electrons	Symbol
11	12	23	11	11	Na

Long Answer Type Questions-Pg-193

54 A. Question

What are cathode rays? What is the nature of charge on cathode rays?

Answer

Cathode rays are the stream of particles coming from the cathode. Cathode rays are negatively charged in nature.

54 B. Question

Explain how, cathode rays are formed from the gas taken in the discharge tube.

Answer

when we pass very high voltage electricity through a gas at low pressure in a discharge tube, the stream of particles are given out by cathode which is known as cathode ray.

54 C. Question

What conclusion is obtained from the fact that all the gases form cathode rays?

Answer

All the atoms contain negatively charged particles called electrons is the conclusion obtained from the fact that all the gases form cathode rays.

55 A. Question

Describe Thomson's model of the atom. Which subatomic particle was not present in Thomson's model of the atom?

Answer

Thomson's model of the atom describes that an atom consists of a sphere of positive charge with negatively charged electrons embedded in it. And also states that the positive and negative charges in an atom are equal in magnitude. The subatomic particle was not present in Thomson's model of the atom was neutron.

55 B. Question

The mass number of an element is 18. It contains 7 electrons. What is the number of protons and neutrons in it?

Answer

Given the mass no. and the no. of electrons are 18 and 7 respectively. Then the no. of protons and neutrons are 7 and 11 respectively.

56 A. Question

Describe the Rutherford's model of an atom. State one drawback of Rutherford's model of the atom.

Answer

The Rutherford's model of an atom can be described by many statements some of then are:-

1) An atom consists of positively charged, dense and very small nucleus containing all the protons and neutrons. Almost all the mass of atom is concentrated in the nucleus.

2) The electrons are revolving at very high speed round the nucleus in fixed circular orbits. And it surround the nucleus.

3) The electrostatic attraction between the positively charged nucleus and negatively charged electrons keep the atom held together.

4) The atom has mostly empty space.

56 B. Question

The mass number of an element is 23 and it contains 11 electrons. What is the number of protons and neutrons in it? What is the atomic number of the element?

Answer

Give,

The mass number of an element is 23, no. of electrons are 11.

Then the no. of protons are 11. And the no. of neutrons are (23-11) = 12.

The atomic no. of the element is 11.

57 A. Question

Describe Bohr's model of the atom. How did Neils Bohr explain the stability of atom?

Answer

The Bohr's model of the atom is described by several statements:-

1) Three particles collectively makes the atom and these are electrons, protons and neutrons.

2) The protons and neutrons are located in the small nucleus at the center of atom.

3) Electrons revolve round the nucleus in fixed circular orbits.

4) For every shell the maximum no. of electrons are fixed. Any shell cannot exceed that value.

5) Each given shell is associated with fixed amount of energy.

6) There is no change in energy of electrons as long as they keep revolving in the same energy level, and the atom remains stable.

57 B. Question

An element has an atomic number of 11 and its mass number is 23. What is the arrangement of electrons in the shells? State nuclear composition of an atom of the element.

Answer

Give,

An element has an atomic number of 11

its mass number is 23.

E.C = 2, 8, 1.

The nuclear has 11 protons and 12 neutrons.

58 A. Question

What is meant by (i) atomic number, and (ii) mass number, of an element? Explain with the help of an example.

Answer

(i) The no. of protons in one atom of an element is known as atomic no.

(ii) The total no. of protons and neutrons present in one atom of an element is known as mass no.

58 B. Question

What is the relation between the atomic number and mass number of an element?

Answer

The relation between the atomic number and mass number of an element is, Atomic no. + no. of Neutrons = Mass no.

58 C. Question

If an element M has mass number 24 and atomic number 12, how many neutrons does its atom contain?

Answer

If an element M has mass number 24 and atomic number 12 then no. of neutrons = (24-12) = 12.

Multiple Choice Questions (MCQs)-Pg-194

59. Question

Rutherford's alpha particle scattering experiment led to the discovery of:

A. Nucleus

B. Electrons

C. Protons

D. Neutrons

Answer

Rutherford's alpha particle scattering experiment led to the discovery of nucleus.

60. Question

Which of the following is the correct electronic configuration of sodium?

A. 2, 8, 1

B. 8, 2, 1

C. 2, 1, 8

D. 2, 8, 2

Answer

The correct electronic configuration of sodium is 2, 8, 1.

61. Question

The particle not present in an ordinary hydrogen atom is:

A. proton

B. neutron

C. nucleus

D. electron

Answer

The particle not present in an ordinary hydrogen atom is neutron.

62. Question

The subatomic particle called electron was discovered by:

A. J.J. Thomson

B. Neils Bohr

C. James Chadwick

D. E. Goldstein

Answer

The subatomic particle called electron was discovered by J.J. Thomson.

63. Question

Which of the following represents the correct electron distribution in magnesium ion?

A. 2, 8

B. 2, 8, 1

C. 2, 8, 8

D. 2, 8, 7

Answer

Magnesium ion, Mg^{2+} has 10 electrons; so, its electronic configuration is 2, 8.

64. Question

The correct electronic configuration of a chloride ion is:

A. 2, 8

B. 2, 8, 8

C. 2, 8, 8

D. 2, 8, 7

Answer

The correct electronic configuration of a chloride ion is 2, 8, 8.

65. Question

Goldstein's experiments which involved passing high voltage electricity through gases at very low pressure resulted in the discovery of:

A. electron

B. proton

C. nucleus

D. neutron

Answer

Goldstein's experiments which involved passing high voltage electricity through gases at very low pressure resulted in the discovery of proton.

66. Question

The number of electrons in the atom of an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of an atom of this element?

A. $^{31}_{15}X$

B. $^{31}_{16}X$

C. $^{16}_{15}X$

D. $^{15}_{16}X$

Answer

The number of electrons in the atom of an element X is 15 and the number of neutrons is 16. The correct representation of an atom of this element is $^{31}_{15}X$.

67. Question

The ion of an element has 3 positive charges. The mass number of atom of this element is 27 and the number of neutrons is 14. What is the number of electrons in the ion?

A. 13

B. 10

C. 14

D. 16

Answer

The ion of an element has 3 positive charges. The mass number of atom of this element is 27 and the number of neutrons is 14. The number of electrons in the ion are 10.

68. Question

The first model of an atom was given by:

A. Neils Bohr

B. Ernest Rutherford

B. J.J. Thomson

D. Eugen Goldstein

Answer

The first model of an atom was given by J.J. Thomson.

69. Question

Which f the following statement is always correct?

A. an atom has equal number of electrons and protons

B. an atom has equal number of electrons and neutrons

C. an atom has equal number of protons and neutrons

D. an atom has equal number of electrons, protons and neutrons

Answer

An atom has equal number of electrons and protons.

Questions Based on High Order Thinking Skills (HOTS)-Pg-194

70. Question

From the symbol <ιμγωιδτη=∀31∀ηειγητ=∀32∀σρχ=∀Χη−4_Στρυχτυρε−οφ−Ατομ−1_φιλεσ/ιμαγε009.πνγ∀>, state:

(i) mass number of phosphorus,

(ii) atomic number of phosphorus, and

(iii) electron configuration of phosphorus.

Answer

From the symbol <ιμγωιδτη=∀31∀ηειγητ=∀32∀σρχ=∀Χη−4_Στρυχτυρε−οφ−Ατομ−1_φιλεσ/ιμαγε009.πνγ∀>, state

(i) mass number of phosphorus is 31

(ii) atomic number of phosphorus is 15.

(iii) electron configuration of phosphorus is 2, 8, 5.

71. Question

The atom of an element X has 7 electrons in its M shell

(a) Write the electronic configuration of element X.

(b) What is the atomic number of element X?

(c) Is it a metal or a non-metal?

(d) What type of ion will be formed by an atom of element X? Write the symbol of the ion formed.

(e) What could element X be?

Answer

(a) The electronic configuration of element X is 2, 8, 7.

(b) The atomic number of element X is 17.

(c) Element X is a non-metal.

(d) Anion will be formed by an atom of element X. The symbol of the ion formed will be X^-.

(e) It should must be chlorine (Cl).

72. Question

An atom of element E contains 3 protons, 3 electrons and 4 neutrons:

(a) What is its atomic number?

(b) What is its mass number?

(c) Write the electronic configuration of the element E.

(d) State whether element E is a metal or non-metal. Why?

(e) What type of ion, cation or anion, will be formed by an atom of element E? Why?

(f) Write the symbol of the ion formed by an atom of element E.

(g) What could element X be?

Answer

(a) The atomic number of element E is 3.

(b) Element E's mass number is 7.

(c) The electronic configuration of the element E is 2, 1.

(d) As element E has 1 valence in its outer most shell, so metal. As it shows the tendency to give electron to attain the noble gas configuration.

(e) Cation will be formed by an atom of element E because it has 1 electron in the outer most orbit, which it can lose quickly to form a positively charged ion.

(f) The symbol of the ion formed by an atom of element E is E^+.

(g) Element E could be Lithium.

73. Question

An atom of an element X may be written as ${}^{9}_{4}X$.

(a) What does the figure 9 indicate?

(b) What does the figure 4 indicate?

(c) What is the number of protons in atom X?

(d) What is the number of neutrons in atom X?

(e) What is the number of electrons in atom X?

(f) How many electrons are there in the outermost shell of an atom of element X?

(g) Write the symbol of ion formed by an element Z is 2, 8, 8.

Answer

(a) The figure 9 indicates mass number.

(b) The figure 4 indicates atomic number.

(c) The number of protons in atom X should be 4.

(d) The number of neutrons in atom X should be 5.

(e) The number of electrons in atom X is 4.

(f) In the outermost shell of an atom of element X there are 2 electrons.

(g) The symbol of ion formed by an element Z is Lithium (Li)

74. Question

The electronic configuration of an element Z is 2, 8, 8.

(a) What is the atomic number of the element?

(b) State whether element Z is a metal or a non-metal.

(c) What type of ion (if any) will be formed by an atom of element Z? Why?

(d) What is special about the outermost electron shell or the atom of this element?

(e) Give the name and symbol of element Z.

(f) Name the group of elements to which Z belongs.

Answer

(a) The atomic number of the element Z is 18.

(b) Element Z is a non-metal.

(c) By an atom of element Z the ion formed will be anion. This is because it has completely filled shell due to which it can neither lose or gain electron.

(d) The outermost electron shell or the atom of this element is completely filled with electrons. It has its noble gas configuration.

(e) The name of the element is argon. And its symbol is Ar.

(f) The group of elements to which Z belongs is noble gas or can say inert gas.

Very Short Answer Type Questions-Pg-210

1. Question

The total number of electrons in a nitrogen atom is 7. Find the number of valence electrons in it.

Answer

The total number of electrons in a nitrogen atom is 7 so its E. C is 2, 5. And the no. of valance electron in it is 5.

2. Question

What is the general name of the elements having 8 electrons in the valence shell of their atoms?

Answer

The general name of the elements having 8 electrons in the valence shell of their atoms is noble gas.

3. Question

Which noble gas has less than 8 electrons in the valence shell of its atom? What is this number?

Answer

The noble gas which has less than 8 electrons in the valence shell of its atom is helium. The atomic no. of helium is 2.

4. Question

State one use of radioactive isotopes in medicine.

Answer

For the treatment of cancer radioactive isotopes is used.

5. Question

Give one example of a radioactive isotope which is used as a fuel in the reactors of nuclear power plants.

Answer

A radioactive isotope which is used as a fuel in the reactors of nuclear power plants is Uranium-235.

6. Question

Name the radioactive isotope which is used in the treatment of cancer.

Answer

The radioactive isotope which is used in the treatment of cancer is Cobalt-60.

7. Question

Which radioactive isotope is used to determine the activity of thyroid gland?

Answer

To determine the activity of thyroid gland Iodine-131 is used as a radioactive isotopes.

8. Question

State one use of radioactive isotopes in industry.

Answer

To detect the leakage in underground oil pipelines, gas pipelines and water pipes we use radioactive isotopes in the industries.

9. Question

State whether the following statement is true or false:

Radioactive isotope of iodine is used for making the medicine called tincture iodine.

Answer

The above given statement is not true.

10. Question

What name is given to those atoms which contain the same number of protons and electrons but different number of neutrons?

Answer

Those atoms which contain the same number of protons and electrons but different number of neutrons are named as isotopes.

11. Question

What is the relationship between an atom containing 11 protons, 11 electrons ad 11 neutrons, and another atom containing 11 protons, 11 electrons and 12 neurtrons?

Answer

The relationship between an atom containing 11 protons, 11 electrons ad 11 neutrons, and another atom containing 11 protons, 11 electrons and 12

neurtrons is, they are isotopes in nature.

12. Question

What name is given to the pair of atoms such as?

Answer

The pair of atoms such as are known as isotopes.

13. Question

What name is given to those isotopes which have unstable nuclei and emit various types of radiations?

Answer

Those isotopes which have unstable nuclei and emit various types of radiations are named as radioactive isotopes.

14. Question

Fill in the following blanks in respect of an atom of an element:

Number of Protons	Number of Neutrons	Mass Number	Atomic Number	Number of Electrons	Valency
11	12	.....	.....	.....	.....

Answer

Number of Protons	Number of Neutrons	Mass Number	Atomic Number	Number of Electrons	Valency
11	12	23	11	11	1

15. Question

Complete the following statements:

(a) Magnesium has 3 valence electrons in the ……. shell.

(b) The valency of nitrogen in N_2 molecule is …….

(c) Isotopes have different mass numbers because their nuclei contain different number of …….

(d) Some boron atoms have mass number 10 and some have mass number 11. These boron atoms with different mass number are called ……..

Answer

(a) Magnesium has 3 valence electrons in the M shell.

(b) The valency of nitrogen in N_2 molecule is 3.

(c) Isotopes have different mass numbers because their nuclei contain different number of neutrons.

(d) Some boron atoms have mass number 10 and some have mass number 11. These boron atoms with different mass number are called isotopes.

Short Answer Type Questions-Pg-210

16. Question

The nucleus of an atom has 5 protons and 6 neutrons. What would be the

(a) atomic number,

(b) mass number,

(c) the number of electrons, and

(d) the number of valence electrons, per atom of this element?

Answer

(a) The nucleus of an atom has 5 protons and 6 neutrons then the atomic no. 5.

(b) The nucleus of an atom has 5 protons and 6 neutrons then the mass no. will be 6+5 = 11.

(c) The nucleus of an atom has 5 protons and 6 neutrons then the no. of electrons = 5.

(d) The nucleus of an atom has 5 protons and 6 neutrons then the no. of valance electrons, per atom = 3.

17. Question

Write the electronic configuration of the element with atomic number 17. Indicate the valency of the element.

Answer

The electronic configuration of the element with atomic number 17 will be (2, 8, 7). The valency of the element will be 8 and the no. of valance electron will be (8-7) = 1.

18. Question

The atomic number of an element X is 16.

(a) Write down the electronic configuration of X.

(b) What will be the valency of X?

Answer

(a) The atomic number of an element X is 16. The E.C can be given as (2, 8, 6).

(b) The atomic number of an element X is 16. The valency of X will be 8 and the no. of valance electron will be 2.

19. Question

What valencies will be shown by the elements A, B, C, D and E having atomic numbers 2, 4, 8, 10, and 13 respectively.

Answer

When atomic no. is 2 then the valency shown by A – 0

When atomic no. is 4 then the valency shown by B - 2

When atomic no. is 8 then the valency shown by C - 2

When atomic no. is 10 then the valency shown by D - 0

When atomic no. is 13 then the valency shown by E - 3

20. Question

Give one use each of the following radioactive isotopes:

(a) Uranium-235

(b) Cobalt–60

Answer

(a) As a fuel in the reactors of nuclear power plants for generating electricity we use Uranium-235.

(b) for the treatment of cancer we use Cobalt–60.

21. Question

Explain why ${}_{1}^{3}H \ and \ {}_{2}^{3}He$ are not considered isotopes.

Answer

${}_{1}^{3}H \ and \ {}_{2}^{3}He$ are not considered isotopes because they do not have same atomic number.

22. Question

What is the reason for the different atomic masses of the isotopes of an element?

Answer

the reason for the different atomic masses of the isotopes of an element is, due to different number of neutrons in their nuclei.

23. Question

What is the reason for the identical chemical properties of all the isotopes of an element? Explain with the help of an example.

Answer

The reason for the identical chemical properties of all the isotopes of an element is, all the isotopes of an element have identical atomic configuration containing same number of valence electrons.

For example: Cl-35 and Cl-37, show identical chemical properties as they have same no. of 7 valence electrons.

24. Question

What is the reason for the slightly different physical properties of all the isotopes of an element?

Answer

The reason for the slightly different physical properties of all the isotopes of an element is the slight difference in the masses of the element.

25. Question

Explain why, the atomic masses of many elements are in fractions and not whole numbers.

Answer

The atomic masses of many elements are in fractions and not whole numbers because of the existence of their isotopes having different masses.

26. Question

Which of the following are isotopes and which are isobars?

Argon, Deuterium, Calcium, Tritium, Protium

Answer

Deuterium, Tritium and Protium are isotopes here and Argon and Calcium are isobars.

27. Question

Hydrogen has three isotopes written as:

$${}_{1}^{1}H,\ {}_{1}^{2}H,\ {}_{1}^{3}H$$

Explain why:

(i) these isotopes have almost identical chemical properties.

(ii) they are electrically neutral.

Answer

(i) These isotopes have almost identical chemical properties because of their identical electronic configuration containing the same no. of valence electrons.

(ii) They are electrically neutral all of them have 1 electron and 1 proton.

28. Question

Given that the percentage abundance of the isotope is 90% and that of the isotope is 10%, calculate the average atomic mass of neon.

Answer

Atomic mass = ∑Mass no. × % of that isotope

$$= 20 \times \frac{90}{100} + 22 \times \frac{10}{100}$$

$$= 20.2u$$

29. Question

What are isobars? Explain with an example.

Answer

The atoms of different elements having different atomic numbers but the same mass number (or same atomic mass) are known as isobars. Example of isobar is Cl, S etc.

30. Question

For the symbols H, D and T, write the subatomic particles (protons, neutrons and electrons) found in each one of them.

Answer

sub atomic particles in H, D, and T can be given as:

H = 1 proton, 0 neutron and 1electron.

D = 1 proton, 1 neutrons and 1 electron.

T = 1 proton, 2 neutrons and 1 electron.

31. Question

An element has Z = 7. What is the valency of the element? Also name the element.

Answer

Given that the element has atomic number 7.

So its E.C = 2,5.

So, the valency of this element is 3. And the name of the given element is Nitrogen.

Long Answer Type Questions-Pg-211

32 A. Question

What are valence electrons? Where are valence electrons situated in an atom?

Answer

Valance electrons are the number of electrons present in the valance shell. In the outermost shell valance electrons are present.

32 B. Question

What is the number of valence electrons in the atoms of an element having atomic number 13? Name the valence shell of this atom.

Answer

An element having atomic number 13 have the electronic configuration 2, 8, 3. So the valance shell of the atom of this element have 3 electrons. The valance of this atom is M.

33 A. Question

What are isotopes? Explain by giving an example.

Answer

The atoms of the same element having the same atomic number but different mass numbers are known as isotopes. For example: the isotopes of chlorine are 35Cl17 and 37Cl17.

33 B. Question

Give one similarity and one difference between a pair of isotopes

Answer

The basic similarity between a pair of isotopes is, both have same atomic number.

The basic difference between a pair of isotopes is, both have different mass number.

33 C. Question

Give the number of protons, neutrons and electrons per atom in the two isotopes of chlorine and .

Answer

In the number of protons, neutrons and electrons are 17, 18, 17 respectively.

In the number of protons, neutrons and electrons are 17, 20, and 17 respectively.

34 A. Question

What are radioactive isotopes? Give two examples of radioactive isotopes

Answer

Due to presence of extra neutrons in their nuclei some isotopes are unstable and emit various types of radiations. These isotopes are called radioactive isotopes.

The two examples of the radioactive isotopes are:

Carbon-14, and Arsenic-74.

34 B. Question

Give any two uses of radioactive isotopes.

Answer

The uses of radioactive isotopes are:

(1) For the treatment of cancer radioactive isotopes are use.

(2) As 'tracers' in medicine to detect the presence of tumors and blood clots in human body radioactive elements are used.

34 C. Question

An element Z contains two naturally occurring isotopes ${}^{35}_{17}Z \ and \ {}^{37}_{17}Z$. If the average atomic mass of this element be 35.5 u, calculate the percentage of two isotopes.

Answer

Given, Average atomic mass = 35.5 u

Let % amount of ${}^{35}Z_{17}$ be y, then amount of ${}^{37}Z_{17}$ is (100 - y).

So,

$$35 \times \frac{y}{100} + 37 \times \frac{(100 - y)}{100} = 35.5$$

So, 35y + 3700 – 37y = 3550

Hence, y = 75

Thus, amount of $^{35}Z_{17}$ is 75% and amount of $^{37}Z_{17}$ is 25%

35 A. Question

Define valency of an element. What valency will be shown by an element having atomic number 14?

Answer

The valency of an element is defined as the capacity of an atom of an element to form chemical bonds. An element having atomic number 14 will show the valency 4.

35 B. Question

What is the relation between the valency of an element and the number of valence electrons in its atoms? Explain with examples.

Answer

The relation between the valency of an element and the number of valence electrons in its atoms is that, the valency of an element is either equal to the number of valence electrons in its atom or equal to the number of electrons required to complete eight electrons in the valence shell.

No. of electrons in an atom = valency of metal.

8 are the no. of valence electron in its atom = valency of non-metal.

For example- the valency of sodium metal is 1 where as the valency of chlorine non-metal is also 1.

Multiple Choice Questions (MCQs)-Pg-211

36. Question

The mass number of two atoms X and Y is the same (40 each) but their atomic numbers are different (being 20 and 18 respectively). X and Y are examples of:

A. chemically similar atoms

B. isotopes

C. solid and liquid metals

D. isobars

Answer

X and Y are examples of isobars.

37. Question

Which of the following statement is correct about the atom of and element?

A. an atom can have only protons and neutrons but no electrons.

B. an atom can have only electrons ad neutrons but no protons

C. an atom can have only electron and proton but o neutron

D. an atom must always have a proton, neutron and electron.

Answer

An atom can have only electron and proton but o neutron is the correct statement about the atoms of an element.

38. Question

There are two species represented as ^{35}Cl and ^{37}Cl. Which of the following statement is correct regarding these species?

A. they have different chemical properties

B. their physical properties are the same

C. they have the same number of protons

D. they are isobars of the same element

Answer

They have the same number of protons is correct regarding this species.

39. Question

The radioactive isotope used in the treatment of cancer is:

A. plutonium – 239

B. arsenic – 74

C. cobalt – 60

D. iodine – 131

Answer

The radioactive isotope used in the treatment of cancer is cobalt – 60.

40. Question

Elements having valency ‘one’ are:

A. Always metals

B. Always non-metals

C. Always metalloids

D. Either metals or non-metals

Answer

Elements having valency ‘one’ are either metals or non-metals.

41. Question

In a sample of ethyl ethanoate ($CH_3COOC_2H_2$), the two oxygen atoms have the same number of electrons but different number of neutrons. Which of the following is the correct reason for it?

A. one of the oxygen atoms has gained electrons

B. one of the oxygen atoms has gained protons

C. the two oxygen atoms are isotopes

D. the two oxygen atoms are isobars

Answer

The two oxygen atoms are isotopes is the correct reason for the two oxygen atoms have the same number of electrons but different number of neutrons.

42. Question

Which of the following elements does not exhibit electrovalency?

A. calcium

B. chromium

C. carbon

D. cadmium

Answer

Carbon do not exhibit electrovalency.

43. Question

The number of valence electrons in a graphite atom is:

A. 2

B. 4

C. 3

D. 5

Answer

The number of valence electrons in a graphite atom is 4.

44. Question

The atomic numbers of four elements A, B, C and D are 12, 13, 15 and 3 respectively. The element which cannot form a cation is:

A. A

B. B

C. C

D. D

Answer

The element which cannot form a cation is C.

45. Question

The number of valence electrons in a sulphide ion, S^{2-}, is:

A. 16

B. 10

C. 9

D. 8

Answer

The number of valence electrons in a sulphide ion, S^{2-}, is 8.

46. Question

For an element, Z = 9. The valency of this element will be:

A. 4

B. 2

C. 1

D. 3

Answer

The valency of element Z will be 1.

47. Question

Four elements W, X, Y and Z contain 8, 11, 9 and 17 protons per atom respectively. The element which cannot form an anion is most likely to be:

A. W

B. X

C. Y

D. Z

Answer

The element which cannot form an anion is most likely to be X.

48. Question

The four atomic species can be represented as follows. Out of these, the two species which can be termed isobars are:

A. $^{201}_{60}X$

B. $^{200}_{61}X$

C. $^{200}_{58}X$

D. $^{203}_{60}X$

A. (i) and (ii)

B. (ii) and (iii)

C. (i) and (iii)

D. (i) and (iv)

Answer

The two species which can be termed isobars are (ii) and (iii).

49. Question

There are four elements P, Q, R and S having atomic numbers of 4, 18, 10 and 16 respectively. The element which can exhibit covalency as well as electrovalency will be:

A. P

B. Q

C. R

D. S

Answer

The element which can exhibit covalency as well as electrovalency will be S.

50. Question

The atomic number of an element X is 8 and that of element Y is 4. Both these elements can exhibit a valency of:

A. 1

B. 2

C. 3

D. 4

Answer

The atomic number of an element X is 8 and that of element Y is 4. Both these elements can exhibit a valency of 2.

51. Question

The isotopes of an element contain:

A. same number of neutrons but different number of protons

B. same number of neutrons but different number of electrons

C. different number of protons as well as different number of neutrons

D. different number of neutrons but same number of protons

Answer

The isotopes of an element contain different number of neutrons but same number of protons.

Questions Based on High Order Thinking Skills (HOTS)-Pg-212

52. Question

What is the number of valence electrons in:

(a) sodium ion, Na^{+}

(b) oxide ion, O^{2-}

Answer

(a) 8 is the number of valence electrons in sodium ion, Na^+ has the electronic configuration of 2, 8.

(b) 8 is the number of valence electrons in oxide ion, as O^{2-} have the electronic configuration of 2, 8.

53. Question

Atom A has a mass number 209 and atomic number 82.

Atom B has a mass number 209 and atomic number 83.

(i) How many protons atom A has?

(ii) How many protons atom B has?

(iii) Are atoms A and B isotopes of the same element?

Answer

(i) Atom A have 82 protons.

(ii) Atom B have 83 protons.

(iii) Both the atoms A and B are not the isotopes of same element.

54. Question

Which of the following pairs are isotopes? Give reasons for your choice:

(i) ${}^{58}_{26}A,\ {}^{58}_{28}B$ or (ii) ${}^{79}_{35}X,\ {}^{80}_{35}Y$

Answer

${}^{79}_{35}X,\ {}^{80}_{35}Y$, this pair is isotopes because they have same atomic number.

55. Question

Three different atoms of oxygen are represented as:

${}^{16}_{8}O,\ {}^{17}_{8}O\ and\ {}^{18}_{8}O$

(i) What do the subscripts (lower figures) and superscripts (upper figures) represent?

(ii) What factor is responsible for the change in the superscripts 16, 17 and 18, though the element is the same?

(iii) What is the usual name for such atoms of an element?

(iv) Give the nuclear composition of ${}^{18}_{8}O$

Answer

(i) The subscripts (lower figures) represents the atomic number and the superscripts (upper figures) represents the mass number.

(ii) The factor is responsible for the change in the superscripts 16, 17 and 18, though the element is the same number of neutrons.

(iii) The usual name for such atoms of an element is isotopes.

(iv) The nuclear composition of ${}^{18}_{8}O$ is that it have 8 protons and 10 neutrons

56. Question

The atomic species A and B have different number of protons but the same number of nucleons. On the other hand, the atomic species X and Y have the same number of protons but different number of nucleons. Which pair is an example of isobars? Why?

Answer

A and B are the example of isobars. Because isobars have same number of nucleons but they have different numbers of protons.

57. Question

Composition of the nuclei of two atomic species A and B is given as under:

	A	B
Protons:	18	20
Neutrons:	22	20

Give the mass numbers of A and B. What is the relation between the two species and which element or elements they represent?

Answer

The mass numbers of A and B is 40 the relation between the two species is that, they are isobars and the element or elements they represent are Argon and Calcium respectively.

58. Question

Which of the following pair is are isobars?

(i) ${}^{58}_{26}A, {}^{58}_{28}B$

(ii) ${}^{79}_{35}X, {}^{80}_{35}Y$

Give reasons for your choice.

Answer

$^{58}_{26}A$, $^{58}_{28}B$, is a pair of isobar. The reason behind I, they both have same number of neutrons.

59. Question

The number of protons, neutrons and electrons in particles A to E are given below:

Particle	Protons	Neutrons	Electrons
A	17	18	17
B	3	4	2
C	18	22	18
D	17	20	17
E	9	10	10

Give reasons, find a pair of isotopes from the above particles.

Answer

A pair of isotopes from the above particles is A and D. This is so, because both the isotopes have same number of protons but they have different number of neutrons.

60. Question

The composition of two atomic particles is given below:

	X	Y
Protons:	8	8
Neutrons:	8	9
Electrons:	8	8

(i) What is the mass number of X?

(ii) What is the mass number of Y?

(iii) What is the relation between X and Y?

(iv) Which element/elements do they represent?

Answer

(i) The mass number of X is (8+8) = 16.

(ii) The mass number of Y is (8+9) = 17.

(iii) The relation between X and Y is, both are isotopes.

(iv) Both the element X and Y represents the oxygen.