



CHEMISTRY

BOOKS - S CHAND IIT JEE

FOUNDATION

ATOMIC STRUCTURE

Question Bank 20 Fill In The Blanks

1. _____ is the smallest particle of a chemical element.



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2. The atomic theory was first proposed in 1808 by _____



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3. An atom consists of the sub-atomic particles protons, electrons, and _____



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4. Nucleus of an atom consists of ___
and _____



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5. The number of protons present in the nucleus of an atom is equal to the number of _____ in a neutral atom and is called the of the atom.



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6. Electrons revolve around the nucleus in fixed _____ paths called orbits or shells.



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7. A chlorine atom has 17 protons and 18 neutrons in its nucleus. Therefore, its atomic number is _____ and the mass number is _____



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8. Those atoms of an element having different number of neutrons are called _____



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9. Hydrogen occurs in nature in three different isotopic forms-protium, deuterium and _____



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10. The atoms of the same element may differ in the number of _____



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11. A _____ is the smallest particle of an element or a compound which is capable of free existence.



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12. Maximum number of electrons that can be present in N shell is _____



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13. The outermost shell of an atom is called its _____ and the electrons present in the outermost'shell are called _____



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14. The number of electrons lost or gained by an atom so as to complete the octet is called



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15. The particle which is formed by the gain of electrons by an atom is called _____



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16. The particle which is formed by the loss of electrons by an atom is called _____



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17. The particle which is formed by the loss or gain of electrons by an atom is called _____



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18. A potassium ion has positive charge because it contains less _____ than _____



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19. A sulphide ion has negative charge because it contains less _____ than _____



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20. An element has atomic number 13 and an atomic mass of 27. The number of electrons in each atom of this element is _____ and the number of neutrons is _____



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Question Bank 20 Fill In The Blanks With Appropriate Words To Make Correct Statements

1. The electrons present in the outermost shell of an atom are called _____ electrons.



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2. Inert gases have _____ electrons or _____ electrons in their valence shell.



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3. Metals have _____, _____ or _____ electrons in their valence shell.



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4. Non-metals have _____, _____ or _____ electrons in their valence shell.



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5. Metals are ___ in nature.



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6. Non-metals are _____ in nature.



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7. During chemical reaction only _____ electrons participate.



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8. Inert gas not having _____ electrons in the valence shell is _____



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9. Metals form _____



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10. Non-metals form _____



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Question Bank 20

1. The force of attraction which holds the different particles together in a molecule is called ___



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2. Choose the elements with electropositive and electronegative valency.

<i>Element</i>	<i>Atomic no.</i>	<i>Electronic configuration</i>		
		<i>K</i>	<i>L</i>	<i>M</i>
A	8	2	6	
B	9	2	7	
C	11	2	8	1
D	12	2	8	2



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3. Who was the first Indian philosopher who had postulated that matter is divisible?



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4. What is atomic mass unit (amu)?



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5. What do you understand by atomic mass of an element?



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6. Two types of atoms of chlorine have atomic masses 35 and 37, then why is the atomic mass of chlorine taken as 35.5?



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7. What is the difference between mass number and atomic mass?



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8. Discovery Of Neutrons is by ?



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9. How was the stability of atom explained by Bohr's model?



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10. Why is atomic number always calculated from the number of protons in the nucleus and not from the number of electrons present in the extra nuclear part?



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11. Atomic number of chlorine is 17. What will be the atomic number of chloride ion (Cl^-)

and why?



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12. Atomic number of sodium is 11. What will be the atomic number of sodium ion (Na^+) and why?



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13. What are the postulates of Bohr's model of atom? How does Bohr model overcome the

drawback of Rutherford's model of atom?



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14. Why are atomic masses of most of the elements fractional and not whole numbers?



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15. Why does helium exist as He whereas hydrogen exists as H_2



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16. Name the three isotopes of hydrogen. How do they differ from each other?



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17. M-shell can have up to 18 electrons, then why does potassium (Atomic number 19) does not have the electronic configuration 2, 8, 9 ?



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18. What are the different isotopes of oxygen?

Write their symbols and draw their complete structures. In what respects do they differ from each other?



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19. As we move away from the nucleus, in atom the potential energy of electron increases, the total energy as a whole increases. What happens to the kinetic energy of the electron?



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20. Could a nucleus of more than one proton but no neutrons exist? Explain.



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21. The valence shell of an element ${}_{20}^{40}\text{X}$ is the 3rd shell.



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22. According to Bohr's atomic model, electrons revolve around the nucleus in elliptical orbits.



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23. The mass number of the atom of an element is the sum of the number of protons and neutrons in the atom. (True / False)



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24. The maximum number of electrons present in the 5th shell is 32. (True / False)



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25. State True or False

Electrons present in the first orbit cannot lose its energy.



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26. J.J. Thomson proposed that the nucleus of an atom contains only nucleus.



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27. A neutron is formed by an electron and a proton combining together. Therefore, it is neutral.



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28. The mass of an electron is about $\frac{1}{2000}$ times that of proton.



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29. The statements below are false. For each statement, replace the underlined term to make a true statement.

Electrons have a positive charge.



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30. The statements below are false. For each statement, replace the underlined term to make a true statement.

All atoms of the same element contain the same number of neutrons.



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31. The statements below are false. For each statement, replace the underlined term to make a true statement.

Protons have no electrical charge.



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32. The statements below are false. For each statement, replace the underlined term to make a true statement.

The atomic number of an element is the number of protons and neutrons in the nucleus.



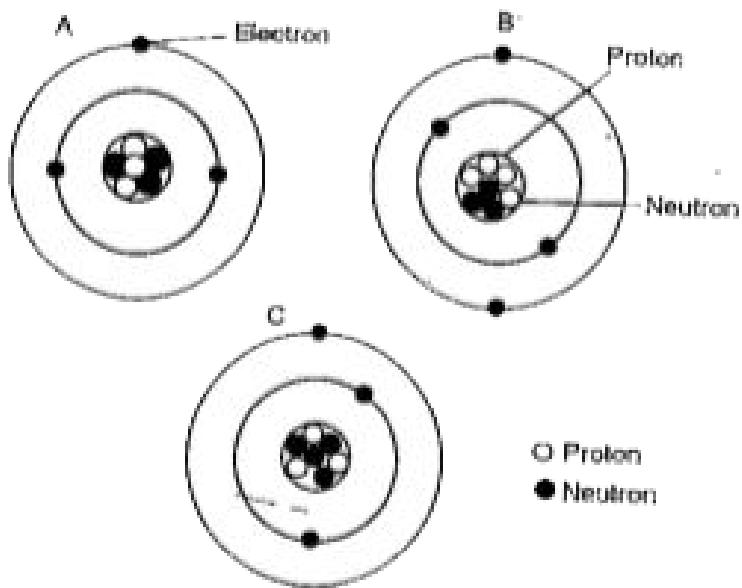
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33. The statements below are false. For each statement, replace the underlined term to make a true statement.

The mass number is an average of the masses of all naturally occurring isotopes of an element.



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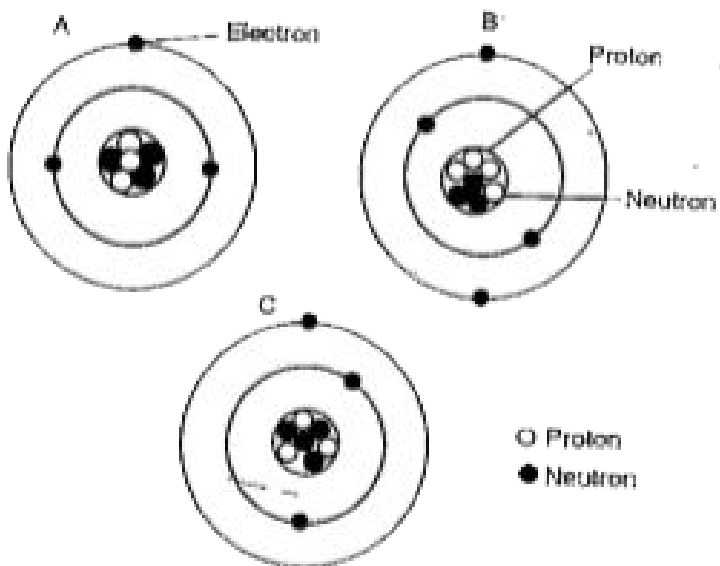


34.

Which diagram represents isotopes of the same element?



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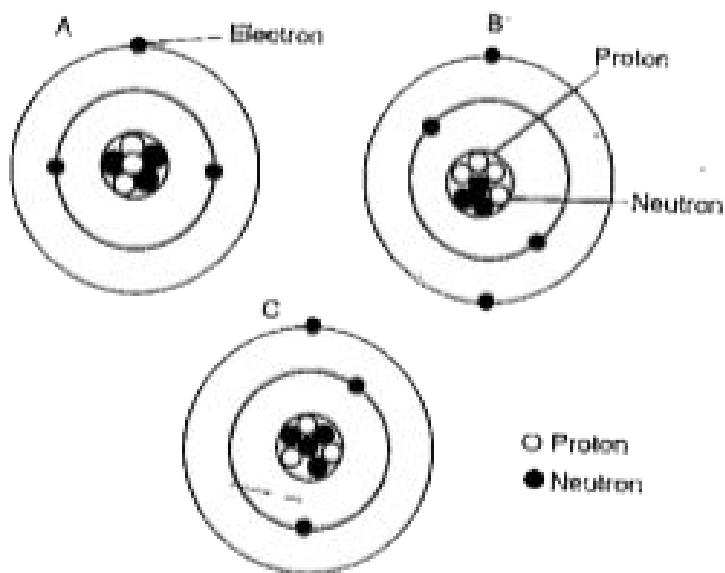


35.

What is the atomic number for A?



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36.

What is the mass number for B?

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37. Classify the following elements as metals, non metals and inert gases and give reasons

in support of your answer.

Chlorine, Magnesium, Argon, Phosphorus,
Potassium, Sulphur, Neon



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38. Use the following terms in the same sentence proton, neutron, and isotope.



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39. Complete each of the following sentences

An atom's _____ is equal to the number of protons in nucleus.



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40. Complete each of the following sentences

by choosing the correct term from the word bank.

An atom's _____ is equal to the weighted

average of the masses of all the naturally occurring isotopes of that element.



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41. Match the entries in column A with the appropriate ones in column B.

Column A

1. Central part of an atom
2. Planetary model of atoms
3. Definite circular paths of electrons
4. Heavy nucleus splits up into two small nuclei with release of energy
5. Plum Pudding model of the atom

Column B

- a. J.J. Thomson
- b. Nuclear fission
- c. Nucleus
- d. Bohr's atomic model
- e. Rutherford's atomic model



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42. All matter is made up of atoms. Which sentence correctly describes atoms?

A. All substances are made of the same atoms.

B. An atom is the smallest particle of a nucleus.

C. An atom is the smallest particle of an element.

D. An atom is a substance that has been cut in half.

Answer: C



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43. What are the negatively charged particle inside an atom called?

Use the diagram to answer this questions

A. protons

B. neutrons

C. nuclei

D. electrons

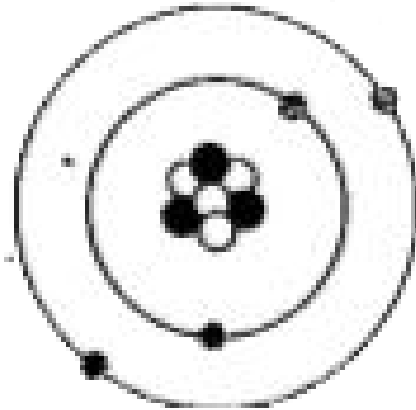
Answer: D



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44. The black circles in the model represent neutrons. What do the white circles

represent?



A. electrons

B. isotopes

C. nuclei

D. protons

Answer: D



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45. The atomic number of an element is determined by

- A. the number of electrons in one atom
- B. the number of neutrons in one atom
- C. the valency of the element
- D. the number of protons in one atom

Answer: D



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46. Which of the following particles has no electric charge?

A. proton

B. neutron

C. electron

D. ion

Answer: B



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47. How many protons does an atom with an atomic number of 23 and a mass number of 51 have?

A. 23

B. 28

C. 51

D. 74

Answer: A



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48. Which of the following determines the identity of an element?

A. atomic number

B. mass number

C. atomic mass

D. overall charge

Answer: A



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49. Isotopes exist because atoms of the same element can have different numbers of

A. protons

B. neutrons

C. electrons

D. None of the above.

Answer: B



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50. Which of the following pieces of equipment was used by J.J. Thomson to find electrons?

A. an electron microscope

B. a magnifying glass

C. a cathode-ray tube

D. a telescope

Answer: C



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51. Which one of the following is true of a neutron?

A. A neutron has half the mass of a proton.

B. A neutron is a little more massive than a proton.

C. A neutron has the same mass as an electron.

D. A neutron is a little more massive than an electron.

Answer: B



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52. The ratio between the neutrons in C and Si with respect to atomic masses 12 and 28 is:

A. 2 : 3

B. 3 : 2

C. 3 : 7

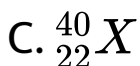
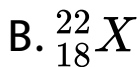
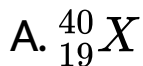
D. 7 : 3

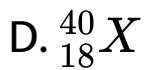
Answer: C



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53. The number of electrons in the atom of an element X is 18 and the number of neutrons is 22. Which of the following is the correct representation of an atom of this element?





Answer: D



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54. An atom differs from its ion in

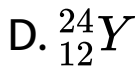
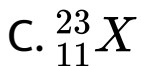
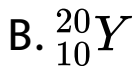
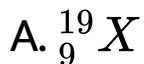
- A. nuclear charge
- B. mass number
- C. number of electrons
- D. number of neutrons

Answer: C



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55. The least reactive element among the following is

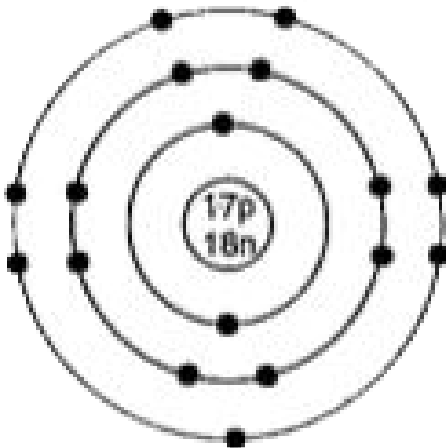


Answer: B



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56. The diagram given below represents an atom of
atom of



A. Potassium

B. Chlorine

C. Sulphur

D. Calcium

Answer: B



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57. The number of valence electrons in is ${}_{15}^{31}X$

is

A. 1

B. 7

C. 6

D. 5

Answer: D



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58. Which of the following particles is largely responsible for the chemical behaviour of elements?

A. Proton

B. Electron

C. Neutron

D. All of these

Answer: B



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59. Which of the following atoms do not usually form bonds?

A. Calcium

B. hydrogen

C. neon

D. oxygen

Answer: B



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60. Which types of atoms usually become negative ions?

- A. metals
- B. non-metals
- C. noble gases
- D. All of these

Answer: B



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61. Which element has a full outermost' energy level containing only two electrons?

A. helium, He

B. fluorine, F

C. hydrogen, H

D. oxygen, O

Answer: A



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62. What type of element tends to lose electrons when it forms bonds?

A. metal

B. non-metal

C. metalloid

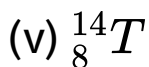
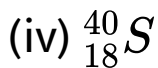
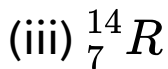
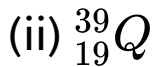
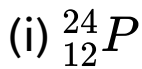
D. noble gas

Answer: A



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63. Write the electronic configuration, number of valence electrons and classify the following as metals, non-metals and inert gases.



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64. Which of the following describes what happens when an atom becomes an anion with a 2 charge?

A. The atom gains 2 protons

B. The atom loses 2 protons

C. The atom gains 2 electrons.

D. The atom loses 2 electrons

Answer: C



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65. Which pair of atoms can form an ionic bond?

A. sodium, Na, and potassium, K

B. potassium, K, and fluorine, F

C. fluorine, F, and chlorine, Cl

D. sodium, Na, and neon, Ne

Answer: B



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66. The atomic number of an element is 15.

Hence, it will show a valency of

A. 3 only

B. 5 only

C. both 3 and 5

D. neither 3 nor 5

Answer: C



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67. The valency of which of the elements is zero?

A. Helium

B. Silver

C. Gold

D. Hydrogen

Answer: A



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68. Which of the following statements 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: A



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69. The number of valence electrons present in noble gases is:

A. 6

B. 18

C. 8

D. 4

Answer: C



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70. Oxygen has an atomic number of 8. Which of the following could form the nucleus of an isotope of oxygen?

A. 4 protons and 4 neutrons

B. 6 protons and 8 neutrons

C. 8 protons and 8 neutrons

D. 10 protons and 10 neutrons.

Answer: C



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71. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

What is its atomic number?



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72. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

What is its mass number?



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73. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

Write the electronic configuration of the element



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74. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

State whether element X is a metal or non-metal. Why?



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75. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

What type of ion, cation or anion, will be formed by an atom of element X? Why?



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76. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

Write the symbols of the ion formed by an atom of element X.



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77. An atom of element X contains 3 protons, 3 electrons and 4 neutrons:

What could element X be?



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78. Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order.

(i) Rutherford's atomic model (ii) Thomson's atomic model

(iii) Bohr's atomic model

A. (i), (ii) and (iii)

B. (ii), (iii) and (i)

C. (ii), (i) and (iii)

D. (iii), (ii) and (i)

Answer: C



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79. For an atomic number 20, the 20th electron will occupy

A. L-shell

B. M-shell

C. N-shell

D. K-shell

Answer: C



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80. Members of which of the following have similar chemical properties?

A. Isotopes

B. Isobars

C. Allotropes

D. Both Isotopes and Allotropes

Answer: A



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81. The number of electrons in an element with atomic number X and mass number Y will be

A. $X - Y$

B. $Y - X$

C. $X + Y$

D. X

Answer: D



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82. The relative atomic masses of many elements are not whole numbers because

A. they cannot be determined very accurately

B. the atoms ionize during the determination of atomic masses

C. of the existence of isotopes

D. of the presence of impurities

Answer: C



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83. Atoms of which of the following have a valency equal to zero.

A. Hydrogen

B. Nitrogen

C. Neon

D. Carbon

Answer: C



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84. Calculate the number of electrons, protons and neutrons in sodium atom. Given that

atomic number of sodium is 11 and mass number (atomic mass) is 23.



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85. The nucleus of the atom of an element contains 17 protons and 18 neutrons. Calculate the atomic number and mass number of the element and represent them along with the symbol of the element.



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86. The atom of an element has 2 electrons in the M shell. What will be the atomic number of the element? Name the element.



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87. Atomic number of Al is 13 and mass number is 27. Calculate the number of electrons, protons and neutrons in the ion formed. Represent the ion. What will be its valency?



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88. An element has atomic number 15. What will be the valency/valencies shown by it?



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89. An ion M^{3+} contains 10 electrons and 14 neutrons. What are the atomic number and mass number of the element M? Name the element.



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90. An ion X^{2-} contains 10 electrons and 8 neutrons. What are the atomic number and mass number of the element X? Name the element.



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91. Calculate the number of protons, neutrons, and electrons in an atom of zinconium-90 that has no overall charge and an atomic number of 40.



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92. Calculate the atomic mass of chlorine, which consists of 76% of all the chlorine in nature, and chlorine - 37 that makes up the other 24%.



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93. Calculate the atomic mass of silver, which occurs naturally as 52% silver - 107 and 48% silver - 109.



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94. Calculate the atomic mass of silicon, which occurs naturally as 92% silicon -28, 5% silicon -29, and 3% silicon - 30



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

A. 13

B. 10

C. 14

D. 16

Answer: B



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96. How many electrons does an atom with an atomic number of 20 and a mass number of 42 have?

A. 20

B. 22

C. 42

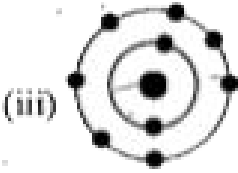
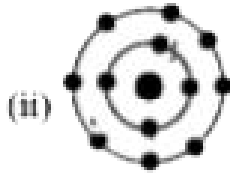
D. 62

Answer: A



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97. Which of the following do not represent Bohr's model of atom correctly?



A. (i) and (ii)

B. (i) and (iii)

C. (ii) and (iv)

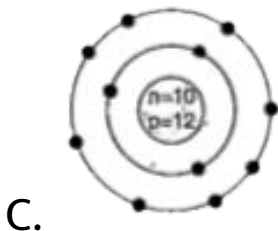
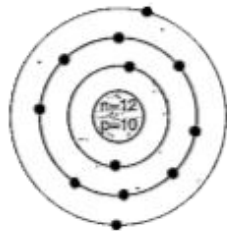
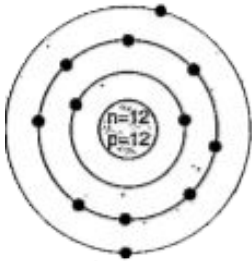
D. (i) and (iv)

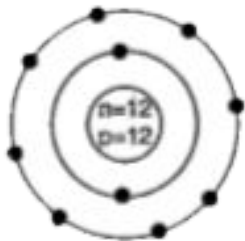
Answer: C



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98. Identify the Mg^{2+} ion from the figure where, n and p represent the number of neutrons and protons respectively.





D.

Answer: D



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99. Elements with valency 1 are

A. always metals

B. always metalloids

C. either metals or non-metals

D. always non-metals

Answer: C



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100. Use the following terms to create a concept map

atom, nucleus, protons, neutrons, electrons, isotopes, atomic number, positively charged,

negatively charged, neutral, Rutherford, J.J.

Thomson, Goldstein, Chadwick



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101. Complete the following sentences by choosing the correct term from the word bank.

nuclear fission, nuclear fusion, nuclear chain reaction

During _____ small nuclei combine.



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102. Complete the following sentences by choosing the correct term from the word bank.

nuclear fission, nuclear fusion, nuclear chain reaction

During _____ nuclei split one after another



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103. The statements below are false. For each statement, replace the underlined term to

make a true statement.

Nuclear fusion involves splitting a nucleus



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104. The statements below are false. For each statement, replace the underlined term to make a true statement.

Radioactivity involves the joining of nuclei.



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105. Compare nuclear fission with nuclear fusion.



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106. Imagine that a uranium nucleus splits and releases three neutrons and that each neutron splits another nucleus. If the first split occurs in stage 1, how many nuclei will split during stage 4?



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107. Which of the following is a use of radioactive material?

A. detecting smoke

B. locating defects in materials

C. generating electrical energy

D. All of the above

Answer: D



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108. Which particle both begins and is produced by a nuclear chain reaction ?

A. positron

B. alpha particle

C. neutron

D. beta particle

Answer: C



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109. Which statement about nuclear fusion is false?

A. Nuclear fusion happens in the sun.

B. Nuclear fusion is the joining of the nuclei of atoms.

C. Nuclear fusion is currently used to generate electrical energy.

D. Nuclear fusion can use hydrogen as fuel.

Answer: C



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110. In fission, the products have less mass than the starting materials do. Why does this happen?



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111. Explain why nuclei of carbon, oxygen, and iron can be found in stars



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112. What are two dangers associated with nuclear fission?



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113. Solve the following crossword with the help of the given clues.

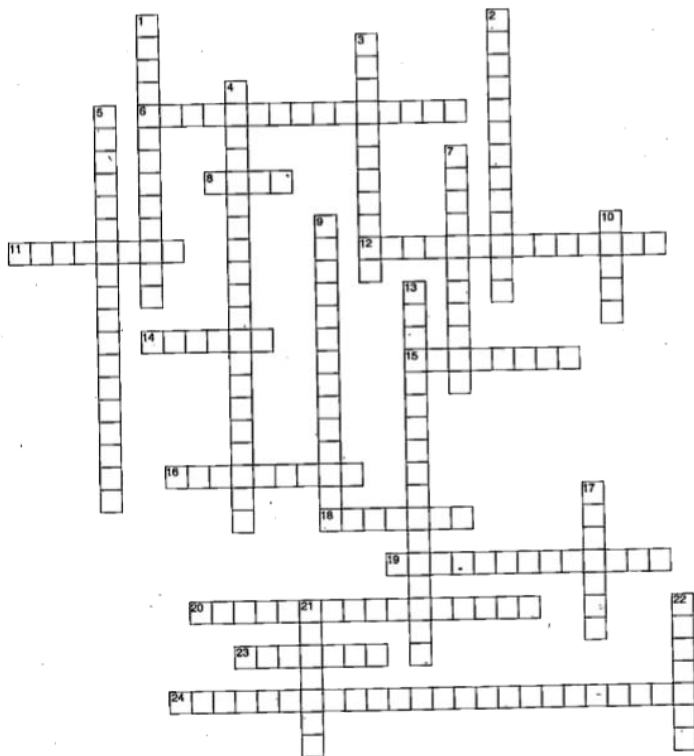
Clues :

ACROSS

6. It occurs when a heavy, unstable nucleus splits into two or more lighter nuclei.
8. The smallest unit of an element that maintains the properties of that element.
11. Atoms that have the same number of protons (or the same atomic number) as other atoms of the same element do but that have different number of neutrons.
12. The transfer of electrons from one atom to another is called _____.
14. A stable sub-atomic particle that has a positive electric charge and is part of the nucleus of an atom.
15. A sub-atomic particle with a negative electric charge that spins about an atom's nucleus in orbits called shells.
16. The particles that build up an atom
18. The positively charged central region of an atom, composed of protons and neutrons and containing most of the mass of the atom.
19. The number of protons in the nucleus of an atom.
20. The combining of atoms to form molecules of new substances.
23. An electrically neutral sub-atomic particle that is part of the nucleus of an atom.
24. The arrangement of electrons in a succession of energy levels or shells (orbits) around the nucleus.

DOWN

1. The outermost shell of an atom, the electrons in which are involved in compound formation.
2. An interaction that holds two atoms in a molecule together.
3. The total number of protons and neutrons present in the nucleus of an atom.
4. The number of times by which the mass of the atom of an element is heavier than 1/12th the mass of a carbon-12 atom.
5. A bond that forms by the complete transfer of electrons from one atom to another which results in positive ions and a negative ions.
7. The six gases helium, neon, argon, krypton, xenon, and radon, which do not react chemically with other substances except under special conditions.
9. The joining together of light atomic nuclei, especially hydrogen nuclei, to form a heavier nucleus, especially a helium nucleus.
10. An ion that has a negative charge.
13. The electrons present in the valence shell of an atom.
17. A substance that cannot be broken down into simpler substances by chemical means.
21. Positively charged ions
22. A whole number that represents the ability of an atom or a group of atoms to combine with other atoms or groups of atoms.





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Question Bank 20 Answer The Following Questions

1. What particle is needed to begin a nuclear chain reaction?



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2. In both fission and fusion, what is converted into energy?



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3. Which kind of nuclear reaction is currently used to generate electrical energy?



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4. Which kind of nuclear reaction is the source of the sun energy?



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Self Assessment Sheet 20

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

A. 2

B. 7

C. 8

D. 9

Answer: C



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2. What is the maximum number of electrons that can be present in the n th shell of an atom?



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3. Choose the correct options and fill in the blanks by the correct word.

An _____ (atom /element) is a pure

substance which cannot be split into anything simpler by chemical means.



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4. Choose the correct options and fill in the blanks by the correct word.

A/An _____(atom/compound) is the smallest particle of an element.



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5. Choose the correct options and fill in the blanks by the correct word.

The atomic number of an element is the number of _____ (neutrons/protons) in the nuclei of its atoms.



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6. Choose the correct options and fill in the blanks by the correct word.

An atom as a whole is electrically _____
(neutral/charged).



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7. Choose the correct options and fill in the blanks by the correct word.

The splitting of a heavier nucleus of an atom into two or more smaller nuclei is called nuclear _____ (fusion/fission).



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8. Match the following :

Column A

1. Dalton
2. J.J. Thomson
3. Chadwick
4. Goldstein
5. Ion

Column B

- a. Discovery of neutron
- b. Electrically-charged atom
- c. Atomic theory
- d. Discovery of electron, and of isotopes
- e. Discovery of proton



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9. Draw diagrams representing the atomic structures of the following:

Oxygen atom





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10. Draw diagrams representing the atomic structures of the following:

chlorine atom



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11. Which one of the following is the correct electronic configuration of potassium?

A. 2,8,9

B. 8, 2,9

C. 2, 8, 8,1

D. 1, 2, 8, 8

Answer: C



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12. What are the main postulates of Dalton's atomic theory ? What were its limitations ?
How has the theory been modified ?



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13. What will be the composition of the nucleus of the atom of an element with atomic number 19 and mass number 39?



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14. Which atom does not have any neutron in the nucleus and why?



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15. State the differences between atoms and ions.



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16. Which symbols are used to represent different Bohr's orbits?



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17. How does their energy change when we move outwards from the nucleus?



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18. Rutherford's experiment showed for the first time that the atom has

A. Electrons

B. Protons

C. Nucleus

D. Neutrons

Answer: C



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19. Neutron is present in all atoms except

A. Nucleus

B. Deuterium

C. Tritium

D. Helium

Answer: A



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20. The statements below are false. For each statement replace the underlined term to make a true statement.

A nucleus is a particle with a negative electric charge.



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21. The statements below are false. For each statement replace the underlined term to make a true statement.

The electrons is where most of an atom's mass is located.



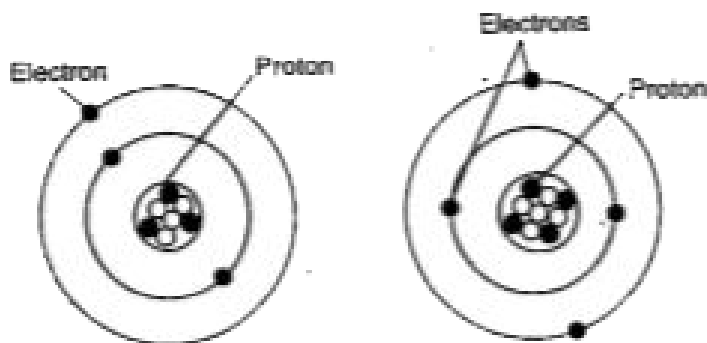
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22. What refinements did Bohr make to Rutherford's proposed atomic theory?



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23. Look at the two atomic models. Do the two atoms represent different elements or different isotopes? Explain.



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