



Single Correct Answer Type

- Choose the incorrect relation on the basis of Bohr's theory
  - Velocity of electron  $\propto \frac{1}{n}$
  - Frequency of revolution  $\propto \frac{1}{n^2}$
  - Radius of orbit  $\propto n^2Z$
  - Force on electron  $\propto \frac{1}{n^4}$
- X-rays were discovered by :
  - Becquerel
  - Roentgen
  - Mme. Curie
  - Van Laue
- Two electrons in the same orbital may be identified with:
  - n
  - l
  - m
  - s
- An electron has principal quantum number 3. The number of its (i) subshells and (ii) orbitals would be respectively:
  - 3 and 5
  - 3 and 7
  - 3 and 9
  - 2 and 5
- Maximum number of electrons in a subshell of an atom is determined by the following:
  - $2n^2$
  - $4l + 2$
  - $2l + 1$
  - $4l - 2$
- Particle having mass 200 times that of an electron is:
  - Proton
  - Positron
  - Meson
  - Neutron
- Which of the following has the maximum number of unpaired electrons?
  - $Mg^{2+}$
  - $Ti^{3+}$
  - $Fe^{2+}$
  - $V^{3+}$
- An electron from one Bohr stationary orbit can go to next higher orbit
  - By emission of electromagnetic radiation
  - By absorption of any electromagnetic radiation
  - By absorption of electromagnetic radiation of particular frequency
  - Without emission or absorption of electromagnetic radiation
- How many neutrons are present in tritium nucleus?
  - 2
  - 3
  - 1
  - 0
- The number of wave made by an electron moving in an orbit having maximum magnetic



quantum number +3 is :

- a)4                      b)3                      c)5                      d)6

11. The wavelength of a spectral line emitted by hydrogen atom in the Lyman series is  $\frac{16}{15R}$  cm. What is the value of  $n_2$ ? (R=Rydberg constant)

- a)2                      b)3                      c)4                      d)1

12. The statements, which is/are correct:

- a) Number of total nodes in an orbital =  $n - 1$   
b) Number of radial nodes in an orbital =  $n - l - 1$   
c) Number of angular nodes in an orbital =  $l$   
d) All of the above

13. If the wavelength of an electromagnetic radiation is 2000Å, what is its energy in ergs?

- a)  $9.94 \times 10^{-12}$                       b)  $9.94 \times 10^{-19}$                       c)  $4.97 \times 10^{-12}$                       d)  $4.97 \times 10^{-19}$

14. Number of unpaired electrons in the electronic configuration  $1s^2, 2s^2 2p^4$ :

- a)2                      b)3                      c)4                      d)6

15. A strong argument for the particle nature of cathode rays is that they:

- a) Produce fluorescence  
b) Travel through vacuum  
c) Get deflected by electric and magnetic fields  
d) Cast shadow

16. The electronic configuration  $1s^2, 2s^2 2p^6, 3s^1 3p^1$  correctly describes:

- a) Ground state of Na    b) Ground state of  $Si^+$     c) Excited state of Mg    d) Excited state of  $Al^{3+}$

17. What accelerating potential is needed to produce an electron beam with an effective wavelength of 0.090Å?

- a)  $1.86 \times 10^4$  eV                      b)  $1.86 \times 10^2$  eV                      c)  $2.86 \times 10^4$  eV                      d)  $2.86 \times 10^2$  eV

18. Which of the following pairs have identical values of  $e/m$ ?

- a) A proton and a neutron                      b) A proton and deuterium  
c) Deuterium and an  $\alpha$ -particles                      d) An electron and  $\gamma$ -rays

19. Positive charge in an atom is:

- a) Scattered all over the atom  
b) Concentrated in the nucleus



- c) Revolving around the nucleus
- d) None is true
20.  $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$  (at. No. of Cr = 24) has a magnetic moment of 3.83 B.M. The correct distribution of 3d electrons in the chromium of the complex:
- a)  $3d_{xy}^1, 3d_{yz}^1, 3d_{xz}^1$
- b)  $3d_{xy}^1, 3d_{yz}^1, 3d_{z^2}^1$
- c)  $(3d_{x^2-y^2}^1), 3d_{z^2}^1, 3d_{xz}^1$
- d)  $3d_{xy}^1, (3d_{x^2-y^2}^1), 3d_{yz}^1$
21. The mass of an electron is  $m$ , its charge is  $e$  and it is accelerated from rest through a potential difference,  $V$ . The velocity of electron will be calculated by formula
- a)  $\sqrt{\frac{V}{m}}$                       b)  $\sqrt{\frac{eV}{m}}$                       c)  $\sqrt{\left(\frac{2eV}{m}\right)}$                       d) None of these
22. The present atomic weight scale is:
- a)  $\text{C}^{12}$                       b)  $\text{O}^{16}$                       c)  $\text{H}^1$                       d)  $\text{C}^{13}$
23. Which one of the following set of quantum numbers is not possible for electron in the ground state of an atom with atomic number 19?
- a)  $n = 2, l = 0, m = 0$     b)  $n = 2, l = 1, m = 0$     c)  $n = 3, l = 1, m = -1$     d)  $n = 3, l = 2, m = +2$
24. Oxygen consists of  $\text{O}^{16}, \text{O}^{17}$  and  $\text{O}^{18}$  isotopes and carbon consists of isotopes of  $\text{C}^{12}$  and  $\text{C}^{13}$ . Total number of  $\text{CO}_2$  molecules possible are:
- a) 6                      b) 12                      c) 18                      d) 1
25. In order to designate an orbital  $n$  in an atom, the number of quantum number required are:
- a) 1                      b) 2                      c) 3                      d) 4
26. For a given value of azimuthal quantum number  $l$ , the total number of values for the magnetic quantum number  $m$  are given by:
- a)  $l + 1$                       b)  $2l + 1$                       c)  $2l - 1$                       d)  $l + 2$
27. Magnetic quantum number for the last electron in sodium is:
- a) 3                      b) 1                      c) 2                      d) Zero
28. The Heisenberg's uncertainty principle can be applied to:
- a) A cricket ball                      b) A football                      c) A jet aeroplane                      d) An electron
29. Isotopes are
- a) Atoms of different elements having same mass number
- b) Atoms of same elements having same mass number



- c) Atoms of same elements having different mass number  
 d) Atoms of different elements having same number of neutrons
30. Which element possess non-spherical shells?  
 a) He                      b) B                      c) Be                      d) Li
31. Splitting of spherical lines when atoms are subjected to strong electric field is called:  
 a) Zeeman effect      b) Stark effect      c) Decay                  d) Disintegration
32. An orbital in which  $n = 4$  and  $l = 2$  is expressed by  
 a)  $4s$                       b)  $4p$                       c)  $4d$                       d)  $5p$
33. Which wave property is directly proportional to energy of electromagnetic radiation:  
 a) Velocity                  b) Frequency              c) Wave number          d) All of these
34. Mass of an electron is :  
 a)  $9.1 \times 10^{-28} \text{g}$       b)  $9.1 \times 10^{-25} \text{g}$       c)  $9.1 \times 10^{-10} \text{g}$       d)  $9.1 \times 10^{-18} \text{g}$
35. Which is the correct outermost shell configuration of chromium?  
 a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_  
 d) \_\_\_\_\_
36. Which of the following ion will show colour in aqueous solution?  
 a)  $\text{La}^{3+} (Z = 57)$       b)  $\text{Ti}^{3+} (Z = 22)$       c)  $\text{Lu}^{3+} (Z = 71)$       d)  $\text{Sc}^{3+} (Z = 21)$
37. The electric configuration of element with atomic number 24 is  
 a)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^4, 4s^2$                       b)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}$   
 c)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6$                       d)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5, 4s^1$
38. What is the maximum number of electrons in an atom that can have the following quantum numbers  $n = 4, m_l = +1$ ?  
 a) 4                      b) 15                      c) 3                      d) 6
39. The principal quantum number of an atom represents:  
 a) Size and energy of the orbit



- b) Spin angular momentum
- c) Orbital angular momentum
- d) Space orientation of the orbitals
40. The specific charge for positive rays is much less than the specific charge for cathode rays. This is because:
- a) Positive rays are positively charged
- b) Charge on positive rays is less
- c) Positive rays comprise ionised atoms, whose mass is much higher
- d) Experimental method for determination is wrong
41. The magnetic moment of electron in an atom (excluding orbital magnetic moment) is given by:
- a)  $\sqrt{n(n+2)}$  Bohr Magneton (or B.M.)      b)  $\sqrt{n(n+1)}$  B.M.      c)  $\sqrt{n(n+3)}$  B.M.      d) None of the above
42. de Broglie equation is a relationship between:
- a) Position of an electron and its momentum
- b) Wavelength of an electron and its momentum
- c) Mass of an electron and its energy
- d) Wavelength of an electron and its frequency
43. Which electromagnetic radiation has extremely small wavelength?
- a) Radiowave      b) Cosmic rays      c) Infrared rays      d) Microwaves
44. Dimensions of Planck's constant are:
- a) force×time      b) energy×distance      c) energy/time      d) energy×time
45. Given : The mass of electron is  $9.11 \times 10^{-31}$  kg and Planck constant is  $6.626 \times 10^{-34}$  Js, the uncertainty involved in the measurement of velocity within a distance of 0.1 Å is:
- a)  $5.79 \times 10^8$  m s<sup>-1</sup>      b)  $5.79 \times 10^5$  m s<sup>-1</sup>      c)  $5.79 \times 10^6$  m s<sup>-1</sup>      d)  $5.79 \times 10^7$  m s<sup>-1</sup>
46. If helium atom and hydrogen molecules are moving with the same velocity, their wavelength ratio will be
- a) 4:1      b) 1:2      c) 2:1      d) 1:4
47. The energy required to break one mode of Cl-Cl bonds in Cl<sub>2</sub> is 242 kJ mol<sup>-1</sup>. The longest wavelength of light capable of breaking a single Cl-Cl bond is
- a) 594 nm      b) 640 nm      c) 700 nm      d) 494 nm
48. The uncertainty in momentum of an electron is  $1 \times 10^{-5}$  kg m/s. the uncertainty in its



position will be ( $h = 6.62 \times 10^{-34} \text{ kg m}^2/\text{s}$ )

- a)  $2.36 \times 10^{-28} \text{ m}$       b)  $5.25 \times 10^{-28} \text{ m}$       c)  $2.27 \times 10^{-30} \text{ m}$       d)  $5.27 \times 10^{-30} \text{ m}$

49. All types of electromagnetic radiations possess same:

- a) Energy      b) Velocity      c) Frequency      d) Wavelength

50. The values of four quantum numbers of valence electron of an element are

$$n = 4, l = 0, m = 0 \text{ and } s = +\frac{1}{2}.$$

The element is

- a) K      b) Ti      c) Na      d) Sc

51. Ground state electronic configuration of nitrogen atom can be represented as

- a)      b)      c)      d)

52. The value of charge on the oil droplets experimentally observed were  $-1.6 \times 10^{-19}$  and  $-4 \times 10^{-19}$  coulomb. The value of the electronic charge, indicated by these results is:

- a)  $1.6 \times 10^{-19}$       b)  $-2.4 \times 10^{-19}$       c)  $-4 \times 10^{-19}$       d)  $-0.8 \times 10^{-19}$

53. Transition from  $n = 4, 5, 6$  to  $n = 3$  in hydrogen spectrum gives:

- a) Lyman series      b) Paschen series      c) Balmer series      d) Pfund series

54. The atomic numbers of elements X, Y and Z are 19, 21 and 25 respectively. The number of electrons present in the M-shell of these elements follow the order

- a)  $Z > X > Y$       b)  $X > Y > Z$       c)  $Z > Y > X$       d)  $Y > Z > X$

55. The mass number of an element is 23 and atomic number is 11. The number of protons, electrons and neutrons respectively present in the atom of the elements are:

- a) 11, 11, 12      b) 12, 12, 11      c) 11, 12, 11      d) 12, 11, 12

56. In photoelectric emission the energy of the emitted electrons is:

- a) Larger than that of incident photon  
b) Smaller than that of incident photo  
c) Same as that of incident photon  
d) Proportional to intensity of incident light

57. Angular momentum of an electron in an orbital is given by :

- a)  $n \frac{h}{2\pi}$       b)  $\frac{h}{2\pi} \times \sqrt{l(l+1)}$       c)  $n \frac{h}{4\pi}$       d) None of these

58. What is the mass of a photon of sodium light with a wavelength of 5890

$\text{\AA}$ ? ( $h = 6.63 \times 10^{-27} \text{ erg-s}$ )

- a)  $5.685 \times 10^{-33} \text{ g}$       b)  $6.256 \times 10^{-33} \text{ g}$       c)  $4.256 \times 10^{-33} \text{ g}$       d)  $3.752 \times 10^{-33} \text{ g}$

59. Consider the ground state of ( $Z = 24$ ). The numbers of electrons with the azimuthal



quantum numbers,  $l = 1$  and  $2$  are respectively

- a) 12 and 4                      b) 12 and 5                      c) 16 and 4                      d) 16 and 5

60. The charge on an electron was discovered by

- a) J.J. Thomson                      b) Neil Bohr                      c) James Chadwick                      d) Mullikan

61. If an electron has spin quantum number of  $+\frac{1}{2}$  and a magnetic quantum number of  $-1$ , it cannot be represented in an

- a) s-orbital                      b) p-orbital                      c) d-orbital                      d) f-orbital

62. The orbital angular momentum for an electron revolving in an orbit is given by  $\sqrt{l(l+1)} \frac{h}{2\pi}$ .

This momentum for an s-electron will be given by

- a)  $+\frac{1}{2} \cdot \frac{h}{2\pi}$                       b) Zero                      c)  $\frac{h}{2\pi}$                       d)  $\sqrt{2} \cdot \frac{h}{2\pi}$

63. A heavy element has atomic number  $X$  and mass number  $Y$ . Correct relationship between  $X$  and  $Y$  is

- a)  $X \leq Y$                       b)  $X \geq Y$                       c)  $X < Y$                       d)  $X \leq Z (1 - Y)^2$

64. Proton is :

- a) Nucleus of deuterium  
b) Ionised hydrogen molecule  
c) Ionised hydrogen atom  
d) An  $\alpha$ -particle

65. An isotone of  ${}_{32}^{66}\text{Ge}$  is

- a)  ${}_{32}^{66}\text{Ge}$                       b)  ${}_{33}^{66}\text{As}$                       c)  ${}_{34}^{66}\text{Se}$                       d)  ${}_{38}^{66}\text{Sc}$

66. Which principle/rule limits the maximum number of electrons in an orbital to two?

- a) Aufbau principle  
b) Pauli's exclusion principle  
c) Hund's rule of maximum multiplicity  
d) Heisenberg's uncertainty principle

67. Magnitude of kinetic energy in an orbit is equal to

- a) Half of the potential energy                      b) Twice of the potential energy  
c) One fourth of the potential energy                      d) None of the above

68. The shortest  $\lambda$  for the Lyman series is: (Given  $R_H = 109678 \text{ cm}^{-1}$ )

- a) 991 Å                      b) 700 Å                      c) 600 Å                      d) 811 Å



69. The maximum number of atomic orbitals associated with a principal quantum number 5 is:  
 a) 9                                      b) 12                                      c) 16                                      d) 25
70. The number of orbitals present in the shell with  $n = 4$  is  
 a) 16                                      b) 8                                      c) 18                                      d) 32
71. Which one of the following is the set of correct quantum numbers of an electron in 3d orbital?  
 a)  $n = 3, l = 0, m = 0, s = -1/2$                                       b)  $n = 2, l = 3, m = 0, s = +1/2$   
 c)  $n = 3, l = 1, m = 0, s = -1/2$                                       d)  $n = 3, l = 2, m = 1, s = +1/2$
72. Different lines in Lyman series of hydrogen spectrum lie in .... region  
 a) Ultraviolet                                      b) Infrared                                      c) Visible                                      d) Far infrared
73. The first energy level that can have d-orbitals is:  
 a) 2                                      b) 3                                      c) 4                                      d) All are correct
74. The uncertainty in the momentum of an electron is  $1.0 \times 10^{-5} \text{ kg ms}^{-1}$ . The uncertainty in its position will be  
 a)  $1.50 \times 10^{-28} \text{ m}$                                       b)  $1.05 \times 10^{-26} \text{ m}$                                       c)  $5.27 \times 10^{-30} \text{ m}$                                       d)  $5.25 \times 10^{-28} \text{ m}$
75. Which of the following particles moving with same velocity would be associated with smaller de-Broglie wavelength?  
 a) Helium molecule                                      b) Oxygen molecule                                      c) Hydrogen molecule                                      d) Carbon molecule
76. Stark effect refers to the  
 a) Splitting up of the lines in an emission spectrum in the presence of an external electrostatic field  
 b) Random scattering of light by colloidal particles  
 c) Splitting up of the lines in an emission spectrum in a magnetic field  
 d) Emission of electrons from metals when light falls upon them
77. For which species, Bohr's theory does not apply:  
 a) H                                      b) Be                                      c) He<sup>+</sup>                                      d) Li<sup>2+</sup>
78. The energy of electron in first orbit of He<sup>+</sup> is ( $R_H = -871.6 \times 10^{-20} \text{ J}$ ). The energy of electron in the first orbit of H is:  
 a)  $-871.6 \times 10^{-20} \text{ J}$                                       b)  $-435.8 \times 10^{-20} \text{ J}$                                       c)  $-217.9 \times 10^{-20} \text{ J}$                                       d)  $-108.9 \times 10^{-20} \text{ J}$
79. The quantum levels upto  $n = 3$  has:  
 a) s and p-levels                                      b) s,p,d,f-levels                                      c) s,p,d-levels                                      d) s-level
80. Which of the subshell has double dumb-bell shape?





- a)<sub>s</sub>                      b)<sub>p</sub>                      c)<sub>d</sub>                      d)<sub>f</sub>
81. The lightest particle is  
 a)  $\alpha$ -particle              b) Positron              c) Proton              d) Neutron
82. The ratio of speed of  $\gamma$ -rays and X-rays is:  
 a) 1                      b)  $< 1$                       c)  $> 1$                       d) None of these
83. The radius of second Bohr's orbit of hydrogen atom is  
 a) 0.053 nm              b) 0.106 nm              c) 0.2116 nm              d) 0.4256 nm
84. Which set of phenomenon shown by the radiation proves the dual nature of radiation?  
 a) Scintillation  
 b) Interference and diffraction  
 c) Interference and photoelectric effect  
 d) None of the above
85. The hydrogen spectrum from an incandescent source of hydrogen is:  
 a) A band spectrum in emission  
 b) A line spectrum in emission  
 c) A band spectrum in absorption  
 d) A line spectrum in absorption
86. The total spin resulting from a  $d^7$  configuration is:  
 a)  $\pm 1/2$                       b)  $\pm 2$                       c)  $\pm 1$                       d)  $\pm 3/2$
87. The path of deflection of electron beam is:  
 a) Directly proportional to the magnitude of applied magnetic field  
 b) Inversely proportional to the magnitude of applied magnetic field  
 c) Inversely proportional to the velocity of electron  
 d) Directly proportional to the  $e/m$  value
88. Which one of the following groupings represents a collection of isoelectronic species?  
 (At. no. Cs=55, Br=35)  
 a) Na,  $Ca^{2+}$ ,  $Mg^{2+}$               b)  $N^{3-}$ , F, Na              c) Be,  $Al^{3+}$ , Cl              d)  $Ca^{2+}$ , Cs, Br
89. Which particle may be removed from a stable neutral atom with least energy change?  
 a) An  $\alpha$ -particle              b) A neutron              c) A proton              d) An electron



90. Visible spectrum of hydrogen shows that it exists in two different forms which are based on direction of spin of the:
- Molecule of hydrogen
  - Nuclei of hydrogen atoms
  - Electrons of hydrogen
  - Atoms of hydrogen molecule
91. Evidence for the existence of different energy levels in atom is supplied by:
- Spectral lines
  - Mass defects
  - Atomic numbers
  - Atomic radii
92. Rutherford's experiment on the scattering of  $\alpha$ -particles showed for the first time that the atom has
- Electrons
  - Protons
  - Nucleus
  - Neutrons
93. The longest  $\lambda$  for the Lyman series is : (Given  $R_H = 109678 \text{ cm}^{-1}$ )
- 1215 Å
  - 1315 Å
  - 1415 Å
  - 1515 Å
94. The angular momentum of electron in  $n$ th orbit is given by:
- $nh$
  - $\frac{h}{2\pi n}$
  - $\frac{nh}{2\pi}$
  - $\frac{n^2h}{2\pi}$
95. According to Bohr's postulates which quantity can take up only discrete values:
- Kinetic energy
  - Angular momentum
  - Momentum
  - Potential energy
96. When the frequency of light incident on a metallic plate is doubled, the KE of the emitted photoelectrons will be:
- Doubled
  - Halved
  - Increased but more than doubled of the previous KE
  - Unchanged
97. The mass of one mole of electron is:
- 0.55 mg
  - 0.008 mg
  - 1.008 mg
  - 0.184 mg
98. The velocities of two particles A and B are  $0.05$  and  $0.02 \text{ ms}^{-1}$  respectively. The mass of B is five times the mass of A. The ratio of their de-Broglie's wavelength is
- 2:1
  - 1:4
  - 1:1
  - 14:1
99. Which are in the ascending order of wavelength?
- $H_\alpha, H_\beta, H_\gamma, \dots$  lines in Balmer series of hydrogen atom
  - Lyman limit, Balmer limit, Paschen limit in the hydrogen spectrum



c) Blue, violet, yellow, red colours in solar spectrum

d) None of the above

100 The representation of the ground state  $\boxed{\uparrow \uparrow}$  electronic configuration of He by box-diagram as

is wrong because it violates

a) Heisenberg's uncertainty principle

b) Bohr's quantization theory of angular momenta

c) Pauli exclusion principle

d) Hund's rule

