

# GPLUS EDUCATION

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CHEMISTRY

## STRUCTURE OF ATOM

### 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  $\propto n^2 Z$
  - 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?
  - $\text{Mg}^{2+}$
  - $\text{Ti}^{3+}$
  - $\text{Fe}^{2+}$
  - $\text{V}^{3+}$
- 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 :
  - 4
  - 3
  - 5
  - 6
- 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)
  - 2
  - 3
  - 4
  - 1
- The statements, which is/are correct:
  - Number of total nodes in an orbital =  $n - 1$
  - Number of radial nodes in an orbital =  $n - l - 1$
  - Number of angular nodes in an orbital =  $l$
  - All of the above
- If the wavelength of an electromagnetic radiation is  $2000\text{\AA}$ , what is its energy in ergs?
  - $9.94 \times 10^{-12}$
  - $9.94 \times 10^{-19}$
  - $4.97 \times 10^{-12}$
  - $4.97 \times 10^{-19}$
- Number of unpaired electrons in the electronic configuration  $1s^2, 2s^2 2p^4$ :
  - 2
  - 3
  - 4
  - 6
- A strong argument for the particle nature of cathode rays is that they:
  - 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  $\text{Si}^+$       c) Excited state of Mg      d) Excited state of  $\text{Al}^{3+}$
17. What accelerating potential is needed to produce an electron beam with an effective wavelength of  $0.090\text{\AA}$ ?  
 a)  $1.86 \times 10^4 \text{eV}$       b)  $1.86 \times 10^2 \text{eV}$       c)  $2.86 \times 10^4 \text{eV}$       d)  $2.86 \times 10^2 \text{eV}$
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)  $3s_{xy}^1, 3d_{yz}^1, 3d_z^1$   
 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)  $9.1 \times 10^{-28}$ g                      b)  $9.1 \times 10^{-25}$ g                      c)  $9.1 \times 10^{-10}$ g                      d)  $9.1 \times 10^{-18}$ g
35. Which is the correct outermost shell configuration of chromium?  
 a) 

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 b) 

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 c) 

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 d) 

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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  $\times$  time                      b) energy  $\times$  distance                      c) energy/time                      d) energy  $\times$  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  $0.1 \text{ \AA}$  is:  
 a)  $5.79 \times 10^8 \text{ m s}^{-1}$                       b)  $5.79 \times 10^5 \text{ m s}^{-1}$                       c)  $5.79 \times 10^6 \text{ m s}^{-1}$                       d)  $5.79 \times 10^7 \text{ m s}^{-1}$
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  $\text{Cl}_2$  is  $242 \text{ kJ mol}^{-1}$ . 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  $1 \times 10^{-5} \text{ kg m/s}$ . 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  $n = 4, l = 0, m = 0$  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)  $\uparrow\downarrow \uparrow\downarrow \uparrow \uparrow \uparrow$                       b)  $\uparrow\downarrow \uparrow\downarrow \uparrow \downarrow \uparrow$                       c)  $\uparrow\downarrow \uparrow\downarrow \uparrow \downarrow \downarrow$                       d)  $\uparrow\downarrow \uparrow\downarrow \downarrow \uparrow \downarrow$
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)  $X = Y$                       b)  $X < Y$                       c)  $X > Y$                       d)  $X = Z(1 - Y)^2$
64. Proton is :  
 a) Nucleus of deuterium  
 b) Ionised hydrogen molecule  
 c) Ionised hydrogen atom  
 d) An  $\alpha$ -particle
65. An isotone of  ${}^{76}_{32}\text{Ge}$  is  
 a)  ${}^{77}_{32}\text{Ge}$                       b)  ${}^{77}_{33}\text{As}$                       c)  ${}^{77}_{34}\text{Se}$                       d)  ${}^{78}_{36}\text{Sc}$
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)  $991 \text{ \AA}$                       b)  $700 \text{ \AA}$                       c)  $600 \text{ \AA}$                       d)  $811 \text{ \AA}$
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)  $\text{He}^+$                       d)  $\text{Li}^{2+}$

78. The energy of electron in first orbit of  $\text{He}^+$  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)  $s$       b)  $p$       c)  $d$       d)  $f$
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,  $\text{Ca}^2$ ,  $\text{Mg}^2$       b)  $\text{N}^3$ , F, Na      c) Be,  $\text{Al}^3$ , Cl      d)  $\text{Ca}^2$ , 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:  
 a) Molecule of hydrogen  
 b) Nuclei of hydrogen atoms  
 c) Electrons of hydrogen  
 d) Atoms of hydrogen molecule
91. Evidence for the existence of different energy levels in atom is supplied by:  
 a) Spectral lines      b) Mass defects      c) Atomic numbers      d) Atomic radii
92. Rutherford's experiment on the scattering of  $\alpha$  -particles showed for the first time that the atom has  
 a) Electrons      b) Protons      c) Nucleus      d) Neutrons
93. The longest  $\lambda$  for the Lyman series is : (Given  $R_H = 109678 \text{ cm}^{-1}$ )  
 a) 1215 Å      b) 1315 Å      c) 1415 Å      d) 1515 Å
94. The angular momentum of electron in  $n$ th orbit is given by:

- a)  $nh$                       b)  $\frac{h}{2\pi n}$                       c)  $\frac{nh}{2\pi}$                       d)  $\frac{n^2 h}{2\pi}$
95. According to Bohr's postulates which quantity can take up only discrete values:  
 a) Kinetic energy                      b) Angular momentum                      c) Momentum                      d) Potential energy
96. When the frequency of light incident on a metallic plate is doubled, the  $KE$  of the emitted photoelectrons will be:  
 a) Doubled  
 b) Halved  
 c) Increased but more than doubled of the previous  $KE$   
 d) Unchanged
97. The mass of one mole of electron is:  
 a) 0.55 mg                      b) 0.008 mg                      c) 1.008 mg                      d) 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  
 a) 2:1                      b) 1:4                      c) 1:1                      d) 14:1
99. Which are in the ascending order of wavelength?  
 a)  $H_\alpha, H_\beta, H_\gamma$  ... lines in Balmer series of hydrogen atom  
 b) 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 

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 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
101. The electronic configuration of the element which is just above the element with atomic number 43 in the same particle group is:  
 a)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^1 4p^6$   
 b)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5, 4s^2$   
 c)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6, 4s^1$   
 d)  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^5$
102. The order of filling of electrons in the orbital of an atom will be:  
 a)  $3d 4s 4p 4d 5s$                       b)  $4s 3d 4p 5s 4d$                       c)  $5s 4p 3d 4d 5s$                       d)  $3d 4p 4s 4d 5s$
103. The Bohr's energy equation for H atom reveals that the energy level of a shell is given by  $E = -13.58/n^2$  eV. The smallest amount that an H-atom will absorb, if in ground state is:  
 a) 1.0 eV                      b) 3.39 eV                      c) 6.79 eV                      d) 10.19 eV
104. The amount of energy required to remove the electron from a  $\text{Li}^{2+}$  ion in its ground state is how many times greater than the amount of energy required to remove the electron from an H atom in its ground state?  
 a) 9                      b) 2                      c) 3                      d) 5
105. Compared to mass of lightest nucleus the mass of an electron is only:  
 a) 1/80                      b) 1/360                      c) 1/1800                      d) 1/1000
106. Bragg's equation will have no solution, if:  
 a)  $\lambda > 2d$                       b)  $\lambda < 2d$                       c)  $\lambda < d$                       d)  $\lambda = d$
107. Size of the nucleus is:  
 a)  $10^{-15} \text{ cm}$                       b)  $10^{-13} \text{ cm}$                       c)  $10^{-10} \text{ cm}$                       d)  $10^{-8} \text{ cm}$
108. The radius of Bohr's first orbit in H-atom is 0.053 nm. The radius of second orbit in  $\text{He}^+$  would be:

- a) 0.0265 nm                      b) 0.0530 nm                      c) 0.1060 nm                      d) 0.2120 nm
109. Splitting of spectrum lines in magnetic field is  
 a) Stark effect                      b) Raman effect                      c) Zeeman effect                      d) Rutherford effect
110. If the radius of first Bohr's orbit be  $a_0$ , then the radius of third Bohr's orbit would be:  
 a)  $3 \times a_0$                       b)  $6 \times a_0$                       c)  $9 \times a_0$                       d)  $1/9 \times a_0$
111. Which of the following atoms has same number of protons and neutrons in its nucleus?  
 a) Carbon                      b) Deuterium                      c) Tritium                      d) Nitrogen
112. The ratio of the difference in energy between the first and the second Bohr orbit to that between the second and the third Bohr orbit is  
 a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$                       c)  $\frac{4}{9}$                       d)  $\frac{27}{5}$
113. The wavelength of radiation emitted when electron falls from 4th Bohr's orbit to 2nd in H-atom is:  
 ( $R_H = -1.09678 \times 10^{-7} \text{m}^{-1}$ )  
 a) 972 nm                      b) 486 nm                      c) 243 nm                      d) 182 nm
114. In an atom with atomic number 29, mass number 59, the number of electrons is:  
 a) 29                      b) 30                      c) 40                      d) 59
115. The atomic transition gives rise to the radiation of frequency  $10^4$  MHz. The change in energy per mole of atoms taking place would be  
 a)  $6.62 \times 10^{-30} \text{J}$                       b)  $5.32 \times 10^{-28} \text{J}$                       c)  $6.62 \times 10^{-20} \text{J}$                       d) 3.99 J
116. Uncertainty in the position of an electron (mass =  $9.1 \times 10^{-31} \text{kg}$ ) moving with a velocity  $300 \text{ms}^{-1}$ , accurate upon 0.001% will be  
 ( $h = 6.63 \times 10^{-34} \text{Js}$ )  
 a)  $19.2 \times 10^{-2} \text{m}$                       b)  $5.76 \times 10^{-2} \text{m}$                       c)  $1.92 \times 10^{-2} \text{m}$                       d)  $3.84 \times 10^{-2} \text{m}$
117. Which of the following is not possible?  
 a)  $n = 2, l = 1, m = 0$                       b)  $n = 2, l = 0, m = -1$                       c)  $n = 3, l = 0, m = 0$                       d)  $n = 3, l = 1, m = -1$
118. The dynamic mass of a photon of wavelength  $\lambda$  is:  
 a) Zero                      b)  $hc/\lambda$                       c)  $h/c\lambda$                       d)  $h/\lambda$
119. The atomic radius is of the order of:  
 a)  $10^{-8} \text{cm}$                       b)  $10^8 \text{cm}$                       c)  $10^{-10} \text{cm}$                       d)  $10^{-12} \text{cm}$
120. When electronic transition occurs from higher energy state to a lower energy state with energy difference equal to  $\Delta E$  expressed in electron volts, the wavelength of line emitted is approximately equal to:  
 a)  $\frac{12375}{\Delta E} \text{\AA}$                       b)  $\frac{12375}{\Delta E} \times 10^{-8} \text{cm}$                       c)  $\frac{12375}{\Delta E} \times 10^{-10} \text{m}$                       d) Either of these
121. A Mo atom in its ground state has a  $4d^5, 5s^1$  configuration and a Ag atom  $4d^{10}, 5s^1$  configuration. This is because a shell which is half-filled or completely filled is particularly  
 a) Strongly exchange destabilized                      b) Weakly exchange stabilized  
 c) Weakly exchange destabilized                      d) Strongly exchange destabilized
122. The ionisation enthalpy of hydrogen atom is  $1.312 \times 10^6 \text{Jmol}^{-1}$ . The energy required to excite the electron in the atom from  $n_1 = 1$  to  $n_2 = 2$  is  
 a)  $8.51 \times 10^5 \text{J mol}^{-1}$                       b)  $6.56 \times 10^5 \text{J mol}^{-1}$                       c)  $7.56 \times 10^5 \text{J mol}^{-1}$                       d)  $9.84 \times 10^5 \text{J mol}^{-1}$
123. Which of the following sets of quantum number is correct for an electron in  $4f$ -orbital?  
 a)  $n = 4, l = 3, m = +4, s = +1/2$                       b)  $n = 4, l = 4, m = -4, s = -1/2$   
 c)  $n = 4, l = 3, m = +1, s = +1/2$                       d)  $n = 3, l = 2, m = -2, s = +1/2$
124. Number of electrons in  $-\text{CONH}_2$  are:  
 a) 24                      b) 20                      c) 22                      d) 18
125. The ratio of radii of two nuclei with mass numbers 27 and 64 is  
 a)  $1/2$                       b)  $3/4$                       c)  $3/2$                       d)  $2/3$
126. The atomic number of Ni and Cu are 28 and 29 respectively. The electronic configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$  represents



- a)  $\text{Cu}^+$                       b)  $\text{Cu}^{2+}$                       c)  $\text{Ni}^{2+}$                       d) Ni
127. The three quantum numbers  $n$ ,  $l$  and  $m$  are the outcome of:  
 a) Bohr's atomic theory  
 b) Solution of Schrödinger principle  
 c) Heisenberg's uncertainty principle  
 d) Aufbau principle
128. Which has the highest  $e/m$  ratio?  
 a)  $\text{He}^{2+}$                       b)  $\text{H}^+$                       c)  $\text{He}^+$                       d)  $\text{D}^+$
129. The electronic configuration of an element in ultimate and penultimate orbitals is  $(n-1)s^2(n-1)p^6(n-1)d^x ns^2$ . If  $n = 4$  and  $x = 5$  then number of protons in the nucleus is  
 a) 25                      b)  $< 724$                       c) 25                      d) 30
130. The de-Broglie wavelength of a tennis ball of mass 60g moving with a velocity of 10 m/s is approximately (Planck's constant,  $h = 6.63 \times 10^{-34}$  Js)  
 a)  $10^{-33}$  m                      b)  $10^{-31}$  m                      c)  $10^{-16}$  m                      d)  $10^{-25}$  m
131. The work-function for photoelectric effect :  
 a) Depends upon the frequency of incident light  
 b) Is same for all metals  
 c) Is different for different metals  
 d) None of the above
132. Line spectra is characteristic of :  
 a) Atoms                      b) Molecules                      c) Radicals                      d) Ions
133. Which of the following is the correct form of Schrodinger wave equation?  
 a)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V) \Psi = 0$                       b)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V) \Psi = 0$   
 c)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V) \Psi = 0$                       d)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m^2}{h^2} (E - V) \Psi = 0$
134. If  $n = 6$ , the correct sequence for filling of electrons will be:  
 a)  $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$   
 b)  $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$   
 c)  $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$   
 d)  $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$
135. Which one is not true for the cathode rays?  
 a) They have kinetic energy  
 b) They cause certain substances to show fluorescence  
 c) They travel in straight line  
 d) They are electromagnetic waves
136. Which of the following ions has electronic configuration  $[\text{Ar}]3d^6$ :  
 a)  ${}_{27}\text{Ni}^{3+}$                       b)  ${}_{25}\text{Mn}^{3+}$                       c)  ${}_{26}\text{Fe}^{3+}$                       d)  ${}_{27}\text{Co}^{3+}$
137. In an atom, an electron is moving with a speed of 600 m/s with an accuracy of 0.005%. Certainty with which the position of the electron can be located is  $\left( \begin{array}{l} h = 6.6 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}, \\ \text{mass of electron, } e_m = 9.1 \times 10^{-31} \text{ kg} \end{array} \right)$   
 a)  $1.52 \times 10^{-4}$  m                      b)  $5.10 \times 10^{-3}$  m                      c)  $1.92 \times 10^{-3}$  m                      d)  $3.84 \times 10^{-3}$  m
138. Consider the ground state of Cr atom ( $Z = 24$ ). 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
139. Moseley's law is : ( $a$  and  $b$  are constants,  $Z$  = atomic number,  $\nu$  = frequency)  
 a)  $\sqrt{\nu} = aZ$                       b)  $\nu = c/\lambda$                       c)  $2d \sin \theta = n\lambda$                       d)  $\sqrt{\nu} = a(Z - b)$
140. From the discharge tube experiment, it is concluded that:  
 a) Mass of a proton is in fraction

- b) Matter contains electrons  
 c) Nucleus contains positive charge  
 d) Positive rays are heavier than protons
141. Which atom has as many as *s*-electrons as *p*-electrons?  
 a) H                                      b) Mg                                      c) N                                      d) Na
142. The electronic configuration of Pd<sup>2+</sup> (at.no.46) is:  
 a) [Kr]4d<sup>8</sup>                                      b) [Kr]5s<sup>2</sup>4d<sup>6</sup>                                      c) [Kr]4d<sup>6</sup>                                      d) [Kr]4d<sup>8</sup>5s<sup>2</sup>
143. When α –particles are sent through a thin metal foil, most of them go straight through the foil because  
 a) Most part of the atom is empty space  
 b) Alpha particles move with high speed  
 c) Alpha particles are much heavier than electrons  
 d) Alpha particles are positively charged
144. A neutral atom of an element has 2K, 8L, 11M and 2N electrons. Total number of electrons with *l* = 2 will be:  
 a) Zero                                      b) 3                                      c) 6                                      d) 10
145. Mosley's name is connected with the discovery of :  
 a) Protons                                      b) Neutrons                                      c) Atomic number                                      d) Atomic weight
146. For a Bohr atom angular momentum *M* of the electron is (*n* = 0, 1, 2, ...)  
 a)  $\frac{nh^2}{4\pi}$                                       b)  $\frac{n^2h^2}{4\pi}$                                       c)  $\frac{\sqrt{\pi h^2}}{4\pi}$                                       d)  $\frac{nh}{2\pi}$
147. When 3*d*-orbital is complete, the newly entering electron goes into:  
 a) 4*f*                                      b) 4*s*                                      c) 4*p*                                      d) 4*d*
148. Which of the followings sets of quantum numbers represents the highest energy of an atom?  
 a) *n* = 3, *l* = 1, *m* = 1, *s* = +1/2                                      b) *n* = 3, *l* = 2, *m* = 1, *s* = +1/2  
 c) *n* = 4, *l* = 0, *m* = 0, *s* = +1/2                                      d) *n* = 3, *l* = 0, *m* = 0, *s* = +1/2
149. When an electron jumps from *L*-level to *M*-level, there occurs:  
 a) Emission of energy  
 b) Absorption of energy  
 c) Emission of γ-radiations  
 d) Emission of X-rays
150. If the kinetic energy of an electron is increased four times, the wavelength of the de-Broglie wave associated with it would become  
 a) Half times                                      b)  $\frac{1}{4}$  times                                      c) Four times                                      d) Two times
151. The work function (Φ) of some metals is listed below. The number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metals is :
- | Met al | L i | N a | K   | M g | C u | A g | Fe  | P t | W   |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Φ(eV)  | 2.4 | 2.3 | 2.2 | 3.7 | 4.8 | 4.3 | 4.7 | 6.3 | 4.5 |
- a) 2  
 b) 4  
 c) 6  
 d) 8
152. "Positronium" is the name given to an atom-like combination formed between:  
 a) A positron and a proton  
 b) A positron and a neutron  
 c) A positron and α-particle

- d) A positron and an electron
153. The nucleus of helium contains:
- Four protons
  - Four neutrons
  - Two neutrons and two protons
  - Four protons and two electrons
154. Photoelectric effect shows:
- Particle-like behaviour of light
  - Wave-like behaviour of light
  - Both wave-like and particle-like behaviour of light
  - Neither wave-like and particle-like behaviour of light
155. When high speed electrons strike a target:
- Only heat is produced
  - Only continuous X-rays are emitted
  - Only continuous and characteristic X-rays are emitted
  - Heat is produced and simultaneously continuous and characteristic X-rays are emitted
156. The de Broglie wavelength of a particle with mass 1 g and velocity 100 m/s is:
- $6.63 \times 10^{-33} \text{m}$
  - $6.63 \times 10^{-34} \text{m}$
  - $6.63 \times 10^{-35} \text{m}$
  - $6.65 \times 10^{-35} \text{m}$
157. After  $np^6$  electronic configuration, the next orbital filled will be
- $(n + 1)d$
  - $(n + 1)s$
  - $(n + 1)f$
  - None of these
158. Choose the incorrect statement
- The shape of an atomic orbital depends upon the azimuthal quantum number
  - The orientation of an atomic orbital depends upon the magnetic quantum number
  - The energy of an electron in an atomic orbital of multi-electron atom depends on principal quantum number
  - The number of degenerate atomic orbitals of one type depends on the value of azimuthal and magnetic quantum numbers
159. Photoelectric effect can be caused by :
- Visible light but not by X-rays
  - Gamma-rays but not by X-rays
  - Ultraviolet light only
  - Visible light, ultraviolet rays, X-rays and gamma rays also
160. The number of neutrons present in  ${}_{19}\text{K}^{39}$  is :
- 39
  - 19
  - 20
  - None of these
161. Deflection back of a few particles on hitting thin foil of gold shows that
- Nucleus is heavy
  - Nucleus is small
  - Both (a) and (b)
  - Electrons create hinderance in the movement of  $\alpha$ - particles.
162. An atom has 2 electrons in *K*-shell, 8 electrons in *L*-shell and 6 electrons in *M*-shell. The number of *s*-electrons present in the element is:
- 10
  - 7
  - 6
  - 4
163. Which orbital is represented by  $\Psi 4, 2, 0$  ?
- $4d$
  - $3d$
  - $4p$
  - $4s$
164. The electronic configuration of a dipositive ion  $M^{2+}$  is 2, 8, 14 and its mass number is 56. The number of neutrons present is
- 32
  - 42
  - 30
  - 34
165. The angular momentum of an electron in 2 *p*-orbital is :

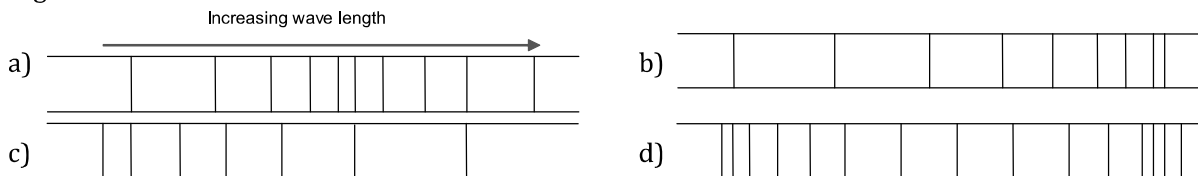
- a)  $\frac{h}{2\pi}$                       b)  $\frac{h}{\sqrt{2\pi}}$                       c)  $\frac{2h}{\pi}$                       d) None of these
166. Which set has the same number of *s*-electrons?  
 a) C, Cu<sup>2+</sup>, Zn                      b) Cu<sup>2+</sup>, Fe<sup>2+</sup>, Ni<sup>2+</sup>                      c) S<sup>2-</sup>, Ni<sup>2+</sup>, Zn                      d) None of these
167. The electronic configuration of P in H<sub>3</sub>PO<sub>4</sub> is  
 a) 1s<sup>2</sup>, 2s<sup>2</sup>, 2p<sup>6</sup>, 3s<sup>2</sup>, 3p<sup>6</sup>                      b) 1s<sup>2</sup>, 2s<sup>2</sup>, 2p<sup>6</sup>, 3s<sup>2</sup>  
 c) 1s<sup>2</sup>, 2s<sup>2</sup>, 2p<sup>6</sup>                      d) 1s<sup>2</sup>, 2s<sup>2</sup>, 2p<sup>6</sup>, 3s<sup>2</sup>, 3p<sup>6</sup>, 4s<sup>1</sup>
168. The Bohr's orbit radius for the hydrogen atom (*n* = 1) is approximately 0.53Å. The radius for the first excited state (*n* = 2) orbit is  
 a) 0.27 Å                      b) 1.27 Å                      c) 2.12 Å                      d) 3.12 Å
169. The threshold frequency of a metal is 4 × 10<sup>14</sup>s<sup>-1</sup>. The minimum energy of photon to cause photoelectric effect is:  
 a) 3.06 × 10<sup>-12</sup> J                      b) 1.4 × 10<sup>-18</sup> J                      c) 3.4 × 10<sup>-19</sup> J                      d) 2.64 × 10<sup>-19</sup> J
170. Which wavelength falls in a X-rays region?  
 a) 10,000 Å                      b) 1000 Å                      c) 1Å                      d) 10<sup>-2</sup>Å
171. Choose the incorrect statement  
 a) Every object emits radiation whose predominant frequency depends on its temperature  
 b) The quantum energy of a wave is proportional to its frequency  
 c) Photons are quanta of light  
 d) The value of Planck's constant is energy dependent
172. What is the energy (in eV) require to excite the electron from *n* = 1 to *n* = 2 state in hydrogen atom? (*n*=principle quantum number)  
 a) 13.6                      b) 3.4                      c) 17.0                      d) 10.2
173. Of the following transitions in hydrogen atom, the one which gives an absorption line of lowest frequency is :  
 a) *n* = 1 to *n* = 2                      b) *n* = 3 to *n* = 8                      c) *n* = 2 to *n* = 1                      d) *n* = 8 to *n* = 3
174. Which is not in accordance to aufbau principle?  
 a)  $\begin{array}{c} 2s \\ \uparrow\downarrow \end{array} \begin{array}{c} 2p \\ \uparrow\downarrow \uparrow\downarrow \end{array}$                       b)  $\begin{array}{c} 2s \\ \uparrow\downarrow \end{array} \begin{array}{c} 2p \\ \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \end{array}$                       c)  $\begin{array}{c} 2s \\ \uparrow\downarrow \end{array} \begin{array}{c} 2p \\ \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \end{array}$                       d)  $\begin{array}{c} 2s \\ \uparrow\downarrow \end{array} \begin{array}{c} 2p \\ \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \end{array}$
175. Which of the following has more number of unpaired electron?  
 a) Zn<sup>+</sup>                      b) Fe<sup>2+</sup>                      c) Ni<sup>2+</sup>                      d) Cu<sup>+</sup>
176. The scientist who proposed the atomic model based on the quantization of energy for the first time is  
 a) Max Planck                      b) Niels Bohr                      c) De-Broglie                      d) Heisenberg
177. The energy per mole of photon of electromagnetic radiation of wavelength 4000 Å is:  
 a) 3.0 × 10<sup>-12</sup>erg                      b) 4.0 × 10<sup>-12</sup>erg                      c) 5.0 × 10<sup>-12</sup>erg                      d) 6.0 × 10<sup>-12</sup>erg
178. A particle *A* moving with a certain velocity has the de-Broglie wavelength of 1 Å. For particle *B* with mass 25% of *A* and velocity 75% of *A*, calculate the de-Broglie wavelength  
 a) 3 Å                      b) 5.33 Å                      c) 6.88 Å                      d) 0.48 Å
179. The correct designation of an electron with *n* = 4, *l* = 3, *m* = 2, and *s* = 1/2 is:  
 a) 3d                      b) 4f                      c) 5p                      d) 6s
180. The energy of the electron in first Bohr's orbit is -13.6eV. The energy of the electron in its first excited state is  
 a) -3.4 eV                      b) -27.8 eV                      c) -6.8 eV                      d) -10.2 eV
181. The statement that does not belong to Bohr's model of atom, is  
 a) Energy of the electrons in the orbit is quantized  
 b) The electron in the orbit nearest to the nucleus is in lowest energy state  
 c) Electrons revolve in different orbits around the nucleus  
 d) The electrons emit energy during revolution due to the presence of Coulombic forces of attraction
182. The ratio of radius of III and IV Bohr's orbits in hydrogen atom is:

- a) 3 : 4                      b) 3 : 8                      c) 9 : 16                      d) 8 : 9

183. In the Schrödinger wave equation,  $\psi$  represents:

- a) Orbitals                      b) Wave function                      c) Amplitude function                      d) All of these

184. Which diagram best represents the appearance of the line spectrum of atomic hydrogen in the visible region?



185. If the electron of a hydrogen atom is present in the first orbit, the total energy of the electron is

- a)  $\frac{-e^2}{r}$                       b)  $\frac{-e^2}{r^2}$                       c)  $\frac{-e^2}{2r}$                       d)  $\frac{-e^2}{2r^2}$

186. What is the charge in coulomb on  $\text{Fe}^{3+}$  ion?

- a)  $4.8 \times 10^{-19}\text{C}$                       b)  $1.6 \times 10^{-19}\text{C}$                       c)  $3.2 \times 10^{-19}\text{C}$                       d)  $6.4 \times 10^{-19}\text{C}$

187. The ground state term symbol for an electronic state is governed by

- a) Hund's rule                      b) Heisenberg's principle  
c) Aufbau principle                      d) Pauli's exclusion principle

188. The number of elliptical orbits, including circular orbits in the M-shell of an atom is:

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

189. Wave mechanical model of the atom depends upon:

- a) de Broglie concept of dual nature of electron  
b) Heisenberg's uncertainty principle  
c) Schrödinger wave equation  
d) All of the above

190. The velocity of a photon is:

- a) Independent of its wavelength  
b) Depends on its wavelength  
c) Depends on its source  
d) Equal to square of its amplitude

191. The frequency of radiation emitted when the electron falls from  $n=4$  to  $n=1$  in a hydrogen atom will be  
(Given, ionisation energy of

$103 \text{ H} = 2.18 \times 10^{-18} \text{ J atom}^{-1}$  and  $h = 6.625 \times 10^{-34} \text{ Js}$ )

- a)  $1.54 \times 10^{15} \text{ s}^{-1}$                       b)  $1.03 \times 10^{15} \text{ s}^{-1}$                       c)  $3.08 \times 10^{15} \text{ s}^{-1}$                       d)  $2.00 \times 10^{15} \text{ s}^{-1}$

192. A node is a surface on which the probability of finding an electron is:

- a) Zero                      b)  $> 1$                       c)  $> 10$                       d)  $> 90$

193. In photoelectric effect, the photo-current:

- a) Increases with increase of frequency of incident photon  
b) Decreases with increase of frequency of incident photon  
c) Does not depend on the frequency of photon but depends only on the intensity of incident light  
d) Depends both on intensity and frequency of the incident photon

194. Possible number of orientations of a subshell is:

- a)  $l$                       b)  $n$                       c)  $2l + 1$                       d)  $n^2$

195. The orientation of an atomic orbital is governed by:

- a) Magnetic quantum number  
b) Principal quantum number  
c) Azimuthal quantum number  
d) Spin quantum number

196. The ratio of the radius of the orbit for the electron orbiting the hydrogen nucleus to that of an electron

orbiting a deuterium nucleus is:

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

197. Which of the following sets of quantum numbers is correct for an electron in 4f-orbital?

- a)  $n = 3, l = 2, m = -2, s = +\frac{1}{2}$   
 b)  $n = 4, l = 4, m = -4, s = -\frac{1}{2}$   
 c)  $n = 4, l = 3, m = +1, s = +\frac{1}{2}$   
 d)  $n = 4, l = 3, m = +4, s = +\frac{1}{2}$

198. The electronic energy levels of the hydrogen atom in the Bohr's theory are called:

- a) Orbitals                      b) Orbits                      c) Rydberg levels                      d) Ground states

199. A photoelectric cell is a device, which :

- a) Converts light into electricity  
 b) Converts electricity into light  
 c) Stores lights  
 d) Stores electricity

200. An f-shell containing 6 unpaired electrons can exchange

- a) 6 electrons                      b) 9 electrons                      c) 12 electrons                      d) 15 electrons

201.  $Mg^{2+}$  is isoelectronic with

- a)  $Cu^{2+}$                       b)  $Zn^{2+}$                       c)  $Na^+$                       d)  $Ca^{2+}$

202. The first orbital of H is represented by :

$\psi = \frac{1}{\sqrt{\pi}} \left(\frac{1}{a_0}\right)^{3/2} e^{-r/a_0}$ , where  $a_0$  is Bohr's radius. The probability of finding the electron at a distance  $r$ , from the nucleus in the region  $dV$  is:

- a)  $\psi^2 dr$                       b)  $\int \psi^2 4\pi r^2 dv$                       c)  $\psi^2 4\pi r^2 dr$                       d)  $\int \psi dv$

203. The correct statement about proton is

- a) It is a nucleus of deuterium                      b) It is an ionized hydrogen atom  
 c) It is an ionized hydrogen molecules                      d) It is an  $\alpha$ - particle

204. The energy  $\Delta E$  corresponding to intense yellow line of sodium of  $\lambda$ , 589 nm is:

- a) 2.10 eV                      b) 43.37 eV                      c) 47.12 eV                      d) 2.11 kcal

205. One electron volt is:

- a)  $1.6 \times 10^{-19}$  erg                      b)  $1.6 \times 10^{-12}$  erg                      c)  $1.6 \times 10^{-8}$  erg                      d)  $1.6 \times 10^8$  erg

206. The quantum number that is in no way related to other quantum number is:

- a)  $l$                       b)  $s$                       c)  $n$                       d)  $m$

207. The de-Broglie wavelength relates to applied voltage for  $\alpha$ -particles as

- a)  $\lambda = \frac{12.3A^\circ}{\sqrt{V}}$                       b)  $\lambda = \frac{0.286}{\sqrt{V}} A^\circ$                       c)  $\lambda = \frac{0.101}{\sqrt{V}} A^\circ$                       d)  $\lambda = \frac{0.856}{\sqrt{V}} A^\circ$

208. Calculate the wavelength (in nanometer) associated with a proton moving at  $1.0 \times 10^3 \text{ms}^{-1}$  (Mass of proton =  $1.67 \times 10^{-27} \text{kg}$  and  $h = 6.63 \times 10^{-34} \text{Js}$ )

- a) 0.032 nm                      b) 0.40 nm                      c) 2.5 nm                      d) 14.0 nm

209. The number of waves in an orbit are

- a)  $n^2$                       b)  $n$                       c)  $n - 1$                       d)  $n - 2$

210. Which of the following electron transition in hydrogen atom will require largest amount of energy?

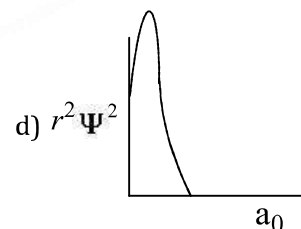
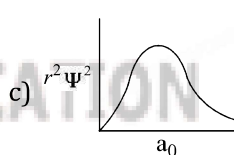
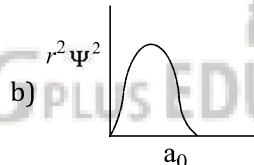
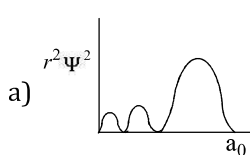
- a) From  $n = 1$  to  $n = 2$                       b) From  $n = 2$  to  $n = 3$   
 c) From  $n = \infty$  to  $n = 1$                       d) From  $n = 3$  to  $n = 5$

211. The principal quantum number  $n$  can have integral values ranging from:

- a) 0 to 10                      b) 1 to  $\infty$                       c) 1 to ( $n = l$ )                      d) 1 to 50

212. Electrons will first enter into the set of quantum numbers  $n = 5, l = 0$  or  $n = 3, l = 2$   
 a)  $n = 5, l = 0$                       b) Both possible                      c)  $n = 3, l = 2$                       d) Data insufficient
213. The relationship between the energy  $E_1$  of the radiation with a wavelength  $8000\text{\AA}$  and the energy  $E_2$  of the radiation with a wavelength  $16000\text{\AA}$  is  
 a)  $E_1 = 6E_2$                       b)  $E_1 = 2E_2$                       c)  $E_1 = 4E_2$                       d)  $E_1 = 1/2E_2$
214. Which combinations of quantum numbers  $n, l, m$  and  $s$  for the electron in an atom does not provide a permissible solution of the wave equation?  
 a)  $3, 2, 1, \frac{1}{2}$                       b)  $3, 1, 1, -\frac{1}{2}$                       c)  $3, 3, 1, -\frac{1}{2}$                       d)  $3, 2, -2, \frac{1}{2}$
215. What is the lowest energy of the spectral line emitted by the hydrogen atom in the Lyman series? ( $h$ =Planck's constant,  $c$ =velocity of light,  $R$ =Rydberg's constant).  
 a)  $\frac{5hcR}{36}$                       b)  $\frac{4hcR}{3}$                       c)  $\frac{3hcR}{4}$                       d)  $\frac{7hcR}{144}$
216. Which is not electromagnetic radiation?  
 a) Infrared rays                      b) X-rays                      c) Cathode rays                      d)  $\gamma$ -rays
217. Which one of the following sets of quantum numbers represents the highest energy level in an atom?  
 a)  $n = 4, l = 0, m = 0, s = +\frac{1}{2}$                       b)  $n = 3, l = 1, m = 1, s = +\frac{1}{2}$   
 c)  $n = 3, l = 2, m = -2, s = +\frac{1}{2}$                       d)  $n = 3, l = 0, m = 0, s = +\frac{1}{2}$
218. Which consists of particle of matter?  
 a) Alpha rays                      b) Beta rays                      c) Cathode rays                      d) All of these
219. If  $\lambda_1$  and  $\lambda_2$  are the wavelength of characteristic X-rays and gamma rays respectively, then the relation between them is:  
 a)  $\lambda_1 = 1/\lambda_2$                       b)  $\lambda_1 = \lambda_2$                       c)  $\lambda_1 > \lambda_2$                       d)  $\lambda_1 < \lambda_2$
220. Which best describe the emission spectra of atomic hydrogen?  
 a) A series of only four lines  
 b) A discrete series of lines of equal intensity and equally spaced with respect to wavelength  
 c) Several discrete series of lines with both intensity and spacings between lines decreasing as the wave number increase within each series  
 d) A continuous emission of radiation of all frequencies
221. In the ground state of the H-atom, the electron is :  
 a) In the second shell  
 b) In the nucleus  
 c) Nearest to the nucleus  
 d) Farthest from the nucleus
222. Atoms consist of electrons, protons and neutrons. If the mass attributed to neutron was halved and that attributed to the electrons was doubled, the atomic mass of  ${}_{6}\text{C}^{12}$  would be approximately:  
 a) Same                      b) Doubled                      c) Halved                      d) Reduced by 25%
223. The number of electrons in a neutral atom of an element is equal to its:  
 a) Atomic weight                      b) Atomic number                      c) Equivalent weight                      d) Electron affinity
224. Which particle contains 2 neutrons and 1 proton?  
 a)  ${}_1\text{H}^2$                       b)  ${}_2\text{He}^4$                       c)  ${}_1\text{T}^3$                       d)  ${}_1\text{D}^2$
225. The highest number of unpaired electrons are in  
 a) Fe                      b)  $\text{Fe}^{2+}$   
 c)  $\text{Fe}^{3+}$                       d) All have equal number of unpaired electrons
226. Maximum number of electrons in an orbit is given by:  
 a)  $n^2$                       b)  $2n^2$                       c)  $n^2/2$                       d) None of these
227. The wave nature of electron is verified by  
 a) De-Broglie                      b) Davisson and Germer

- c) Rutherford  
d) All of these
228. Compared to the mass of lightest nuclei, the mass of an electron is only (app.)  
a)  $1/80$                       b)  $1/800$                       c)  $1/1800$                       d)  $1/2800$
229. Which one of the following pair of atoms/atom-ion have identical ground state configuration?  
a)  $\text{Li}^+$  and  $\text{He}^+$                       b)  $\text{Cl}^-$  and Ar                      c)  $\text{Na}^+$  and  $\text{K}^+$                       d)  $\text{F}^+$  and Ne
230. The total number of orbitals in a shell with principal quantum number ' $n$ ' is:  
a)  $2n$                       b)  $2n^2$                       c)  $n^2$                       d)  $n + 1$
231. Which of the following statements does not form a part of Bohr's model of hydrogen atom?  
a) Energy of the electrons in the orbit is quantised  
b) The electron in the orbit nearest the nucleus has the lowest energy  
c) Electrons revolve in different orbits around the nucleus  
d) The position and velocity of the electrons in the orbit cannot be determined simultaneously
232. Penetration power of proton is:  
a) Greater than  $e$                       b) Less than electron                      c) Greater than ' $n$ '                      d) None of these
233. Bohr's theory is applicable to  
a) He                      b)  $\text{Li}^{2+}$                       c)  $\text{He}^{2+}$                       d) None of these
234. Which set of quantum numbers is possible for the last electron of  $\text{Mg}^+$  ion?  
a)  $n = 3, l = 2, m = 0, s = +1/2$   
b)  $n = 2, l = 3, m = 0, s = +1/2$   
c)  $n = 1, l = 0, m = 0, s = +1/2$   
d)  $n = 3, l = 0, m = 0, s = +1/2$
235. The electronic configuration for  ${}_{26}\text{Fe}$  is:  
a)  $[\text{Ar}]3d^6, 4s^2$                       b)  $[\text{Ar}]3d^7, 4s^2$                       c)  $[\text{Ar}]3d^5, 4s^2$                       d)  $[\text{Ar}]3d^7, 4s^1$
236. Which of the following radial distribution graphs correspond to  $n = 3, l = 2$  for an atom?

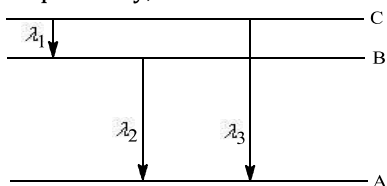


237. In which orbital electron is most tightly bound to the nucleus?  
a)  $5s$                       b)  $4p$                       c)  $4d$                       d)  $5d$
238.  $\text{Ca}^{2+}$  is isoelectronic with  
a) Na                      b) Ar                      c)  $\text{Mg}^{2+}$                       d) Kr
239. Threshold wavelength depends upon :  
a) Frequency of incident radiation  
b) Velocity of electrons  
c) Work function  
d) None of the above
240. The electrons identified by quantum numbers  
I.  $n = 4, l = 1$   
II.  $n = 4, l = 0$   
III.  $n = 3, l = 2$   
IV.  $n = 2, l = 1$   
Can be placed in order of increasing energy from the lowest to highest as  
a)  $\text{IV} < \text{II} < \text{III} < \text{I}$                       b)  $\text{II} < \text{IV} < \text{I} < \text{III}$                       c)  $\text{I} < \text{III} < \text{II} < \text{IV}$                       d)  $\text{III} < \text{I} < \text{IV} < \text{II}$
241. The energy of an electron in first Bohr orbit of H-atom is  $-13.6 \text{ eV}$ . The possible energy value of electron in the excited state of  $\text{Li}^{2+}$  is  
a)  $-122.4 \text{ eV}$                       b)  $30.6 \text{ eV}$                       c)  $-30.6 \text{ eV}$                       d)  $13.6 \text{ eV}$



242. When the azimuthal quantum number has the value of 2, the number of orbitals possible are  
 a) 7                                      b) 5                                      c) 3                                      d) 0
243. Compared to the lightest atom the heaviest atom weighs:  
 a) 200 times                              b) 238 times                              c) 92 times                              d) 16 times
244. If the following particles travel with equal speed, then for which particle the wavelength will be longest?  
 a) Proton                                      b) Neutron                                      c)  $\alpha$ -particle                                      d)  $\beta$ -particle
245. The orbital cylindrically symmetrical about  $x$ -axis is:  
 a)  $p_z$                                       b)  $p_y$                                       c)  $p_x$                                       d)  $d_{xz}$
246. The orbital with maximum number of possible orientations is:  
 a)  $s$                                       b)  $p$                                       c)  $d$                                       d)  $f$
247. Einstein's photoelectric equation states that  $E_k = h\nu - W$   
 Here,  $E_k$  refers to  
 a) Kinetic energy of all ejected electrons                                      b) Mean kinetic energy of emitted electrons  
 c) Minimum kinetic energy of emitted electrons                                      d) Maximum kinetic energy of emitted electrons
248. The orbital closest to the nucleus is:  
 a)  $7s$                                       b)  $3d$                                       c)  $6p$                                       d)  $4s$
249. Isoelectronic pair among the following is  
 a) Ca and K                                      b) Ar and  $Ca^{2+}$                                       c) K and  $Ca^{2+}$                                       d) Ar and K
250. We can say that the energy of a photon of frequency  $\nu$  is given by  $E = h\nu$ , where  $h$  is Planck's constant. The momentum of a photon is  $p = h/\lambda$ , where  $\lambda$  is the wavelength of photon. Then we may conclude that velocity of light is equal to:  
 a)  $(E/p)^{1/2}$                                       b)  $E/p$                                       c)  $Ep$                                       d)  $(E/p)^2$
251. Uncertainty in position of a particle of 25 g in space is  $10^{-5}$  m. Hence, uncertainty in velocity ( $ms^{-1}$ ) is (Planck's constant  $h = 6.6 \times 10^{-34}$  Js)  
 a)  $2.1 \times 10^{-28}$                                       b)  $2.1 \times 10^{-34}$                                       c)  $0.5 \times 10^{-34}$                                       d)  $5.0 \times 10^{-24}$
252. The mass of a neutron is of the order of:  
 a)  $10^{-23}$  kg                                      b)  $10^{-24}$  kg                                      c)  $10^{-26}$  kg                                      d)  $10^{-27}$  kg
253. The de Broglie wavelength of a 66 kg man skiing down Kufri Hill in Shimla at  $1 \times 10^3$  m sec $^{-1}$  is:  
 a)  $1 \times 10^{-36}$  m                                      b)  $1 \times 10^{-37}$  m                                      c)  $1 \times 10^{-38}$  m                                      d)  $1 \times 10^{-39}$  m
254. The  $Z$  –component of angular momentum of an electron in an atomic orbital is governed by the  
 a) Magnetic quantum number                                      b) Azimuthal quantum number  
 c) Spin quantum number                                      d) Principal quantum number
255. An electron with values 4, 2,  $-2$  and  $+1/2$  for the set of four quantum numbers  $n, l, m_l$  and  $s$  respectively, belongs to  
 a)  $4s$ -orbital                                      b)  $4p$ -orbital                                      c)  $4d$ -orbital                                      d)  $4f$ -orbital
256. Consider the following statements :  
 1. Electron density in  $xy$  plane in  $3d_{x^2-y^2}$  orbital is zero  
 2. Electron density in  $xy$  plane in  $3d_{z^2}$  orbital is zero  
 3.  $s$  orbital has only one spherical node  
 4. For  $2p_z$  orbital  $yz$  is the nodal plane  
 The correct statements are  
 a) 2 and 3                                      b) 1,2,3,4                                      c) Only 2                                      d) 1 and 3
257. The maximum probability of finding electron in the  $d_{xy}$  orbital is:  
 a) Along the  $x$ -axis  
 b) Along the  $y$ -axis  
 c) At an angle of  $45^\circ$  from the  $x$ - and  $y$ -axes  
 d) At an angle of  $90^\circ$  from the  $x$ - and  $y$ -axes
258. Two electron in an atom of an element cannot have:  
 a) The same principle quantum number

- b) The same azimuthal quantum number  
 c) The same magnetic quantum number  
 d) An identical set of quantum numbers
259. The energy of electromagnetic radiation depends on:  
 a) Amplitude and wavelength  
 b) Wavelength  
 c) Amplitude  
 d) Temperature of medium through which it passes
260. Correct electronic configuration of  $\text{Cu}^{2+}$  is:  
 a)  $[\text{Ar}]3d^8, 4s^1$       b)  $[\text{Ar}]3d^{10}, 4s^2 4p^1$       c)  $[\text{Ar}]3d^{10}, 4s^1$       d)  $[\text{Ar}]3d^9$
261. The difference between ions and atoms is of:  
 a) Relative size      b) Configuration      c) Presence of charge      d) All of these
262. Electronic configuration of  $\text{H}^-$  is:  
 a)  $1s^0$       b)  $1s^1$       c)  $1s^2$       d)  $1s^1, 2s^2$
263. The ground state term symbol for an electronic state is governed by  
 a) Heisenberg's principle      b) Hund's rule  
 c) Aufbau principle      d) Pauli exclusion principle
264. The electronic transitions from  $n=2$  to  $n=1$  will produce shortest wavelength in (where  $n$ =principle quantum state)  
 a)  $\text{Li}^{2+}$       b)  $\text{He}^+$       c) H      d)  $\text{H}^+$
265. The atomic number of an element is 17. The number of orbitals containing electron pairs in the valency shell is:  
 a) 8      b) 2      c) 3      d) 6
266. The number of electrons in an atom with atomic number 105 having  $(n + l) = 8$  are:  
 a) 30      b) 17      c) 15      d) Unpredictable
267. Three isotopes of an element have mass numbers,  $m, (m + 1)$  and  $(m + 2)$ . If the mean mass number is  $(m + 0.5)$  then which of the following ratios may be accepted for  $m, (m + 1), (m + 2)$  in that order:  
 a) 1 : 1 : 1      b) 4 : 1 : 1      c) 3 : 2 : 1      d) 2 : 1 : 1
268. According to Bohr's theory the radius of electron in an orbit described by principle quantum number  $n$  and atomic number  $Z$  is proportional to :  
 a)  $Z^2 n^2$       b)  $\frac{Z^2}{n^2}$       c)  $\frac{Z^2}{n}$       d)  $\frac{n^2}{Z}$
269. The radius of the first Bohr orbit of hydrogen atom is  $0.529 \text{ \AA}$ . The radius of the third orbit of  $\text{H}^+$  will be  
 a)  $8.46 \text{ \AA}$       b)  $0.705 \text{ \AA}$       c)  $1.59 \text{ \AA}$       d)  $4.76 \text{ \AA}$
270. The de Broglie wavelength associated with a material particle is:  
 a) Inversely proportional to momentum  
 b) Inversely proportional to its energy  
 c) Directly proportional to momentum  
 d) Directly proportional to its energy
271. Energy levels  $A, B, C$  of a certain atom corresponds to increasing values of energy, i.e.,  $E_A < E_B < E_C$ . If  $\lambda_1, \lambda_2$  and  $\lambda_3$  are the wavelengths of radiations corresponding to the transitions  $C$  to  $B, B$  to  $A$  and  $C$  to  $A$  respectively, which of the following statements is correct?

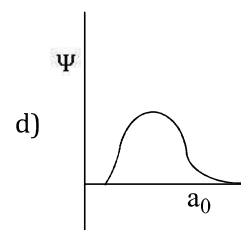
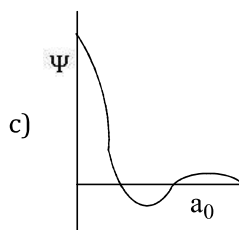
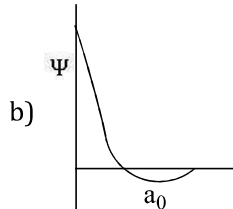
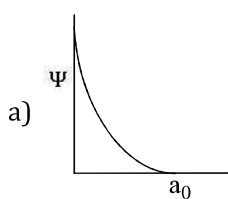


- a)  $\lambda_3 = \lambda_1 + \lambda_2$       b)  $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$       c)  $\lambda_1 + \lambda_2 + \lambda_3 = 0$       d)  $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

272. Naturally occurring elements are mixtures of:  
 a) Isotone                      b) Isobars                      c) Isotopes                      d) Isomers
273. Krypton ( ${}_{36}\text{Kr}$ ) has the electronic configuration ( ${}_{18}\text{Ar}$ ) $4s^2 3d^{10} 4p^6$ , the 37th electron will go into which of the following subshells?  
 a)  $4f$                       b)  $4d$                       c)  $3p$                       d)  $5s$
274. 1 fermi is equal to :  
 a)  $10^{-13}$  cm                      b)  $10^{-10}$  cm                      c)  $10^{-4}$  cm                      d)  $10^{-8}$  cm
275. When an electron moves from higher orbit to a lower orbit ... is produced  
 a) Absorption spectra                      b) Emission spectra                      c)  $\alpha$ -particle                      d) None of these
276. A photon in X region is more energetic than in the visible region X is:  
 a) Infrared                      b) Ultraviolet                      c) Microwave                      d) Radiowave
277. According to aufbau principle, the correct order of energy of  $3d$ ,  $4s$  and  $4p$ -orbitals is  
 a)  $4p < 3d < 4s$                       b)  $4s < 4p < 3d$                       c)  $4s < 3d < 4p$                       d)  $3d < 4s < 4p$
278. The total number of valency electrons for  $\text{NH}_4^+$  is :  
 a) 9                      b) 8                      c) 6                      d) 11
279. According to Bohr's model of hydrogen atom  
 a) Total energy of the electron is quantized                      b) Angular momentum of electron is quantised  
 c) Both (a) and (b)                      d) None of the above
280. The H-spectrum show  
 a) Heisenberg's uncertainty principle                      b) Diffraction  
 c) Polarisation                      d) Presence of quantised energy level
281. The total number of protons present in all the elements upto 'Zn' in the periodic table is:  
 a) 300                      b) 350                      c) 465                      d) 450
282. Time period of a wave is  $5 \times 10^{-3}$ s, what is the frequency?  
 a)  $5 \times 10^{-3}\text{s}^{-1}$                       b)  $2 \times 10^2\text{s}^{-1}$                       c)  $23 \times 10^3\text{s}^{-1}$                       d)  $5 \times 10^2\text{s}^{-1}$
283. The increasing order (lowest first) of the value of  $\frac{e}{m}$  for electron ( $e$ ), proton ( $p$ ),neutron ( $n$ ) and alpha particle ( $\alpha$ ) will be  
 a)  $n, \alpha, p, e$                       b)  $e, p, n, \alpha$                       c)  $n, p, e, \alpha$                       d)  $n, p, \alpha, e$
284. Orbitals processing the same energy are called:  
 a) Hybrid orbitals                      b) Valency orbitals                      c)  $d$ -orbitals                      d) Degenerate orbitals
285. Which set has the same number of unpaired electrons in their ground state?  
 a) N, P, V                      b) Na, P, Cl                      c)  $\text{Na}^+, \text{Mg}^{2+}, \text{Al}$                       d)  $\text{Cl}^-, \text{Fe}^{3+}, \text{Cr}^{3+}$
286. Wavelength of a photon is  $2.0 \times 10^{-11}\text{m}$ ,  $h = 6.6 \times 10^{-34}$  Js. The momentum of photon is:  
 a)  $3.3 \times 10^{-23}$  kg m  $\text{s}^{-1}$   
 b)  $3.3 \times 10^{22}$  kg m  $\text{s}^{-1}$   
 c)  $1.452 \times 10^{-44}$  kg m  $\text{s}^{-1}$   
 d)  $6.89 \times 10^{43}$  kg m  $\text{s}^{-1}$
287. The atomic number of an element is 35 and its mass is 81. The number of electrons in its outermost shell is  
 a) 3                      b) 5                      c) 7                      d) 9
288. According to Dalton's atomic theory, the smallest particle which is capable of independent existence is:  
 a) Element                      b) Atom                      c) Molecule                      d) Ion
289. The possibility of finding an electron in an orbital was conceived by:  
 a) Rutherford                      b) Bohr                      c) Heisenberg                      d) Schrödinger
290. Which statement is/are correct?  
 a) Volume of proton is approximately  $(\frac{4}{3} \pi r^3) = 1.5 \times 10^{-38}$   $\text{cm}^3$   
 b) The radius electron is  $42.8 \times 10^{-13}\text{cm}$   
 c) The density of nucleus is  $10^{14}\text{g}/\text{cm}^3$   
 d) All of the above

291. X-rays cannot penetrate through a sheet of:  
 a) Wood                                      b) Paper                                      c) Aluminium                                      d) Lead
292. How many electrons can fit into the orbitals that comprise the 3rd quantum shell?  
 a) 2    b) 8    c) 18    d) 32
293. The total values of magnetic quantum number of an electron when the value of  $n = 2$  is:  
 a) 9    b) 6    c) 4    d) 2
294. Which transition in the hydrogen atomic spectrum will have the same wavelength as the transition,  $n=4$  to  $n=2$  of  $\text{He}^+$  spectrum?  
 a)  $n = 4$  to  $n = 3$                       b)  $n = 3$  to  $n = 2$                       c)  $n = 4$  to  $n = 2$                       d)  $n = 2$  to  $n = 1$
295. According to  $(n + l)$  rule after completing ' $np$ ' level the electron enters to:  
 a)  $(n - 1)d$                                       b)  $(n + 1)s$                                       c)  $nd$     d)  $(n + 1)p$
296. If the series limit of wavelength of the Lyman series for the hydrogen atom is  $912 \text{ \AA}$ , then the series limit of wavelength for the Balmer series of the hydrogen atom is:  
 a)  $912 \text{ \AA}$                                       b)  $912 \times 2 \text{ \AA}$                                       c)  $912 \times 4 \text{ \AA}$                                       d)  $912/2 \text{ \AA}$
297. The best metal to be used for photoemission is:  
 a) Potassium                                      b) Sodium                                      c) Cesium                                      d) Lithium
298. The correct Schrödinger's wave equation of an electron with  $E$  as total energy and  $V$  as potential energy is:  
 a)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2}{mh^2} (E - V)\Psi = 0$   
 b)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi m}{h^2} (E - V)\Psi = 0$   
 c)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2} (E - V)\Psi = 0$   
 d)  $\frac{\partial^2 \Psi}{\partial x^2} + \frac{\partial^2 \Psi}{\partial y^2} + \frac{\partial^2 \Psi}{\partial z^2} + \frac{8\pi m^2}{h} (E - V)\Psi = 0$
299. Electronic configuration of tritium is :  
 a)  $1s^1$     b)  $1s^2, 2s^2$     c)  $1s^1, 2s^1$     d) None of these
300. The ratio of  $e/m$ , i. e., specific charge for a cathode ray:  
 a) Has the smallest value when the discharge tube is filled with  $\text{H}_2$   
 b) Is constant  
 c) Varies with the atomic number of gas in the discharge tube  
 d) Varies with the atomic number of an element forming the cathode
301. The energy of a photon is  $3 \times 10^{-12}$  ergs. What is its wavelength in nm?  
 ( $h = 6.62 \times 10^{-27}$  ergs,  $c = 3 \times 10^{10}$  cm/s)  
 a) 662    b) 1324    c) 66.2    d) 6.62
302. In a multi-electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric fields?  
 (A)  $n = 1, l = 0, m = 0$   
 (B)  $n = 2, l = 0, m = 0$   
 (C)  $n = 2, l = 1, m = 1$   
 (D)  $n = 3, l = 2, m = 1$   
 (E)  $n = 3, l = 2, m = 0$   
 a) (D) and (E)  
 b) (C) and (D)  
 c) (B) and (C)  
 d) (A) and (B)
303. Zeeman 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
304. Bohr's radius of 2nd orbit of  $\text{Be}^{3+}$  is equal to that of  
 a) 4th orbit of hydrogen  
 b) 2nd orbit of  $\text{He}^+$   
 c) 3rd orbit of  $\text{Li}^{2+}$   
 d) First orbit of hydrogen
305. The velocity of an electron must possess to acquire a momentum equal to the photon of wavelength 5200  $\text{\AA}$ , will be  
 a)  $1398 \text{ ms}^{-1}$   
 b)  $1298 \text{ ms}^{-1}$   
 c)  $1400 \text{ ms}^{-1}$   
 d)  $1300 \text{ ms}^{-1}$
306. In potassium the order of energy level for 19th electron is:  
 a)  $3s > 3d$   
 b)  $4s < 3d$   
 c)  $4s > 4p$   
 d)  $4s = 3d$
307.  $[\text{Ar}]3d^{10}, 4s^1$  electronic configuration belongs to  
 a) Ti  
 b) Tl  
 c) Cu  
 d) V
308. The charge on an electron is  $4.8 \times 10^{-10}$  esu. What is the value of charge in  $\text{Li}^+$  ion?  
 a)  $4.8 \times 10^{-10}$  esu  
 b)  $9.6 \times 10^{-10}$  esu  
 c)  $1.44 \times 10^{-9}$  esu  
 d)  $2.4 \times 10^{-10}$  esu
309. What is the ration of mass of an electron to the mass of a proton?  
 a) 1:2  
 b) 1:1  
 c) 1:1837  
 d) 1:3
310. As the number of orbit increase from the nucleus, the difference between the adjacent energy levels:  
 a) Increases  
 b) Remains constant  
 c) Decreases  
 d) None of these
311. The potential energy of an electron present in the ground state of  $\text{Li}^{2+}$  ion is  
 a)  $+\frac{3e^2}{4\pi\epsilon_0 r}$   
 b)  $-\frac{3e}{4\pi\epsilon_0 r}$   
 c)  $-\frac{3e^2}{4\pi\epsilon_0 r}$   
 d)  $-\frac{3e^2}{4\pi\epsilon_0 r^2}$
312. The orbital angular momentum of a  $p$ -electron is given as:  
 a)  $\frac{h}{\sqrt{2\pi}}$   
 b)  $\sqrt{3} \frac{h}{2\pi}$   
 c)  $\sqrt{\frac{3h}{2\pi}}$   
 d)  $\sqrt{6} \cdot \frac{h}{2\pi}$
313. Transition from  $n = 2,3,4,5 \dots$  to  $n = 1$  is called  
 a) Lyman series  
 b) Paschen series  
 c) Balmer series  
 d) Bracket series
314. If the total energy of an electron in a hydrogen like atom in an excited state is  $-3.4 \text{ eV}$ , then the de Broglie wavelength of the electron is:  
 a)  $6.6 \times 10^{-10}$   
 b)  $3 \times 10^{-10}$   
 c)  $5 \times 10^{-9}$   
 d)  $9.3 \times 10^{-12}$
315. Which  $d$ -orbital does not have four lobes?  
 a)  $d_{x^2-y^2}$   
 b)  $d_{xy}$   
 c)  $d_{z^2}$   
 d)  $d_{xz}$
316. The nucleus of an atom contains  
 a) Proton and electron  
 b) Neutron and electron  
 c) Proton and neutron  
 d) Proton, neutron and electron
317. Total number of electrons present in acetylene molecule is:  
 a) 14  
 b) 26  
 c) 18  
 d) 16
318. An ion which has 18 electrons in the outermost shell is:  
 a)  $\text{Cu}^+$   
 b)  $\text{Th}^{4+}$   
 c)  $\text{Cs}^+$   
 d)  $\text{K}^+$
319. The maximum number of electrons in a  $p$ -orbital with  $n = 6$  and  $m = 0$  can be:  
 a) 2  
 b) 6  
 c) 10  
 d) 14
320. The graph representing node is



321. Energy of photon of visible light is

- a) 1 eV                                      b) 1 MeV                                      c) 1 eV                                      d) 1 keV
322. Which of the following statements is incorrect?
- Extra stability of half filled and completely filled orbitals among  $s$  and  $p$  block elements is reflected in trends of IE across a period
  - Extra stability of half-filled and completely filled orbitals among  $s$  and  $p$  block elements is reflected in EA trends across a period
  - Aufbau principle is incorrect for cases where energy difference between  $ns$  and  $(n - 1)d$  sub-shell is larger
  - Extra stability to half filled sub-shell is due to higher exchange energies
323. The photoelectric effect occurs only when the incident light has more frequency than a certain minimum:
- Frequency
  - Wavelength
  - Speed
  - Charge
324. If the energy difference between the ground state of an atom and its excited state is  $4.4 \times 10^{-4}$ J, the wavelength of photon required to produce the transition
- $2.26 \times 10^{-12}$ m
  - $1.13 \times 10^{-12}$ m
  - $4.52 \times 10^{-16}$ m
  - $4.52 \times 10^{-12}$ m
325. For which of the following, the radius will be same as for hydrogen atom having  $n = 1$ ?
- $\text{He}^+, n = 2$
  - $\text{Li}^{2+}, n = 2$
  - $\text{Be}^{3+}, n = 2$
  - $\text{Li}^{2+}, n = 3$
326. The volume of a proton is approximately;
- $1.5 \times 10^{-30}$ cm<sup>3</sup>
  - $1.5 \times 10^{-38}$ cm<sup>3</sup>
  - $1.5 \times 10^{-34}$ cm<sup>3</sup>
  - None of these
327. Normally, the time taken in the transition is :
- Zero
  - 1 sec
  - $10^{-5}$ sec
  - $10^{-8}$ sec
328. When the value of azimuthal quantum number is 3, magnetic quantum number can have values:
- +1, -1
  - +3, +2, +1, 0, -1, -2, -3
  - +2, +1, 0, -1, -2
  - +1, 0, -1
329. Positive rays or canal rays are:
- Electromagnetic waves
  - A steam of positively charged gaseous ions
  - A steam of electrons
  - Neutrons
330. X-rays do not show the phenomenon of :
- Diffraction
  - Polarisation
  - Deflection by electric field
  - Interference
331. For an electron, if the uncertainty in velocity is  $\Delta v$ , the uncertainty in its position ( $\Delta x$ ) is given by:
- $\frac{h}{2} \pi m \Delta v$
  - $\frac{2\pi}{hm \Delta v}$
  - $\frac{h}{4\pi m \Delta v}$
  - $\frac{2\pi m}{h \Delta v}$
332. If the shortest wavelength of H-atom in Lyman series is  $x$ , the longest wavelength in Balmer series of  $\text{He}^+$  is
- $\frac{36x}{5}$
  - $\frac{5x}{9}$
  - $\frac{x}{4}$
  - $\frac{9x}{5}$
333. Rydberg is :
- Also called Rydberg constant and is a universal constant
  - Unit of wavelength and one Rydberg equal to  $1.097 \times 10^{-7}$ m<sup>-1</sup>
  - Unit of wave number and one Rydberg equal to  $1.097 \times 10^7$ m<sup>-1</sup>
  - Unit of energy and one Rydberg equal to 13.6 eV
334. Which is not deflected by magnetic field:
- Neutron
  - Positron
  - Proton
  - Electron
335. The quantum numbers  $+\frac{1}{2}$  and  $-\frac{1}{2}$  for an electron represent
- Rotation of electron in clockwise and anticlockwise direction respectively
  - Rotation of electron in anticlockwise and clockwise direction respectively

- c) Magnetic moment of electron pointing up and down respectively  
 d) Two quantum mechanical spin states which have no classical analogue
336. Increase in the frequency of the incident radiations increases the:  
 a) Rate of emission of photo-electrons  
 b) Work function  
 c) Kinetic energy of photo-electrons  
 d) Threshold frequency
337. What is the frequency of photon whose momentum is  $1.1 \times 10^{-23} \text{ kg ms}^{-2}$ ?  
 a)  $5 \times 10^{16} \text{ Hz}$                       b)  $5 \times 10^{17} \text{ Hz}$                       c)  $0.5 \times 10^{18} \text{ Hz}$                       d)  $5 \times 10^{18} \text{ Hz}$
338. A quanta will have more energy, if :  
 a) The wavelength is larger  
 b) The frequency is higher  
 c) The amplitude is higher  
 d) The velocity is lower
339.  $\text{I}_2$  molecule dissociates into atoms after absorbing light of  $4500 \text{ \AA}$ . If one quantum of energy is absorbed by each molecule, the KE of iodine atoms will be (BE of  $\text{I}_2 = 240 \text{ kJ/mol}$ )  
 a)  $240 \times 10^{-19} \text{ J}$                       b)  $0.216 \times 10^{-19} \text{ J}$                       c)  $2.16 \times 10^{-19} \text{ J}$                       d)  $2.40 \times 10^{-19} \text{ J}$
340. The rest mass of a photon of wavelength  $\lambda$  is:  
 a) Zero                      b)  $hc/\lambda$                       c)  $h/c\lambda$                       d)  $h/\lambda$
341. An atom emits energy equal to  $4 \times 10^{-12} \text{ erg}$ . To which part of electromagnetic spectrum it belongs?  
 a) UV region                      b) Visible region                      c) IR region                      d) Microwave region
342. The valence shell electronic configuration of  $\text{Cr}^{2+}$  ion is  
 a)  $4s^0 3d^4$                       b)  $4s^2 3d^2$                       c)  $4s^2 3d^0$                       d)  $3p^6 4s^2$
343. The total number of electrons present in all the 's' orbitals, all the 'p' orbitals and all the 'd' orbitals of cesium ion are respectively  
 a) 8, 26, 10                      b) 10, 24, 20                      c) 8, 22, 24                      d) 12, 20, 22
344. In the above question, the velocity acquired by the electron will be;  
 a)  $\sqrt{V/m}$                       b)  $\sqrt{(eV/m)}$                       c)  $\sqrt{(2eV/m)}$                       d) None of these
345. The ionization energy of the ground state hydrogen atom is  $2.18 \times 10^{-18} \text{ J}$ . The energy of an electron in its second orbit would be  
 a)  $-2.67 \times 10^{-18} \text{ J}$                       b)  $-5.45 \times 10^{-19} \text{ J}$                       c)  $-3.58 \times 10^{-18} \text{ J}$                       d)  $-4.68 \times 10^{-19} \text{ J}$
346. The velocity of electron in first orbit of H-atoms as compared to the velocity of light is  
 a)  $\frac{1}{10}$  th                      b)  $\frac{1}{100}$  th                      c)  $\frac{1}{1000}$  th                      d) Same
347. A gas absorbs photon of  $355 \text{ nm}$  and emits at two wavelengths. If one of the emission is at  $680 \text{ nm}$ , the other is at  
 a)  $1035 \text{ nm}$                       b)  $325 \text{ nm}$                       c)  $743 \text{ nm}$                       d)  $518 \text{ nm}$
348. Bohr's model violates the rules of classical physics because it assumes that:  
 a) All electrons have same charge  
 b) The nucleus have same charge  
 c) Electrons can revolve around the nucleus  
 d) A charged particle can accelerate without emitting radiant energy
349. The stability of ferric ion is due to  
 a) Half filled *f*-orbitals                      b) Half filled *d*-orbitals  
 c) Completely filled *f*-orbitals                      d) Completely filled *d*-orbitals
350. The electron possesses wave properties was shown experimentally by:  
 a) Bohr                      b) de Broglie                      c) Davission and germer                      d) Schrödinger
351. The nature of canal rays depends on:

- a) Nature of electrode  
 b) Nature of discharging tube  
 c) Nature of residual gas  
 d) All of the above
352. Total number of valency electrons in phosphonium ion  $\text{PH}_4^+$  is:  
 a) 16                                      b) 32                                      c) 8                                      d) 18
353. Neutron possesses:  
 a) Positive charge                                      b) No net charge  
 c) Negative charge                                      d) All are correct
354. Cathode-ray tube is used in:  
 a) Compound microscope  
 b) A radio receiver  
 c) A television set  
 d) A van de Graff generator
355. Non-directional orbital is  
 a)  $4p$                                       b)  $4d$                                       c)  $4f$                                       d)  $3s$
356. How many unpaired electrons are present in  $\text{Ni}^{2+}$  cation? (At. No. = 28)  
 a) 0                                      b) 2                                      c) 4                                      d) 6
357. The maximum sum of the number of neutrons and proton is an isotope of hydrogen is :  
 a) 6                                      b) 5                                      c) 4                                      d) 3
358. The magnitude of the spin angular momentum of an electron is given by  
 a)  $S = \sqrt{s(s+1)} \frac{h}{2\pi}$                                       b)  $S = s \frac{h}{2\pi}$                                       c)  $S = \frac{3}{2} \times \frac{h}{2\pi}$                                       d) None of these
359. A  $3d$ -electron having  $s = +1/2$  can have a magnetic quantum no:  
 a) +2                                      b) +3                                      c) -3                                      d) +4
360. The emission spectrum of hydrogen is found to satisfy the expression for the energy change,  $\Delta E$  (in joules), such that  $\Delta E = 2.18 \times 10^{-18} \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$  J, where,  $n_1 = 1, 2, 3, \dots$  and  $n_2 = 2, 3, 4, \dots$ . The spectral lines correspond to Paschen series are  
 a)  $n_1 = 1$  and  $n_2 = 2, 3, 4$                                       b)  $n_1 = 1$  and  $n_2 = 3, 4, 5$   
 c)  $n_1 = 3$  and  $n_2 = 4, 5, 6$                                       d)  $n_1 = 2$  and  $n_2 = 3, 4, 5$
361. The maximum number of  $3d$ -electrons having spin quantum number  $s = +1/2$  are:  
 a) 10                                      b) 14                                      c) 5                                      d) None of these
362. The ratio of nucleons in  $\text{O}^{16}$  and  $\text{O}^{18}$  is:  
 a)  $8/9$                                       b)  $4/5$                                       c)  $9/8$                                       d) 1
363. A particle moving with a velocity  $10^6$  m/s will have de-Broglie wavelength nearly [Given,  $m = 6.62 \times 10^{-27}$  kg,  $h = 6.62 \times 10^{-34}$  J - s]  
 a)  $10^{-9}$  m                                      b)  $10^{-13}$  m                                      c)  $10^{-19}$  m                                      d)  $1 \text{ \AA}$
364. Which is not permissible subshell?  
 a)  $2d$                                       b)  $4f$                                       c)  $6p$                                       d)  $3s$
365. In Bohr's series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inner-orbit jumps of the electron for Bohr orbit in an atom of hydrogen?  
 a)  $3 \rightarrow 2$                                       b)  $5 \rightarrow 2$                                       c)  $4 \rightarrow 1$                                       d)  $2 \rightarrow 5$
366. If the electron in the hydrogen atom is excited to  $n = 5$ , the number of different frequencies of radiations which may be emitted is:  
 a) 4                                      b) 5                                      c) 8                                      d) 10
367. The uncertainty principle and the concept of wave nature of matter was proposed by ... and ... respectively  
 a) Heisenberg, de Broglie  
 b) de Broglie, Heisenberg  
 c) Heisenberg, Planck



- d) Planck, Heisenberg
368. Quantum theory was postulated by:  
 a) Rutherford                      b) Maxwell                      c) Max Planck                      d) Becquerel
369. If the nitrogen atom had electronic configuration  $1s^7$ , it would have energy lower than that of the normal ground state configuration  $1s^2 2s^2 2p^3$ , because the electrons would be closer to the nucleus. Yet  $1s^7$  is not observed because it violates :  
 a) Heisenberg's uncertainty principle  
 b) Hund's rule  
 c) Pauli's exclusion principle  
 d) Bohr's postulate of stationary orbits
370. The number of  $p$ -electrons in bromine atom is  
 a) 12                      b) 15                      c) 7                      d) 17
371. Potassium ion is isoelectronic with the atom of:  
 a) Ar                      b) He                      c) Fe                      d) Mg
372. An electron that has quantum number  $n = 3$  and  $m = 2$ :  
 a) Must have spin value  $+1/2$   
 b) Must have  $l = 1$   
 c) Must have  $l = 0, 1$  or  $2$   
 d) Must have  $l = 2$
373. Cr has electronic configuration as  
 a)  $3s^2 3p^6 3d^4 4s^1$                       b)  $3s^2 3p^6 3d^5 4s^1$                       c)  $3s^2 3p^6 3d^6$                       d) None of these
374. The number of vacant orbitals of element with atomic number 14 is:  
 a) 2                      b) 4                      c) 8                      d) 6
375. Energy of H-atom in the ground state is  $-13.6$  eV, hence energy in the second excited state is  
 a)  $-6.8$  eV                      b)  $-3.4$  eV                      c)  $-1.51$  eV                      d)  $-4.53$  eV
376. As electron moves away from the nucleus, its KE:  
 a) Decreases                      b) Increases                      c) Remains constant                      d) None of these
377. A hydrogen atom in its ground state absorbs a photon. The maximum energy of such a photon is:  
 a)  $1.5$  eV                      b)  $3.4$  eV                      c)  $10.2$  eV                      d)  $13.6$  eV
378. Wave nature of electrons was demonstrated by  
 a) Schrodinger                      b) De-Broglie                      c) Davisson and Garmer                      d) Heisenberg
379. The principal quantum number of H-atom orbital, if the electron energy is  $-3.4$  eV, will be  
 a) 1                      b) 2                      c) 3                      d) Zero
380. No two electrons can have the same values of .... quantum numbers.  
 a) One                      b) Two                      c) Three                      d) Four
381. If  $n = 3, l = 0$  and  $m = 0$ , then atomic number is  
 a) 12 or 13                      b) 13 or 14                      c) 10 or 11                      d) 11 or 12
382. The threshold wavelength for photoelectric effect on sodium is  $5000 \text{ \AA}$ . Its work function is:  
 a)  $4 \times 10^{-19}$  J                      b) 1 J                      c)  $2 \times 10^{-19}$  J                      d)  $3 \times 10^{-10}$  J
383. The first atom with incomplete  $d$ -shell is:  
 a) Sc                      b) Cu                      c) Fe                      d) Zn
384. The wave number of the spectral line in the emission spectrum of hydrogen will be equal to  $\frac{8}{9}$  times the Rydberg's constant if the electron jumps from  
 a)  $n = 3$  to  $n = 1$                       b)  $n = 10$  to  $n = 1$                       c)  $n = 9$  to  $n = 1$                       d)  $n = 2$  to  $n = 1$
385. Particle nature of electron was experimentally demonstrated by  
 a) Max Bon                      b) J.J. Thomson                      c) De-Broglie                      d) Schrodinger
386. The difference in angular momentum associated with the electron in two successive orbits of hydrogen atom is:  
 a)  $h/\pi$                       b)  $h/2\pi$                       c)  $h/2$                       d)  $(n - 1)h/2\pi$

387. The volume of nucleus is about:  
 a)  $10^{-4}$  times that of an atom  
 b)  $10^{-12}$  times that of an atom  
 c)  $10^{-6}$  times that of an atom  
 d)  $10^{-10}$  times that of an atom
388. The species having more electrons than neutrons is:  
 a) F                                      b) Na<sup>+</sup>                                      c) O<sup>2-</sup>                                      d) Mg<sup>2+</sup>
389. The characteristic not associated with Planck's theory is  
 a) Radiations are associated with energy  
 b) The magnitude of energy associated with a quantum is proportional to frequency  
 c) Radiation energy is neither emitted nor absorbed continuously  
 d) Radiation energy is neither emitted nor absorbed discontinuously
390. H has two natural isotopes of  ${}_1\text{H}^1$  and  ${}_1\text{H}^2$  and O has two isotopes O<sup>16</sup> and O<sup>18</sup>. Which of the following mol. wt. of H<sub>2</sub>O will not be possible?  
 a) 19                                      b) 20                                      c) 24                                      d) 22
391. Which ion has the maximum magnetic moment?  
 a) Mn<sup>3+</sup>                                      b) Cu<sup>2+</sup>                                      c) Fe<sup>3+</sup>                                      d) V<sup>3+</sup>
392. Photoelectric effect was discovered by :  
 a) Hallwach                                      b) Lenard                                      c) Einstein                                      d) Hertz
393. The electronic configuration of Cr<sup>3+</sup> is  
 a) [Ar]3d<sup>4</sup>4s<sup>2</sup>                                      b) [Ar]3d<sup>3</sup>4s<sup>0</sup>                                      c) [Ar]3d<sup>2</sup>4s<sup>1</sup>                                      d) [Ar]3d<sup>5</sup>4s<sup>1</sup>
394. When light is directed at the metal surface, the emitted electrons:  
 a) Are called photons  
 b) Have random energies  
 c) Have energies that depend upon intensity of light  
 d) Have energies that depend upon the frequency of light
395. Increasing order (lowest first) for the values of  $e/m$  for electron ( $e$ ), proton ( $p$ ), neutron ( $n$ ) and  $\alpha$ -particles is  
 a)  $e, p, n, \alpha$                                       b)  $n, \alpha, p, e$                                       c)  $n, p, e, \alpha$                                       d)  $n, p, \alpha, e$
396. A photon having a wavelength of 845 Å, causes the ionisation of N atom. What is the ionisation energy of N?  
 a) 1.4 kJ                                      b)  $1.4 \times 10^4$  kJ                                      c)  $1.4 \times 10^2$  kJ                                      d)  $1.4 \times 10^3$  kJ
397. The minimum real charge on of any particle, which can exist is:  
 a)  $1.6 \times 10^{-19}$  coulomb    b)  $1.6 \times 10^{-10}$  coulomb    c)  $4.8 \times 10^{-10}$  coulomb    d) Zero
398. Minimum number of photons of light of wavelength 4000 Å, which provide 1 J energy:  
 a)  $2 \times 10^{18}$                                       b)  $2 \times 10^9$                                       c)  $2 \times 10^{20}$                                       d)  $2 \times 10^{10}$
399. An electron jumps from an outer orbit to an inner orbit with an energy difference of 3.0eV. What will be the wavelength of the line emitted?  
 a) 3660 Å                                      b) 3620 Å                                      c) 4140 Å                                      d) 4560 Å
400. When a gold sheet is bombarded by a beam of  $\alpha$  -particles, only a few of them get deflected, whereas most go straight, undeflected. This is because  
 a) The force of attraction exerted on  $\alpha$ - particle by electrons is insufficient  
 b) The volume of nucleus is smaller than atom  
 c) The force of repulsion acting on fast moving  $\alpha$ -particle is very small  
 d) The neutrons have no effect on  $\alpha$ -particle
401. Which of the following elements has least number of electrons in its M-shell?  
 a) K                                      b) Mn                                      c) Ni                                      d) Sc
402. The mass of an electron is  $m$ , its charge  $e$  and it is accelerated from rest through a potential difference V. The kinetic energy of the electron in joules will be :

- a) V                                      b) eV                                      c) MeV                                      d) None of these
403. In an atom wave mechanics suggests that electrons:  
 a) Move around the nucleus in circular orbits  
 b) Move around the nucleus in elliptical orbits  
 c) Form diffused cloud around the nucleus  
 d) None of the above
404. Which of the following is non-permissible?  
 a)  $n = 4, l = 3, m = 0$       b)  $n = 4, l = 2, m = 1$       c)  $n = 4, l = 4, m = 1$       d)  $n = 4, l = 0, m = 0$
405. Which electronic configuration does not follow the Pauli's exclusion principle?  
 a)  $1s^2, 2s^2 2p^4$                       b)  $1s^2, 2s^2 2p^4, 3s^2$                       c)  $1s^2, 2p^4$                       d)  $1s^2, 2s^2 2p^6, 3s^3$
406. Given that in the H-atom the transition energy for  $n = 1$  to  $n = 2$ , 10.2eV, the energy for the same transition in  $Be^{3+}$  is:  
 a) 20.4 eV                                      b) 30.6 eV                                      c) 163.2 eV                                      d) 40.8 eV
407. How many electrons can be accommodated in a subshell for which  $n = 3, l = 1$ ?  
 a) 8    b) 6    c) 18    d) 32
408. Which of the following is correctly matched?  
 a) Momentum of H atom when electrons return from  $n = 2$  to  $n = 1$ :  $\frac{3Rh}{4}$   
 b) Momentum of photon : Independent of wavelength of light  
 c)  $e/m$  ratio of anode rays : Independent of gas in the discharge tube  
 d) Radius of nucleus : (Mass no.)<sup>1/2</sup>
409. One require energy  $E_n$  to remove nucleon and an energy  $E_e$  to remove an electron from the orbit of an atom, then:  
 a)  $E_n = E_e$                                       b)  $E_n < E_e$                                       c)  $E_n > E_e$                                       d)  $E_n \geq E_e$
410. Light, a well known form of energy, is treated as a form of matter, by saying that it consist of :  
 a) Photons or bundles of energy  
 b) Electrons or a wave like matter  
 c) Neutrons, since electrically neutral  
 d) None of the above
411. Number of orbits and orbitals having electrons in  ${}_{14}Si$  are respectively :  
 a) 3, 6    b) 6, 3    c) 7, 3    d) 3, 8
412. In a hydrogen atom, if energy of an electron in ground state is  $-13.6$  eV, then that in the 2nd excited state is:  
 a)  $-1.51$  eV                                      b)  $-3.4$  eV                                      c)  $-6.0$  eV                                      d)  $-13.6$  eV
413. The number of electrons with the azimuthal quantum number  $l = 1$  and 2 for  ${}_{24}Cr$  in ground state are:  
 a) 16 and 5                                      b) 12 and 5                                      c) 16 and 4                                      d) 12 and 4
414. The number of valence electrons in completely excited sulphur atom is:  
 a) Zero    b) 4    c) 6    d) 2
415. An improbable configuration is:  
 a)  $[Ar]3d^4, 4s^2$                                       b)  $[Ar]3d^5, 4s^1$                                       c)  $[Ar]3d^6, 4s^2$                                       d)  $[Ar]3d^{10}, 4s^1$
416. The wave number of radiation of wavelength 500 nm is:  
 a)  $5 \times 10^{-7} m^{-1}$                                       b)  $2 \times 10^{-7} m^{-1}$                                       c)  $2 \times 10^6 m^{-1}$                                       d)  $500 \times 10^{-9} m^{-1}$
417. The energies  $E_1$  and  $E_2$  of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths *i. e.*  $\lambda_1$  and  $\lambda_2$  will be:  
 a)  $\lambda_1 = \frac{1}{2} \lambda_2$                                       b)  $\lambda_1 = \lambda_2$                                       c)  $\lambda_1 = 2\lambda_2$                                       d)  $\lambda_1 = 4\lambda_2$
418. The nitrogen atom has 7 electrons, the nitride ion ( $N^{3-}$ ) will have  
 a) 7 protons and 10 electrons  
 b) 4 protons and 7 electrons  
 c) 4 protons and 10 electrons

- d) 10 protons and 7 electrons
419. Which among the following is correct for  ${}_5\text{B}$  in normal state?
- a)  $\begin{array}{c} 1s \\ \boxed{\uparrow\downarrow} \end{array} \quad \begin{array}{c} 2p \\ \boxed{\phantom{\uparrow}} \boxed{1} \boxed{\phantom{\uparrow}} \end{array}$   
: Against Hund's rule
- b)  $\begin{array}{c} 1s \\ \boxed{1} \end{array} \quad \begin{array}{c} 2p \\ \boxed{1} \boxed{1} \boxed{\phantom{\uparrow}} \end{array}$   
: Against Aufbau principle as well as Hund's rule
- c)  $\begin{array}{c} 1s \\ \boxed{11} \end{array} \quad \begin{array}{c} 2p \\ \boxed{1} \boxed{\phantom{\uparrow}} \boxed{\phantom{\uparrow}} \end{array}$   
: Violation of Pauli's exclusion principle and not Hund's rule
- d)  $\begin{array}{c} 1s \\ \boxed{\uparrow\downarrow} \end{array} \quad \begin{array}{c} 2p \\ \boxed{1} \boxed{\phantom{\uparrow}} \boxed{\phantom{\uparrow}} \end{array}$   
: Against Aufbau principle
420. Cathode rays are produced when the pressure in the discharge tube is of the order of :
- a) 76 cm of Hg  
b)  $10^{-6}$  cm of Hg  
c) 1 cm of Hg  
d)  $10^{-2}$  to  $10^{-3}$  mm of Hg
421. The energy ration of a photon of wavelength 3000 Å and 6000Å is
- a) 1:1    b) 2:1    c) 1:2    d) 1:4
422. The study of photoelectric effect is useful in understanding :
- a) Conservation of energy  
b) Quantization of charge  
c) Conservation of charge  
d) Conservation of kinetic energy
423. What is the correct orbital designation for the electron with the quantum numbers,  $n = 4, l = 3, m = -2, s = 1/2$ ?
- a) 3s    b) 4f    c) 5p    d) 6s
424.  $E_1$  for  $\text{He}^+$  is  $-54.4$  eV. The  $E_2$  for  $\text{He}^+$  would be :
- a)  $-6.8$ eV    b)  $-13.6$ eV    c)  $-27.2$ eV    d)  $-108.8$ eV
425. The total number of fundamental particles in one atom of  ${}^{14}_6\text{C}$  is:
- a) 6    b) 8    c) 14    d) 20
426. In ground state of chromium atom ( $Z = 24$ ) the total number of orbitals populated by one or more electrons is:
- a) 15    b) 16    c) 20    d) 14
427. Heisenberg's uncertainty principle has no significance for a moving
- a) Proton    b) Neutron    c) Electron    d) Cricket ball
428. Which set is not correct?
- a) 3, 1, 0,  $-1/2$     b) 3, 2, 1,  $+1/2$     c) 3, 1, 2,  $-1/2$     d) 3, 2, 0,  $+1/2$
429. If  $E_e, E_\alpha$  and  $E_p$  represent the kinetic energies of an electron, alpha particle and a proton respectively, each moving with same de-Broglie wavelength then
- a)  $E_e = E_\alpha = E_p$     b)  $E_e > E_\alpha > E_p$     c)  $E_\alpha > E_p > E_e$     d)  $E_e > E_p > E_\alpha$
430. Which among the following species have the same number of electrons in its outermost as well as penultimate shell?
- a)  $\text{Mg}^{2+}$     b)  $\text{O}^{2-}$     c)  $\text{F}^-$     d)  $\text{Ca}^{2+}$
431. Photons of energy 6 eV are incidented on a potassium surface of work function 2.1 eV. What is the stopping potential?
- a)  $-6$  V    b)  $-2.1$  V    c)  $-3.9$  V    d)  $-8.1$  V
432. If uncertainty in position and momentum are equal, then uncertainty in velocity is:
- a)  $\sqrt{\frac{h}{2\pi}}$     b)  $\frac{1}{m}\sqrt{\frac{h}{\pi}}$     c)  $\sqrt{\frac{h}{\pi}}$     d)  $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$

433. Which one of the following ions is not isoelectronic with  $O^{2-}$ ?  
 a)  $Ti^+$                                   b)  $Na^+$                                   c)  $F^-$                                   d)  $N^{3-}$
434. How many electrons with  $l = 2$  are there in an atom having atomic number 23?  
 a) 2    b) 3    c) 4    d) 5
435. The statements are valid for :  
 (i) In filling a group of orbitals of equal energy, it is energetically preferable to assign electrons to empty orbitals rather than pair them into a particular orbital  
 (ii) When two electrons are placed in two different orbitals, energy is lower if the spins are parallel  
 a) Aufbau principle  
 b) Hund's rule  
 c) Pauli's exclusion principle  
 d) Uncertainty principle
436. The radius of electron in the first excited state of hydrogen atom is  
 (Where,  $a_0$  is the Bohr's radius)  
 a)  $a_0$     b)  $4a_0$     c)  $2a_0$     d)  $8a_0$
437. The momentum of a photon of frequency  $5 \times 10^{17} s^{-1}$  is nearly:  
 a)  $1.1 \times 10^{-24} \text{ kg m s}^{-1}$   
 b)  $3.33 \times 10^{-43} \text{ kg m s}^{-1}$   
 c)  $2.27 \times 10^{-40} \text{ kg m s}^{-1}$   
 d)  $2.27 \times 10^{-38} \text{ kg m s}^{-1}$
438. In hydrogen atom, which energy level order is not correct:  
 a)  $1s < 2p$     b)  $2p = 2s$     c)  $2p > 2s$     d)  $2p < 3s$
439. The frequency  $\nu$  of certain line of the Lyman series of the atomic spectrum of hydrogen satisfies the following conditions:  
 (i) It is the sum of the frequencies of another Lyman line and a Balmer line.  
 (ii) It is the sum of the frequencies of a certain line, a Lyman line, and a Paschen line.  
 (iii) It is the sum of the frequencies of a Lyman and a Paschen line but no Bracket line.  
 To what transition does  $\nu$  correspond?  
 a)  $n_2 = 3$  to  $n_1 = 1$                                   b)  $n_2 = 3$  to  $n_1 = 2$                                   c)  $n_2 = 2$  to  $n_1 = 1$                                   d)  $n_2 = 4$  to  $n_1 = 1$
440. An isobar of  ${}_{20}Ca^{40}$  is  
 a)  ${}_{18}Ar^{40}$     b)  ${}_{20}Ca^{38}$     c)  ${}_{20}Ca^{42}$     d)  ${}_{18}Ar^{38}$
441. If the speed of electron in the Bohr's first orbit of hydrogen atom is  $x$ , the speed of the electron in the third Bohr's orbit is:  
 a)  $x/9$     b)  $x/3$     c)  $3x$     d)  $9x$
442. The electronic velocity in the fourth Bohr's orbit of hydrogen is  $v$ . The velocity of the electron in the first orbit would be:  
 a)  $4v$     b)  $16v$     c)  $v/4$     d)  $v/16$
443. Which type of radiation is not emitted by the electronic structure of atoms?  
 a) Ultraviolet light                                  b) X-rays    c) Visible light    d)  $\gamma$ -rays
444. If  $E_1, E_2$  and  $E_3$  represent respectively the kinetic energies of an electron, an alpha particle and a proton each having same de Broglie wavelength then:  
 a)  $E_1 > E_3 > E_2$                                   b)  $E_2 > E_3 > E_1$                                   c)  $E_1 > E_2 > E_3$                                   d)  $E_1 = E_2 = E_3$
445. The frequency of first line of Balmer series in hydrogen atom is  $\nu_0$ . The frequency of corresponding line emitted by singly ionised helium atom is :  
 a)  $2\nu_0$     b)  $4\nu_0$     c)  $\nu_0/2$     d)  $\nu_0/4$
446. In a set of degenerate orbitals, the electrons distribute themselves to retain like spins as far as possible. This statement belongs to  
 a) Pauli's exclusion principle                                  b) Aufbau principle  
 c) Hund's rule of maximum multiplicity                                  d) Slater's rule

447. Electrons occupy the available sub-level which has lower  $n + l$  value. This is called:  
 a) Hund's rule  
 b) Aufbau principle  
 c) Heisenberg's uncertainty principle  
 d) Pauli's principle
448. Choose the correct statement among the following  
 a)  $\Psi^2$  represents the atomic orbital  
 b) The number of peaks in radial distribution is  $n - l$   
 c) A node is a point in space around nucleus where the wave function  $\Psi$  has zero value  
 d) All of the above
449. Which possesses an inert gas configuration?  
 a)  $\text{Fe}^{3+}$                       b)  $\text{Cl}^-$                       c)  $\text{Mg}^+$                       d)  $\text{Cr}^{3+}$
450. Angular momentum of an electron in the  $n$  th orbit of hydrogen atom is given by  
 a)  $\frac{nh}{2\pi}$                       b)  $nh$                       c)  $\frac{2\pi}{nh}$                       d)  $\frac{\pi}{2nh}$
451. The discovered of neutron became very late because:  
 a) Neutrons are present in nucleus  
 b) Neutrons are fundamental particles  
 c) Neutrons are chargeless  
 d) All of the above
452. The frequency of a spectral line for electron transition in an atom is directly proportional to  
 a) Number of electrons undergoing transition  
 b) Velocity of electron  
 c) The difference of energy between energy levels involved in the transition  
 d) None of the above
453. Photoelectric emission is observed from a surface for frequency  $\nu_1$  and  $\nu_2$  of the incident radiation ( $\nu_1 > \nu_2$ ). If the maximum kinetic energies of the photoelectrons in the two cases are in the ratio  $1 : k$ , then the threshold frequency  $\nu_0$  is given by:  
 a)  $\frac{\nu_2 - \nu_1}{k - 1}$                       b)  $\frac{k\nu_1 - \nu_2}{k - 1}$                       c)  $\frac{k\nu_2 - \nu_1}{k - 1}$                       d)  $\frac{\nu_2 - \nu_1}{k}$
454. The number of  $2p$ -electrons having spin quantum numbers  $s = -1/2$  are  
 a) 6                      b) 0                      c) 2                      d) 3
455. Which statement relating to the spectrum of H atom is false?  
 a) The lines can be defined by quantum number  
 b) The lines of longest wavelength in the Balmer series corresponds to the transition between  $n = 3$  and  $n = 2$  levels  
 c) The spectral lines are closer together at longer wavelengths  
 d) A continuum occurs at  $n = \infty$
456. The atomic number of the element having maximum number of unpaired  $3p$ -electrons is:  
 a) 15                      b) 10                      c) 12                      d) 8
457. The maximum wavelength of light that can excite an electron from first to third orbit of hydrogen atom is:  
 a) 487 nm                      b) 170 nm                      c) 103 nm                      d) 17 nm
458. The incorrect statement about Bohr's orbit of hydrogen atom is  
 a)  $r = n^2 \frac{h^2}{4\pi^2 m \left(\frac{e^2}{4\pi\epsilon_0}\right)}$                       b) KE of electron = PE of electron  
 c)  $E = -\frac{1}{n^2} \frac{2\pi^2 m \left(\frac{e^2}{4\pi\epsilon_0}\right)^2}{h^2}$                       d) None of the above is incorrect
459. Four different sets of quantum numbers for 4 electrons are given below

$$e_1 = 4, 0, 0, -\frac{1}{2}; e_2 = 3, 1, 1, -\frac{1}{2}$$

$$e_3 = 3, 2, 2, +\frac{1}{2}; e_4 = 3, 0, 0, +\frac{1}{2}$$

The order of energy of  $e_1, e_2, e_3$  and  $e_4$  is

- a)  $e_1 > e_2 > e_3 > e_4$       b)  $e_4 > e_3 > e_2 > e_1$       c)  $e_3 > e_1 > e_2 > e_4$       d)  $e_2 > e_3 > e_4 > e_1$

460. When electrons in  $N$ -shell of excited hydrogen atom return to ground state, the number of possible lines spectrum is:

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

461. The electrons occupying the same orbital have always spin:

- a) Paired                                      b) Unpaired                                      c) Both (a) and (b)                                      d) None of these

462. The energy of hydrogen atom in its ground state is  $-13.6$  eV. The energy of the level corresponding to the quantum number  $n=5$  is

- a)  $-5.4$  eV                                      b)  $-0.54$  eV                                      c)  $-2.72$  eV                                      d)  $-0.85$  eV

463. According to Bohr's theory, the angular momentum for an electron of 5th orbit is:

- a)  $\frac{2.5h}{\pi}$                                       b)  $\frac{5h}{\pi}$                                       c)  $\frac{25h}{\pi}$                                       d)  $\frac{6h}{2\pi}$

464. In which of the orbit of  $\text{He}^+$ , the angular momentum of the electron in  $h/2\pi$ ?

- a) First orbit                                      b) Second orbit                                      c) Third orbit                                      d) Fourth orbit

465. Correct set of four quantum numbers for valence electron of rubidium ( $Z = 37$ ) is

- a)  $5, 0, 0, +\frac{1}{2}$                                       b)  $5, 1, 0, +\frac{1}{2}$                                       c)  $5, 1, 1, +\frac{1}{2}$                                       d)  $6, 0, 0, +\frac{1}{2}$

466. Electron density in the YZ plane of  $3d_{x^2-y^2}$  orbital is

- a) Zero                                      b) 0.50                                      c) 0.75                                      d) 0.90

467. The total number of orbitals possible for principle quantum number  $n$  is

- a)  $n$                                       b)  $n^2$                                       c)  $2n$                                       d)  $2n^2$

468. Which does not characterise X-rays?

- a) The radiation can ionise gas  
b) It causes ZnS to fluorescence  
c) Deflected by electric and magnetic fields  
d) Have wavelength shorter than ultraviolet rays

469. The velocity of an electron placed in 3rd orbit of H atom, will be

- a)  $2.79 \times 10^7$  cm/s                                      b)  $9.27 \times 10^{27}$  cm/s                                      c)  $7.29 \times 10^7$  cm/s                                      d)  $92.7 \times 10^7$  cm/s

470. The electronic configuration of an atom is  $1s^2, 2s^2 2p^3$ . The number of unpaired electrons in this atom is:

- a) 1                                      b) Zero                                      c) 3                                      d) 5

471. The orbital angular momentum of an electron in  $2s$  orbital is

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

472. In the atomic spectrum of hydrogen the series of lines observed in the visible region is:

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

473. According to Bohr's model of hydrogen atom :

- a) The linear velocity of the electron is quantised  
b) The angular velocity of the electron is quantised  
c) The linear momentum of the electron is quantised  
d) The angular momentum of the electron is quantised

474. Which transition of electron in the hydrogen atom emits maximum energy?

- a)  $2 \rightarrow 1$                                       b)  $1 \rightarrow 4$                                       c)  $4 \rightarrow 3$                                       d)  $3 \rightarrow 2$

475. The quantum number that does not describe the distance and the angular disposition of the electron:

- a)  $n$                                       b)  $l$                                       c)  $m$                                       d)  $s$

476.  $\text{Li}^{2+}$  and  $\text{Be}^{3+}$  are:

- a) Isotopes                      b) Isomers                      c) Isobars                      d) Isoelectronic
477. In H atom, the electron is de-excited from 5th shell to 1st shell. How many different lines may appear in line spectrum?  
 a) 4                                  b) 8                                  c) 10                                  d) 12
478. The electronic configuration with maximum exchange energy will be  
 a)  $3d_{xy}^1 3d_{yz}^1 3d_{zx}^1 4s^1$                       b)  $3d_{xy}^1 3d_{yz}^1 3d_{zx}^1 3d_{x^2-y^2}^1 3d_{z^2}^1 4s^1$   
 c)  $3d_{xy}^2 3d_{yz}^2 3d_{zx}^2 3d_{x^2-y^2}^2 3d_{z^2}^1 4s^1$                       d)  $3d_{xy}^2 3d_{yz}^2 3d_{zx}^2 3d_{x^2-y^2}^2 3d_{z^2}^2 4s^1$
479. The orbital diagram in which aufbau principle is violated is:  
 a) 

↑↓	↑↓	↑	
----	----	---	--

  
 b) 

↑	↑↓	↑	↑
---	----	---	---

  
 c) 

↑↓	↑	↑	↑
----	---	---	---

  
 d) 

↑↓	↑↓	↑↓	↑
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480. In the ground state of  $\text{Cu}^+$ , the number of shell occupied, sub-shells occupied, filled orbitals and unpaired electrons respectively are  
 a) 4,8,15,0                      b) 3,6,15,1                      c) 3,6,14,0                      d) 4,7,14,2
481. If  $h$  is Planck's constant, the momentum of a photon of wavelength  $0.01 \text{ \AA}$  is:  
 a)  $10^{-2}h$                       b)  $h$                                   c)  $10^2h$                                   d)  $10^{12}h$
482. What does the electronic configuration  $1s^2, 2s^2, 2p^5, 3s^1$  indicate?  
 a) Ground state of fluorine                      b) Excited state of fluorine  
 c) Excited state of neon                                  d) Excited state of the  $\text{O}_2^-$  ion
483. Each  $p$ -orbital and each  $d$ -orbital except one has lobes respectively as:  
 a) 2,4                                  b) 1,4                                  c) 2,3                                  d) 1,1
484. Which of the following statements regarding an orbital is correct?  
 a) An orbital is a definite trajectory around the nucleus in which electron can move  
 b) An orbital always has spherical trajectory  
 c) An orbital is the region around the nucleus where there is a 90 – 95% probability of finding all the electrons of an atom  
 d) An orbital is characterized by 3 quantum numbers  $n, l$  and  $m$
485. An electronic transition in hydrogen atom results in the formation of  $H_\alpha$  line of hydrogen in Lyman series, the energies associated with the electron in each of the orbits involved in the transition (in  $\text{kcal mol}^{-1}$ ) are  
 a)  $-313.6, -34.84$                       b)  $-313.6, -78.4$                       c)  $-78.4, -34.84$                       d)  $-78.4, -19.6$
486. The wavelengths of the radiations emitted when in a H atom, electron falls from infinity to stationary state 1, is:  
 a)  $9.1 \times 10^{-8} \text{ nm}$                       b) 192 nm                                  c) 406 nm                                  d) 91 nm
487. The values of quantum numbers for the outermost electron in scandium ( $\text{Sc} = 21$ ) are:  
 a)  $n = 3, l = 2$                       b)  $n = 3, l = 3$                       c)  $n = 4, l = 0$                       d)  $n = 2, l = 3$
488. Ultraviolet light of 6.2 eV falls on aluminium surface (work function = 4.2eV). The kinetic energy (in joule) of the fastest electron emitted is approximately:  
 a)  $3 \times 10^{-21}$                       b)  $3 \times 10^{-19}$                       c)  $3 \times 10^{-17}$                       d)  $3 \times 10^{-15}$
489. The number of spherical nodes in  $3p$  orbitals is  
 a) 0    b) 1    c) 2    d) 3
490. The maximum number of electron in  $p$ -orbital with  $n = 5, m = 1$  is  
 a) 6    b) 2    c) 14    d) 10
491. The species that has same number of electrons as  ${}_{16}\text{S}^{32}$  is:  
 a)  ${}_{16}\text{S}^+$                                   b)  ${}_{17}\text{Cl}^-$                                   c)  ${}_{16}\text{S}^-$                                   d)  ${}_{17}\text{Cl}^+$
492. Select the odd man:



- a) Deuteron                      b) Proton                      c) Electron                      d) Cyclotron
493. Assuming the velocity be same, which sub-atomic particle possesses smallest de Broglie wavelength;  
a) An electron                      b) A proton                      c) An  $\alpha$ -particle                      d) All have same  $\lambda$
494. The chromium has different electronic configuration then what is expected according to aufbau principle because:  
a) Cr is a metal  
b) It belongs to  $d$ -block elements  
c) Half-filled  $d$ -orbitals give extra stability  
d) None of the above
495. If the ionisation potential for hydrogen atom is 13.6eV, then the wavelength of light required for the ionisation of hydrogen atom would be:  
a) 1911 nm                      b) 912 nm                      c) 68 nm                      d) 91.2 nm
496. Bohr's atomic theory gave the idea of:  
a) Quantum numbers                      b) Shape of sub-levels                      c) Nucleus                      d) Stationary states
497. Which species has more electrons than protons?  
a)  $\text{Cl}^-$                       b)  $\text{Ca}^{2+}$                       c)  $\text{K}^+$                       d)  $\text{Sc}^{3+}$
498. Electronic configuration of niobium (Nb = 41) is:  
a)  $[\text{Kr}]4d^4, 5s^1$                       b)  $[\text{Kr}]4d^6$                       c)  $[\text{Kr}]4d^3, 5s^2$                       d)  $[\text{Kr}]5s^2 5 p^3$
499. The momentum of radiation of wavelength 0.33 nm is ...kg m sec<sup>-1</sup> .  
a)  $2 \times 10^{-24}$                       b)  $2 \times 10^{-12}$                       c)  $2 \times 10^{-6}$                       d)  $2 \times 10^{-48}$
500. Predict the total spin in  $\text{Ni}^{2+}$  ion:  
a)  $\pm 5/2$                       b)  $\pm 3/2$                       c)  $\pm 1/2$                       d)  $\pm 1$
501. An increasing order (lowest first) for the values of  $e/m$  for electron ( $e$ ), proton ( $p$ ), neutron ( $n$ ) and alpha ( $\alpha$ ) particle is:  
a)  $e, p, n, \alpha$                       b)  $n, \alpha, p, e$                       c)  $n, p, e, \alpha$                       d)  $n, p, \alpha, e$
502. Choose the arrangement which shows the increasing value of  $e/m$  for  $e, p, n$  and  $\alpha$ -particles  
a)  $n < \alpha < p < e$                       b)  $e < p < \alpha < n$                       c)  $n < p < e < \alpha$                       d)  $p < n < \alpha < e$
503. The ' $m$ ' value for an electron in an atom is equal to the number of  $m$  value for  $l = 1$ . The electron may be present in  
a)  $3d_{x^2-y^2}$                       b)  $5f_{x(x^2-y^2)}$                       c)  $4f_{x^3/z}$                       d) None of these
504. The kinetic energy of an electron in the second Bohr's orbit of a hydrogen atom is: ( $a_0$  is Bohr's radius)  
a)  $\frac{h^2}{4\pi^2 m a_0^2}$                       b)  $\frac{h^2}{16\pi^2 m a_0^2}$                       c)  $\frac{h^2}{32\pi^2 m a_0^2}$                       d)  $\frac{h^2}{64\pi^2 m a_0^2}$
505. Number of electrons in nucleus of an element of atomic number 14 is:  
a) Zero                      b) 14                      c) 7                      d) 20
506. When an electron of charge  $e$  and mass  $m$  moves with velocity  $u$  about the nuclear charge  $Ze$  in the circular orbit of radius  $r$ , the potential energy of the electron is given by:  
a)  $Ze^2/r$                       b)  $-Ze^2/r$                       c)  $Ze^2/r^2$                       d)  $mu^2/r$
507. The orbital angular momentum of an electron revolving in a  $p$ -orbital is  
a) Zero                      b)  $\frac{h}{\sqrt{2\pi}}$                       c)  $\frac{h}{2\pi}$                       d)  $\frac{1}{2} \frac{h}{2\pi}$
508. The ratio of specific charge  $e/m$  of a proton to that of an  $\alpha$ -particle is:  
a) 1 : 4                      b) 1 : 2                      c) 1 : 1/4                      d) 1 : 1/2
509. Possible values of ' $m$ ' for a given value of  $n$  are:  
a)  $n^2$                       b)  $2l + 1$                       c)  $n$                       d)  $2l$
510. Common name for proton and neutron is  
a) Deuteron                      b) Positron                      c) Meson                      d) Nucleon
511. Two electrons  $A$  and  $B$  in an atom have the following set of quantum numbers:  
 $A: 3, \quad 2, \quad -2, \quad +1/2,$

$B: 3, 0, 0, +1/2,$

Which statement is correct for  $A$  and  $B$ ?

- a)  $A$  and  $B$  have same energy
- b)  $A$  has more energy than  $B$
- c)  $B$  has more energy than  $A$
- d)  $A$  and  $B$  represents same electron

512. Radius of nucleus is proportional to ...where  $A$  is mass number

- a)  $A$
- b)  $A^{1/3}$
- c)  $A^2$
- d)  $A^{2/3}$

513. The energy levels for  ${}_Z A^{(+z-1)}$  can be given by:

- a)  $E_n$  for  $A^{(+z-1)} = Z^2 \times E_n$  for H
- b)  $E_n$  for  $A^{(+z-1)} = Z \times E_n$  for H
- c)  $E_n$  for  $A^{(+z-1)} = \frac{1}{Z^2} \times E_n$  for H
- d)  $E_n$  for  $A^{(+z-1)} = \frac{1}{Z} \times E_n$  for H

514. The observation that the ground state of nitrogen atom has 3 unpaired electrons in its electronic configuration and not otherwise is associated with

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

515. The energy of the electron in second Bohr's orbit in the hydrogen atom is  $-3.41\text{eV}$ . The energy of the electron in second Bohr's orbit of  $\text{He}^+$  ion would be:

- a)  $-85\text{ eV}$
- b)  $-13.62\text{ eV}$
- c)  $-1.70\text{ eV}$
- d)  $-6.82\text{ eV}$

516. As an electron is brought from an infinite distance close to the nucleus of the atom, the energy of the electron-nucleus system:

- a) Increases to a greater positive value
- b) Decreases to a smaller positive value
- c) Decreases to a greater negative value
- d) Decreases to a smaller negative value

517. Beryllium's fourth electron will have the four quantum numbers:

$n \quad l \quad m \quad s$

- a) 1 0 0 +1/2
- b) 1 1 1 +1/2
- c) 2 0 0 +1/2
- d) 2 1 0 +1/2

518. The electrons would go to lower energy levels first and then to higher energy levels according to which of the following?

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

519. When the speed of electron increase, the specific charge:

- a) Decreases
- b) Increases
- c) Remains same
- d) None of these

520. In the absence of magnetic field  $p$ -orbitals are known as... fold degenerate

- a) Three
- b) Two
- c) One
- d) Four

521. In hydrogen spectrum least energetic transition of electrons are found in:

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

522. The electronic configuration of an element is  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^5, 4s^2$ . This represents its

- a) Cationic form
- b) Anionic form
- c) Ground state
- d) Excited state

523. A body of mass  $x$  kg is moving with a velocity of  $100\text{ms}^{-1}$ . Its de-Broglie wavelength is  $6.62 \times 10^{-35}\text{m}$ .

Hence,  $x$  is ( $h = 6.62 \times 10^{-34}\text{Js}$ )

- a) 0.1 kg
- b) 0.25 kg
- c) 0.15 kg
- d) 0.2 kg

524. Maximum number of electrons in a subshell with  $l = 3$  and  $n = 4$  is:

- a) 10
- b) 12
- c) 14
- d) 16

525. One energy difference between the states  $n = 2$  and  $n = 3$  is  $E$  eV, in hydrogen atom. The ionisation potential of H atom is:
- a)  $3.2 E$                       b)  $5.6 E$                       c)  $7.2 E$                       d)  $13.2 E$
526. The first emission line in the electronic spectrum of hydrogen in the Balmer series appears at  $\text{cm}^{-1}$
- a)  $\frac{9R}{400} \text{cm}^{-1}$                       b)  $\frac{7R}{144} \text{cm}^{-1}$                       c)  $\frac{3R}{4} \text{cm}^{-1}$                       d)  $\frac{5R}{36} \text{cm}^{-1}$
527. The probability of finding an electron residing in a  $p_x$  orbital is not zero:
- a) In the  $yz$  plane                      b) In the  $xy$  plane                      c) In the  $y$  direction                      d) In the  $z$  direction
528. What is the electronic configuration of  $\text{Mn}^{2+}$ ?
- a)  $[\text{Ne}]3d^5, 4s^0$                       b)  $[\text{Ar}]3d^5, 4s^2$                       c)  $[\text{Ar}]3d^5, 4s^0$                       d)  $[\text{Ne}]3s^5, 4s^2$
529. Number of neutron in  $\text{C}^{12}$  is
- a) 6                      b) 7                      c) 8                      d) 9
530. Which of the following reaction led to the discovery of neutrons?
- a)  ${}_6\text{C}^{16} + {}_1\text{p}^1 \rightarrow {}_7\text{N}^{14} + {}_0\text{n}^1$                       b)  ${}_4\text{Be}^9 + {}_2\text{He}^4 \rightarrow {}_6\text{C}^{12} + {}_0\text{n}^1$   
 c)  ${}_5\text{B}^{11} + {}_1\text{D}^2 \rightarrow {}_6\text{C}^{11} + {}_0\text{n}^1$                       d)  ${}_4\text{Be}^8 + {}_2\text{He}^4 \rightarrow {}_6\text{C}^{11} + {}_0\text{n}^1$
531. Combination of an  $\alpha$ -particle with a nuclide results in the formation of a new nuclide which has:
- a) Less number of neutrons  
 b) Equal number of electrons  
 c) Lower mass number  
 d) Higher atomic number
532. The radius of which of the following orbit is same as that of the first Bohr's orbit of hydrogen atom?
- a)  $\text{Li}^{2+}(n = 2)$                       b)  $\text{Li}^{2+}(n = 3)$                       c)  $\text{Be}^{3+}(n = 2)$                       d)  $\text{He}^+(n = 2)$
533. Which statement is not correct in case of isotopes of chlorine  ${}_{17}\text{Cl}^{35}$  and  ${}_{17}\text{Cl}^{37}$ ?
- a) Both have same atomic number  
 b) Both have the same number of electrons  
 c) Both have same number of neutrons  
 d) Both have same number of protons
534. Which has minimum number of unpaired  $d$ -electrons?
- a)  $\text{Fe}^{3+}$                       b)  $\text{Co}^{3+}$                       c)  $\text{Co}^{2+}$                       d)  $\text{Mn}^{2+}$
535. The total spin for atoms with atomic number 7, 24, 34 and 36 will be
- a)  $0, \pm 1, \pm 3, \pm 3/2$                       b)  $\pm 1, 0, \pm 3/2, \pm 3$                       c)  $\pm 3/2, \pm 3, \pm 1, 0$                       d)  $\pm 3, \pm 1, 0, \pm 3/2$
536. A photo-sensitive metal is not emitting photo-electrons when irradiated. It will do so when threshold is crossed. To cross the threshold we need to increase :
- a) Intensity                      b) Frequency                      c) Wavelength                      d) None of these
537. The  $KE$  of electron in  $\text{He}^+$  will be maximum in:
- a) 3rd orbit  
 b) 2nd orbit  
 c) 1st orbit  
 d) In orbit with  $n = \infty$
538. Which neutral atom has 18 electrons in its outer shell?
- a)  $\text{Cu}^+$                       b) Pd                      c)  $\text{Mn}^{4+}$                       d) Zn
539. Rutherford scattering formula fails for very small scattering angles because
- a) The kinetic energy of  $\alpha$ - particles is larger  
 b) The gold foil is very thin  
 c) The full nuclear charge of the target atom is partially screened by its electron  
 d) All of the above
540. 3  $p$ -orbital has :
- a) Two non-spherical nodes  
 b) Two spherical nodes

- c) One spherical and one non-spherical node  
d) One spherical and two non-spherical nodes
541. Rutherford's alpha particle scattering experiment eventually led to the conclusion that:  
a) Mass and energy are related  
b) Electrons occupy space around the nucleus  
c) Neutrons are buried deep into the nucleus  
d) The point of impact with matter can be precisely determined
542. The  $d$ -orbital with the orientation along  $X$  and  $Y$  axes is called:  
a)  $d_{z^2}$                       b)  $d_{zx}$                       c)  $d_{yz}$                       d)  $d_{x^2-y^2}$
543. Which of the following transitions are not allowed in the normal electronic emission spectrum of an atom?  
a)  $2s \rightarrow 1s$                       b)  $2p \rightarrow 1s$                       c)  $3d \rightarrow 4p$                       d)  $5p \rightarrow 3s$
544. In an atom two electrons move around the nucleus in circular orbits of radii  $R$  and  $4R$ . The ratio of the time taken by them to complete one revolution is:  
a) 1 : 4                      b) 4 : 1                      c) 1 : 8                      d) 8 : 7
545. The value of Planck's constant is  $6.63 \times 10^{-34}$  Js. The velocity of light is  $3.0 \times 10^8$  m s<sup>-1</sup>. Which value is closest to the wavelength in nanometre of a quantum of light with frequency of  $8 \times 10^{15}$  s<sup>-1</sup>?  
a)  $2 \times 10^{-25}$                       b)  $5 \times 10^{-18}$                       c)  $4 \times 10^{-8}$                       d)  $3 \times 10^7$
546. The number of electrons and protons in an atoms of third alkaline earth metal is  
a)  $e$  20,  $p$  20                      b)  $e$  18,  $p$  20                      c)  $e$  18,  $p$  18                      d)  $e$  19,  $p$  20
547. In photoelectric effect the number of photo-electron emitted is proportional to :  
a) Intensity of incident beam  
b) Frequency of incident beam  
c) Velocity of incident beam  
d) Work function of photo cathode
548. Which of the following statements is wrong about cathode rays?  
a) They produce heating effect  
b) They carry negative charge  
c) They produce  $X$  -rays when strike with material having high atomic masses  
d) None of the above
549. In an atom no two electrons can have the same value for all the quantum numbers. This was proposed by:  
a) Hund                      b) Pauli                      c) Dalton                      d) Avogadro
550. The minimum energy required to eject an electron from an atom is called :  
a) Kinetic energy                      b) Electrical energy                      c) Chemical energy                      d) Work function
551. The orbital angular momentum for an electron revolving in an orbit is  $\frac{h}{2\pi} \sqrt{l(l+1)}$ . Thus momentum for a  $s$ -electron is:  
a)  $\frac{h}{2\pi}$                       b)  $\sqrt{2} \cdot \frac{h}{2\pi}$                       c)  $\frac{1}{2} \cdot \frac{h}{2\pi}$                       d) Zero
552. The binding energy of the electron in the lowest orbit of the hydrogen atom is 13.6 eV. The energies required in eV to remove an electron from three lowest orbits of the hydrogen atom are:  
a) 13.6, 6.8, 8.4 eV                      b) 13.6, 10.2, 3.4 eV                      c) 13.6, 27.2, 40.8 eV                      d) 13.6, 3.4, 1.5 eV
553. The probability of finding the electron in the orbital is  
a) 100%                      b) 90-95%                      c) 70-80%                      d) 50-60%
554. The correct de Broglie relationship is:  
a)  $\frac{\lambda}{mu} = p$                       b)  $\lambda = \frac{h}{mu}$                       c)  $\lambda = \frac{h}{mp}$                       d)  $\lambda m = \frac{u}{p}$
555. The one electron species having ionisation energy of 54.4 eV is  
a) H                      b) He<sup>+</sup>                      c) B<sup>4+</sup>                      d) Li<sup>2+</sup>
556. The correct set of quantum numbers ( $n, l$  and  $m$  respectively) for the unpaired electron of chlorine atom is  
a) 2, 1, 0                      b) 2, 1, 1                      c) 3, 1, 1                      d) 3, 2, 1

557. If  $R_H'$  is the Rydberg constant, then the energy of an electron in the ground state of hydrogen atom is:  
 a)  $\frac{R_H c}{h}$                       b)  $\frac{I}{R_H c h}$                       c)  $\frac{hc}{R_H}$                       d)  $-R_H hc$
558. The radius of hydrogen atom is  $0.53 \text{ \AA}$ . The radius of  ${}_3\text{Li}^{2+}$  is of  
 a)  $1.27 \text{ \AA}$                       b)  $0.17 \text{ \AA}$                       c)  $0.57 \text{ \AA}$                       d)  $0.99 \text{ \AA}$
559. Among the following series of transition metal ions, the one in which all metal ions have  $3d^2$  electronic configuration is (At. no. Ti=22, V=23, Cr=24, Mn=25)  
 a)  $\text{Ti}^{3+}, \text{V}^{2+}, \text{Cr}^{3+}, \text{Mn}^{4+}$     b)  $\text{Ti}^+, \text{V}^{4+}, \text{Cr}^{6+}, \text{Mn}^{7+}$     c)  $\text{Ti}^{4+}, \text{V}^{3+}, \text{Cr}^{2+}, \text{Mn}^{3+}$     d)  $\text{Ti}^{2+}, \text{V}^{3+}, \text{Cr}^{4+}, \text{Mn}^{5+}$
560. Total number of unpaired electrons, in an unexcited atom of atomic number 29 is:  
 a) 1                      b) 2                      c) 3                      d) 4
561. The work function for a metal is 4 eV. To emit a photoelectron of zero velocity from the surface of the metal, the wavelength of incident light should be:  
 a)  $2700 \text{ \AA}$                       b)  $1700 \text{ \AA}$                       c)  $5900 \text{ \AA}$                       d)  $3100 \text{ \AA}$
562. The wave number of the first line in the Lyman series in hydrogen spectrum is  
 a)  $72755.5 \text{ cm}^{-1}$                       b)  $109678 \text{ cm}^{-1}$                       c)  $82258.5 \text{ cm}^{-1}$                       d)  $65473.6 \text{ cm}^{-1}$
563. The nodes present in  $3p$ -orbitals are  
 a) One spherical, one planar                      b) Two spherical  
 c) Two planar                      d) One planar
564. Electronic configuration of deuterium atom is  
 a)  $1s^1$                       b)  $2s^2$                       c)  $2s^1$                       d)  $1s^2$
565. The number of  $d$ -electrons retained in  $\text{Fe}^{2+}$  (At. No. Fe=26) ions is  
 a) 3                      b) 4                      c) 5                      d) 6
566. For azimuthal quantum number  $l = 3$ , the maximum number of electrons will be:  
 a) 2                      b) 6                      c) Zero                      d) 14
567. Which of the following sets of quantum numbers is correct?  
 a)  $n = 5, l = 4, m = 0, s = +\frac{1}{2}$                       b)  $n = 3, l = 3, m = +3, s = +\frac{1}{2}$   
 c)  $n = 6, l = 0, m + 1, s = -\frac{1}{2}$                       d)  $n = 4, l = 2, m = +2, s = 0$
568. Correct energy value order is  
 a)  $ns, np, nd, (n - 1)f$                       b)  $ns, np, (n - 1)d, (n - 2)f$   
 c)  $ns, np, (n - 1)d, (n - 1)f$                       d)  $ns, (n - 1)d, np, (n - 1)f$
569. Which hydrogen like species will have same radius as that of Bohr orbit hydrogen atom?  
 a)  $n = 2, \text{Li}^{2+}$                       b)  $n = 2, \text{Be}^{3+}$                       c)  $n = 2, \text{He}^+$                       d)  $n = 3, \text{Li}^{2+}$
570. The nucleus and an atom can be assumed to be spherical. The radius of the nucleus of mass no.  $A$  is given by  $1.25 \times 10^{-13} \times A^{1/3} \text{ cm}$ . The atomic radius of atom is  $1 \text{ \AA}$ . If the mass no. is 64, the fraction of the atomic volume that is occupied by nucleus is:  
 a)  $1.0 \times 10^{-3}$                       b)  $5.0 \times 10^{-5}$                       c)  $2.5 \times 10^{-2}$                       d)  $1.25 \times 10^{-13}$
571. The expression  $Ze$  gives :  
 a) The charge of  $\alpha$ -particle  
 b) The charge on an atom  
 c) The charge on the nucleus of atomic number  $Z$   
 d) The kinetic energy of an  $\alpha$ -particle
572. Which has the highest number of unpaired electrons?  
 a) Mn                      b)  $\text{Mn}^{5+}$                       c)  $\text{Mn}^{3+}$                       d)  $\text{Mn}^{4+}$
573. The ratio between the neutrons present in carbon and silicon with respect to atomic masses of 12 and 28 is:  
 a) 3 : 7                      b) 7 : 3                      c) 3 : 4                      d) 6 : 28
574. The last electron placed in the third ( $n = 3$ ) quantum shell for:

- a) Kr                                      b) Zn                                      c) Cu                                      d) Ca
575. Which have the same number of *s*-electrons as the *d*-electrons in  $\text{Fe}^{2+}$ ?
- a) Li                                      b) Na                                      c) N                                      d) P
576. The number of spectral lines that can be possible when electrons in 7th shell in different hydrogen atoms return to the 2nd shell, is
- a) 12                                      b) 15                                      c) 14                                      d) 10
577. The value of Rydberg constant is
- a)  $10,9678 \text{ cm}^{-1}$                       b)  $10,9876 \text{ cm}^{-1}$                       c)  $10,8769 \text{ cm}^{-1}$                       d)  $10,8976 \text{ cm}^{-1}$
578. In absence of Pauli exclusion principle, the electronic configuration of Li in ground state may be:
- a)  $1s^2, 2s^2$                               b)  $1s^3$                                       c)  $1s^1, 2s^2$                               d)  $1s^2, 2s^1 2p^1$
579. Which relates to light only as stream of particles?
- a) Diffraction                              b) Photoelectric effect                      c) Interference                              d) Planck's theory
580. Who introduced the concept of electron spin?
- a) Schrödinger  
b) Planck  
c) Bohr  
d) Uhlenbeck and Gaudsmit
581. The unit of wavelength (nm) is equal to:
- a)  $10 \text{ \AA}$                                       b)  $100 \text{ \AA}$                                       c)  $1000 \text{ \AA}$                                       d)  $55 \text{ \AA}$
582. Mass of neutron is ... times the mass of electron
- a) 1840                                      b) 1480                                      c) 2000                                      d) None of these
583. The highest excited state that unexcited hydrogen atom can reach when they are bombarded with 12.2 eV electron is :
- a)  $n = 1$                                       b)  $n = 2$                                       c)  $n = 3$                                       d)  $n = 4$
584. The total number of atomic orbitals in fourth energy level of an atom is:
- a) 4                                      b) 8                                      c) 16                                      d) 32
585. The radius of the first Bohr orbit of hydrogen atom is  $0.529 \text{ \AA}$ . The radius of the third orbit of  $\text{H}^+$  will be
- a)  $8.46 \text{ \AA}$                                       b)  $0.705 \text{ \AA}$                                       c)  $1.59 \text{ \AA}$                                       d)  $4.79 \text{ \AA}$
586. Particles, which can be added to the nucleus of an atom without changing the chemical properties, are called:
- a) Electrons                                      b) Protons                                      c) Neutrons                                      d)  $\alpha$ -particles
587. An electron with values 4, 3,  $-2$  and  $+\frac{1}{2}$  for the set of four quantum numbers  $n, l, m_l$  and  $m_s$ , respectively, belongs to
- a) 4s orbital                                      b) 4p orbital                                      c) 4d orbital                                      d) 4f orbital
588. The total number of electrons that can be accommodated in all the orbitals having principal quantum number 2 and azimuthal quantum number 1 is:
- a) 2                                      b) 4                                      c) 6                                      d) 8
589. When atoms are bombarded with  $\alpha$ -particles suffer deflections while others pass through undeflected. This is because :
- a) The force of attraction on the  $\alpha$ -particle by the oppositely charged electrons is not sufficient  
b) The nucleus occupies much smaller volume compared to the volume of the atom  
c) The force of repulsion on the fast moving  $\alpha$ -particle small  
d) The effect in the nucleus do not have any effect on the  $\alpha$ -particles
590. How many electrons with  $l = 3$  are there in an atom having atomic number 54?
- a) 3                                      b) 10                                      c) 14                                      d) None of these
591. Suppose a completely filled or half filled set of *p* or *d*-orbitals is spherically symmetrical. Point out the species, which is spherical symmetrical?
- a) O                                      b) C                                      c)  $\text{Cl}^-$                                       d) Fe
592. The number of electrons and neutrons of an element is 18 and 20 respectively. Its mass number is

- a) 2                                      b) 17                                      c) 37                                      d) 38
593. Which  $d$ -orbital has different shape from rest of all  $d$ -orbital?  
 a)  $d_{x^2-y^2}$                                       b)  $d_{z^2}$                                       c)  $d_{x^2y}$                                       d)  $d_{xz}$
594. Photoelectric effect is the phenomenon in which:  
 a) Photons come out of a metal when it is hit by a beam of electrons  
 b) Photons come out of the nucleus of an atom under the action of an electric field  
 c) Electrons come out of a metal with a constant velocity which depends on the frequency and intensity of incident light wave  
 d) Electrons come out of a metal with different velocities not greater than a certain value which depends only on the frequency of the incident light wave and not on its intensity
595. Total number of orientations of sublevel in  $n^{\text{th}}$  orbit is:  
 a)  $2n$                                       b)  $2l + 1$                                       c)  $n^2$                                       d)  $2n^2$
596. What is the minimum energy that photons must possess in order to produce photoelectric effect with platinum metal? The threshold frequency for platinum is  $1.3 \times 10^{15} \text{ s}^{-1}$   
 a)  $3.6 \times 10^{-13} \text{ erg}$                                       b)  $8.2 \times 10^{-13} \text{ erg}$                                       c)  $8.2 \times 10^{-14} \text{ erg}$                                       d)  $8.6 \times 10^{-12} \text{ erg}$
597. For an electron in a hydrogen atom, the wave function  $\Psi$  is proportional to  $\exp^{-r/a_0}$ , where  $a_0$  is the Bohr's radius. What is the ratio of the probability of finding the electron at the nucleus to the probability of finding it at  $a_0$ ?  
 a)  $e$                                       b)  $e^2$                                       c)  $\frac{1}{e^2}$                                       d) Zero
598. Millikan's oil drop experiment is used to find:  
 a)  $e/m$  ratio of electron                                      b) Electronic charge  
 c) Mass of an electron                                      d) Velocity of an electron
599. The maximum number of unpaired electrons present in  $4f$ -energy level is:  
 a) 5                                      b) 7                                      c) 10                                      d) 6
600. According to Bohr's model of the hydrogen atom, the radius of a stationary orbit characterised by the principle quantum number  $n$  is proportional to:  
 a)  $n^{-1}$                                       b)  $n$                                       c)  $n^{-2}$                                       d)  $n^2$
601. Which one of the following has unit positive charge and 1 u mass?  
 a) Electron                                      b) Neutron                                      c) Proton                                      d) None of these
602. The frequency of a green light is  $6 \times 10^{14} \text{ Hz}$ . Its wavelength is:  
 a) 500 nm                                      b) 5 nm                                      c) 50,000 nm                                      d) None of these
603. Among the following sets of quantum numbers, which one is incorrect for  $4d$  -electron?  
 a)  $4, 3, 2, +\frac{1}{2}$                                       b)  $4, 2, 1, +\frac{1}{2}$                                       c)  $4, 2, -2, +\frac{1}{2}$                                       d)  $4, 2, 1, -\frac{1}{2}$
604. Nitrogen has the electronic configuration  $1s^2, 2s^2, 2p_x^1, 2p_y^1, 2p_z^1$  and not  $1s^2, 2s^2, 2p_x^2, 2p_x^1, 2p_z^0$ . It was proposed by:  
 a) Aufbau principle  
 b) Pauli's exclusion principle  
 c) Hund's rule  
 d) Uncertainty principle
605. Which one of the following sets of ions represents a collection of isoelectronic species?  
 a)  $\text{K}^+, \text{Cl}^-, \text{Ca}^{2+}, \text{Sc}^{3+}$                                       b)  $\text{Ba}^{2+}, \text{Sr}^{2+}, \text{K}^+, \text{S}^{2-}$                                       c)  $\text{N}^{3-}, \text{O}^{2-}, \text{F}^-, \text{S}^{2-}$                                       d)  $\text{Li}^+, \text{Na}^+, \text{Mg}^{2+}, \text{Ca}^{2+}$
606. The  $e/m$  ratio is maximum for:  
 a)  $\text{D}^+$                                       b)  $\text{He}^+$                                       c)  $\text{H}^+$                                       d)  $\text{He}^{2+}$
607. The principle, which gives a way to fill the electrons in the available energy level is:  
 a) Hund's rule  
 b) Pauli's exclusion principle  
 c) Aufbau principle

- d) None of the above
608. The ground state electronic configuration of nitrogen atom can be represented as  
 a)  $\boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow}$                       b)  $\boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow}$   
 c)  $\boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow} \quad \boxed{1\downarrow}$                       d) All of the above
609. The uncertainty in position of a minute particle of mass 25 g in space is  $10^{-5}$  m. The uncertainty in its velocity (in  $\text{m s}^{-1}$ ) is:  
 a)  $2.1 \times 10^{-34}$                       b)  $0.5 \times 10^{-34}$                       c)  $2.1 \times 10^{-28}$                       d)  $0.5 \times 10^{-23}$
610. Out of first 100 elements, number of elements having electrons in  $3d$ -orbitals are:  
 a) 80                      b) 10                      c) 100                      d) 60
611. Number of electrons in 1.8 mL of  $\text{H}_2\text{O}$  are:  
 a)  $6.02 \times 10^{23}$                       b)  $6.02 \times 10^{24}$                       c)  $6.02 \times 10^{22}$                       d)  $6.02 \times 10^{25}$
612. The number of orbitals present in the shell with  $n = 4$  is  
 a) 8                      b) 16                      c) 18                      d) 32
613. Number of electrons in the outermost orbit of the element of atomic number 15 is:  
 a) 7                      b) 5                      c) 3                      d) 2
614. The angular momentum of electron of H-atom is proportional to:  
 a)  $r^2$                       b)  $\frac{1}{r}$                       c)  $\sqrt{r}$                       d)  $\frac{1}{\sqrt{r}}$
615. The total number of electrons present in 1 mL Mg:  
 (Given density of  ${}_{12}\text{Mg}^{24} = 1.2 \text{ g/mL}$ )  
 a) 0.6 N                      b) 6 N                      c) 2 N                      d) 3 N
616. Which set of quantum number represents the electron of the lowest energy?  
 a)  $n = 2, l = 0, m = 0, s = -1/2$   
 b)  $n = 2, l = 1, m = 0, s = +1/2$   
 c)  $n = 4, l = 0, m = 0, s = +1/2$   
 d)  $n = 4, l = 0, m = 0, s = -1/2$
617. Electron behaves both as a particle and a wave. This was proposed by  
 a) Heisenberg                      b) Gilbert N. Lewis                      c) de-Broglie                      d) L. Rutherford
618. Which of the following is isoelectronic with carbon atom?  
 a)  $\text{N}^+$                       b)  $\text{O}^{2-}$                       c)  $\text{Na}^+$                       d)  $\text{Al}^{3+}$
619. The uncertainty in position for a dust particle ( $m = 10^{-11} \text{ g}$ ; diameter =  $10^{-4} \text{ cm}$  and velocity =  $10^{-4} \text{ cm/s}$ ) will be (The error in measurement of velocity is 1%)  
 a)  $5.27 \times 10^{-4} \text{ cm}$                       b)  $5.27 \times 10^{-5} \text{ cm}$                       c)  $5.27 \times 10^{-6} \text{ cm}$                       d)  $5.27 \times 10^{-7} \text{ cm}$
620. Which is not basic postulate of Dalton's atomic theory?  
 a) Atoms are neither created nor destroyed in a chemical reaction  
 b) In a given compound, the relative number and kinds of atoms are constant  
 c) Atoms of all elements are alike, including their masses  
 d) Each element is composed of extremely small particles called atoms
621. Among the various quantum numbers ( $n, l, m, s$ ) describing an electron, which can have the largest value:  
 a)  $n$                       b)  $l$                       c)  $m$                       d)  $s$
622. The valency orbital configuration of an element with  $Z = 23$  is:  
 a)  $3d^5$                       b)  $3d^3, 4s^2$                       c)  $3d^2, 4s^1 4 p^1$                       d)  $3d^3, 4s^1 4 p^1$
623. A particle of mass, ' $m$ ' when annihilated completely given an energy  $E$  equal to:  
 a)  $mc^2$                       b)  $m/c^2$                       c)  $mc$                       d)  $c^2/m$
624. The correct set of four quantum number for the valence electron of rubidium ( $Z=37$ ) is  
 a)  $n = 5, l = 0, m = 0, s = +1/2$                       b)  $n = 5, l = 1, m = 1, s = +1/2$   
 c)  $n = 5, l = 1, m = 1, s = +1/2$                       d)  $n = 6, l = 0, m = 0, s = +1/2$
625. A photon is :  
 a) A quanta of light (or electromagnetic) energy



- b) A quanta of matter  
 c) A positively charged particle  
 d) An instrument for measuring light intensity
626. Which orbital is dumb-bell shaped?  
 a)  $s$                                       b)  $2p_y$                                       c)  $3s$                                       d)  $3d_z^2$
627. Aufbau principle does not give the correct arrangement of filling up of atomic orbital's in  
 a) Cu and Zn                                      b) Co and Zn                                      c) Mn and Cr                                      d) Cu and Cr
628. Ordinary oxygen contains:  
 a) Only O-16 isotope  
 b) Only O-17 isotope  
 c) A mixture of O-16 and O-18 isotopes  
 d) A mixture of O-16, O-17 and O-18 isotopes
629. The approximate quantum number of a circular orbit of diameter, 20.6 nm of the hydrogen atom according to Bohr's theory is:  
 a) 10                                      b) 14                                      c) 12                                      d) 16
630. A  $p$ -orbital in a given shell can accommodate upto  
 a) Four electrons                                      b) Two electrons with parallel spin  
 c) Six electrons                                      d) Two electrons with opposite spin
631. An electron beam is accelerated through a potential difference of 10,000 volt. The de-Broglie wavelength of the electron beam is  
 a)  $0.123 \text{ \AA}$                                       b)  $0.356 \text{ \AA}$                                       c)  $0.186 \text{ \AA}$                                       d)  $0.258 \text{ \AA}$
632. Transition of electron from  $n = 3$  to  $n = 1$  level results in:  
 a) X-ray spectrum                                      b) Emission spectrum                                      c) Band spectrum                                      d) Infrared spectrum
633. Atomic radius is of the order of  $10^{-8} \text{ cm}$  and nuclear radius of the order of  $10^{-13} \text{ cm}$ . The fraction of atom occupied by nucleus is:  
 a)  $10^{-5}$                                       b)  $10^5$                                       c)  $10^{-15}$                                       d) None of these
634. The ratio of the masses of proton and neutron are:  
 a)  $> 1$                                       b)  $< 1$                                       c)  $= 1$                                       d)  $> \sqrt{1}$
635. If the mass number of an element is  $W$  and its atomic number is  $N$ , then:  
 a) Number of  ${}_{-1}e^0 = W - N$   
 b) Number of protons ( ${}_1H^1$ ) =  $W - N$   
 c) Number of  ${}_0n^1 = W - N$   
 d) Number of  ${}_0n^1 = N$
636. For a particular value of azimuthal quantum number, the total number of magnetic quantum number values are given by  
 a)  $l = \frac{m + 1}{2}$                                       b)  $l = \frac{m - 1}{2}$                                       c)  $l = \frac{2m + 1}{2}$                                       d)  $m = \frac{2l + 1}{2}$
637. The relation between energy of a radiation and its frequency was given by:  
 a) De Broglie                                      b) Einstein                                      c) Planck                                      d) Bohr
638. The filling of  $4p$ -sublevel starts in the element of atomic number:  
 a) 29                                      b) 31                                      c) 35                                      d) 19
639. The angular speed of the electron in the  $n$ th orbit of Bohr hydrogen atom is :  
 a) Directly proportional to  $n$   
 b) Inversely proportional to  $\sqrt{n}$   
 c) Inversely proportional to  $n^2$   
 d) Inversely proportional to  $n^3$
640. The chlorine atom differs from chloride ion in the number of:  
 a) Protons                                      b) Neutrons                                      c) Electrons                                      d) None of these
641. If the ionisation potential for hydrogen atom is 13.6 eV, then the ionisation potential for  $\text{He}^+$  ion should be

- a) 13.6 eV                      b) 6.8 eV                      c) 54.4 eV                      d) 72.2 eV
642. The  $\lambda$  for  $H_\alpha$  line of Balmer series is 6500 Å. Thus,  $\lambda$  for  $H_\beta$  line of Balmer series is :  
 a) 4814 Å                      b) 4914 Å                      c) 5014 Å                      d) 4714 Å
643. According to Bohr's theory, the angular momentum for an electron of 3rd orbit is  
 a)  $3h$                       b)  $1.5h$                       c)  $9h$                       d)  $2\frac{h}{\pi}$
644. The de-Broglie equation applies  
 a) To protons only                      b) To electrons only  
 c) All the material objects in motion                      d) To neutrons only
645. Which of the following electronic configuration is not possible?  
 a)  $1s^2, 2s^2$                       b)  $1s^2, 2s^2 2p^6$                       c)  $[\text{Ar}]3d^{10}, 4s^2 4p^2$                       d)  $1s^2, 2s^2 2p^2, 3s^1$
646. Maximum number of electrons which can be accommodated in a  $g$ -subshell is:  
 a) 14                      b) 18                      c) 12                      d) 20
647. The correct ground state electronic configuration of chromium is  
 a)  $[\text{Ar}]3d^5 4s^1$                       b)  $[\text{Ar}]3d^4 4s^2$                       c)  $[\text{Ar}]3d^6 4s^0$                       d)  $[\text{Ar}]4d^5 4s^1$
648. The ionisation energy of hydrogen atom is 13.6 eV. What will be the ionisation energy of  $\text{He}^+$ ?  
 a) 13.6 eV                      b) 54.4 eV                      c) 122.4 eV                      d) Zero
649. If each hydrogen atom is excited by giving 8.4 eV of energy, then the number of spectral lines emitted is equal to:  
 a) None                      b) Two                      c) Three                      d) Four
650.  $\psi^2$  (psi) the wave function represents the probability of finding electron. Its value depends:  
 a) Inside the nucleus  
 b) Far from the nucleus  
 c) Near the nucleus  
 d) Upon the type of orbital
651. The orbital angular momentum of an electron in a  $d$ -orbital is  
 a)  $\sqrt{6}\frac{h}{2\pi}$                       b)  $\sqrt{2}\frac{h}{2\pi}$                       c)  $\frac{h}{2\pi}$                       d)  $\frac{2h}{2\pi}$
652. The space between the proton and electron in hydrogen atom is:  
 a) Filled with air  
 b) Empty  
 c) Filled with magnetic radiation  
 d) None of the above
653. When  $4f$ -level of an atom is completely filled with electrons, the next electron will enter:  
 a)  $5s$                       b)  $6s$                       c)  $5d$                       d)  $5p$
654. The number of unpaired electrons in  $\text{Fe}^{3+}$  ion is  
 a) 3                      b) 1                      c) 5                      d) 2
655. The number of  $d$ -electrons in  $\text{Fe}^{2+}$  (at. No. of Fe = 26) is not equal to that of the:  
 a)  $p$ -electrons in Ne (at. no. = 10)  
 b)  $s$ -electrons in Mg (at. no. = 12)  
 c)  $d$ -electrons in Fe  
 d)  $p$ -electrons in  $\text{Cl}^-$  (at. no. Cl = 17)
656. When the value of azimuthal quantum number is 1, magnetic quantum number can have values :  
 a)  $-1$  only                      b)  $+1$  only                      c)  $+1, 0, -1$                       d)  $+1$  and  $-1$
657. The H atom electron dropped from  $n = 3$  to  $n = 2$ , then energy emitted is  
 a) 1.9 eV                      b) 12 eV                      c) 10.2 eV                      d) 0.65 eV
658. The  $n + l$  value for the 3  $p$ -energy level is:  
 a) 4                      b) 7                      c) 3                      d) 1
659. The maximum number of sublevels, orbitals and electrons in  $N$ -shell of an atom are respectively

- a) 4, 12, 32                      b) 4, 16, 30                      c) 4, 16, 32                      d) 4, 32, 64
660. A particle having a mass of 1.0 mg has a velocity of 3600 km/h. Calculate the wavelength of the particle ( $h = 6.626 \times 10^{-27}$  erg – s)
- a)  $6.626 \times 10^{-28}$  cm              b)  $6.626 \times 10^{-29}$  cm              c)  $6.626 \times 10^{-30}$  cm              d)  $6.626 \times 10^{-31}$  cm
661. The target used for production of X-ray beam must have:
- a) High melting point and high atomic number  
 b) High melting point and low atomic number  
 c) Low melting point and low atomic number  
 d) Low melting point and high atomic number
662. When photons of energy 4.25 eV strike the surface of a metal *A*, the ejected photoelectrons have maximum kinetic energy,  $T_A$  (expressed in eV) and de Broglie wavelength  $\lambda_A$ . The maximum kinetic energy of photoelectrons liberated from another metal *B* by photons of energy 4.70 eV is  $T_B = T_A - 1.50$  eV. If the de Broglie wavelength of these photoelectrons is  $\lambda_B = 2\lambda_A$ , then which is not correct?
- a) The work function of *A* is 2.25 eV  
 b) The work function of *B* is 3.70 eV  
 c)  $T_A = 2.00$  eV  
 d)  $T_B = 0.5$  eV
663. An electron is in one of the 3*d*-orbitals, which of the quantum number is not possible?
- a)  $l = 1$                                   b)  $n = 3$                                   c)  $m = 1$                                   d)  $m = 2$
664. The momentum of a photon is  $p$ . The corresponding wavelength is:
- a)  $h/p$                                       b)  $hp$                                       c)  $p/h$                                       d)  $h/\sqrt{p}$
665. An electron, a proton and an alpha particle have KE of  $16E$ ,  $4E$  and  $E$  respectively. What is the qualitative order of their de-Broglie wavelengths?
- a)  $\lambda_e > \lambda_p > \lambda_\alpha$                       b)  $\lambda_p = \lambda_\alpha > \lambda_e$                       c)  $\lambda_p < \lambda_e < \lambda_\alpha$                       d)  $\lambda_\alpha < \lambda_e \approx \lambda_p$
666. How many sets of four quantum number are possible for the electrons present in  $\text{He}^{2-}$ ?
- a) 4    b) 3    c) 2    d) None of these
667. Which of the following has the maximum number of unpaired 'd' electrons?
- a)  $\text{Zn}^{2+}$                                       b)  $\text{Fe}^{2+}$                                       c)  $\text{Ni}^{3+}$                                       d)  $\text{Cu}^+$
668. The electrons, identified by quantum number  $n$  and  $l$ ,
- V.  $n = 3; l = 2$   
 VI.  $n = 5; l = 0$   
 VII.  $n = 4; l = 1$   
 VIII.  $n = 4; l = 2$   
 IX.  $n = 4; l = 0$
- can be placed in order of increasing energy, as
- a) I < V < III < IV < II                      b) I < V < III < II < IV                      c) V < I < III < II < IV                      d) V < I < II < III < IV
669. Identify the least stable ion amongst the following
- a)  $\text{Li}^-$     b)  $\text{Be}^-$     c)  $\text{B}^-$     d)  $\text{C}^-$
670. Mass number of atom represents the number of its:
- a) Protons only  
 b) Protons and neutrons  
 c) Protons and electrons  
 d) Neutrons and electrons
671. The equation,  $\lambda = \frac{h}{mv}$  was deduced by
- a) Newton                                      b) de-Broglie                                      c) Planck                                      d) Heisenberg
672. Ionisation potential of hydrogen atom is 13.6 eV. Hydrogen atom in the ground state are excited by monochromatic light of energy 12.1 eV. The spectral lines emitted by hydrogen according to Bohr's theory will be:

- a) One                                      b) Two                                      c) Three                                      d) Four
673. The line spectrum observed when electron falls from the higher level into  $L$ -level is known as:  
 a) Balmer series                              b) Paschen series                              c) Bracket series                              d) None of these
674. Atomic weight of Ne is 20.2. Ne is a mixture of  $\text{Ne}^{20}$  and  $\text{Ne}^{22}$ . Relative abundance of heavier isotope is:  
 a) 90                                      b) 20                                      c) 40                                      d) 10
675. The number of waves in an orbit are  
 a)  $n^2$                                       b)  $n$                                       c)  $n - 1$                                       d)  $n - 2$
676. An ion  $\text{Mn}^{a+}$  has the magnetic moment equal to 4.9 B.M. The value of  $a$  is:  
 a) 3                                      b) 4                                      c) 2                                      d) 5
677. The number of electrons in  $[\text{}_{19}\text{K}^{40}]^-$  is:  
 a) 19                                      b) 20                                      c) 18                                      d) 40
678.  $p$ -orbitals of an atom in presence of magnetic field are;  
 a) Three fold degenerate  
 b) Two fold degenerate  
 c) Non-degenerate  
 d) None of these
679. In 'aufbau principle', the term aufbau represents:  
 a) The name of scientist  
 b) German term meaning for building up  
 c) The energy of electron  
 d) The angular momentum of electron
680. The velocity of electron in the hydrogen atom is  $2.2 \times 10^6 \text{m/s}$ . The de Broglie wavelength for this electron is:  
 a) 33 nm                                      b) 45.6 nm                                      c) 23.3 nm                                      d) 0.33 nm
681. An atom has net charge of  $-1$ . It has 18 electrons and 20 neutrons. Its mass number is:  
 a) 37                                      b) 35                                      c) 38                                      d) 20
682. Which of the following is related with both wave nature and particle nature?  
 a) Interference                              b)  $E = mc^2$                               c) Diffraction                              d)  $E = h\nu$
683. An electron is moving in Bohr's fourth orbit. Its de-Broglie wavelength is  $\lambda$ . What is the circumference of the fourth orbit?  
 a)  $\frac{2}{\lambda}$                                       b)  $2\lambda$                                       c)  $4\lambda$                                       d)  $\frac{4}{\lambda}$
684. Which of the following sets of quantum numbers represents an impossible arrangement?  

$n$	$l$	$m$	$s$		$n$	$l$	$m$	$s$
a) 3	2	-2	$+\frac{1}{2}$		b) 3	2	-3	$+\frac{1}{2}$
c) 4	0	0	$-\frac{1}{2}$		d) 5	3	0	$-\frac{1}{2}$
685. A cricket ball of 0.5 kg is moving with a velocity of 100m/s. The wavelength associated with its motion is  
 a) 0.01 cm                                      b)  $6.6 \times 10^{-34} \text{m}$                                       c)  $1.32 \times 10^{-35} \text{m}$                                       d)  $6.6 \times 10^{-28} \text{m}$
686. The ratio between kinetic energy and the total energy of the electrons of hydrogen atom according to Bohr's model is:  
 a) 1 : -1                                      b) 1 : 1                                      c) 1 : 2                                      d) 2 : 1
687. Binding energy of hydrogen atom is 13.6 eV. The binding energy of a singly ionised helium atom is:  
 a) 13.6 eV                                      b) 27.2 eV                                      c) 54.4 eV                                      d) 3.4 eV
688. Calculate the velocity of an electron having wavelength of 0.15 nm Mass of an electron is  $9.109 \times 10^{-28} \text{g}$ . ( $h = 6.626 \times 10^{-27} \text{erg-s}$ ).  
 a)  $0.262 \times 10^{-8} \text{cm.s}^{-1}$                                       b)  $2.062 \times 10^{-15} \text{cm.s}^{-1}$                                       c)  $4.84 \times 10^8 \text{cm.s}^{-1}$                                       d)  $2.062 \times 10^{-9} \text{cm.s}^{-1}$
689. Einstein's theory of photoelectric effect is based on  
 a) Maxwell's electromagnetic theory of light                                      b) Planck's quantum theory of light

- c) Both of the above                                      d) None of the above
690. Which orbital does not possess angular node?  
 a) s                                      b) p                                      c) d                                      d) f
691. The azimuthal quantum number for an electron in a 5d-orbital is:  
 a) May be zero  
 b) Two  
 c) Can have any value less than 5 but greater than zero  
 d) May be +5 to −5 including zero
692. What is the wavelength of an  $\alpha$ -particle having mass  $6.6 \times 10^{-27}$  kg moving with a speed of  $10^5$  cm s<sup>-1</sup>?  
 ( $h = 6.6 \times 10^{-34}$  kg m<sup>2</sup> – s)  
 a)  $2 \times 10^{-12}$  m                      b)  $3 \times 10^{-10}$  m                      c)  $1 \times 10^{-10}$  m                      d)  $2 \times 10^{-10}$  m
693. A transition element X has configuration [Ar]3d<sup>5</sup> in its +3 oxidation state. Its atomic number is:  
 a) 22                                      b) 25                                      c) 26                                      d) 19
694. The maximum energy is possessed by an electron, when it is present  
 a) In nucleus                                      b) In ground state  
 c) In first excited state                      d) At infinite distance from the nucleus
695. The radii of two of the first four Bohr's orbits of the hydrogen atom are in the ratio 1 : 4. The energy difference between them may be:  
 a) either 12.09 eV or 3.4 eV  
 b) either 2.55 eV or 10.2 eV  
 c) either 13.6 eV or 3.4 eV  
 d) either 3.4 eV or 0.85 eV
696. The frequency of light emitted for the transition  $n=40$  to  $n=2$  of He<sup>+</sup> is equal to the transition in H atom corresponding to which of the following?  
 a)  $n = 3$  to  $n = 1$                       b)  $n = 2$  to  $n = 1$                       c)  $n = 3$  to  $n = 2$                       d)  $n = 4$  to  $n = 3$
697. What is the atomic number of the element with  $M^{2+}$  ion having electronic configuration [Ar]3d<sup>8</sup>?  
 a) 25                                      b) 28                                      c) 27                                      d) 26
698. The first emission line of Balmer series for H-spectrum has the wave no. equal to:  
 a)  $\frac{9R_H}{400}$  cm<sup>-1</sup>                      b)  $\frac{7R_H}{144}$  cm<sup>-1</sup>                      c)  $\frac{3R_H}{4}$  cm<sup>-1</sup>                      d)  $\frac{5R_H}{36}$  cm<sup>-1</sup>
699. Which statement does not form part of Bohr's model of the hydrogen atom?  
 a) Energy of the electrons in the orbit is quantized  
 b) The electron in the orbit nearest the nucleus is in the lowest energy  
 c) Electrons revolve in different orbits around the nucleus  
 d) The position and velocity of the electrons in the orbit cannot be determined simultaneously
700. If  $r$  is the radius of first orbit, the radius of  $n^{th}$  orbit of the H atom will be  
 a)  $rn^2$                                       b)  $rn$                                       c)  $\frac{r}{n}$                                       d)  $r^2n^2$
701. Neutron was discovered by:  
 a) Thomson                                      b) Chadwick                                      c) Bohr                                      d) Rutherford
702. The frequency of radiations emitted when electron falls from  $n = 4$  to  $n = 1$  in H atom would be:  
 (Given  $E_1$  for H =  $2.18 \times 10^{-18}$  J atom<sup>-1</sup> and  $h = 6.625 \times 10^{-34}$  Js.)  
 a)  $1.54 \times 10^{15}$  s<sup>-1</sup>                      b)  $1.03 \times 10^{15}$  s<sup>-1</sup>                      c)  $3.08 \times 10^{15}$  s<sup>-1</sup>                      d)  $2.0 \times 10^{15}$  s<sup>-1</sup>
703. Nuclides:  
 a) Have same number of protons  
 b) Have specific atomic numbers  
 c) Have specific atomic number and mass numbers  
 d) Are isotopes
704. The compound in which cation is isoelectronic with anion is  
 a) NaCl                                      b) CsF                                      c) NaI                                      d) K<sub>2</sub>S

705. The electronic configuration of silver atom in ground state is:  
 a)  $[\text{Ar}]3d^{10}, 4s^1$       b)  $[\text{Xe}]4f^{14}, 5d^{10}, 6s^1$       c)  $[\text{Kr}]4d^{10}, 5s^1$       d)  $[\text{Kr}]4d^9, 5s^2$
706.  $n$  and  $l$  values of an orbital "A" are 3 and 2 and of another orbital "B" are 5 and 0. The energy of:  
 a) B is more than A  
 b) A is more than B  
 c) A and B are of same energy  
 d) None of the above
707. Which is correct in case of  $p$ -orbitals?  
 a) They are spherical  
 b) They have a strong directional character  
 c) They are five fold degenerate  
 d) They have no directional character
708. X-rays and  $\gamma$ -rays of same energies may be distinguished by:  
 a) Velocity      b) Ionizing power      c) Intensity      d) Method of production
709. A neutral atom always consist of :  
 a) Protons  
 b) Neutrons + protons  
 c) Neutrons + electrons  
 d) Neutrons + protons + electrons
710. A photon of 300 nm is absorbed by a gas then re-emits two photons. One re-emitted photon has wavelength 496 nm, the wavelength of second re-emitted photon is:  
 a) 757      b) 857      c) 957      d) 657
711. If uncertainties in the measurement of position and momentum of an electron are equal, the uncertainty in the measurement of velocity is  
 a)  $8.0 \times 10^{12} \text{ ms}^{-1}$       b)  $4.2 \times 10^{10} \text{ ms}^{-1}$       c)  $8.5 \times 10^{10} \text{ ms}^{-1}$       d)  $6.2 \times 10^{10} \text{ ms}^{-1}$
712. If the quantum number for the 5<sup>th</sup> electron in carbon atoms are 2,1,1,+1/2, then for the 6<sup>th</sup> electron, these values would be  
 a) 2, 1, 0,  $-\frac{1}{2}$       b) 2, 0, 1,  $+\frac{1}{2}$       c) 2, 1, 1,  $-\frac{1}{2}$       d) 2, 1,  $-1$ ,  $+\frac{1}{2}$
713. A patient is asked to drink  $\text{BaSO}_4$  solution for examining the stomach by X-rays, because X-rays are:  
 a) Less absorbed by heavy atoms  
 b) More absorbed by heavy atoms  
 c) Diffracted by heavy atoms  
 d) Refracted by heavy atoms
714. Which of the following is correct for number of electrons, number of orbitals respectively in  $n$ -orbit?  
 a) 4, 4 and 8      b) 4, 8 and 16      c) 32, 16 and 4      d) 4, 16 and 32
715. Which has highest  $e/m$  ratio?  
 a)  $\text{He}^{2+}$       b)  $\text{H}^+$       c)  $\text{He}^+$       d) H
716. The quantum number sufficient to describe the electron in H atom is:  
 a)  $n$       b) 1      c)  $m$       d)  $s$
717. If an isotope of hydrogen has two neutrons in its atom, its atomic number and mass number will be:  
 a) 2 and 1      b) 3 and 1      c) 1 and 1      d) 1 and 3
718. The radius of hydrogen atom in the ground state is  $0.53 \text{ \AA}$ . The radius of  $\text{Li}^{2+}$  ion (atomic number =3) in a similar state is  
 a)  $0.176 \text{ \AA}$       b)  $0.30 \text{ \AA}$       c)  $0.53 \text{ \AA}$       d)  $1.23 \text{ \AA}$
719. The speed of the cathode rays is:  
 a) Equal to light  
 b) Less than light  
 c) Greater than light

- d) May be less than, greater than or equal to light
720. Bohr model can explain
- The solar spectrum
  - The spectrum of hydrogen molecule
  - Spectrum of any atom or ion containing one electron only
  - The spectrum of hydrogen atom only
721. Which represents the correct set up of the four quantum numbers of 4s-electron?
- 4, 3, 2, +1/2
  - 4, 2, 1, 0
  - 4, 3, -2, +1/2
  - 4, 0, 0, 1/2
722. Electron in the atom are held by:
- Coulombic forces
  - Nuclear forces
  - Gravitational forces
  - Van der Waals' forces
723. According to Bohr's theory, the angular momentum of an electron in 5th orbit is
- $25 \frac{h}{\pi}$
  - $1.0 \frac{h}{\pi}$
  - $10 \frac{h}{\pi}$
  - $2.5 \frac{h}{\pi}$
724. Positron is:
- Electron with +ve charge
  - A helium nucleus
  - A nucleus with two protons
  - A nuclear with one neutron and one proton
725. The line spectra of two elements are not identical because
- The elements do not have the same number of neutrons
  - They have different mass numbers
  - Their outermost electrons are at different energy levels
  - All of the above
726. Which of the following expressions gives the de-Broglie relationship?
- $p = \frac{h}{mv}$
  - $\lambda = \frac{h}{mv}$
  - $\lambda = \frac{h}{mp}$
  - $\lambda m = \frac{v}{p}$
727. Three electrons in *p*-sublevel must have the quantum number:
- $n = 2$
  - $m = 0$
  - $l = 0$
  - $s = -1/2$  or  $+1/2$
728. The number of vacant *d*-orbitals in completely excited Cl atom is:
- 2
  - 3
  - 1
  - 4
729. The planck's constant has a unit of :
- Work
  - Energy
  - Angular momentum
  - Linear momentum
730. The quantum numbers of most energetic electron in Ne atom when it is in first excited state is:
- 2, 1, 0, +1/2
  - 3, 1, 1, +1/2
  - 3, 0, 0, +1/2
  - 3, 1, 0, +1/2
731. The charge to mass ratio of  $\alpha$ -particle is approximately ... the charge to mass ratio of protons
- Six times
  - Four times
  - Half
  - Two times
732. The number of photons emitted per second by a 60 W source of monochromatic light of wavelength 663 nm is ( $h = 6.63 \times 10^{-34}$  Js)
- $4 \times 10^{-20}$
  - $1.54 \times 10^{20}$
  - $3 \times 10^{-20}$
  - $2 \times 10^{20}$
733. Density of the electron is:
- $2.77 \times 10^{12}$  g/mL
  - $4.38 \times 10^{17}$  g/mL
  - $2.17 \times 10^{14}$  g/mL
  - None of these
734. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant =  $1.097 \times 10^7 \text{ m}^{-1}$ )
- 91 nm
  - 192 nm
  - 406 nm
  - $9.1 \times 10^{-8}$  nm
735. The number of electrons accommodated in an orbit with principle quantum number 2, is
- 2
  - 6
  - 10
  - 8
736. Suppose  $10^{-17}$  J of light energy is needed by the interior of a human eye to see an object. Calculate the number of photons of green light ( $\lambda = 550$  nm) needed to generate this minimum amount of energy
- 26
  - 27
  - 28
  - 29

737. A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be:  
 a)  $6.6 \times 10^{-32}$  m      b)  $6.6 \times 10^{-34}$  m      c)  $1.0 \times 10^{-35}$  m      d)  $1.0 \times 10^{-32}$  m
738. Which of the following is correct?  
 a)  ${}_1\text{H}^1$  and  ${}_2\text{He}^3$  are isotopes      b)  ${}_6\text{C}^{14}$  and  ${}_7\text{N}^{14}$  are isotopes  
 c)  ${}_{19}\text{K}^{39}$  and  ${}_{20}\text{Ca}^{40}$  are isotones      d)  ${}_9\text{F}^{19}$  and  ${}_{11}\text{Na}^{24}$  are isodiaphers
739. Nuclear theory of the atom was put forward by  
 a) Rutherford      b) Aston      c) Neils Bohr      d) J.J. Thomson
740. Which of the following is not permissible arrangement of electrons in an atom?  
 a)  $n = 3, l = 2, m = -2, s = -1/2$   
 b)  $n = 4, l = 0, m = 0, s = -1/2$   
 c)  $n = 5, l = 3, m = 0, s = +1/2$   
 d)  $n = 3, l = 2, m = -3, s = -1/2$
741. The measurement of the electron position is associated with an uncertainty in momentum, which is equal to  $1 \times 10^{-18}$  g cm s<sup>-1</sup>. The uncertainty in electron velocity is:  
 (mass of an electron is  $9 \times 10^{-28}$  g)  
 a)  $1 \times 10^6$  cm s<sup>-1</sup>      b)  $1 \times 10^5$  cm s<sup>-1</sup>      c)  $1 \times 10^{11}$  cm s<sup>-1</sup>      d)  $1.1 \times 10^9$  cm s<sup>-1</sup>
742. The two electrons in K-sub shell will differ in  
 a) Principal quantum number      b) Azimuthal quantum number  
 c) Magnetic quantum number      d) Spin quantum number
743. An atom having even number of electrons may be:  
 a) Diamagnetic  
 b) Paramagnetic  
 c) Diamagnetic or paramagnetic  
 d) None of the above
744. Dual nature of particles was proposed by  
 a) Heisenberg      b) Lowry      c) de-Broglie      d) Schrodinger
745. In photoelectric effect, the number of photoelectrons emitted is proportions to  
 a) Intensity of incident beam      b) Frequency of incident beam  
 c) Wavelength of incident beam      d) All of the above
746. A ball of mass 200 g is moving with a velocity of 10 m sec<sup>-1</sup>. If the error in measurement of velocity is 0.1%, the uncertainty in its position is:  
 a)  $3.3 \times 10^{-31}$  m      b)  $3.3 \times 10^{-27}$  m      c)  $5.3 \times 10^{-25}$  m      d)  $2.64 \times 10^{-32}$  m
747. The number of radial nodes of 3s and 2p-orbitals are respectively  
 a) 2, 0      b) 0, 2      c) 1, 2      d) 2, 11
748. The mass of a photon with wavelength 3.6 Å is  
 a)  $6.135 \times 10^{-29}$  kg      b)  $3.60 \times 10^{-29}$  kg      c)  $6.135 \times 10^{-33}$  kg      d)  $3.60 \times 10^{-27}$  kg
749. Correct set of four quantum numbers of a 4d-electron is:  
 a) 4, 3, -2, 1/2      b) 4, 2, -1, 0      c) 4, 3, -2, +1/2      d) 4, 2, -1, -1/2
750. The orbital angular momentum of an electron in 3s-orbital is  
 a)  $\frac{1}{2} \cdot \frac{h}{2\pi}$       b)  $\frac{h}{2\pi}$       c)  $\frac{1}{3} \cdot \frac{h}{2\pi}$       d) Zero
751. The uncertainties in the velocities of two particles A and B are 0.05 and 0.02 ms<sup>-1</sup> respectively. The mass of B is five times to that of mass A. What is the ratio of uncertainties  $\left(\frac{\Delta x_A}{\Delta x_B}\right)$  in their positions?  
 a) 2      b) 0.25      c) 4      d) 1
752. Which of the following statement is relation to the hydrogen atom is correct?  
 a) 3s, 3p and 3d-orbitals all have the same energy  
 b) 3s and 3p-orbitals is lower energy than 3d-orbital  
 c) 3p-orbital is lower in energy than 3d-orbital  
 d) 3s-orbital is lower in energy than 3p-orbital



753. Atoms in hydrogen gas have preponderance of:  
 a)  ${}_1\text{H}^1$  atoms  
 b) Deuterium atoms  
 c) Tritium atoms  
 d) All the three (a),(b) and (c) are in equal ratio
754. The energy of the electron at infinite distance from the nucleus in Bohr's model is taken as:  
 a) Zero  
 b) Positive  
 c) Negative  
 d) Any value
755. The quantum numbers for the last electron in an atom are  $n = 3, l = 1$  and  $m = -1$ . The atom is:  
 a) Al  
 b) Si  
 c) Mg  
 d) C
756. The maximum number of electrons possible in a sublevel is equal to:  
 a)  $2l + 1$   
 b)  $2n^2$   
 c)  $2l^2$   
 d)  $4l + 2$
757. The quantum number for the last electrons of an atom are  $n = 2, l = 0, m = 0, s = +1/2$ . The atom is:  
 a) Lithium  
 b) Boron  
 c) Carbon  
 d) Hydrogen
758. The radius of second stationary orbit in Bohr's atoms is  $R$ . The radius of third orbit will be:  
 a)  $3R$   
 b)  $9R$   
 c)  $2.25 R$   
 d)  $R/3$
759. Number of  $f$ -orbitals associated with  $n = 5$  is:  
 a) 7  
 b) 5  
 c) 9  
 d) 10
760. The number of  $d$ -electrons retained in  $\text{Fe}^{2+}$  ion is :  
 a) 5  
 b) 6  
 c) 3  
 d) 4
761. The triad of nuclei which is isotonic is  
 a)  ${}^{14}_6\text{C}, {}^{14}_7\text{N}, {}^{17}_9\text{F}$   
 b)  ${}^{14}_6\text{C}, {}^{14}_7\text{N}, {}^{19}_9\text{F}$   
 c)  ${}^{14}_6\text{C}, {}^{15}_7\text{N}, {}^{17}_9\text{F}$   
 d)  ${}^{12}_6\text{C}, {}^{14}_7\text{N}, {}^{19}_9\text{F}$
762. The wavelength of a spectral line in Lyman series, when electron jumps back from 2nd orbit, is  
 a)  $1162 \text{ \AA}$   
 b)  $1216 \text{ \AA}$   
 c)  $1362 \text{ \AA}$   
 d)  $1176 \text{ \AA}$
763. Ionisation energy of  $\text{He}^+$  is  $19.6 \times 10^{-18} \text{ J atom}^{-1}$ . The energy of the first stationary state ( $n = 1$ ) of  $\text{Li}^{2+}$  is  
 a)  $4.41 \times 10^{-16} \text{ J atom}^{-1}$   
 b)  $-4.41 \times 10^{-17} \text{ J atom}^{-1}$   
 c)  $-2.2 \times 10^{-15} \text{ J atom}^{-1}$   
 d)  $8.82 \times 10^{-17} \text{ J atom}^{-1}$
764. The energy of second Bohr orbit of the hydrogen atom is  $-328 \text{ kJ mol}^{-1}$ ; hence the energy of fourth Bohr orbit would be  
 a)  $-41 \text{ kJ mol}^{-1}$   
 b)  $-1312 \text{ kJ mol}^{-1}$   
 c)  $-164 \text{ kJ mol}^{-1}$   
 d)  $-82 \text{ kJ mol}^{-1}$
765. In hydrogen spectrum most energetic transitions of electrons are found in:  
 a) Balmer series  
 b) Bracket series  
 c) Paschen series  
 d) Lyman series
766. The ratio of specific charge ( $e/m$ ) of an electron to that of a hydrogen ion is:  
 a) 1 : 1  
 b) 1840 : 1  
 c) 1 : 1840  
 d) 2 : 1
767. Which property of elements is not a whole number?  
 a) Mass number  
 b) Atomic number  
 c) Average atomic weight  
 d) None of these
768. The maximum kinetic energy of the photoelectrons is found to be  $6.63 \times 10^{-19} \text{ J}$ . When the metal is irradiated with a radiation of frequency  $2 \times 10^{15} \text{ Hz}$ , the threshold frequency of the metal is about  
 a)  $2 \times 10^{15} \text{ s}^{-1}$   
 b)  $1 \times 10^{15} \text{ s}^{-1}$   
 c)  $2.5 \times 10^{15} \text{ s}^{-1}$   
 d)  $4 \times 10^{15} \text{ s}^{-1}$
769. Which of the following is Heisenberg uncertainty principle?  
 a)  $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$   
 b)  $\Delta x \cdot \Delta p = \frac{h}{4\pi}$   
 c)  $\Delta x \cdot \Delta p \leq \frac{h}{4\pi}$   
 d)  $\Delta x \cdot \Delta p < \frac{h}{4\pi}$
770. Which of the following make up an isotonic triad?  
 a)  ${}^{78}_{32}\text{Ge}, {}^{77}_{33}\text{As}, {}^{74}_{31}\text{Ga}$   
 b)  ${}^{40}_{18}\text{Ar}, {}^{40}_{19}\text{K}, {}^{40}_{20}\text{Ca}$   
 c)  ${}^{233}_{92}\text{U}, {}^{232}_{90}\text{Th}, {}^{239}_{94}\text{Pu}$   
 d)  ${}^{14}_6\text{C}, {}^{16}_8\text{O}, {}^{15}_7\text{N}$
771. The magnetic quantum number for valency electron of sodium is:  
 a) 3  
 b) 2  
 c) 1  
 d) Zero
772. Which pair has elements containing same number of electrons in the outermost orbit?

- a) Cl and Br                      b) Ca and Cl                      c) Na and Cl                      d) N and O
773. The electromagnetic radiation with maximum wavelength is:  
 a) Ultraviolet                      b) Radiowaves                      c) X-ray                      d) Infrared
774. An element contains:  
 a) Only one type of nuclide  
 b) Two types of nuclides  
 c) Different types of nuclides  
 d) None of the above
775. Which of the following statements is incorrect?  
 a) The charge on electron and proton are equal and opposite  
 b) Neutrons have no charge  
 c) The mass of proton and electron are nearly the same  
 d) None of the above
776. Heaviest particle is:  
 a) Meson                      b) Neutron                      c) Proton                      d) Electron
777. The set of quantum numbers for the outermost electron for copper in its ground state is  
 a)  $4, 1, 1, +\frac{1}{2}$                       b)  $3, 2, 2, +\frac{1}{2}$                       c)  $4, 0, 0, +\frac{1}{2}$                       d)  $4, 2, 2, +\frac{1}{2}$
778. A certain negative ion  $X^{2-}$  has in its nucleus 18 neutrons and 18 electrons in its extra nuclear structure. What is the mass number of the most abundant isotope of X?  
 a) 36                      b) 35.46                      c) 32                      d) 39
779. Atom containing an odd number of electron is:  
 a) Ferromagnetic                      b) Ferrimagnetic                      c) Paramagnetic                      d) Diamagnetic
780. Amplification of electromagnetic waves by simulated emission of radiation produces:  
 a) Polarised light                      b) Neutrons                      c) Laser                      d)  $\gamma$ -rays
781. In the discharge tube emission of cathode rays requires:  
 a) Low potential and low pressure  
 b) Low potential and high pressure  
 c) High potential and high pressure  
 d) High potential and low pressure
782. Which electron transition in a hydrogen atom requires the largest amount of energy?  
 a) From  $n = 1$  to  $n = 2$     b) From  $n = 2$  to  $n = 3$     c) From  $n = \infty$  to  $n = 1$     d) From  $n = 3$  to  $n = 5$
783. The number of electrons in the valence shell of calcium is  
 a) 2                      b) 4                      c) 6                      d) 8
784. A cricket ball of 0.5 kg is moving with a velocity of 100 m/s. The wavelength associated with its motion is  
 a) 1/100 cm                      b)  $6.6 \times 10^{-34}$ m                      c)  $1.32 \times 10^{-35}$ m                      d)  $6.6 \times 10^{-28}$ m
785. A body of mass 10 mg is moving with a velocity of  $100 \text{ ms}^{-1}$ . The wavelength of de-Broglie wave associated with it would be  
 ( $h = 6.63 \times 10^{-34}$ J.s)  
 a)  $6.63 \times 10^{-35}$ m                      b)  $6.63 \times 10^{-34}$ m                      c)  $6.63 \times 10^{-31}$ m                      d)  $6.63 \times 10^{-37}$ m
786. The absolute value of the charge on electron was determined by  
 a) J.J. Thomson                      b) R.A. Millikan                      c) Rutherford                      d) Chadwick
787. Which of the following will violates aufbau principle as well as Pauli's exclusion principle?  
 a) 

1s	2s	2p
1↓	1↓	1↓ 1↓ 1↓

                      b) 

1s	2s	2p
1↓	1↓	1↓ 1↓ 1↓

  
 c) 

1s	2s	2p
1↓	1↓	1↓ 1↓ 1↓

  
 d) None of the above
788. The angular momentum of an electron in an atomic orbital is governed by the:  
 a) Principal quantum number

- b) Azimuthal quantum number  
c) Magnetic quantum number  
d) Spin quantum number
789. In Bohr's model of the hydrogen atom the ratio between the period of revolution of an electron in the orbit  $n = 1$  to the period of revolution of the electron in the orbit  $n = 2$  is:  
a) 1 : 2                      b) 2 : 1                      c) 1 : 4                      d) 1 : 8
790. The "spin-only" magnetic moment [in unit of Bohr magneton, ( $\mu_B$ )] of  $\text{Ni}^{2+}$  in aqueous solution would be:  
(At. no. Ni = 28)  
a) 2.84                      b) 4.90                      c) 0                      d) 1.73
791. The atoms in a molecule vibrate around their mean position by stretching or bending out of place. These vibration and the energy they carry are studied by:  
a) X-ray spectra              b) Visible spectra              c) IR spectra              d) UV spectra
792. The maximum number of electrons that can have principle quantum number,  $n = 3$  and spin quantum number,  $m_s = -\frac{1}{2}$ , is  
a) 3                      b) 5                      c) 7                      d) 9
793. Maximum number of electrons present in "N" shell is:  
a) 18                      b) 32                      c) 2                      d) 8
794. Which electronic level will allow the hydrogen atom to absorb photon but not to emit?  
a) 1s                      b) 2s                      c) 2p                      d) 2d
795. The mass of electron moving with velocity of light is:  
a)  $2m_e$                       b)  $3m_e$                       c) Infinite                      d) Zero
796. The electron configuration of the oxide ion is much most similar to the electron configuration of the  
a) Sulphide ion              b) Nitride ion              c) Oxygen atom              d) Nitrogen atom
797. If  $S_1$  be the specific charge ( $e/m$ ) of cathode ray and  $S_2$  be that of positive rays, then which is true?  
a)  $S_1 = S_2$               b)  $S_1 < S_2$               c)  $S_1 > S_2$               d) Either of these