GPLUS EDUCATION

Date :
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ATOMS

Single Correct Answer Type

1. First Bohr radius of an atom with $Z = 82$ is R. Radius of its third orbit is
a) $9\ R$ b) $6\ R$ c) $3\ R$ d) R

2. In the Bohr model of a hydrogen atom, the centripetal force is furnished by the coulomb attraction between the proton and the electron. If a_o is the radius of the ground state orbit, m is the mass and e is charge on the electron and ε_o is the vacuum permittivity, the speed of the electron is
a) 0 b) $\frac{e}{\sqrt{\varepsilon_0 a_0 m}}$ c) $\frac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$ d) $\sqrt{\frac{4\pi\varepsilon_0 a_0 m}{e}}$

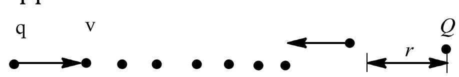
3. In Bohr's model of hydrogen atom, which of the following pairs of quantities are quantized?
a) Energy and linear momentum b) Linear and angular momentum
c) Energy and angular momentum d) None of the above

4. Energy required for the electron excitation in Li^{2+} from the first to the third Bohr orbit is
a) 36.3 eV b) 108.8 eV c) 122.4 eV d) 12.1eV

5. The ratio of minimum wavelength of Lyman and Balmer series will be
a) 10 b) 5 c) 0.25 d) 1.25

6. The ionisation potential of hydrogen atom is -13.6 eV. An electron in the ground state of a hydrogen atoms absorbs a photon of energy 12.75 eV. How many different spectral line can one expect when the electron make a downward transition?
a) 1 b) 4 c) 2 d) 6

7. A charged particle q is shot towards another charged particle Q which is fixed, with a speed v. It approaches Q upto a closest distance r and then returns. If q was given a speed $2v$, the closest distance of approach would be



a) r b) $2r$ c) $r/2$ d) $r/4$

8. Ionization potential of hydrogen atom is13.6 eV. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy 12.1 eV. According to Bohr's theory, the spectral lines emitted by hydrogen will be
a) Two b) Three c) Four d) One

9. The first member of the Balmer's series of the hydrogen has a wavelength λ, the wavelength of the second member of its series is
a) $\frac{27}{20}\lambda$ b) $\frac{20}{27}\lambda$ c) $\frac{27}{20}\lambda$ d) None of these

10. The ratio of areas of the electron orbits for the first excited state and the ground state for the hydrogen atom is
a) 4:1 b) 16:1 c) 8:1 d) 2:1

11. The acceleration of electron in the first orbit of hydrogen atom is
a) $\frac{4\pi^2 m}{h^3}$ b) $\frac{h^2}{4\pi^2 mr}$ c) $\frac{h^2}{4\pi^2 m^2 r^3}$ d) $\frac{m^2 h^2}{4\pi^2 r^3}$

12. An α-particle of energy 5 MeV is scattered through $180°$ by a fixed uranium nucleus. The distance of the closest approach is of the order of
a) 1Å b) 10^{-10} cm c) 10^{-12} cm d) 10^{-15} cm

13. In Raman effect, Stokes' lines are spectral lines having
    a) Frequency greater than that of the original line
    b) Wavelength equal to that of the original line
    c) Wavelength less than that of the original line
    d) Wavelength greater than that of the original line
14. Suppose an electron is attracted towards the origin by a force $\frac{k}{r}$, where k is constant and r is the distance of the electron from the origin. By applying Bohr model to this system, the radius of the nth orbital of the electron is found to be r_n and the kinetic energy of the electron to be T_n. Then which of the following is true?
    a) $T_n \propto \frac{1}{n^2}, r_n \propto n^2$
    b) T_n independent of $n, r_n \propto n$
    c) $T_n \propto \frac{1}{n}, r_n \propto n$
    d) $T_n \propto \frac{1}{n}, r_n \propto n^2$
15. What is the difference of angular momenta of an electron in two consecutive orbits in hydrogen atom?
    a) $\frac{h}{2}$ b) $\frac{h}{\pi}$ c) $\frac{2\pi}{h}$ d) $\frac{h}{2\pi}$
16. The Kinetic energy of the electron in an orbit of radius r in hydrogen atom is (e =electronic charge)
    a) $\frac{e^2}{r^2}$ b) $\frac{e^2}{2r}$ c) $\frac{e^2}{r}$ d) $\frac{e^2}{2r^2}$
17. Imagine an atom made up of proton and a hypothetical particle of double the mass of electron, but having the same charge as that of electron. Apply the Bohr atom model and consider all possible transitions of this hypothetical particle to the first excited level. The longest wavelength photon that will be emitted has wavelength λ,(given in terms of Rydberg constant R for hydrogen atom) equal to
    a) $\frac{9}{5R}$ b) $\frac{36}{5R}$ c) $\frac{18}{5R}$ d) $\frac{4}{R}$
18. If E_P and E_K are the potential energy and kinetic energy of the electron in stationary orbit in the hydrogen atom, the value of $\frac{E_P}{E_K}$ is
    a) 2 b) -1 c) 1 d) -2
19. Let the PE of hydrogen atom in the ground state be zero. Then its total energy in the first excited state will be
    a) 27.2 eV b) 23.8 eV c) 12.6 eV d) 10.2 eV
20. An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of closest approach for the alpha nucleus will be proportional to
    a) v^2 b) 1/m c) $1/v^4$ d) $1/Ze$
21. A photon collides with a stationary hydrogen atom in ground state inelastically. Energy of the colliding photon is 10.2 eV. After a time interval of the order of micro second another photon collides with same hydrogen atom inelastically with an energy of 15n eV. What will be observed by the detector?
    a) 2 photon of energy 10.2 eV.
    b) 2 photon of energy of 1.4 eV.
    c) One photon of energy 10.2 eV and an electron of energy 1.4 eV
    d) One photon of energy 10.2 eV and another photon of energy 1.4 eV
22. Which state of triply ionised beryllium (Be^{3+}) has the same orbital radius as that of ground state of hydrogen?
    a) $n = 3$ b) $n = 4$ c) $n = 1$ d) $n = 2$
23. The energy of an electron in nth orbit of the hydrogen atom is given by $E_n = \frac{-13.6}{n^2}$eV The energy required to raise an electron from the first orbit to the second orbit will be
    a) 10.2 eV b) 12.1 eV c) 13.6 eV d) 3.4 eV
24. When a hydrogen atom is bombarded, the atom is excited to then $n = 4$ state. The energy released, when

the atom goes from $n = 4$ state to the ground state is

a) 1.275 eV b) 12.75 eV c) 5 eV d) 8 eV

25. Energy E of a hydrogen atom with principal quantum number n is given by $E = -\frac{13.6}{n^2}$ eV.The energy of a photon ejected when the electron jumps from n =3 state to $n = 2$state of hydrogen , is approximately

a) 1.5 eV b) 0.85 eV c) 3.4 eV d) 1.9 eV

26. In the Bohr model of the hydrogen atom, let $R, V$and E represent the radius of the orbit, the speed of electron and the total energy of the electron respectively. Which of the following quantities is proportional to quantum number n?

a) $\frac{R}{E}$ b) $\frac{E}{V}$ c) RE d) VR

27. For ionising an excited hydrogen atom, the energy required (in eV) will be

a) A little less than 13.6 b) 13.6 c) More than 13.6 d) 3.4 or less

28. In hydrogen atom, the electron is moving round the nucleus with velocity 2.18×10^6 ms^{-1} in an orbit of radius 0.528 Å. The acceleration of the electron is

a) 9×10^{18} ms^{-2} b) 9×10^{22} ms^{-2} c) 9×10^{-22} ms^{-2} d) 9×10^{12} ms^{-2}

29. The angular momentum of electron in hydrogen atom is proportional to

a) $\sqrt{r}$ b) $1/r$ c) r^2 d) $1/\sqrt{r}$

30. For an electron in the second orbit of Bohr's hydrogen atom, the moment of linear momentum is

a) $n\pi$ b) $2\pi h$ c) $\frac{2h}{\pi}$ d) $\frac{h}{\pi}$

31. If the electron is a hydrogen atom jumps from an orbit with level $n_1 = 3$ to an orbit with level $n_1 = 2$, the emitted radiation has a wavelength given by

a) $\lambda = \frac{36}{5R}$ b) $\lambda = \frac{5R}{36}$ c) $\lambda = \frac{6}{R}$ d) $\lambda = \frac{R}{6}$

32. In a hydrogen atom, the electron moves around the nucleus in a circular orbit of radius 5×10^{-11}m. Its time period is 1.5×10^{-16}.The current associated with the electron motion is (charge of electron is 1.6×10^{-16} C)

a) 1.00 A b) 1.066×10^{-3} A c) 1.81×10^{-3} A d) 1.66×10^{-3} A

33. Let the potential energy of hydrogen atom in the ground state be regarded as zero. Then its potential energy in the first excited state will be

a) 20.4 eV b) 13.6 eV c) 3.4 eV d) 10.2eV

34. If the shortest wavelength in the Lyman series is 911.6 Å, the longest wavelength in the same series will be

a) 1600 Å b) 2430Å c) 1215 Å d) ∞

35. According to Bohr's atomic model, the relation between principal quantum number(n) and radius of orbit(r) is

a) $r \propto n^2$ b) $r \propto \frac{1}{n^2}$ c) $r \propto \frac{1}{n}$ d) $r \propto n$

36. The atomic number and the mass number of an atom remains unchanged when it emits

a) a photon b) a neutron c) β −particle d) An α − particle

37. The Rydberg constant R for hydrogen is

a) $R = -\left(\frac{1}{4\pi\varepsilon_0}\right)\frac{2\pi^2 me^2}{ch^2}$ b) $R = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{2\pi^2 me^2}{ch^2}$

c) $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2\frac{2\pi^2 me^2}{c^2h^2}$ d) $R = \left(\frac{1}{4\pi\varepsilon_0}\right)^2\frac{2\pi^2 me^4}{ch^3}$

38. For light of wavelength 5000 Å, photon energy is nearly 2.5 eV. For X-rays of wavelength 1 Å, the photon energy will be close to

a) $[2.5 \div 5000]$eV b) $[2.5 \div (5000)^2]$eV c) $[2.5 \times 5000]$eV d) $[2.5 \times (5000)^2]$eV

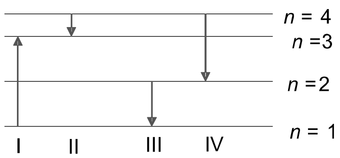
39. Which of the following transition in Balmer series for hydrogen will have longest wavelength?

a) n=2 to n=1 b) n =6 to n=1 c) n =3 to n=2 d) n =6 to n=2

40. Ionization potential of hydrogen atom is 13.6 eV. Hydrogen atoms in the ground state are exicted by monochromatic radiation of photon energy 12.1 eV. The spectral lines emitted by hydrogen atom according to Bohr's theory will be
a) One b) Two c) Three d) Four
41. The ratio of the frequencies of the long wavelength limits of the Lyman and Balmer series of hydrogen is
a) 27: 5 b) 5: 27 c) 4: 1 d) 1: 4
42. Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ. If R is the Rydberg constant, the principal quantum number n of the excited state is
a) $\sqrt{\frac{\lambda R}{\lambda R-1}}$ b) $\sqrt{\frac{\lambda}{\lambda R-1}}$ c) $\sqrt{\frac{\lambda R^2}{\lambda R-1}}$ d) $\sqrt{\frac{\lambda R}{\lambda-1}}$
43. The angular speed of the electric 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
44. The ratio of the wavelengths for $2 \rightarrow 1$ transition in Li^{2+}, He^+ and H is
a) 1:2:3 b) $\frac{1}{9}:\frac{1}{4}:\frac{1}{1}$ c) 1:4:1 d) 3:2:1
45. The ratio of kinetic energy and the total energy of the electron in the nth quantum state of Bohr's atomic model of hydrogen atom is
a) -2 b) -1 c) $+2$ d) $+1$
46. White light is passed through a dilutee solution of potassium permanganate. The spectrum produced by the emergent light is
a) Band emission spectrum b) Line emission spectrum
c) Band absorption spectrum d) Line absorption spectrum
47. The ratio of minimum to maximum wavelength in Balmer series is
a) 5:9 b) 5:36 c) 1:4 d) 3:4
48. Which of the following atoms has the lowest ionization potential?
a) $^{14}_{7}N$ b) $^{133}_{55}Cs$ c) $^{40}_{18}Ar$ d) $^{16}_{8}O$
49. Assuming f to be frequency of first line in Balmer series, the frequency of the immediate next(ie, second) line is
a) 0.50 f b) 1.35 f c) 2.05 f d) 2.70 f
50. Solar spectrum is an example for
a) Line emission spectrum b) Continuous emission spectrum
c) Band absorption spectrum d) Line absorption spectrum
51. The transition from the state n=4 to n=3 in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from
a) $2 \rightarrow 1$ b) $3 \rightarrow 2$ c) $4 \rightarrow 2$ d) $5 \rightarrow 3$
52. An electron of charge e moves with a constant speed v along a circle of radius r, its magnetic moment will be
a) evr b) $evr/2$ c) $\pi r^2 ev$ d) $2\pi rev$
53. The angular momentum (L) of an electron moving in a stable orbit around nucleus is
a) Half integral multiple of $\frac{h}{2\pi}$ b) integral multiple of h
c) integral multiple of $\frac{h}{2\pi}$ d) Half integral multiple of h
54. Mercury vapour lamp gives
a) Continuous spectrum b) Line spectrum
c) Band spectrum d) Absorption spectrum
55. In H spectrum, the wavelength of H_α line is 656 nm whereas in a distance galaxy, the wavelength of H_α line is 706 nm. Estimate the speed of galaxy with respect to earth
a) $2 \times 10^8 ms^{-1}$ b) $2 \times 10^7 ms^{-1}$ c) $2 \times 10^6 ms^{-1}$ d) $2 \times 10^5 ms^{-1}$

56. The largest wavelength in the ultraviolet region of the hydrogen spectrum is 122 nm. The smallest wavelength in the infrared region of the hydrogen spectrum (to the nearest integer) is
a) 802 nm b) 823 nm c) 1882 nm d) 1648 nm
57. Excitation energy of a hydrogen like atom in its first excitation state is 40.8 eV. Energy needed to remove the electron from the ion in ground state is
a) 40.8 eV b) 27.2 eV c) 54.4 eV d) 13.6 eV
58. The shortest wavelength which can be obtained in hydrogen spectrum is ($R = 10^7\ m^{-1}$)
a) 1000 Å b) 800 Å c) 1300 Å d) 2100 Å
59. Electrons in a certain energy level $n = n_1$, can emit 3 spectral lines. When they are in another energy level, $n = n_2$, they can emit 6 spectral lines. The orbital speed of the electrons in the orbits are in the ratio
a) 4:3 b) 3:4 c) 2:1 d) 1:2
60. The ionisation potential of hydrogen atom is 13.6 eV. The energy required to remove an electron from the second orbit of hydrogen will be
a) 27.4 eV b) 13.6 eV c) 3.4 eV d) None of these
61. A neon sign does not produce
a) A line spectrum b) An emission spectrum
c) An absorption spectrum d) Photons
62. If a is radius of first Bohr orbit in hydrogen atom, the radius of the third orbit is
a) 3 a b) 9 a c) 27 a d) 81 a
63. The product of linear momentum and angular momentum of an electron of the hydrogen atom is proportional to n^x, where x is
a) 0 b) 1 c) -2 d) 2
64. In the Bohr's model of the hydrogen atom, the lowest orbit corresponds to
a) Infinite energy b) Maximum energy c) Minimum energy d) Zero energy
65. In the spectrum of hydrogen atom, the ratio of the longest wavelength in Lyman series to the longest wavelength in the Balmer series is
a) 5/27 b) 1/93 c) 4/9 d) 3/2
66. Wavelength of first line in Lyman series is λ. The wavelength of first line in Balmer series is
a) $\frac{5}{27}\lambda$ b) $\frac{36}{5}\lambda$ c) $\frac{27}{5}\lambda$ d) $\frac{5}{36}\lambda$
67. The colour of the second line of Balmer series is
a) Blue b) Yellow c) red d) violet
68. Continuous emission spectrum is produced by
a) Incandescent electric lamp b) Mercury vapour lamp
c) Sodium vapour lamp d) Polyatomic substances
69. Assuming the mass of earth as 6.64×10^{24} kg and the average mass of the atoms that makes up earth as 40 u (atomic mass unit), the number of atoms in the earth is approximately
a) 10^{30} b) 10^{40} c) 10^{50} d) 10^{60}
70. The total energy of an electron in the first excited state of hydrogen is about -3.4eV. Its kinetic energy in this state is
a) $-$ 3.4 eV b) $-$ 6.8 eV c) 6.8 eV d) 3.4 eV
71. What is the maximum wavelength of light emitted in Lyman series by hydrogen atom?
a) 691 nm b) 550 nm c) 380 nm d) 122 nm
72. When hydrogen atom is in its first excited level, its radius is how many times its ground state radius?
a) Half b) Same c) Twice d) Four times
73. If the electron in hydrogen atom jumps from the third to second orbit, the wavelength of the emitted radiation in terms of Rydberg constant R is given by
a) $\lambda = \frac{36}{5R}$ b) $\lambda = \frac{5R}{36}$ c) $\lambda = \frac{5}{R}$ d) $\lambda = \frac{R}{6}$

74. The shortest wavelength in Lyman series is 91.2 nm. The longest wavelength of the series is
a) 121.6 nm b) 182.4 nm c) 234.4 nm d) 364.8 nm
75. In a hydrogen atom, the electron in a given orbit has total energy −1.5 eV. The potential energy is
a) 1.5 eV b) −1.5 eV c) 3.0 eV d) −3.0 eV
76. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy?



a) III b) IV c) I d) II
77. In an inelastic collision an electron excites a hydrogen atom from its ground state to a M-shell state. A second electron collides instantaneously with the excited hydrogen atom in the M-state and ionizes it.At least how much energy the second electron transfers to the atom in the M-state?
a) +3.4 eV b) + 1.51 eV c) - 3.4 eV d) -1.51eV
78. The series limit wavelength of the Lyman series for the hydrogen atom is given by
a) $1/R$ b) $4/R$ c) $9/R$ d) $16/R$
79. The energy of electron in the nth orbit of hydrogen atom is expressed as $\text{En} = \frac{-14.6}{n^2}$ eV. The shortest and longest wavelength of Lyman series will be
a) 910Å, 1213 Å b) 5463 Å , 7858 Å c) 1315 Å, 1530 Å d) None of these
80. Radius of $_2He^4$ nucleus is 3fermi. The radius of $_{82}Pb^{206}$ nucleus will be
a) 5 fermi b) 6 fermi c) 11.16 fermi d) 8 fermi
81. An electron is moving in an orbit of a hydrogen atom from which there can be a maximum of six transition. An electron is moving in an orbit of another hydrogen atom from which there can be a maximum of three transition. The ratio of the velocities of the electron in these two orbits is
a) $\frac{1}{2}$ b) $\frac{2}{1}$ c) $\frac{5}{4}$ d) $\frac{3}{4}$
82. The ionization energy of hydrogen atom is 13.6eV. Following Bohr's theory, the energy corresponding to a transition between 3rd and 4th orbit is
a) 3.40 eV b) 1.51 eV c) 0.85 eV d) 0.66 eV
83. For hydrogen atom electron in n th Bohr orbit, the ratio of radius of orbit to its de-Broglie wavelength is
a) $\frac{n}{2\pi}$ b) $\frac{n^2}{2\pi}$ c) $\frac{1}{2\pi n}$ d) $\frac{1}{2\pi n^2}$
84. The energy of an electron in an excited hydrogen atom is −3.4 eV. Its angular momentum is
a) 3.72×10^{-34} Js b) 2.11×10^{-34} Js c) 1.57×10^{-34} Js d) 1.11×10^{-34} Js
85. The first excitation potential of a given atom is 10.2 V. Then ionisation potential must be
a) 20.4 V b) 13.6 V c) 30.6 V d) 40.8 V
86. The ionisation energy of 10 time ionised sodium atom is
a) $\frac{13.6}{11}$eV b) $\frac{13.6}{112}$eV c) $13.6 \times (11)^2$eV d) 13.6 eV
87. Given that in a hydrogen atom, the energy of nth orbit $E_n = -\frac{13.6}{n^2}$eV. The amount of energy required to send electron from first orbit to second orbit is
a) 10.2 eV b) 12.1 eV c) 13.6 eV d) 3.4 eV
88. The spin-orbit interaction has no effect in the level of the hydrogen atom
a) s −level b) p −level c) d −level d) f −level
89. An α −particle of energy 5MeV is scattered through 180° by a fixed uranium nucleus. The distance of closest approach is of the order of
a) 1 A° b) 10^{-10} cm c) 10^{-12}cm d) 10^{-15}cm

90. The K_α line of singly ionised calcium has a wavelength of 393.3nm as measured on earth. In the spectrum of one of the observed galaxies, the spectral line is located at 401.8 nm. The speed with which this galaxy is moving away from us, will be

a) 7400 ms^{-1} b) 32.4×10^2 ms^{-1} c) 6480kms^{-1} d) None of these

91. The wavelength of the first spectral line in the Balmer series of hydrogen atom is 6561 Å. The wavelength of the second spectral line in the Balmer series of singly ionized helium atom is

a) 1215 Å b) 1640 Å c) 2430 Å d) 4687 Å

92. What is the radius of Iodine atom? (Atomic no.53, mass no.126)

a) 2.5×10^{-11}m b) 2.5×10^{-9}m c) 7×10^{-9}m d) 7×10^{-11}m

93. Hydrogen atom excites energy level from fundamental state to $n = 3$. Number of spectrum lines, according to Bohr, is

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

94. If elements with principal quantum number $n > 4$ not allowed in nature, the number of possible elements would be

a) 60 b) 32 c) 4 d) 64

95. Ionisation potential of hydrogen atom is 13.6 eV. The least energy of photon of Balmer series is

a) 3.4 eV b) 1.89 eV c) 10.2 ev d) 8.5 eV

96. The wavelength of radiation emitted is λ_0 when an electron jumps from the third to the second orbit of hydrogen atom. For the electron jump from the fourth to the second orbit of hydrogen atom,the wavelength of radiation emitted will be

a) $\frac{16}{25}\lambda_0$ b) $\frac{20}{27}\lambda_0$ c) $\frac{27}{20}\lambda_0$ d) $\frac{25}{16}\lambda_0$

97. The first excited state of hydrogen atoms is 10.2 eV above its ground state. The temperature needed to excite hydrogen atoms to first excited level, is

a) 7.9×10^4 K b) 3.5×10^4 K c) $5.8 \times 10^4 K$ d) 14×10^4 K

98. The figure indicates the energy levels of a certain atom. When the system moves from $2E$ level to$E$, a photon of wavelength λ is emitted. The wavelength of photon produced during its transition from $\frac{4E}{3}$level to E is

a) $\frac{\lambda}{3}$ b) $\frac{3\lambda}{4}$ c) $\frac{4\lambda}{3}$ d) 3λ

99. In an atom, the two electrons move round the nucleus in circular orbits of radii R and $4R$. The ratio of the times taken by them to complete one revolution is

a) 1/4 b) 4/1 c) 8/1 d) 1/8

100. The orbital frequency of an electron in the hydrogen atom is proportional to

a) n^3 b) n^{-3} c) n d) n^0

101. The first line of Balmer series has wavelength 6563 Å. What will be the wavelength of the first member of Lyman series?

a) 1215.4 Å b) 2500 Å c) 7500 Å d) 600 Å

102. As the electron in Bohr orbit of hydrogen atom passes from state n=2 to n=1 , the kinetic energy K and potential energy U change as

a) K two-fold, U four-fold b) K four-fold, U two-fold

c) K four-fold, U also four-fold d) K two-fold, U also two-fold

103. Which of the following lines of the H-atom spectrum belongs to the Balmer series?

a) 1025 Å b) 1218 Å c) 4861 Å d) 18751 Å

104. The electric potential between a proton and an electron is given by $V = V_0 \text{ In} \frac{r}{r_0}$, where r_0 is a constant. Assuming Bohr's model to be applicable, write variation of r_n with n, n being the principal quantum number?

a) $r_n \propto n$ b) $r_n \propto \frac{1}{n}$ c) $r_n \propto n^2$ d) $r_n \propto \frac{1}{n^2}$

105. Band spectrum is also called
a) Molecular spectrum
b) Atomic spectrum
c) Flash spectrum
d) Line absorption spectrum

106. The radius of hydrogen atom in its ground state is 5.3×10^{-11} m. After collision with an electron it is found to have a radius of 212×10^{-11} m. What is the principal quantum number n of the final state of atom?
a) $n = 4$
b) $n = 2$
c) $n = 16$
d) $n = 3$

107. In terms of Bohr radius a_o, the radius of the second Bohr orbit of a hydrogen atoms is given by
a) $4\ a_o$
b) $8\ a_o$
c) $\sqrt{2}\ a_o$
d) $2\ a_o$

108. The production of band spectra is caused by
a) Atomic nuclei
b) Hot metals
c) Molecules
d) electrons

109. If the radii of nuclei of ${}_{13}Al^{27}$ and ${}_{30}Zn^{64}$ are R_1 and R_2 respectively, then $\frac{R_1}{R_2}$ is equal to
a) $\frac{27}{64}$
b) $\frac{64}{27}$
c) $\frac{4}{3}$
d) $\frac{3}{4}$

110. Three photons coming from excited atomic hydrogen sample are observed, their energies are 12.1 eV, 10.2 eV and 1.9 eV. These photons must come from
a) Single atom
b) Two atoms
c) Three atoms
d) Either two or three atom

111. Electrons in the atom are held to the nucleus by
a) Coulomb's forces
b) Nuclear forces
c) Van der Waals' forces
d) Gravitational forces

112. The magnetic moment of the ground state of an atom whose open sub-shell is half-filled with five electrons is
a) $\sqrt{35}\sqrt{\mu_B}$
b) $35\ \mu_B$
c) $35\sqrt{\mu_B}$
d) $\mu_B\sqrt{35}$

113. The wavelength of the first spectral line of sodium is 5896 Å. The first excitation potential of sodium atom will be ($h = 6.63 \times 10^{-34}$Js)
a) 4.2 V
b) 3.5 V
c) 2.1 V
d) None of these

114. If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and Paschen series respectively, then $\lambda_1 : \lambda_2$ is
a) 1:3
b) 1:30
c) 7:50
d) 7:108

115. The energy of a hydrogen atom in its ground state is -13.6eV. The energy of the level corresponding to the quantum number $n = 5$ is
a) -0.54 eV
b) -5.40 eV
c) 20.58 eV
d) -2.72 eV

116. If the atom ${}_{100}Fm^{257}$ follows the Bohr model and the radius of ${}_{100}Fm^{257}$ is n times the Bohr radius, then find n.
a) 100
b) 200
c) 4
d) 1/4

117. In Rutherford scattering experiment, what will be the correct angle for α scattering for an impact parameter b=0?
a) 90°
b) 270°
c) 0°
d) 180°

118. Consider an electron in the nth orbit of a hydrogen atom in the Bohr model. The circumference of the orbit can be expressed in terms of the de-Broglie wavelength λ of that electron as
a) $(0.529)\ n\lambda$
b) $\sqrt{n}\ \lambda$
c) $(13.6)\lambda$
d) $n\lambda$

119. The spectral series of the hydrogen atom that lies in the visible ragion of the electromagnetic spectrum
a) Paschen
b) Balmer
c) Lyman
d) Brackett

120. An electron collides with a hydrogen atom in its ground state and excites it to n=3. The energy given to hydrogen atom in this inelastic collision is(neglect the recoiling of hydrogen atom)
a) 10.2 eV
b) 12.1 eV
c) 12.5 eV
d) None of these

121. The required energy to detach one electron from Balmer series of hydrogen spectrum is

a) 13.6 eV b) 10.2 eV c) 3.4 eV d) −1.5 eV

122. V_1 is the frequency of the series limit of Lyman series, V_2 is the frequency of the first line of Lyman series and V_3 is the frequency of the series limit of the Balmer series. Then

a) $v_1 - v_2 = v_3$ b) $v_1 = v_2 - v_3$ c) $\frac{1}{v_2} = \frac{1}{v_1} + \frac{1}{v_3}$ d) $\frac{1}{v_1} = \frac{1}{v_2} + \frac{1}{v_3}$

123. The ionisation potential of mercury is 10.39 V. How far an electron must travel in an electric field of 1.5×10^6 Vm^{-1} to gain sufficient energy to ionize mercury?

a) $\frac{10.39}{1.5 \times 10^6} \times 1.0 \times 10^{-19}$ m b) $\frac{10.39}{1.5 \times 10^6}$m

c) $1.39 \times 1.6 \times 10^{-19}$ m d) $\frac{10.39}{1.6 \times 10^{-19}}$m

124. Which of the following transition gives the photon of minimum frequency?

a) n=2 to n=1 b) n =3 to n=1 c) n =3 to n=2 d) n =4 to n=3

125. If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{2+} is

a) 30.6 eV b) 13.6 eV c) 3.4 eV d) 122.4 eV

126. If series limit of Balmer series is 6400 Å, then series limit of Paschen series will be

a) 6400 Å b) 18680 Å c) 14400 Å d) 2400 Å

127. 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 the three lowest orbits of the hydrogen atom are

a) 13.6, 6.8, 8.4 b) 13.6, 10.2, 3.4 c) 13.6, 27.2, 40.8 d) 13.6, 3.4, 1.5

128. An electron of an atom transits from n_1 to n_2. In which of the following maximum frequency of photon will be emitted?

a) n_1=1 to n_2=2 b) n_1=2 to n_2=1 c) n_1=2 to n_2=6 d) n_1=6 to n_2=2

129. Rutherford's atomic model could account for

a) Concept of stationary orbits b) The positively charged control core of an atom

c) Origin of spectra d) Stability of atoms

130. An electron jumps from the 4th orbit to 2nd orbit of hydrogen atom. Given the Rydberg's constant $R = 10^5$ cm $^{-1}$, the frequency in hertz of the emitted radiation will be

a) $\frac{3}{16} \times 10^5$ b) $\frac{3}{16} \times 10^{15}$ c) $\frac{9}{16} \times 10^{15}$ d) $\frac{3}{4} \times 10^{15}$

131. Hydrogen atoms are excited from ground state of the principal quantum number 4. Then the number of spectral lines observed will be

a) 3 b) 6 c) 5 d) 2

132. Number of neutrons in C^{12} and C^{14} are

a) 8 and 6 b) 6 and 8 c) 6 and 6 d) 8 and 8

133. In the Bohr model of hydrogen atom, the electron is pictured to rotate in a circular orbit of radius 5×10^{-11} m, at a speed 2.2×10^6 ms^{-1}. What is the current associated with electron motion?

a) 1.12 mA b) 3 mA c) 0.75 mA d) 2.25 mA

134. The nucleus of an atom consists of

a) Electrons and protons b) Electrons, protons and neutrons

c) Electrons and Neutrons d) Neutrons and protons

135. Ionization energy of He^+ ion at minimum position is

a) 13.6 eV b) 27.2 eV c) 54.4 eV d) 68.0 eV

136. The ratio of minimum wavelengths of Lyman and Balmer series will be

a) 1.25 b) 0.25 c) 5 d) 10

137. According to Bohr's theory of hydrogen atom, for the electron in the nth allowed orbit the

(i) Linear momentum is proportional to $1/n$

(ii)Radius is proportional to n

(iii)Kinetic energy is proportional to $1/n^2$

(iv) Angular momentum is proportional to n

Choose the correct option from the codes given below.

a) (i),(iii),(iv) are correct b) (i) is correct

c) (i),(ii) are correct d) (iii) is correct

138. The ratio of the energies of the hydrogen atom in its first to second excited states is

a) 9/4 b) 4/1 c) 8/1 d) 1/8

139. Two energy lavels of an electron in an atom are separated by 2.3 eV. The frequency of radiation emitted when the electrons go from higher to lower level is

a) 6.95×10^{14} Hz b) 3.68×10^{15} Hz c) 5.6×10^{14} Hz d) 9.11×10^{15} Hz

140. When an electron jumps from the orbit $n = 2$ to $n = 4$,then wavelength of the radiations absorbed will be (R is Rydberg's constant)

a) $\frac{3R}{16}$ b) $\frac{5R}{16}$ c) $\frac{16}{5R}$ d) $\frac{16}{3R}$

141. The spectrum of an oil flame is an example for

a) Line emission spectrum b) Continuous emission spectrum

c) Line absorption spectrum d) Band emissionspectrum

142. In a hypothetical bohr hydrogen atom, the mass of the electron is doubled. The energy $E_o$and energy r_o of the first orbit will be (a_o is the Bohr radius)

a) $E_o = -27.2\text{eV}; r_o = a_o/2$ b) $E_o = -27.2\text{eV}; r_o = a_o$

c) $E_o = -13.6\text{eV}; r_o = a_o/2$ d) $E_o = -13.6\text{eV}; r_o = a_o$

143. At the time of total solar eclipse, the spectrum of solar radiation will have

a) A large number of dark Fraunhofer lines

b) A smaller number of dark Fraunhofer lines

c) No lines at all

d) All Fraunhofer lines changed into bright coloured lines

144. Bohr's atom model assumes

a) The nucleus is of infinite mass and is at rest

b) Electrons in a quantized orbit will not radiate energy

c) Mass of electron remains constant

d) All the above conditions.

145. The ratio of minimum to maximum wavelength in Balmer series is

a) 5: 9 b) 5: 36 c) 1: 4 d) 3: 4

146. The ground state energy of hydrogen atom is −13.6 eV. When its electron is in the first excited state, its excitation energy is

a) 3.4 eV b) 6.8 eV c) 10.2 eV d) zero

147. Wavelength of light emitted from second orbit to first orbit in a hydrogen atom is

a) 6563 Å b) 4102 Å c) 4861 Å d) 1215 Å

148. If λ is the wavelength of hydrogen atom from the transition n =3 to n=1, then what is the wavelength for doubly ionised lithium ion for same transition?

a) $\frac{\lambda}{3}$ b) 3λ c) $\frac{\lambda}{9}$ d) 9λ

149. If the wavelength of the first line of the balmer series of hydrogen is 6561Å, the wavelength of the second line of the series should be

a) 13122 Å b) 3280 Å c) 4860 Å d) 2187 Å

150. If an electron is revolving around the hydrogen nucleus at a distance of 0.1 nm, what would be its speed?

a) $2.188 \times 106\ \text{ms}^{-1}$ b) $1.094 \times 106\ \text{ms}^{-1}$ c) $4.376 \times 106\ \text{ms}^{-1}$ d) $1.59 \times 106\ \text{ms} - 1$

151. The acceleration of electron in the first orbit of hydrogen atom is

a) $\frac{4\pi^2 m}{h^3}$ b) $\frac{h^2}{4\pi^2 mr}$ c) $\frac{h^2}{2\pi^2 m^2 r^3}$ d) $\frac{m^2 h^2}{4\pi^2 r^3}$

152. In a hydrogen atom, the electron is making $6.6 \times 10^{15} revs^{-1}$ around the nucleus in an orbit of radius 0.528 Å.The magnetic moment (Am^2) will be

a) 1×10^{-15} b) 1×10^{-10} c) 1×10^{-23} d) 1×10^{-27}

153. The ratio of longest wavelength and the shortest wavelength observed in the fifth spectral series of emission spectrum of hydrogen is

a) 4/3 b) 525/376 c) 36/11 d) 960/11

154. The ionization energy of Li^{2+} is equal to

a) $9hcR$ b) $6\ hcR$ c) $2\ hcR$ d) hcR

155. The wavelengths involved in the Spectrum of deuterium (^2_1D) are slightly different from that of hydrogen Spectrum, because

a) Sizes of the two nuclei are different
b) Nuclear forces are different in the two cases
c) Masses of the two nuclei are different
d) Attraction between the electron and the nucleus is different in the two cases.

156. Of the following transition in the hydrogen atom, the one which gives an emission line of the highest frequency is

a) $n=1$ to $n=2$ b) $n=2$ to $n=1$ c) $n=3$ to $n=10$ d) $n=10$ to $n=3$

157. The wave number of the energy emitted when electron comes from fourth orbit to second orbit in hydrogen is 20,397 cm^{-1}. The wave number of the energy for the same transition in He^+ is

a) 5,099 cm^{-1} b) 20,497 cm^{-1} c) 14400 Å d) 81,588 cm^{-1}